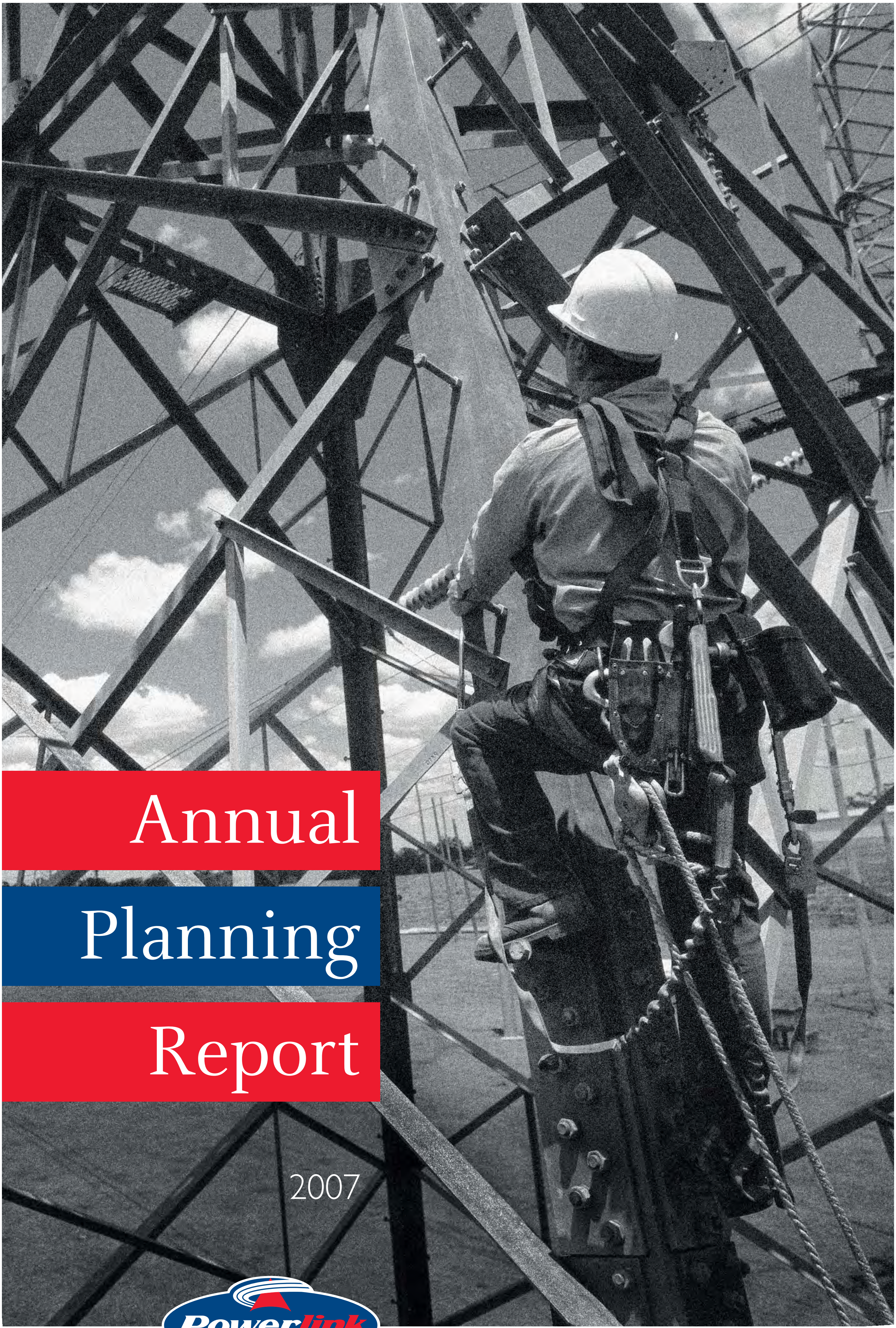

Annual Planning Report

2007

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EXECUTIVE SUMMARY

Transmission network planning and development are integral to Powerlink Queensland meeting its obligations. This Annual Planning Report (APR) is a key part of the process. It provides information about the Queensland electricity transmission network to Registered Participants and interested parties. It includes information on electricity demand forecasts, the existing electricity supply system including committed generation and network developments, as well as estimates of grid capability and potential network and non-network developments required in the future to meet growing customer demand for electricity in a timely manner.

Electricity Demand Forecast

Electricity usage in Queensland has grown strongly during the past ten years, and this trend is expected to continue in the next ten years. The summer maximum electricity demand (weather and diversity corrected) has grown significantly over the past five years with a state-wide growth of 29%, and a growth of 38% in South East Queensland.

The growth in summer maximum electricity demand delivered from the transmission grid is forecast to remain high for the next three years, with slightly lower growth for the rest of the ten year forecast period. On average, summer maximum electricity demand is forecast to increase at an average rate of 3.9% per annum from 7,935MW in 2006/07 to 11,612MW in 2016/17.

The continuing high forecast growth in demand for the next three summers (5% per annum) is attributable to the expected continuation of rapidly increasing penetration and usage of domestic air conditioners, and growth in the mining industry. The former factors are particularly evident in South East Queensland, where the forecast summer weather corrected demand growth for the next three years is 6% per annum. Beyond 2009/10, domestic air conditioning penetration is forecast to slow, which will cause the annual demand growth rate to move closer to the long term average of about 4% per annum.

The forecast high level of demand growth will require substantial future augmentation to the Queensland transmission network to ensure grid capability keeps pace with demand, particularly in the south eastern part of the state.

Electricity Energy Forecast

Annual energy to be supplied by the Queensland transmission grid is forecast to increase at an average rate of 3.8% per annum over the next ten years for the medium economic growth scenario.

These latest energy forecasts are generally consistent with those from the 2006 and 2005 APRs, which predicted state-wide energy growth of 3.4% and 3.2% per annum respectively. However, due to the mild 2006 winter and 2006/07 summer, which resulted in low energy usage for the year, the ten year energy growth rate has increased slightly because of the lower starting base.

A noticeable feature of the 2006 forecast energy growth was that the highest growth rates were expected to occur in the early years of the ten year outlook period. This expectation remains current and is mainly due to an upward revision in electricity consumption in the coal mining sector over the next five years, the effect of increasing penetration of domestic air conditioning, some new small industrial loads and the continuation of strong population growth as well as additional water pumping and treatment loads associated with the South East Queensland Water Grid.

Transmission Projects Completed

Significant projects completed since the 2006 Annual Planning Report include:

- The second stage of the Belmont to Murarrie reinforcement, which has augmented transmission capability to the Brisbane CBD and Australia TradeCoast areas;
- Establishment of the Goodna 275/110kV Substation which has augmented transmission capability to the Ipswich and Brisbane South West areas;
- The Greenbank to Maudsland 275kV reinforcement which has augmented transmission capability to the Gold Coast; and
- Establishment of the Algester and Sumner 110kV Substations to augment supply capability to the ENERGEX distribution network.

In addition, support contracts were maintained with power stations in North Queensland to assist in meeting peak electricity demand requirements in the region.

Transmission Projects in Progress

Powerlink is currently implementing the following major augmentation projects.

Three 275kV transmission lines:

- Between Broadsound and Nebo and between Nebo and Strathmore, including an static VAR compensator (SVC) at Strathmore, to increase transfer capability between Central and Northern Queensland;
- Between Middle Ridge (in the Toowoomba area) and Greenbank (in the Logan area) to increase transfer capability between South West and South East Queensland; and
- Between Ross (Townsville) and Yabulu South, including Yabulu South Substation, to increase transfer capability into the Townsville area.

Establishment or augmentation of four 275kV substations:

- New substation at Abermain to augment transmission capability to the Ipswich area;
- New substation at Teebar Creek to augment transmission capability to the Wide Bay area;
- An additional 275/132kV transformer at Woree Substation to augment transmission capability to the Cairns area; and
- An additional 275/110kV transformer at Murarrie Substation to augment transmission capability to the Australia TradeCoast and Brisbane CBD.

Four 132kV transmission lines:

- Between Ross and Townsville South and between Townsville South and Townsville East to augment supply to the southern industrial and eastern CBD areas of Townsville;
- Between Nebo and Pioneer Valley to augment transmission capability to the Mackay and Proserpine areas;
- Between Lilyvale and Blackwater to augment transmission capability to the Central Queensland coal mining areas; and
- Between Bouldercombe and Pandoin to augment transmission capability to Rockhampton and surrounding areas.

Smaller augmentations such as the installation of capacitor banks and transformer upgrades are also underway to satisfy network reliability standards.

Generation Capacity

Market development of new generating capacity in the Queensland region is continuing with a 450MW gas fired power station commissioned at Braemar Substation (near Dalby), and a 750MW coal fired power station at Kogan Creek (near Chinchilla) being commissioned in 2007.

These significant generation developments will alter flows on the Queensland transmission grid, as these generators compete in the wholesale electricity market to supply the forecast electricity demand in Queensland and the interconnected states of New South Wales, Victoria, and South Australia.

Queensland - New South Wales Interconnector (QNI)

The southerly maximum transfer capability of the QNI is 1,078MW. This limit remains conditional on availability of online stability monitoring equipment. Powerlink is continuing to work closely with its New South Wales counterpart, TransGrid, to design and implement controller tunings at various SVCs to allow this limit to be unconditionally available.

Minor works are already underway in New South Wales to improve the availability of the existing QNI maximum transfer capability during summer when there have been thermal limitations on existing transmission plant for both southerly and northerly flows. These works include installation of a phase shifting regulator at Armidale and uprating of one of the existing Armidale to Tamworth 330kV circuits.

Based on preliminary studies undertaken in 2005, Powerlink and TransGrid identified that a low capability upgrade of QNI may be justified based on the Australian Energy Regulator's (AER) revised Regulatory Test.

Powerlink and TransGrid have therefore committed to undertaking full joint studies which are now in progress. These studies will take account of the impact on market benefits of the new Tallawarra 400MW combined cycle gas turbine (CCGT) power station (in the Wollongong area) as well as the impact of the recently announced Uranquinty 600MW and Munmorah 660MW power stations.

It is expected that studies will have progressed to the stage where Powerlink and TransGrid will report the outcomes of the detailed technical and economic studies within the later part of 2007.

Major Flow Paths

Within Queensland, Powerlink's transmission grid performed well over the 2006/07 summer with transfer limits being reached at most grid sections for less than 1% of the time during the six months from October 2006 to March 2007, the period of highest demand.

The Central Queensland to North Queensland (CQ-NQ) limit is managed by the network support arrangements between Powerlink and North Queensland generators which have been approved under the AER Regulatory Test process. The staged CQ-NQ transmission project due for completion between 2007 and 2009 will improve transfer capability to meet forecast electricity demand in North Queensland.

The Central Queensland to South Queensland (CQ-SQ) limit bound for 4.7% of the time over the summer period due to the capacity across this grid section being fully utilised during opportunities to export electricity to New South Wales. Commissioning of new generating plant in Southern Queensland since the 2006/07 summer is expected to reduce flows on this grid section in the 2007/08 summer; however this may be affected by reductions in generation due to water shortage.

The Tarong limit experienced minor binding over the 2006/07 summer. To keep pace with the high load growth in South East Queensland, the Middle Ridge to Greenbank transmission reinforcement along with additional shunt compensation has been committed for the 2007/08 summer. These projects will increase transfer capabilities to ensure reliable transmission is maintained for forecast peak electricity demands in South East Queensland.

The Gold Coast limit bound for around 11% of the time during winter and 0.7% of the time during summer. Even though Powerlink completed a project, in late 2006, to increase the transfer capability of the Gold Coast grid section, binding events on this grid section occurred during periods when spare capability across this grid section was fully utilised by the Terranora Interconnector transferring power into New South Wales. Powerlink has committed projects underway that increase the transfer capability of the Gold Coast grid section to meet forecast load growth in the Gold Coast and Tweed Heads areas.

Future Augmentations

The predominant driver for augmentations to network capability will continue to be the need to maintain reliability standards as demand grows. Powerlink is committed to continually reviewing and expanding its transmission network to meet this need in a timely manner.

The National Electricity Rules requires the APR to identify emerging limitations which are expected to arise some years into the future, assuming that demand for electricity continues to grow as forecast. Early identification allows Powerlink to implement appropriate augmentations to maintain a reliable power supply to customers.

The APR highlights those potential future limitations for which Powerlink intends to implement augmentations or initiate consultation with Registered Participants and interested parties in the near future.

Consultation on Network Augmentations

Powerlink has already issued papers to inform Registered Participants and interested parties about forecast future network limitations in the Bowen, South Queensland and South East Queensland areas, and to seek advice on possible solutions. Powerlink expects to initiate consultation processes for a number of other forecast future network limitations within the next 12 months so that augmentations can be planned and implemented in a timely manner.

This APR also contains details of the following proposed new small network assets:

- Installation of a 132/110kV transformer at Palmwoods Substation on the Sunshine Coast; and
- Installation of a shunt capacitor bank at Belmont Substation in Brisbane.

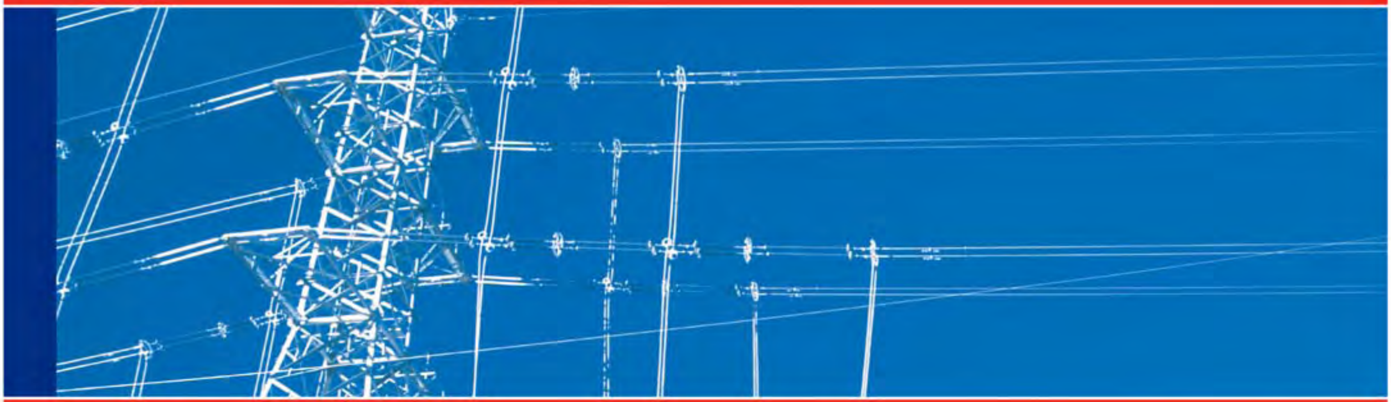
Powerlink invites submissions on these proposed new small network augmentations by 27 July 2007.

Proposed Network Replacements

In addition to developing its network to meet forecast electricity demand, Powerlink is also required to maintain the capability of its existing network. Powerlink undertakes asset replacement projects when assets are determined to reach the end of their technical life.

In response to requests from interested parties, Powerlink has included in this report a list of potential replacement works over the value of $5 million that may occur in the next five years.

CHAPTER ONE
Introduction



1.1 Introduction

Powerlink Queensland is a Transmission Network Service Provider (TNSP) in the National Electricity Market (NEM) that owns, develops, operates and maintains Queensland's high voltage electricity transmission network. It has also been appointed by the Queensland Government as the Jurisdictional Planning Body (JPB) responsible for transmission network planning within the state.

Powerlink as part of its planning responsibilities undertakes an annual planning review of the capability of its transmission network to meet forecast electricity demand requirements. Pursuant to the National Electricity Rules (NER), Powerlink is required to inform industry participants and other interested parties of the findings of this review in its Annual Planning Report (APR) which is published in June each year.

This 2007 APR provides details of Powerlink's latest planning review. The report includes information on electricity demand forecasts, the existing electricity supply system including committed generation and transmission network developments and forecasts of network capability. Emerging limitations in the capability of the network are identified and possible supply solutions to address these limitations are discussed. Interested parties are encouraged to provide input to facilitate identification of the most economic solution to ensure supply reliability can be maintained to customers in the face of continued strong growth in electricity demand.

Powerlink's annual planning review and report are an important part of the process of planning the Queensland transmission network to continue to meet the needs of participants in the NEM and users of electricity in Queensland.

1.2 Context of the Annual Planning Report

All bodies with jurisdictional planning responsibilities in the NEM are required to undertake the annual planning review and reporting process prescribed in the (NER).

Information from this process is also provided to the National Electricity Market Management Company (NEMMCO) to assist it in preparing the Statement of Opportunities (SOO).

The SOO is the primary document for examining electricity supply and demand issues across all regions in the NEM and covers the following issues:

- Adequacy of NEM electricity supplies to meet projected electricity demand;
- The Annual National Transmission Statement (ANTS), which reviews National Transmission Flow Paths (NTFPs), forecast constraints and options to relieve those constraints; and
- Supplementary economic, developmental and historical information.

Powerlink recommends that interested parties review its 2007 APR in conjunction with NEMMCO's 2007 SOO, which is expected to be published by 31 October 2007.

1.3 Purpose of the Annual Planning Report

The purpose of Powerlink's APR is to provide information about the Queensland electricity transmission network to Registered Participants and interested parties.

It aims to provide information that assists interested parties to:

- Identify locations that would benefit from significant electricity supply capability or demand side management (DSM) initiatives;
- Identify locations where major industrial loads could be connected;
- Understand how the electricity supply system affects their needs;
- Consider the transmission network's capability to transfer quantities of bulk electrical energy; and
- Provide input into the future development of the transmission network.

Readers should note that this document is not intended to be relied upon or used for other purposes, such as for the evaluation of participants' investment decisions.

1.4 Role of Powerlink Queensland

As the owner and operator of the electricity transmission network in Queensland, Powerlink is registered with NEMMCO as a TNSP under the NER.

In this role, and in the context of this APR, Powerlink's transmission network planning and development responsibilities include the following:

- Ensuring that its network is operated with sufficient capability, and augmented if necessary, to provide network services to customers;
- Ensuring that its network complies with technical and reliability standards contained in the NER and jurisdictional obligations;
- Conducting annual planning reviews with Distribution Network Service Providers (DNSP) and other TNSPs whose networks are connected to Powerlink's transmission network, that is ENERGEX, Ergon Energy, Country Energy and TransGrid;
- Advising Registered Participants and interested parties of emerging network limitations within the time required for action;
- Developing recommendations to address emerging network limitations through joint planning with DNSPs and consultation with Registered Participants and interested parties. Solutions may include network or non-network options such as local generation and DSM initiatives; and
- Undertaking the role of proponent of regulated transmission augmentations in Queensland.

Powerlink has also been nominated by the Queensland Government, under Clause 5.6.3(b) of the NER, as the entity having transmission network planning responsibility in Queensland (also known as the Jurisdictional Planning Body). In this role, Powerlink represents the Queensland jurisdiction on the Inter-Regional Planning Committee (IRPC). Powerlink's role on the IRPC includes:

- Providing information on the Queensland network to allow NEMMCO to carry out its obligations, such as publication of the SOO and preparation of the ANTS;
- Providing advice, where necessary, of proposed Queensland augmentations which have a material inter-network effect;
- Participating in inter-regional system tests associated with new or augmented interconnections; and
- Participating in the technical evaluation of proposals for network developments which have a material inter-network effect.

The function of the IRPC is described in Clause 5.6.3 of the NER.

1.5 Overview of Planning Responsibilities

The development of the Queensland transmission network encompasses the following:

- Connection of new participants, or alteration of existing connections;
- The shared network within Queensland; and
- New interconnectors or augmentation to existing interconnectors between Powerlink's network and networks owned by other TNSPs.

1.5.1 Planning of Connections

Participants wishing to connect to the Queensland transmission network include new and existing generators, major loads and DNSPs. Planning of new connections or alterations of existing connections involves consultation between Powerlink and the connecting party, determination of technical requirements and completion of connection agreements.

1.5.2 Planning of the Shared Network within Queensland

Powerlink is responsible for planning the shared transmission network within Queensland. The NER sets out the planning process and requires Powerlink to apply the Regulatory Test promulgated by the AER to new regulated network augmentation proposals. The planning process requires consultation with registered participants and interested parties including customers, generators and DNSPs. The significant inputs into the network planning process within Queensland are:

- The forecast of customer electricity demand (including demand side management) and its location;
- Location, capacity and expected operation of generation;
- The assessment of future network capability;
- Planning criteria for the network; and
- Prediction of future loadings on the transmission network.

The 10 year forecasts of electrical demand and energy across Queensland are used together with forecast generation patterns to determine potential flows on transmission network elements. The location and capacity of existing and committed generation in Queensland is sourced from the NEMMCO SOO, unless modified following advice from relevant participants. Information about existing and committed embedded generation and demand management within distribution systems is provided by the DNSPs.

Powerlink examines the capability of its existing network and future capability following any changes resulting from committed augmentations. This involves consultation with the relevant DNSP where the performance of the transmission system may be affected by the distribution system (for example, where the two systems operate in parallel).

Where potential flows on transmission system elements could exceed network capability, Powerlink is required to notify market participants of these forecast network limitations. If augmentation is considered necessary, joint planning investigations are carried out with the DNSPs (or TNSPs if relevant) in accordance with the provisions of Clause 5.6.2 of the NER. The objective of this joint planning is to identify the most cost effective network solution.

In addition to the requirement for joint planning, Powerlink has other obligations that govern how it should address forecast network limitations.

The *Electricity Act 1994 (Queensland)* requires that Powerlink "ensure as far as technically and economically practicable, that the transmission grid is operated with enough capacity (and if necessary, augmented or extended to provide enough capacity) to provide network services to persons authorised to connect to the grid or take electricity from the grid".

It is a condition of Powerlink's Transmission Authority that it meets licence and NER requirements relating to technical performance standards during intact and contingency conditions. Under its Transmission Authority, Powerlink plans and develops its network to supply forecast peak demand during a single network element outage.

In addition, other obligations are contained in Schedule 5.1 of the NER. The NER sets out minimum performance requirements of the network and connections and requires that reliability standards at each connection point be included in the relevant connection agreement.

New network developments may be proposed to meet these legislative and NER obligations. Powerlink may also propose network augmentations that deliver a net market benefit when measured in accordance with the AER Regulatory Test.

The requirements for initiating new regulated network developments are set down in Clauses 5.6.2, 5.6.6, and 5.6.6A of the NER. These clauses apply to different types of proposed augmentations.

While each of these clauses involves a slightly different process, particularly with respect to consultation with interested parties, the main steps in network planning can be summarised as follows:

- Disclosure of information regarding the need for augmentation - this examines the demand growth;
- Generation and network capability to determine the time when additional capability is required;
- Consultation on assumptions made and potential solutions, which may include transmission or distribution network augmentation, local generation or demand side management initiatives;
- Where a network development has a material inter-network impact, either the agreement of the entities responsible for those affected networks must be obtained, or the development must be examined by the Inter Regional Planning Committee;
- Analysis of the feasible options to determine the one that satisfies the AER Regulatory Test. In the case of an augmentation required to meet reliability and quality standards, this involves a cost effectiveness analysis to determine the option that minimises present value of costs. In all other cases, the Regulatory Test requires that the proposed development maximises the net market benefit as defined in the Regulatory Test; and
- Consultation and publication of a recommended course of action to address the identified network limitation.

1.5.3 Planning of Interconnectors

Development and assessment of new or augmented interconnections between Queensland and New South Wales (or other States) are the responsibility of the respective project proponents.

Powerlink will develop plans in association with the owners of connected networks to augment interconnection capability where justified. Any plans to establish or augment interconnectors will be outlined in Powerlink's APR (refer Chapter 2). The NER also provides a role to be carried out by the IRPC. This committee, convened by NEMMCO, includes a representative of the entity having transmission planning responsibility in each state jurisdiction. The inter-jurisdictional planning process involves NEMMCO publishing the SOO by 31 October each year. The SOO provides information on the projected supply/demand balance for each NEM region.

The ANTS, a component of the SOO, provides information relevant to the technical and economic need for augmentation of NTFPs. This includes information on the significance of forecast constraints on power transfers between regions. It also identifies options for the reduction or removal of future network constraints.

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CHAPTER TWO

Summary of relevant national transmission flow path developments

2.1 Purpose

The Annual National Transmission Statement (ANTS) provides information on the projected need and potential future development of national transmission flow paths (NTFPs) across the National Electricity Market (NEM).

Information relating to potential projects which could affect NTFPs is to be identified by the relevant Transmission Network Service Providers (TNSPs) within their Annual Planning Report (APR).

This section of the APR summarises potential projects identified by Powerlink which could affect transmission flow paths within the Queensland region.

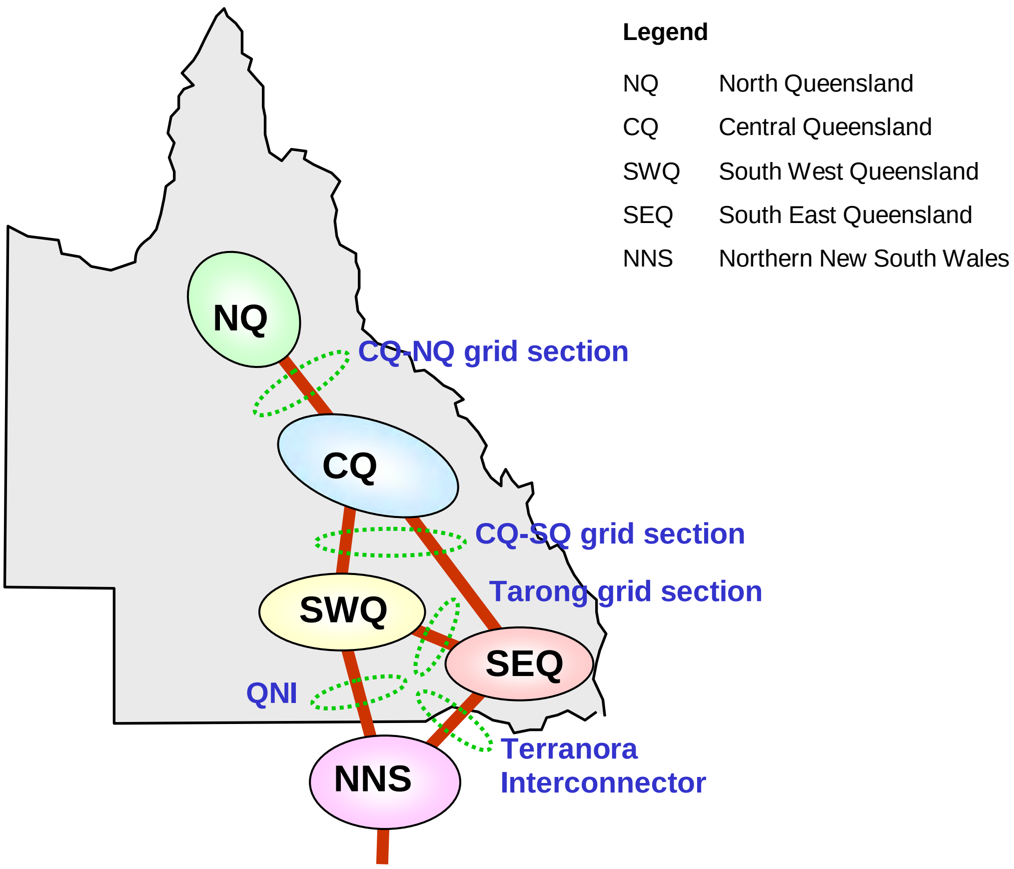
2.2 National Transmission Flow Paths

In 2005, the National Electrical Market Management Company (NEMMCO) defined the criteria for NTFPs as well as the proposed flowpaths for the 2005 ANTS. These flow paths will remain unchanged for the 2007 ANTS.

The NTFPs within Queensland correspond with parts of the transmission system used to transport significant amounts of electricity between generation and load centres. These flow paths also align with key intra-regional network sections described within Section 5.3.

The NTFPs for the Queensland region are shown within Figure 2.1.

Figure 2.1: Queensland Major Transmission Flow Paths



2.3 Categories of Augmentations

NEMMCO has defined three categories to classify the status of flow path augmentations for the ANTS. These categories indicate the level of certainty of a particular augmentation. Powerlink has indicated the status of potential augmentations according to these categories which are summarised as follows:

Committed augmentation:	Project approved including completion of National Electricity Rules (NER) processes for regulated network augmentations.
Routine augmentation:	Projects that are not yet committed for which there is a reasonable expectation that the project will be undertaken to maintain network capability, meet mandated standards, or to ensure transfer capability is not restricted by equipment that can be installed in a low cost and economic manner.
Conceptual augmentation:	Projects identified as potential network options to increase the transfer capability of a NTFP.

2.4 Potential Augmentations to Flow Paths

Potential augmentations which may increase the transfer capability of NTFPs for the Queensland region are summarised within Tables 2.1 and 2.2.

It should be noted that under the NER both non-network and network options are required to be evaluated and compared within the NER prescribed processes for regulated network augmentations. This section provides information relating to network options only.

Table 2.1: Committed and Routine Augmentations for the Queensland Region

FLOW PATH	PROJECT DESCRIPTION	AUGMENTATION BASIS	IMPACT ON NETWORK LIMITS	EXPECTED COMPLETION	STATUS
CQ-NQ	Staged construction of a 275kV transmission line between Broadsound and Ross, and installation of an SVC at Strathmore	Transfer capability plus local generation may be insufficient to meet future demand	Increases maximum CQ-NQ transfer from current levels to around 1100-1380MW	Staged completion for Summer 2009/10	Committed
	Stringing of the second side of the existing Stanwell to Broadsound 275kV circuit	Transfer capability plus local generation may be insufficient to meet future demand	Increases maximum CQ-NQ transfer to around 1600MW	Summer 2012/13	Routine
CQ-SQ (1)	Installation of 120MVAr capacitor bank at Wurdong and 50MVAr capacitor bank at Palmwoods	Small network project to ensure required transfer capability is maintained	Preserves the CQ-SQ transfer limit at maximum level of 1900MW	Summer 2007/08	Committed
	Installation of Woolooga SVC on the coastal CQ-SQ 275kV circuits	Transfer capability plus local generation may be insufficient to meet future demand	Increases maximum CQ-SQ stability limits to around 2000-2200MW, increases the Tarong voltage stability limit by around 60MW, and increases the Gold Coast voltage stability limit by around 10MW	Summer 2008/09	Routine
SWQ-SEQ	Construction of new transmission line from Middle Ridge to Greenbank, installation of second Middle Ridge 330/275kV transformer, and installation of 200MVAr capacitor bank at Greenbank	Transfer capability plus local generation may be insufficient to meet future demand	Provides an initial capacity increase for the Tarong voltage stability limit of around 250MW, increases the SWQ thermal limit by around 500-700MW, and increases the Gold Coast voltage stability limit by 60MW	Summer 2007/08	Committed
	Installation of second 275/110kV transformer and 50MVAr capacitor bank at Molendinar	This project addresses localised reliability requirements within the Gold Coast area	Provides an initial capacity increase in the Gold Coast voltage stability limit of around 30MW, and also increases the Tarong voltage stability limit by around 45MW	Summer 2007/08	Committed

FLOW PATH	PROJECT DESCRIPTION	AUGMENTATION BASIS	IMPACT ON NETWORK LIMITS	EXPECTED COMPLETION	STATUS
SWQ-SEQ (Cont'd)	Establishment of Abermain 275kV Substation and installation of 275/110kV transformer	This project addresses localised reliability requirements within the south west Brisbane area	Increases the Tarong voltage stability limit by around 25MW and the Gold Coast voltage stability limit by around 10MW	Summer 2008/09	Committed
	Installation of 120MVAr capacitor bank at South Pine Substation	Small network project to ensure required transfer capability is maintained	Increases the Tarong voltage stability limit by around 25MW and the Gold Coast voltage stability limit by around 10MW	Summer 2008/09	Committed
	Installation of SVC and 200MVAr capacitor bank at Greenbank Substation	Transfer capability plus local generation may be insufficient to meet future demand	Increases the Tarong voltage stability limit by around 140MW and the Gold Coast voltage stability limit by around 55MW	Summer 2008/09	Routine
	Installation of 200MVAr capacitor banks at Greenbank and Tarong, 120MVAr capacitor banks at South Pine, Mt England and Belmont, and 50MVAr capacitor banks at Ashgrove West, Rocklea and Loganlea	Transfer capability plus local generation may be insufficient to meet future demand	Increases the Tarong voltage stability limit by around 160MW and the Gold Coast voltage stability limit by around 70MW	Summer 2009/10	Committed
	Upgrade of the existing Middle Ridge 330/275kV transformer to 1500MVA and installation of series reactors on the Millmerran to Middle Ridge 330kV circuits	Transfer capability plus local generation may be insufficient to meet future demand	Expected to increase the SWQ limit by up to 300MW	Summer 2010/10	Routine
	Installation of 120MVAr capacitor bank at Belmont Substation	Small network project to ensure required transfer capability is maintained	Increases the Tarong voltage stability limit by around 25MW and the Gold Coast voltage stability limit by around 10MW	Summer 2010/11	Routine
	Installation of reactive compensation within SEQ to address increasing load growth	Small network project to ensure required transfer capability is maintained	Increases the Tarong voltage stability limit by around 75MW and the Gold Coast voltage stability limit by around 50MW	Summer 2010/11	Routine

FLOW PATH	PROJECT DESCRIPTION	AUGMENTATION BASIS	IMPACT ON NETWORK LIMITS	EXPECTED COMPLETION	STATUS
SWQ-SEQ (Cont'd)	Construction of new double circuit transmission line between Braemar and Tarong	Transfer capability plus local generation may be insufficient to meet future demand	Expected to increase the SWQ limit by around 500-1000MW	Summer 2011/12	Routine
	Establishment of Halys 275kV Substation (near Tarong), and construction of double circuit 500kV transmission line from Halys to Blackwall (initially operating at 275kV)	Transfer capability plus local generation may be insufficient to meet future demand	Provides an initial capacity increase to the Tarong voltage stability limit of around 350MW, increases the Tarong thermal limit by around 2000MW, and increases the Gold Coast voltage stability limit by around 75MW	Summer 2011/12	Routine
	Installation of third 275/110kV transformer at Molendinar	This project addresses localised reliability requirements within the Gold Coast area	Provides an initial capacity increase in the Gold Coast voltage stability limit of around 15MW, and also increases the Tarong voltage stability limit by around 15MW	Summer 2011/12	Routine
	Installation of reactive compensation within SEQ to address increasing load growth	Small network projects to ensure required power transfer capabilities are maintained	It has been assumed that these projects increase the Tarong voltage stability limit by around 100MW and the Gold Coast voltage stability limit by around 60MW on an annual basis	Summer 2012/13+ (2)	Routine
SEQ-NNS	Uprating of the existing Mudgeeraba to Terranora 110kV circuits	This project addresses localised reliability requirements within the southern Gold Coast and northern NSW area	Increases the thermal capability of the Mudgeeraba to Terranora circuits by around 45-55MW	Summer 2007/08	Committed

Notes:

(1) The CQ-SQ heading represents the combined CQ-SWQ and CQ-SEQ flow paths. The flow paths have been combined to align with the current representation of the CQ-SQ limit within the National Electricity Market Dispatch Engine (NEMDE).

(2) It is expected that an on-going program of static and dynamic reactive compensation routine projects will be required to address increasing SEQ load growth into the future. Annual increases in the Tarong and Gold Coast voltage stability limits of 100MW and 60MW respectively have been assumed to be required from October 2012 onwards.

Table 2.2 Conceptual Augmentations for the Queensland Region

FLOW PATH	PROJECT DESCRIPTION	AUGMENTATION BASIS	FLOW PATH IMPROVEMENT	INDICATIVE COST
CQ-SQ (1)	*Option 1* (2) Construction of a switching station at the mid-point of the Tarong-Calvale circuits (Auburn River) and installation of series capacitors	Transfer capability plus local generation may be insufficient to meet future demand. There may also be market benefits under certain generation development scenarios	Increases the maximum CQ-SQ transient stability limit to around 2500MW	$80M (approximately)
	Option 2 (2) Construction of a new 275kV double circuit transmission line from Central Queensland to South Queensland	Transfer capability plus local generation may be insufficient to meet future demand. There may also be market benefits under certain generation development scenarios	Increases the maximum CQ-SQ transfer limit to around 2700MW	$270M (approximately)
	Option 3 (2) Construction of a new 500kV double circuit transmission line from Central Queensland to South Queensland	Transfer capability plus local generation may be insufficient to meet future demand. There may also be market benefits under certain generation development scenarios	Increases the maximum CQ-SQ transfer limit up to around 3500MW	$400M (approximately)
SWQ-SEQ	Establishment of Halys and Blackwall 500kV Substations, and conversion of the double circuit Halys to Blackwall transmission line to 500kV operation (3)	Transfer capability plus local generation may be insufficient to meet future demand	Provides an additional capacity increase to the Tarong voltage stability limit of around 350MW, increases the Tarong thermal limit by around 1600MW, and increases the Gold Coast voltage stability limit by around 75MW	$200M (approximately)
	Rebuild of an existing Greenbank to Mudgeeraba 275kV single circuit to double circuit, and upgrade of two existing Mudgeeraba 275/110kV transformers to 375MVA	Transfer capability plus local generation may be insufficient to meet future demand	Increases the thermal transfer capability to the Gold Coast by around 125MW	$90M (approximately)
NNS-SWQ and SWQ-NNS	*Option 1* Installation of series compensation (located on the Armidale to Dumaresq and Dumaresq to Bulli Creek 330kV circuits), dynamic shunt compensation device (ie SVC), and power system control equipment	This project may be justified under the market benefits limb of the AER Regulatory Test	Increases the voltage, transient and oscillatory stability limits by up to 300-400MW	$120M (approximately)

FLOW PATH	PROJECT DESCRIPTION	AUGMENTATION BASIS	FLOW PATH IMPROVEMENT	INDICATIVE COST
NNS-SWQ and SWQ-NNS (Cont'd)	*Option 2* Establishment of a 1500MW HVDC back to back asynchronous link most likely located at Bulli Creek or Dumaresq Substations	This project may be justified under the market benefits limb of the AER Regulatory Test	Provides an equivalent transfer capability of around 1500MW in the southerly direction and around 1000MW in the northerly direction	$400M (approximately)
	Option 3 Construction of a second AC interconnector between Queensland and New South Wales. It may build on other 330kV and 275kV developments required to meet reliability obligations in each region	This project may be justified under the market benefits limb of the AER Regulatory Test	Increases the transfer capability between the two regions by around 800-1000MW	$800M (approximately)

Notes:

(1) The CQ-SQ heading represents the combined CQ-SWQ and CQ-SEQ flow paths. The flow paths have been combined to align with the current representation of the CQ-SQ limit within NEMDE.

(2) These augmentation options may be dependent on the location and size of potential new entry generation, and are not necessarily substitutable or designed to be implemented in the order shown.

(3) This conceptual augmentation is a further development of the Halys to Blackwall routine augmentation detailed within Table 2.1.

CHAPTER THREE
Intra-regional energy and demand projections

3.1 Background to Load Forecasts

3.1.1 Sources of Load Forecasts

In accordance with the National Electricity Rules (NER), Powerlink has obtained summer and winter demand forecasts over a ten year horizon from Distribution Network Service Providers (DNSPs) based on their post winter 2006 review, and from directly connected customers, at each connection supply point in Powerlink's transmission network. These individual connection supply point forecasts were aggregated into estimated demand forecasts for the total Queensland region and for ten geographical zones as defined in Table 3.12 in Section 3.5, using diversity factors observed from historical trends up to the end of March 2007.

Energy forecasts for each connection supply point were also obtained from the DNSPs and directly connected customers, and these have also been aggregated for the Queensland region and for each of the ten geographical zones in Queensland.

The National Institute of Economic and Industrial Research (NIEIR) was engaged by Powerlink to provide an independent assessment of energy and demand forecasts for the Queensland region and for the former DNSP areas within Queensland, in April 2007. These forecasts were based on a 'top-down' economic growth perspective with high and low growth scenarios and predicted levels of embedded generation.

National Electricity Market Management Company (NEMMCO) also engaged NIEIR to provide an updated independent assessment of economic outlook for all the regions of the National Electricity Market (NEM) in April 2007, including high and low growth scenarios and embedded generation levels. These reports contained no significant changes to the Queensland economic outlooks previously provided and accordingly, the forecasts in this chapter will be consistent with the Queensland forecasts in NEMMCO's 2007 Statement of Opportunities (SOO).

3.1.2 Basis of Load Forecasts

Economic Activity

Three forecast scenarios of economic activity in all NEM states were updated by NIEIR in April 2007. The three scenarios can be characterised as:

- Medium Growth Scenario (the base case), considered to be most probable;
- High Growth Scenario; and
- Low Growth Scenario.

The average economic growth for the High, Medium and Low Growth Scenarios developed by NIEIR over the period 2006/07 to 2016/17 are:

Table 3.1: Economic Growth

	HIGH	MEDIUM	LOW
Australian Gross Domestic Product (average growth p.a.)	4.0%	3.0%	2.1%
Queensland Gross State Product (average growth p.a.)	5.0%	3.9%	2.9%

For Queensland these updated growth rates are slightly higher for the high growth scenario, unchanged for the medium growth scenario and slightly lower for the low growth scenario compared to the NIEIR prediction outlined in the Powerlink 2006 Annual Planning Report (APR).

Weather Conditions

Within each of these three economic scenarios, three forecasts were also prepared to incorporate sensitivity of maximum summer and winter demands to prevailing ambient temperature weather conditions, namely:

- A 10% probability of exceedance (PoE) forecast, corresponding to one year in ten hot summer or cold winter conditions;
- A 50% PoE forecast, corresponding to one year in two (average summer or average winter) conditions; and
- A 90% PoE forecast, corresponding to mild summer or mild winter conditions, which would be expected to be exceeded in nine years out of ten.

Cogeneration and Renewable Energy Source Generation

The NIEIR 2007 forecasts for embedded cogeneration and renewable energy source generation projects are identical to those published in the 2006 APR.

Table 3.2 shows the forecast total output of non-scheduled cogeneration and other non-scheduled embedded generation projects. It should be noted that Table 3.2 is not the total of all embedded generation in Queensland, as it excludes the output of the existing Roma, Barcaldine and Townsville (Yabulu) Power Stations.

Whilst being embedded in the distribution networks, Roma, Barcaldine and the 66kV output component of Townsville (Yabulu) Power Stations are scheduled market generators and as such their output is included within the 'delivered from network' forecasts in this APR. However, Table 3.2 does include the output of the existing Invicta Sugar Mill Power Station, which is non- scheduled despite being connected to the transmission network. Accordingly, its output is included within both Table 3.2 and the 'delivered from network' forecasts in this APR.

The new Pioneer Sugar Mill generator (embedded non-scheduled), located at Ayr, south of Townsville, significantly reduces the energy supplied from Clare Substation in the Ross zone.

It should be noted that uncommitted non-scheduled embedded generation projects have not been incorporated into Powerlink's delivered energy and demand forecasts. This is consistent with future uncommitted loads also not being included in these forecasts. Therefore, when the native demand is determined as discussed below and in Appendix H, future uncommitted non-scheduled embedded generation is not added.

Table 3.2: Forecast of Non-Scheduled and Exempted Generation

NIEIR Forecast of Queensland Total Cogeneration and Other Non-Scheduled Embedded (Renewable and Non-Renewable Energy Source) Annual Generation (GWh) (1) (2) (3)

YEAR	COGENERATION	OTHER EMBEDDED GENERATION	TOTAL
2007/08	2,569	502	3,071
2008/09	2,569	505	3,074
2009/10	2,652	583	3,235
2010/11	2,652	586	3,238
2011/12	2,652	586	3,238
2012/13	2,744	667	3,411
2013/14	2,744	667	3,411
2014/15	2,744	670	3,414
2015/16	2,744	670	3,414
2016/17	2,744	673	3,417

Notes:

(1) These total generator outputs do not represent export to the distribution network as they include the energy required for the plant's own use.

(2) Invicta Mill bagasse cogeneration output is included in this table despite being connected to Powerlink's transmission network, as it is non-scheduled.

(3) This table excludes the output of Barcaldine, Roma and the 66kV output component of Townsville (Yabulu) Power Stations as these are embedded scheduled market generators.

As in previous reports, the energy delivered to the Wivenhoe pumps is excluded from both the demand and energy forecasts in this report.

Native Demand

Native demand refers to the actual demand delivered into the distribution networks and to transmission connected consumers. Referring to Figure 3.1, it is the sum of delivered demand (energy) from a TNSP and from significant, non-scheduled embedded generation. In the case of Queensland, non-scheduled embedded generation includes sugar mill cogeneration, thermal landfill and biomass generation.

A forecast of native demand is given in Appendix H.

Interconnector Loads

Energy flows across the Queensland/New South Wales Interconnector (QNI) and the Terranora Interconnector are not included in the forecast loads in this Chapter, as they are not part of the Queensland customer load. These flows will increase or decrease the dispatch of generation within Queensland and the loading on parts of the transmission network to meet the demand.

New Regional Boundaries

From March 2006, load in the Tweed area was included within the New South Wales forecast instead of Queensland's. Historical data and forecasts within this report have been adjusted to reflect this. This change does not alter Powerlink's obligations in respect of supply to the Tweed area and network planning will continue to accommodate this demand.

New Large Loads - Committed
Since the 2006 APR new and increased pumping loads due to the South East Queensland Water Grid and the new desalination plant at Tugun have been included within the forecast. The first new coal loader in the Gladstone area has been delayed and will now be commissioned in late 2007.

The forecasts in this chapter include a further new port handling facility at Dalrymple Bay (south of Mackay) and a second new port handling facility in the Gladstone area. There is also increased loading forecast for Brisbane Airport due to expansions and commercial loads.

Some expected coal mining load increases, new coal handling plants at Mackay and Gladstone and the load build up of an existing industrial plant near Ipswich have been delayed.

New Large Loads - Uncommitted
There have been several proposals for large metal processing or other industrial loads which are not yet considered to be committed and are therefore not included in the medium economic forecast.

These include the following possible or proposed projects:

- A new aluminium smelter at Aldoga - south west of Gladstone;
- Major expansions of an existing aluminium smelter (Gladstone) and an existing zinc smelter plant (Townsville);
- Industrial loads in the Swanbank area (including a steel mill);
- Several additional coal mines in the Central Queensland/Bowen Basin area including some very large projects;
- Future electrification of the inland Bowen Basin to Abbot Point (Bowen) Railway Line ("Northern Link") and possible further port handling facility upgrades; and
- Additional desalination plants in South East Queensland.

Some of these additional demands have been included in the high growth scenario in accordance with customer data provided. These developments could translate to the following additional load to be supplied from the network.

Table 3.3: Uncommitted Large Loads

ZONE	TYPE OF PLANT	POSSIBLE LOAD
Ross	Zinc	Up to 120MW
North	Port facilities and increased railway loadings	Up to 80MW
Gladstone	Aluminium & zinc	Up to 900MW
Moreton South	Steel mill	Up to 160MW
Central West & North	Increase in coal mining load	Up to 200MW

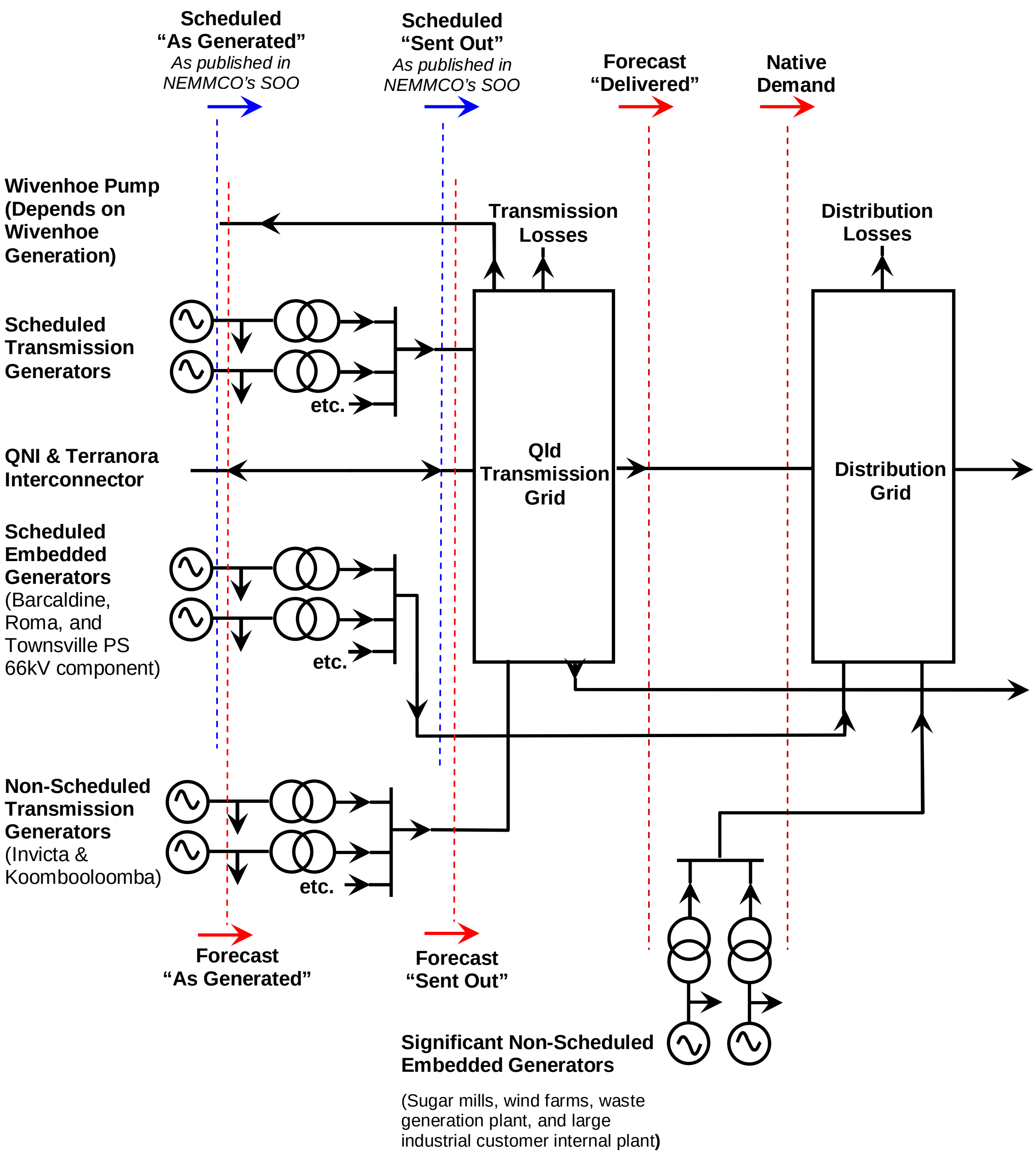
DNSP and NIEIR Forecast Reconciliation
Powerlink also contracted NIEIR to provide an economic outlook and embedded generation forecast for Queensland. This enabled an independent check with the new DNSP and customer forecasts and these were found to be in close agreement and consistent with Powerlink's trend and weather analysis.

Reconciliation between the NIEIR forecast and the more detailed forecasts provided by DNSPs and customers was undertaken for the medium growth scenario and average weather conditions. Whilst there is agreement between these load forecasts, NIEIR has flagged that there could be higher growth rates in the second half of the next ten year period should a major new gas pipeline eventuate in Queensland within that timeframe, creating a flow-on economic growth stimulus.

3.1.3 Load Forecast Definitions

The relationship between the classes of generation and the forecast quantities in this report is shown in Figure 3.1.

Figure 3.1: Load Forecast Definitions



3.2 Recent Energy and Demands

3.2.1 Recent Summers

Summer 2006/07 in Queensland was mild across the state. South East Queensland (as measured at Archerfield Aerodrome) had its mildest summer since 1999/00. South West Queensland, Central Queensland and North Queensland had their mildest summers since 1999/00, 2000/01 and 2000/01 respectively. The diversity of load and weather patterns across Queensland was greater than normal with South East Queensland peaking on a different day to the whole state. Hot conditions coincidently over most of Queensland for working week day periods did not occur until March. Despite this, Queensland still reached a record actual demand of 8,589MW as generated and 7,832MW as delivered on 12 March 2007.

The weather and diversity corrected, as delivered summer maximum demand for Queensland was 7,935MW, as outlined in Appendix F. This has grown from 7,688MW in 2005/06 representing a 3.2% increase. Appendix G discusses some specific attributes associated with summer 2006/07 that led to this temperature and diversity correction.

At the time of Queensland actual peak demand for summer 2006/07, the weather pattern diversity across the state was greater than normal at 96.2% coincidence compared with the ten year average of 97.1% coincidence. As previously stated, South East Queensland peak demand was on a different day to the State peak demand. At the time of the state peak, it was 175MW below its own temperature corrected peak. In most years, South East Queensland local peak coincides with the state total peak.

The actual delivered summer energy for Queensland in 2006/07 was 3.6% lower than in summer 2005/06. This reduction was due to the mild summer in 2006/07 compared to the record hottest (based on average temperature) summer in 2005/06. Further explanation can be found in Appendix G.

Recent surveys have shown that the increase in the number of residences in South East Queensland with new air conditioning installed in 2006 fell to about half the record increase of the previous year, well below expectations of the previous survey and as assumed in the 2006 APR forecast. This may have been influenced by the mild winter 2006 conditions.

However, air conditioning unit sales during 2006 fell to a much lesser degree relative to the previous year. In accordance with the surveys, this suggests that substantial upgrading or additional air conditioning units by existing users continued at recent high levels.

The surveys continue to show that in South East Queensland, many households without air conditioning intend to install and many existing users intend to upgrade or add air conditioners, over the next one to two years. After this, a saturation effect is expected to take over on both counts.

Queensland's annual population growth as recently reported by the Australian Bureau of Statistics for the year ending 30 September 2006 shows a drop from 2.3% in the previous year to 1.9%, predominately caused by a reduction in migration to Queensland.

A summary of recent South East Queensland summer prevailing weather conditions, seasonal energy delivered and electricity demands is shown in Table 3.4. All forecast and historic data now excludes the Tweed Shire electricity load. The 2006/07 South East Queensland summer was particularly mild with no very hot conditions at all. Nevertheless, a new actual peak demand of 4,302MW was recorded on 29 January when the Brisbane temperature peaked at 34°C.

Table 3.4 presents historic data associated with South East Queensland summer demand and Brisbane temperature. Short comments are also provided on prevailing Queensland weather conditions.

Table 3.4: Comparison of Recent South East Queensland Summer Delivered Load

SUMMER (1)	ENERGY GWH	MAXIMUM DEMAND MW	PREVAILING QUEENSLAND WEATHER CONDITIONS	BRISBANE TEMPERATURE (2)		
				SUMMER AVERAGE °C	PEAK DEMAND DAY °C	NO DAYS >28.4°C
1997/98	3,928	2,596	Hot	26.12	29.00	10
1998/99	3,973	2,762	Average	24.68	29.75	8
1999/00	4,085	2,946	Mild	22.62	31.95	2
2000/01	4,352	2,977	Average, dry	24.39	28.90	4
2001/02	4,694	3,120	Sustained hot and dry, extreme central to north	25.58	26.95	10
2002/03	4,746	3,383	Mild, late wet season in north	24.41	28.95	2
2003/04	5,282	3,847	Hot and humid	26.01	30.60	17 (3)
2004/05	5,373	4,024	Average	25.09	28.10	4
2005/06	5,917	4,149	No very hot working weekday conditions, but high temperatures at other times leading to high energy consumption	26.20	27.90	7 (4)
2006/07	5,578	4,302	Mild - no extreme conditions	24.00	28.30	3 (5)

Notes:

(1) In this table summer includes all the days of December, January and February.

(2) In this report, Brisbane temperature is measured at Archerfield, this being more representative of general South East Queensland weather conditions than previous reference to Brisbane Airport. Day temperatures refer to average of daily minimum and daily maximum to represent the driver for cooling load, with a 25% loading of the previous day temperatures if hotter. The 28.4°C is the 50% PoE reference temperature which is expected to be exceeded two to three days per summer on average.

(3) This included ten days from 12 to 23 February 2004.

(4) Only one of these seven days was on a working week day. This day was in early December when general air conditioning demand is not as high as later in summer.

(5) In addition to the three summer days where the 50% PoE temperature was met or exceeded, there were two days in March and one day in November where it was also exceeded.

3.2.2 Recent Winters

A summary for South East Queensland of recent winter electricity demands, seasonal energy delivered and prevailing weather conditions, is shown in Table 3.5. All forecast and historic data now excludes the Tweed Shire of New South Wales.

The South East Queensland winter of 2006 was relatively mild overall and did not contain any particularly cold periods. The peak load in South East Queensland for winter 2006 was 3,882MW which occurred on a wet day with very little temperature variation. As such conditions are unusual for winter peak demands it is appropriate that this demand should not be temperature corrected.

The actual recorded Queensland maximum delivered demand increased by 4.9% to 6,891MW. The weather and diversity corrected winter maximum delivered demand was 6,878MW representing a true growth of 5.9%, as outlined in Appendix F.

The growth in actual delivered winter energy in 2006 was 2.8% for Queensland and 3.7% for South East Queensland. The effect of increasing domestic air conditioning on winter electricity consumption is not as clear as in summer, since reverse cycle units may in many cases be replacing less efficient means of household heating. As shown in Appendix F, no discernable trend of a significant increase in sensitivity of winter daily peak demands against Brisbane temperature has yet emerged. As reverse cycle air conditioning becomes more prevalent in the future, an increase in this sensitivity is expected to emerge.

Table 3.5: Comparison of Recent South East Queensland Winter Delivered Load

WINTER (1)	ENERGY GWH	MAX DEMAND MW	PREVAILING QUEENSLAND WEATHER CONDITIONS	BRISBANE TEMPERATURE (2)		
				WINTER AVERAGE °C	PEAK DEMAND DAY °C	NO DAYS <10.9°C
1998	3,982	2,617	Mild to warm	16.45	11.85	0
1999	4,227	2,769	Mild	15.32	15.50	0
2000	4,456	2,992	Cooler than average	14.32	8.80	2
2001	4,543	2,975	Mild	14.99	10.10	3
2002	4,775	2,999	Average	14.57	12.85	1
2003	4,921	3,325	Mild but one 8 day cold snap	14.96	10.95	4
2004	5,094	3,504	Mild	15.40	11.80	0
2005	5,252	3,731	Mild	15.68	10.50	2
2006	5,447	3,882	Mild	15.55	13.85	0

Notes:

(1) In this table, winter means all the days of June, July and August.

(2) In this report, Brisbane temperature is measured at Archerfield - being more representative of general South East Queensland weather conditions than previous reference to Brisbane Airport. Day temperatures refer to average of daily minimum and daily maximum to represent the driver for heating load, with a 25% loading of the previous day temperatures if cooler. The 10.9°C is the 50% PoE reference temperature. Actual temperatures are expected to be below this for two to three days per winter on average.

3.2.3 Seasonal Growth Patterns

The hot summers of 1997/98, 2001/02, 2003/04 and 2005/06 resulted in large increases in summer delivered energy. The relatively cooler than average winters of 1997 and 2000 also resulted in higher winter delivered energy. These effects can be seen in Figure 3.2 by comparison to the trend-line of summer and winter energy delivered to DNSPs over the last seven years. Figure 3.2 excludes the energy delivered to major industrial customers connected directly to the transmission network, so that it is indicative of the underlying trend of electricity consumption growth in Queensland.

Of particular note is the reduction in energy from the hot summer 2005/06 to the mild summer 2006/07 as delivered to the DNSPs. This emphasises the fact that Queensland non-industrial load is temperature sensitive over the summer period.

3.2.4 Temperature and Diversity Correction of Demands

Powerlink analyses the temperature dependence of demands for all ten zones across Queensland, with reference to weather station data from eight locations, as outlined in Appendix F.

Queensland is too large geographically to be accurately described as having a demand dependence on a single location's weather. The three recent hot summers of 2001/02, 2003/04 and 2005/06 have shown that such an approach can be misleading. In summer 2001/02, the maximum Queensland region demands coincided with the hottest weather and highest demands in northern Queensland. However, in summer 2003/04, the northern Queensland demands and temperatures were relatively low at the times of hottest weather and highest demands in southern Queensland.

Furthermore, in the last two summers a new trend has emerged where the South East Queensland demand has exhibited an increased diversity to the total Queensland demand. Whether this trend will continue is not yet clear.

Accordingly, Powerlink continues to review and dynamically update the methodology of weather correcting historical Queensland region demand, and continues to separate the analysis into five components for separate correction and combination according to updated average historical coincidence factors. The components are:

- South East Queensland area, (which does not include the Wide Bay area) corrected against Brisbane (Archerfield) temperature;
- Major industrial loads which might exhibit fluctuating levels independent of temperature conditions are corrected to typical levels coincident with time of Queensland region maximum demand;
- Northern Queensland area, without its large industrial loads, corrected against Townsville temperature;
- Central Queensland area (which includes the Wide Bay area) without its large industrial loads, corrected against Rockhampton temperature; and
- South West Queensland area, corrected against Toowoomba temperature.

Queensland region corrected demands for all winters and summers from 1998, under the revised methodology, are shown on Figure 3.3. Figure 3.4 shows the same information for South East Queensland alone. The methodology is further outlined in Appendix F.

Figure 3.2: Historic Energy to DNSPs in Queensland

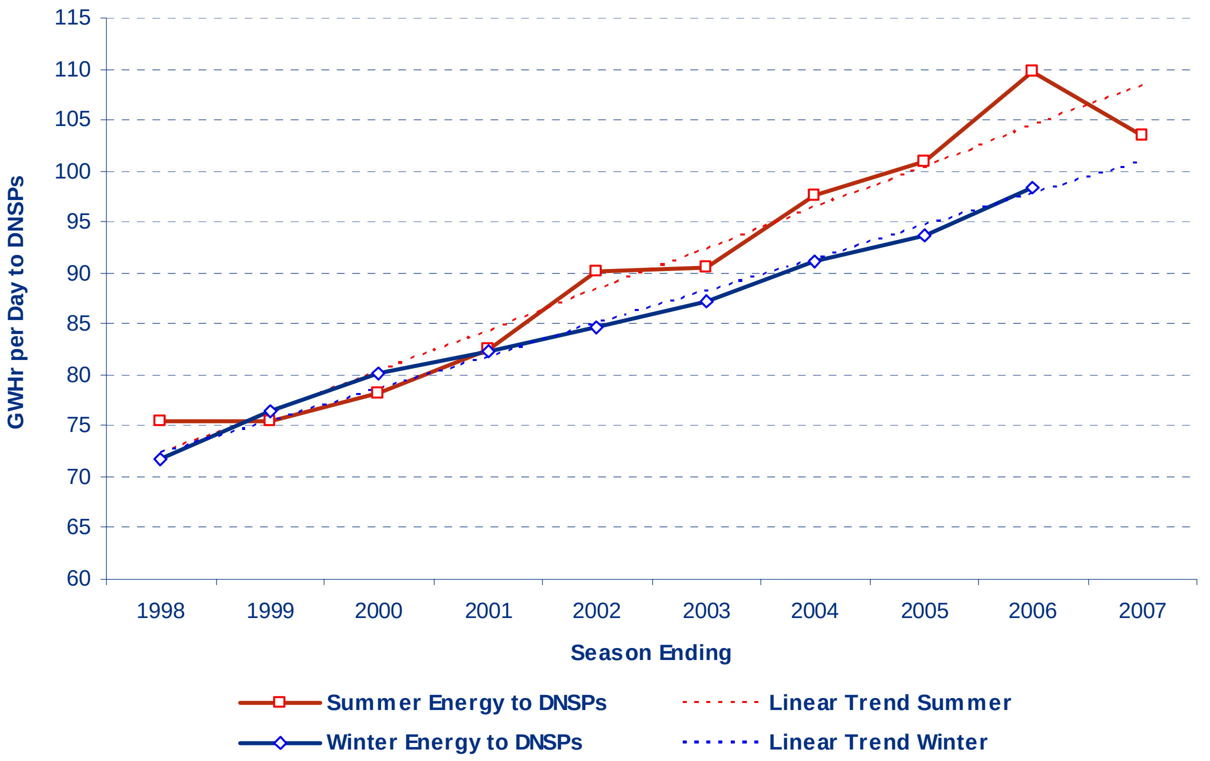


Figure 3.3: Historic Demand for Queensland (Including Temperature and Diversity Correction)

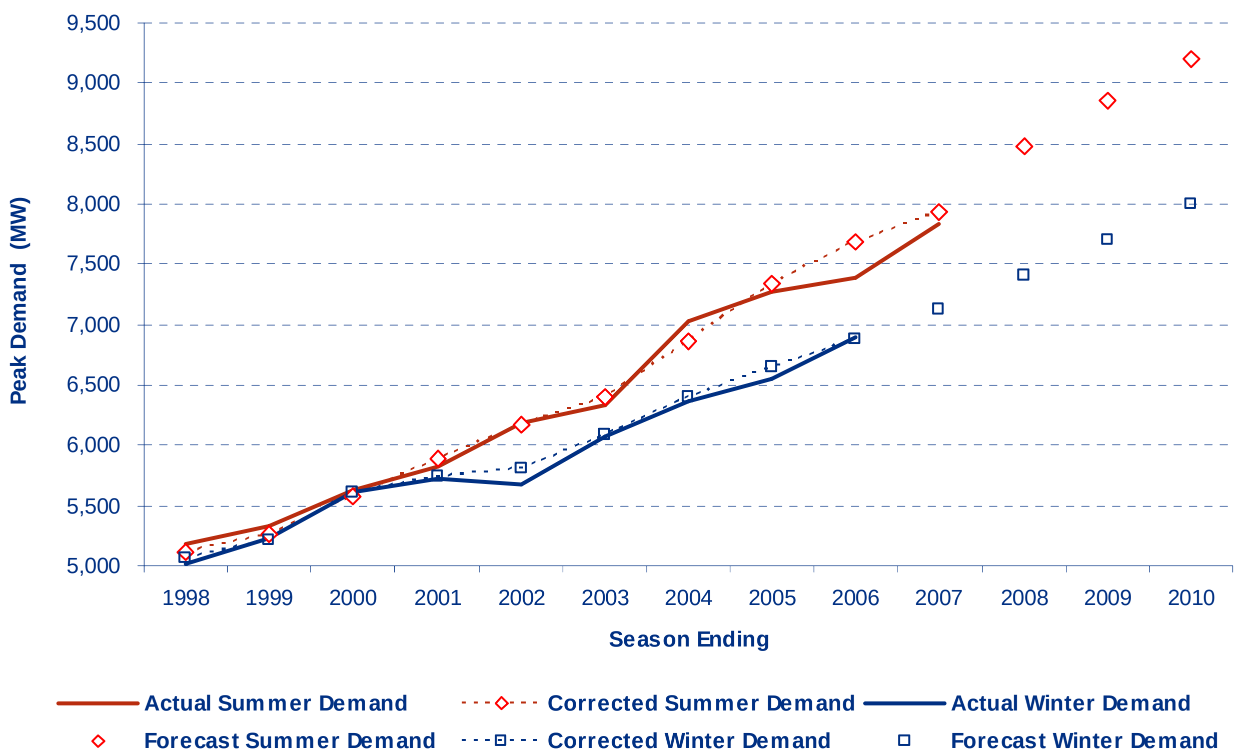
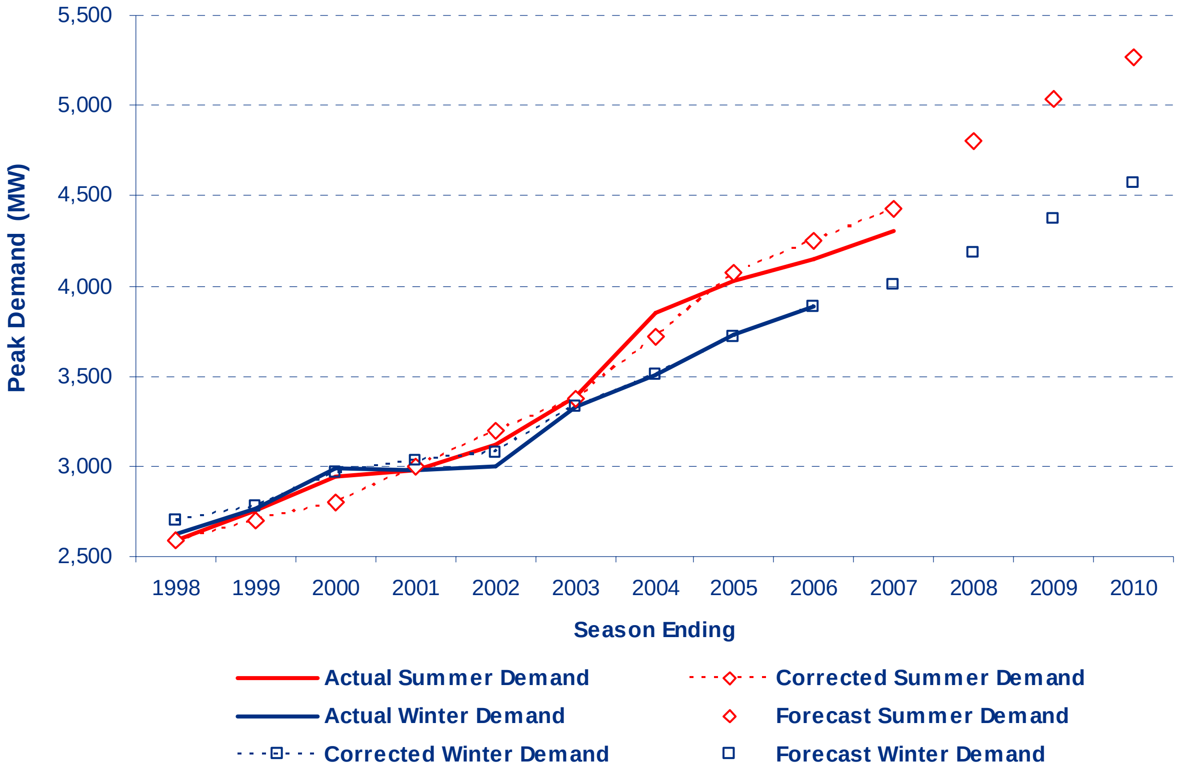


Figure 3.4: Historic Demand for South East Queensland (Including Temperature and Diversity Correction)



3.3 Comparison with the 2006 Annual Planning Report

In comparison with the 2006 forecast, the forecast in this APR shows a similar demand growth rate for summer over the next ten years from a lower starting point. The growth rate in winter demand has again fallen slightly. There is an increase in the forecast growth rate for annual energy delivered from the transmission network and from embedded scheduled generators, particularly in the later years of the forecast. The main factors contributing to these changes are:

- The mild 2006/07 summer has led to low energy usage for the 2006/07 financial year. Consequently the ten year energy growth rate appears higher from this low base. The energy supplied to non-industrial customers over the summer months was actually less than the previous year with average summer temperatures about two degrees cooler;
- The forecast temperature sensitivity of South East Queensland load has been revised down slightly based on 2006/07 observations;
- The diversity of South East Queensland load with respect to state load has been increased based on 2006/07 observations;
- Higher expected levels of committed embedded non-scheduled generation have been reflected through appropriate reductions to the forecast as delivered from the transmission network;
- A new desalination plant at Tugun and pumping loads for the South East Queensland Water Grid;
- Some block loads that were expected by summer 2006/07 have now been deferred. These include coal handling plants and coal mines;
- The temperature and diversity corrected 2006/07 demand for South East Queensland (4,421MW) that was 233MW below last year's forecast. Appendix G discusses at summer 2006/07 in more detail;
- The increase in new domestic air conditioning installations was lower than forecast due to the mild conditions;

- The summer demand and energy forecast has increased in the later years due to the resources boom continuing;
- ENERGEX, NIEIR and Queensland Government surveys continue to predict an increase in new domestic air conditioning installations, as well as a strong ongoing trend to upgrade older air conditioning installations;
- NIEIR predictions of Queensland economic growth rates have slightly increased generally over the next ten years, and remain substantially higher than the other states of Australia; and
- Ratios to convert forecast 50% PoE summer demands to 10% PoE summer demands have been revised slightly down to reflect a drop in recent air conditioning sales matching observations.

3.4 Forecast Data

The information pertaining to the forecasts is shown in tables and figures as follows.

3.4.1 Energy Forecast

Table 3.7 and Figures 3.5 and 3.6 show the historical and ten year forecast of net energy supplied from the transmission network together with embedded scheduled generators in the Queensland region for the Low, Medium and High Economic Growth scenarios.

3.4.2 Summer Demand Forecast

Table 3.8 and Figure 3.7 show the historical and ten year Queensland region summer demand forecast (delivered from the network and embedded scheduled generators) for each of the three economic scenarios and also for 10%, 50% and 90% PoE weather conditions.

3.4.3 Winter Demand Forecast

Table 3.9 and Figure 3.8 show the historical and ten year Queensland region winter demand forecast (delivered from the network and embedded scheduled generators) for each of the three economic scenarios and also for 10%, 50% and 90% PoE weather conditions.

3.4.4 Transmission Losses and Auxiliaries

Table 3.10 shows the Medium Growth Scenario forecast of average weather winter and summer maximum coincident region electricity demand including estimates of Transmission Network Losses, Power Station Sent Out and As Generated Demands.

Table 3.11 shows the Medium Growth forecast of one in ten year or 10% PoE weather winter and summer maximum coincident region electricity demand including estimates of Transmission Network Losses, Power Station Sent Out and As Generated Demands.

3.4.5 Load Profiles

Figure 3.9 shows the daily load profile on the days of the recent 2006 winter and 2006/07 summer Queensland region peak demand delivered from the transmission network and from embedded scheduled generators. Figure 3.10 shows the cumulative annual load duration curve for 2005/06.

3.4.6 Connection Point Forecasts

The forecast loading at connection points to Powerlink's network for summer and winter are shown in Appendix E.

It should be noted that the forecasts have been derived from information and historical revenue metering data up to and including March 2007 and are based on assumptions and third party predictions that may or may not prove to be correct. The 'projected actual' forecast for 2006/07 accounts for actual energy delivery in the first nine months of the financial year, that is, up to the end of March 2007 plus forecast energy to the end of June based on statistical 'as generated' data.

In summary, the forecast average annual growth rates for the Queensland region over the next ten years under low, medium and high economic growth scenarios are shown in Table 3.6. However, these averages mask a higher summer demand growth (weather and diversity corrected) over the next three years up to 2009/10, which averages 6.0% per annum in South East Queensland and 5.0% per annum for the whole Queensland region under a Medium Growth Scenario.

Table 3.6: Average Annual Growth Rate over Next Ten Years

	ECONOMIC GROWTH SCENARIO		
	HIGH	MEDIUM	LOW
Queensland Gross State Product	5.0%	3.9%	2.9%
Energy Delivered (1)	6.4%	3.8%	2.3%
Summer Peak Demand (50% PoE) (2)	5.8%	3.9%	2.7%
Winter Peak Demand (50% PoE) (2)	6.1%	3.4%	1.8%

Notes:

(1) This is energy delivered from the transmission network and from embedded scheduled generators and is reduced by the forecast growth in embedded non-scheduled generation. If there were to be no increase in embedded non-scheduled generation above current levels the average forecast growth rate in energy delivered would be 3.5% per annum under the medium growth scenario.

(2) This is the half hour average power delivered from the transmission network and from embedded scheduled generators.

Table 3.7: Annual Energy GWh – Actual and Forecast

YEAR	SENT OUT (1)			TRANSMISSION LOSSES (2)			DELIVERED (3)		
97/98		35,311			1,645			33,666	
98/99		36,189			1,540			34,649	
99/00		38,052			1,471			36,581	
00/01		39,804			1,625			38,179	
01/02		41,869			1,974			39,895	
02/03		42,687			1,837			40,850	
03/04		44,586			1,924			42,662	
04/05		45,684			1,794			43,890	
05/06		47,261			1,652			45,609	
06/07 (4)		48,163			1,854			46,309	
FORECAST	**LOW**	**MEDIUM**	**HIGH**	**LOW**	**MEDIUM**	**HIGH**	**LOW**	**MEDIUM**	**HIGH**
07/08	50,349	51,593	53,179	1,941	2,012	2,104	48,408	49,581	51,075
08/09	51,614	53,664	56,232	2,032	2,151	2,304	49,583	51,513	53,928
09/10	52,830	55,644	59,328	2,120	2,288	2,514	50,710	53,356	56,814
10/11	54,287	57,890	63,909	2,226	2,447	2,829	52,061	55,443	61,080
11/12	55,340	59,924	67,003	2,308	2,594	3,056	53,032	57,330	63,947
12/13	56,742	62,265	70,925	2,415	2,768	3,351	54,326	59,496	67,575
13/14	57,943	64,299	76,686	2,509	2,923	3,784	55,434	61,376	72,902
14/15	58,942	66,207	82,615	2,590	3,071	4,248	56,352	63,136	78,368
15/16	60,001	68,325	86,514	2,678	3,239	4,576	57,324	65,086	81,938
16/17	60,874	70,448	90,659	2,754	3,411	4,933	58,120	67,036	85,726

Notes

(1) This is the input energy that is sent into the Queensland network from Queensland scheduled generators, Invicta Mill and Koombooloomba (transmission connected but non-scheduled), and Net Imports to Queensland. The energy to Wivenhoe Pumps is not included in this table as it is not predictable and is accordingly assumed to be netted off any Wivenhoe generation.

(2) This includes the Queensland share of losses on the Queensland/New South Wales Interconnector. Recent relatively lower loss levels reflect better load sharing following commissioning of the Millmerran-Middle Ridge 330kV line and increased generation levels in northern Queensland which reduces Central to Northern Queensland power flow levels. The table assumes that future transmission works will provide a partial check against escalating loss levels otherwise due to general growth in power flow levels.

(3) From revenue metering (excludes Wivenhoe pumps plus import less export).

(4) These projected end of financial year values are based on revenue and statistical metering data until March 2007.

Figure 3.5: History and Forecasts of Annual Energy Delivered for Medium Economic Growth Scenario

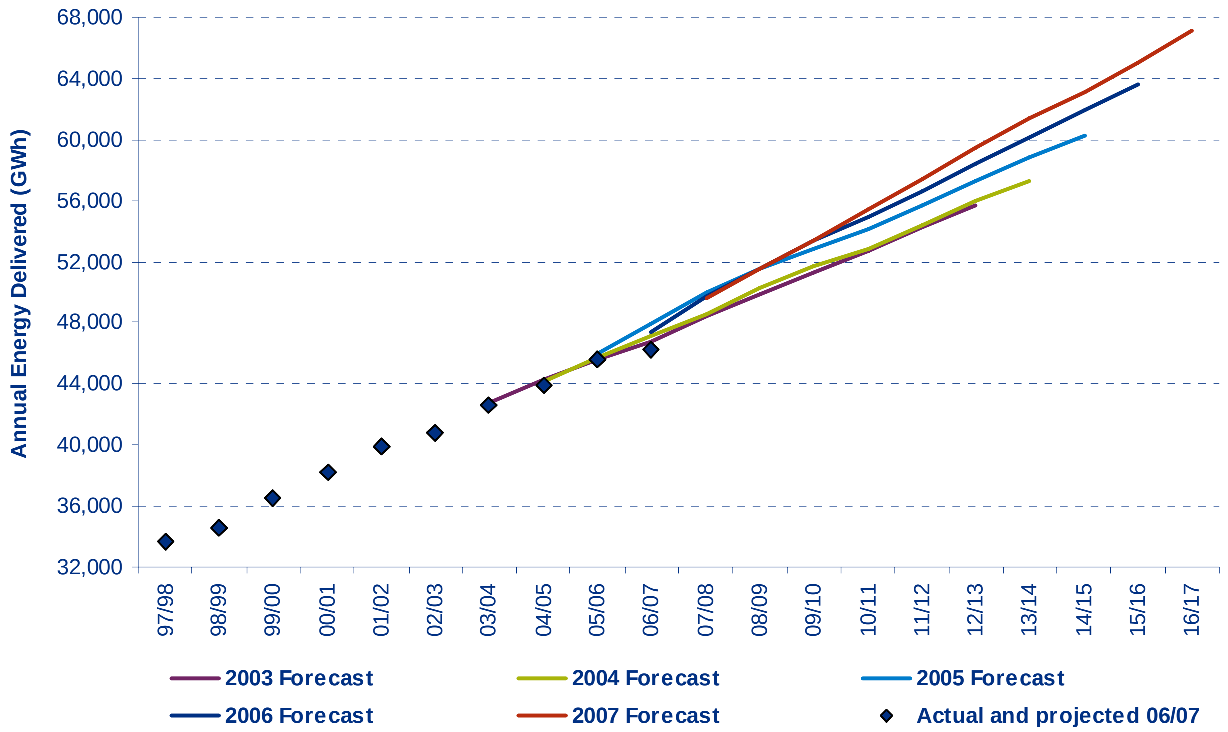


Figure 3.6: History and Forecast of Energy Delivered for Low, Medium and High Economic Growth Scenarios

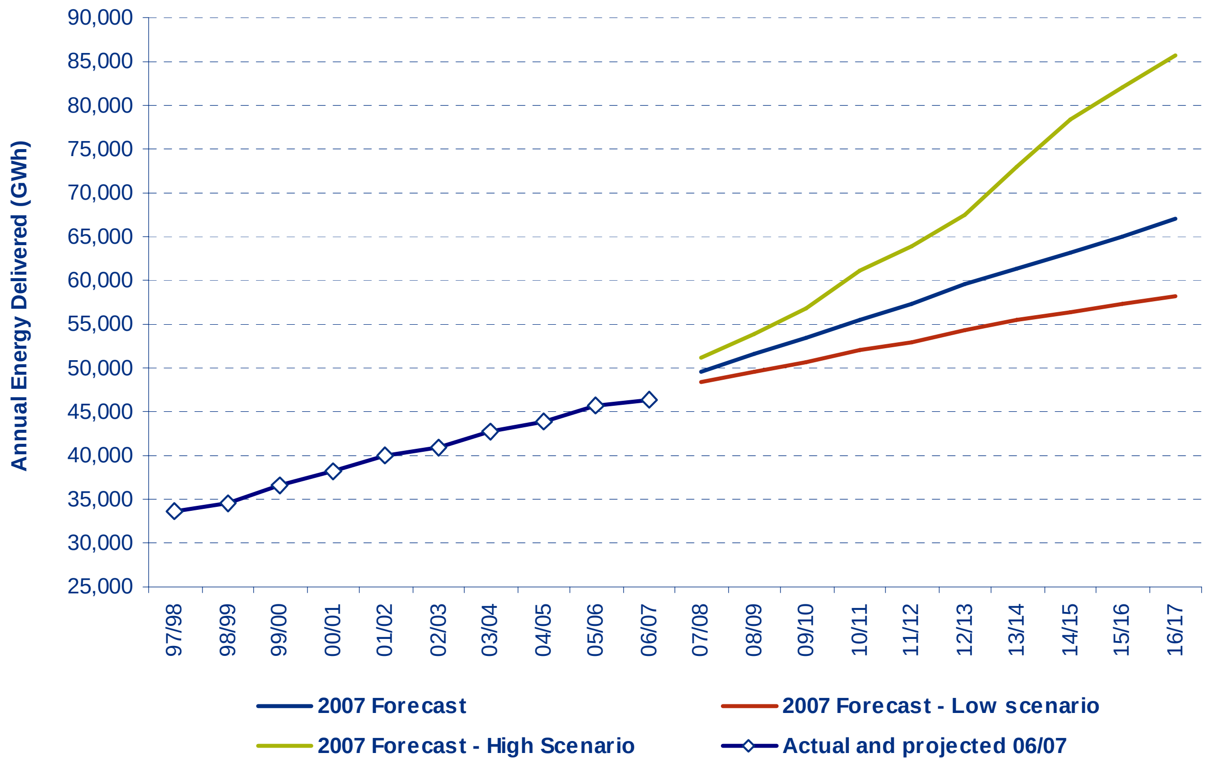


Table 3.8: Peak Summer Demand

SUMMER	ACTUAL	50%POE TEMPERATURE AND DIVERSITY CORRECTED PEAK DEMAND								
97/98	5,184	5,123								
98/99	5,330	5,264								
99/00	5,620	5,580								
00/01	5,830	5,890								
01/02	6,183	6,170								
02/03	6,336	6,404								
03/04	7,020	6,857								
04/05	7,282	7,337								
05/06	7,388	7,688								
06/07	7,832	7,935								
SUMMER FORECASTS		HIGH GROWTH SCENARIO			MEDIUM GROWTH SCENARIO			LOW GROWTH SCENARIO		
		10%POE	50%POE	90%POE	10%POE	50%POE	90%POE	10%POE	50%POE	90%POE
07/08	-	9,175	8,711	8,432	8,932	8,483	8,212	8,728	8,290	8,027
08/09	-	9,728	9,229	8,927	9,338	8,862	8,573	9,003	8,545	8,268
09/10	-	10,254	9,720	9,395	9,709	9,206	8,900	9,257	8,780	8,490
10/11	-	10,975	10,400	10,051	10,087	9,557	9,234	9,514	9,018	8,716
11/12	-	11,464	10,855	10,483	10,457	9,900	9,560	9,729	9,215	8,902
12/13	-	12,066	11,417	11,019	10,857	10,272	9,914	9,989	9,456	9,130
13/14	-	13,059	12,370	11,948	11,208	10,595	10,220	10,221	9,668	9,330
14/15	-	13,645	12,912	12,463	11,555	10,914	10,521	10,436	9,864	9,513
15/16	-	14,233	13,457	12,981	11,934	11,263	10,851	10,664	10,072	9,709
16/17	-	14,822	14,002	13,498	12,313	11,612	11,182	10,892	10,281	9,905

Figure 3.7: Queensland Region Summer Peak Demand

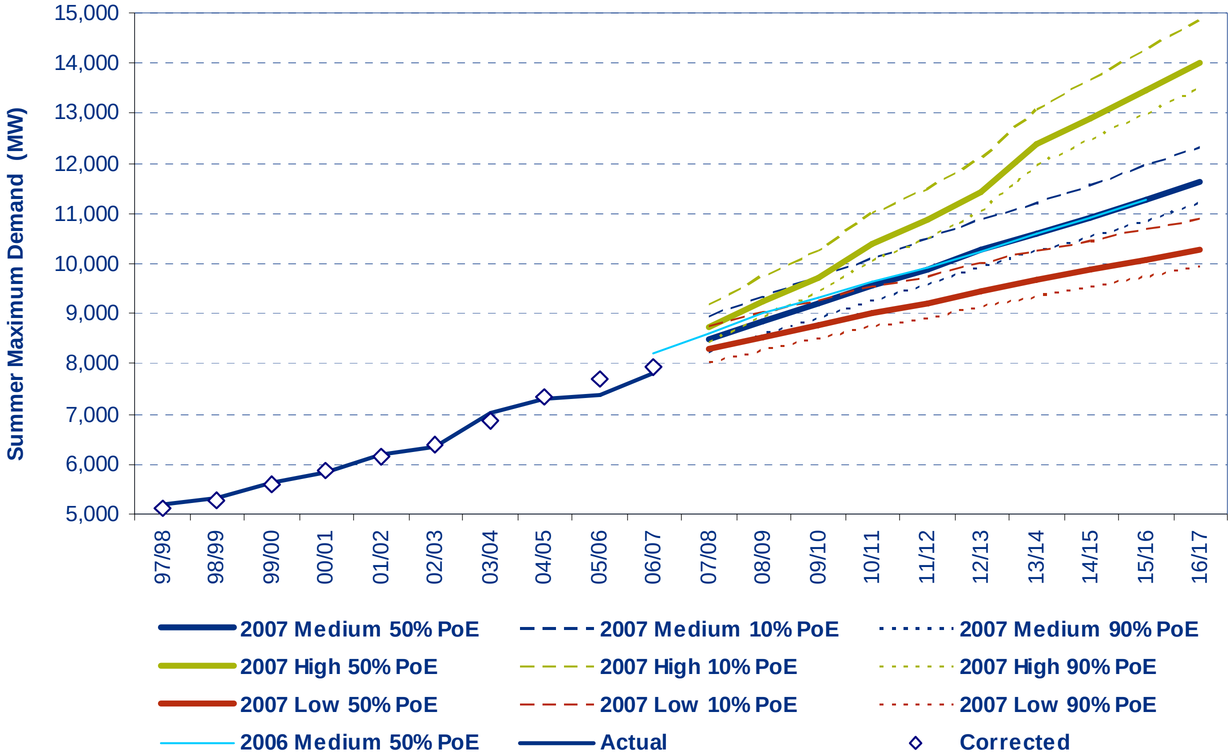


Table 3.9: Peak Winter Demand

WINTER	ACTUAL	50%POE TEMPERATURE AND DIVERSITY CORRECTED PEAK DEMAND
1998	5,021	5,073
1999	5,233	5,218
2000	5,609	5,606
2001	5,731	5,748
2002	5,671	5,801
2003	6,066	6,088
2004	6,366	6,394
2005	6,553	6,652
2006	6,891	6,878

WINTER FORECASTS		HIGH GROWTH SCENARIO			MEDIUM GROWTH SCENARIO			LOW GROWTH SCENARIO		
		10%POE	50%POE	90%POE	10%POE	50%POE	90%POE	10%POE	50%POE	90%POE
2007	-	7,431	7,293	7,194	7,258	7,123	7,028	7,127	6,996	6,902
2008	-	7,872	7,725	7,621	7,546	7,407	7,307	7,281	7,148	7,052
2009	-	8,374	8,219	8,108	7,847	7,702	7,599	7,453	7,317	7,220
2010	-	8,902	8,737	8,618	8,147	7,997	7,890	7,626	7,487	7,388
2011	-	9,499	9,326	9,200	8,447	8,293	8,181	7,776	7,636	7,534
2012	-	10,002	9,818	9,685	8,711	8,552	8,436	7,890	7,749	7,645
2013	-	10,549	10,356	10,213	9,022	8,857	8,737	8,068	7,924	7,818
2014	-	11,565	11,361	11,210	9,293	9,124	8,998	8,198	8,052	7,943
2015	-	12,072	11,859	11,698	9,542	9,368	9,238	8,292	8,145	8,033
2016	-	12,634	12,409	12,238	9,808	9,629	9,493	8,371	8,223	8,109

Figure 3.8: Queensland Region Winter Peak Demand

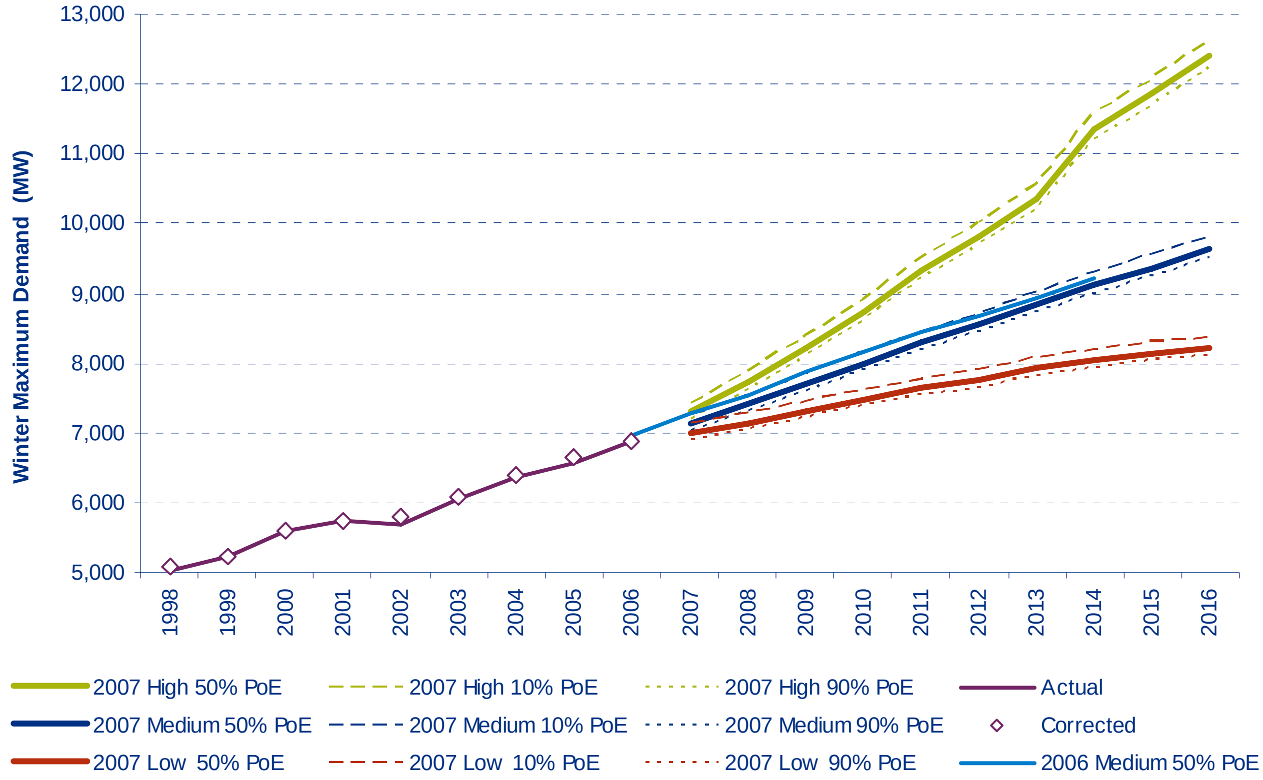


Table 3.10: Maximum Demand – 50% PoE Forecast

	STATION "AS GENERATED" DEMAND	STATION AUXS & LOSSES	STATION "SENT OUT" DEMAND	TRANSMISSION LOSSES	DELIVERED FROM NETWORK DEMAND (1)
Winter State Peak					
2007	7,905	474	7,431	308	7,123
2008	8,220	493	7,727	320	7,407
2009	8,548	513	8,035	333	7,702
2010	8,875	533	8,343	345	7,997
2011	9,203	552	8,651	358	8,293
2012	9,491	569	8,921	369	8,552
2013	9,830	590	9,240	383	8,857
2014	10,126	608	9,518	394	9,124
2015	10,397	624	9,773	405	9,368
2016	10,686	641	10,045	416	9,629
Summer State Peak					
07/08	9,468	568	8,900	417	8,483
08/09	9,890	593	9,297	435	8,862
09/10	10,274	616	9,658	452	9,206
10/11	10,666	640	10,026	469	9,557
11/12	11,049	663	10,386	486	9,900
12/13	11,464	688	10,776	504	10,272
13/14	11,825	709	11,115	520	10,595
14/15	12,181	731	11,450	536	10,914
15/16	12,571	754	11,816	553	11,263
16/17	12,960	778	12,182	570	11,612

Notes:

(1) 'Delivered from Network' includes the demand taken directly from the transmission network as well as net power output from embedded scheduled generators (currently Barcaldine, Roma and the 66kV output component of Townsville Power Stations).

Table 3.11: Maximum Demand – 10% PoE Forecast

	STATION "AS GENERATED" DEMAND	STATION AUXS & LOSSES	STATION "SENT OUT" DEMAND	TRANSMISSION LOSSES	DELIVERED FROM NETWORK DEMAND (1)
Winter State Peak					
2007	8,059	484	7,576	318	7,258
2008	8,379	503	7,876	330	7,546
2009	8,713	523	8,190	344	7,847
2010	9,046	543	8,503	357	8,147
2011	9,380	563	8,817	370	8,447
2012	9,673	580	9,093	381	8,711
2013	10,018	601	9,417	395	9,022
2014	10,319	619	9,700	407	9,293
2015	10,596	636	9,960	418	9,542
2016	10,891	653	10,237	429	9,808
Summer State Peak					
07/08	9,988	599	9,388	456	8,932
08/09	10,442	627	9,815	477	9,338
09/10	10,857	651	10,206	496	9,709
10/11	11,280	677	10,603	516	10,087
11/12	11,694	702	10,992	535	10,457
12/13	12,141	728	11,413	556	10,857
13/14	12,534	752	11,782	574	11,208
14/15	12,923	775	12,147	592	11,555
15/16	13,347	801	12,546	612	11,934
16/17	13,771	826	12,945	632	12,313

Notes:

(1) 'Delivered from Network' includes the demand taken directly from the transmission network as well as net power output from embedded scheduled generators (currently Barcaldine, Roma and the 66kV output component of Townsville Power Stations).

3.5 Zone Forecasts

The ten geographical zones referred to throughout this report are defined as follows:

Table 3.12: Zone Definitions

ZONE	AREA COVERED
Far North	North of Tully including Chalumbin.
Ross	North of Proserpine and Collinsville, but excluding the Far North zone (includes Tully).
North	North of Broadsound and Dysart but excluding the Far North and Ross zones (includes Proserpine and Collinsville).
Central West	Collectively encompasses the area south of Nebo, Peak Downs and Mt McLaren, and north of Gin Gin, but excluding that part defined as the Gladstone zone.
Gladstone	Specifically covers the Powerlink transmission network connecting Gladstone power station, Callemondah (railway supply), Gladstone South, QAL supply, Wurdong and Boyne Smelter supply.
Wide Bay	Gin Gin, Teebar Creek and Woolooga 275kV Substation loads excluding Gympie.
South West	Tarong and Middle Ridge load areas west of Postmans Ridge. From winter 2005 onwards, includes Goondiwindi (Waggamba) load.
Moreton North	South of Woolooga and east of Middle Ridge, but excluding the Moreton South and Gold Coast zones.
Moreton South	Generally, south of the Brisbane River, but currently includes the ENERGEX Victoria Park and Mayne 110kV Substation load areas as supplied from Belmont 275/110kV Substation, and excludes the Gold Coast zone.
Gold Coast	South of Coomera to the Gold Coast and excludes Tweed Shire of NSW.

Each zone normally experiences its own zone peak demand, which is usually greater than that shown in Tables 3.15 and 3.16, as it does not coincide with the time of Queensland region maximum demand.

Table 3.13 shows the average ratio of forecast zone peak demand to zone demand at the time of forecast Queensland region peak demands. These values can be used to multiply demands in Tables 3.15 and 3.16 to estimate each zone's individual peak demand, not necessarily coincident with the time of Queensland region peak demand. The ratios are based on historical trends and customer future expectations. The higher than previous ratios for the Ross Zone reflect increased diversity at the time of Queensland region peak demand of the large industrial loads within this zone.

Table 3.13: Average Ratio of Zone Peak Demand to Zone Demand at Time of Queensland Region Peak

ZONE	WINTER	SUMMER
Far North	1.21	1.06
Ross	1.30	1.20
North	1.14	1.13
Central West	1.06	1.07
Gladstone	1.03	1.03
Wide Bay	1.05	1.08
South West	1.07	1.06
Moreton North	1.01	1.01
Moreton South	1.01	1.01
Gold Coast	1.03	1.02

Table 3.14 shows the forecast of energy supplied from the transmission network and embedded scheduled generators for the Medium Growth Scenario for each of the ten zones in the Queensland region.

Table 3.15 shows the forecast of winter demand delivered from the transmission network and embedded scheduled generators (coincident with the Queensland region winter peak) for each of the ten zones within Queensland. It is based on the Medium Growth Scenario and average winter weather.

Table 3.16 shows the forecast of summer demand delivered from the transmission network and embedded scheduled generators (coincident with the Queensland region summer peak) for each of the ten zones within Queensland. It is based on the Medium Growth Scenario and average summer weather.

Table 3.14: Annual Energy by Zone

Actual and Forecast Annual Energy (GWh) Delivered from the Transmission Network including from Embedded Scheduled Generators in Each Zone for the Medium Growth Scenario

YEAR	FAR NORTH	ROSS	NORTH	CENTRAL WEST	GLAD STONE	WIDE BAY	SOUTH WEST	MORETON NORTH	MORETON SOUTH	GOLD COAST	TOTAL
Actuals											
1999/00	1,430	2,454	1,963	2,789	8,660	1,088	1,575	6,101	8,116	2,404	**36,581**
2000/01	1,457	2,962	2,055	2,876	8,697	1,187	1,659	6,421	8,333	2,531	**38,179**
2001/02	1,536	2,971	2,219	3,069	8,948	1,257	1,717	6,769	8,746	2,663	**39,896**
2002/03	1,549	2,934	2,296	3,109	9,098	1,256	1,738	6,975	9,174	2,721	**40,850**
2003/04	1,631	3,095	2,397	3,174	9,285	1,327	1,828	7,276	9,708	2,942	**42,662**
2004/05	1,673	3,010	2,542	3,269	9,452	1,419	1,943	7,456	10,092	3,034	**43,890**
2005/06	1,745	2,937	2,571	3,363	9,707	1,468	2,092	7,820	10,652	3,253	**45,609**
Projected 2006/07	1,777	3,064	2,735	3,187	10,051	1,468	2,104	7,849	10,794	3,281	**46,309**
Forecasts											
2007/08	1,812	3,489	3,134	3,699	10,289	1,507	2,138	8,366	11,694	3,453	**49,581**
2008/09	1,875	3,635	3,273	3,922	10,548	1,563	2,209	8,737	12,173	3,579	**51,513**
2009/10	1,948	3,757	3,539	4,065	10,612	1,617	2,275	9,037	12,659	3,846	**53,356**
2010/11	2,025	3,858	3,725	4,216	10,869	1,674	2,332	9,453	13,162	4,129	**55,443**
2011/12	2,108	3,946	3,952	4,309	11,035	1,733	2,402	9,915	13,632	4,298	**57,330**
2012/13	2,188	4,034	4,101	4,390	11,485	1,792	2,479	10,274	14,221	4,532	**59,496**
2013/14	2,267	4,122	4,257	4,472	11,554	1,850	2,558	10,766	14,789	4,739	**61,376**
2014/15	2,347	4,211	4,355	4,552	11,623	1,915	2,638	11,413	15,092	4,990	**63,136**
2015/16	2,427	4,300	4,451	4,634	11,723	1,973	2,720	11,868	15,747	5,240	**65,086**
2016/17	2,507	4,390	4,548	4,716	11,824	2,032	2,803	12,324	16,402	5,490	**67,036**

Table 3.15: State Winter Peak Demand by Zone

Actual and Forecast Demand (MW) on the Transmission Network and Embedded Scheduled Generators in Each Zone at the Time of Coincident State Winter Peak 50% PoE Demand for Average Weather and Diversity Conditions and Medium Growth Scenario

YEAR	FAR NORTH	ROSS	NORTH	CENTRAL WEST	GLAD STONE	WIDE BAY	SOUTH WEST	MORETON NORTH	MORETON SOUTH	GOLD COAST	TOTAL
Actuals											
2000	179	354	271	423	986	198	312	1,080	1,350	454	**5,609**
2001	184	378	255	442	1,019	189	301	1,110	1,365	487	**5,731**
2002	163	339	285	383	1,055	160	286	1,115	1,433	452	**5,671**
2003	177	348	295	412	1,009	181	318	1,250	1,575	500	**6,066**
2004	206	354	323	425	1,092	216	345	1,260	1,607	539	**6,366**
2005	192	257	277	431	1,081	261	343	1,366	1,780	564	**6,553**
2006	207	322	325	409	1,157	228	361	1,384	1,900	598	**6,891**
Forecasts											
2007	213	346	347	428	1,190	237	359	1,430	1,938	634	**7,123**
2008	220	369	372	457	1,201	236	370	1,494	2,038	650	**7,407**
2009	228	377	392	481	1,230	243	381	1,573	2,124	674	**7,702**
2010	235	383	407	499	1,262	251	394	1,644	2,188	734	**7,997**
2011	242	391	420	519	1,287	259	404	1,713	2,294	764	**8,293**
2012	250	397	433	528	1,300	267	414	1,798	2,371	794	**8,552**
2013	258	403	445	535	1,354	275	424	1,875	2,458	830	**8,857**
2014	266	410	456	543	1,362	283	434	1,957	2,549	863	**9,124**
2015	274	417	463	551	1,370	292	444	2,032	2,622	904	**9,368**
2016	283	424	469	558	1,388	301	454	2,103	2,710	940	**9,629**

Table 3.16: State Summer Peak Demand by Zone

Actual and Forecast Demand (MW) on the Transmission Network and Embedded Scheduled Generators in Each Zone at the Time of Coincident State Summer 50% PoE Peak Demand with Average Weather and Diversity Conditions and Medium Growth Scenario

YEAR	FAR NORTH	ROSS	NORTH	CENTRAL WEST	GLAD STONE	WIDE BAY	SOUTH WEST	MORETON NORTH	MORETON SOUTH	GOLD COAST	TOTAL
Actuals											
2000/01	252	458	294	391	993	195	270	1,068	1,472	437	**5,830**
2001/02	278	504	355	436	1,040	222	258	1,183	1,461	447	**6,183**
2002/03	264	410	307	426	1,048	200	298	1,243	1,653	488	**6,336**
2003/04	265	452	318	459	1,087	253	339	1,387	1,890	570	**7,020**
2004/05	277	425	342	482	1,107	276	349	1,425	1,990	609	**7,282**
2005/06	284	447	373	492	1,115	292	351	1,439	1,999	596	**7,388**
2006/07	329	461	452	509	1,164	296	375	1,533	2,102	611	**7,832**
Forecasts											
2007/08	322	524	439	531	1,192	288	388	1,624	2,439	736	**8,483**
2008/09	336	537	463	559	1,225	297	405	1,728	2,547	764	**8,862**
2009/10	349	550	484	584	1,248	306	424	1,804	2,627	831	**9,206**
2010/11	363	563	499	611	1,273	315	440	1,884	2,744	864	**9,557**
2011/12	378	576	515	626	1,297	324	456	1,985	2,844	899	**9,900**
2012/13	393	589	531	641	1,346	334	472	2,076	2,952	939	**10,272**
2013/14	409	602	546	656	1,355	343	488	2,168	3,052	977	**10,595**
2014/15	425	615	556	671	1,364	353	504	2,257	3,146	1,026	**10,914**
2015/16	441	630	565	685	1,382	363	520	2,344	3,262	1,071	**11,263**
2016/17	458	644	575	700	1,400	373	536	2,431	3,379	1,117	**11,612**

3.6 Daily and Annual Load Profiles

The daily load profiles for the Queensland region on the days 2006 winter and 2006/07 summer peak demand delivered from the transmission network and from embedded scheduled generators are shown on Figure 3.9.

The annual cumulative load duration characteristic for the Queensland region demand delivered from the transmission network and from embedded scheduled generators is shown on Figure 3.10 for the 2006/07 financial year.

Figure 3.9: Summer and Winter Peaks 2006/07

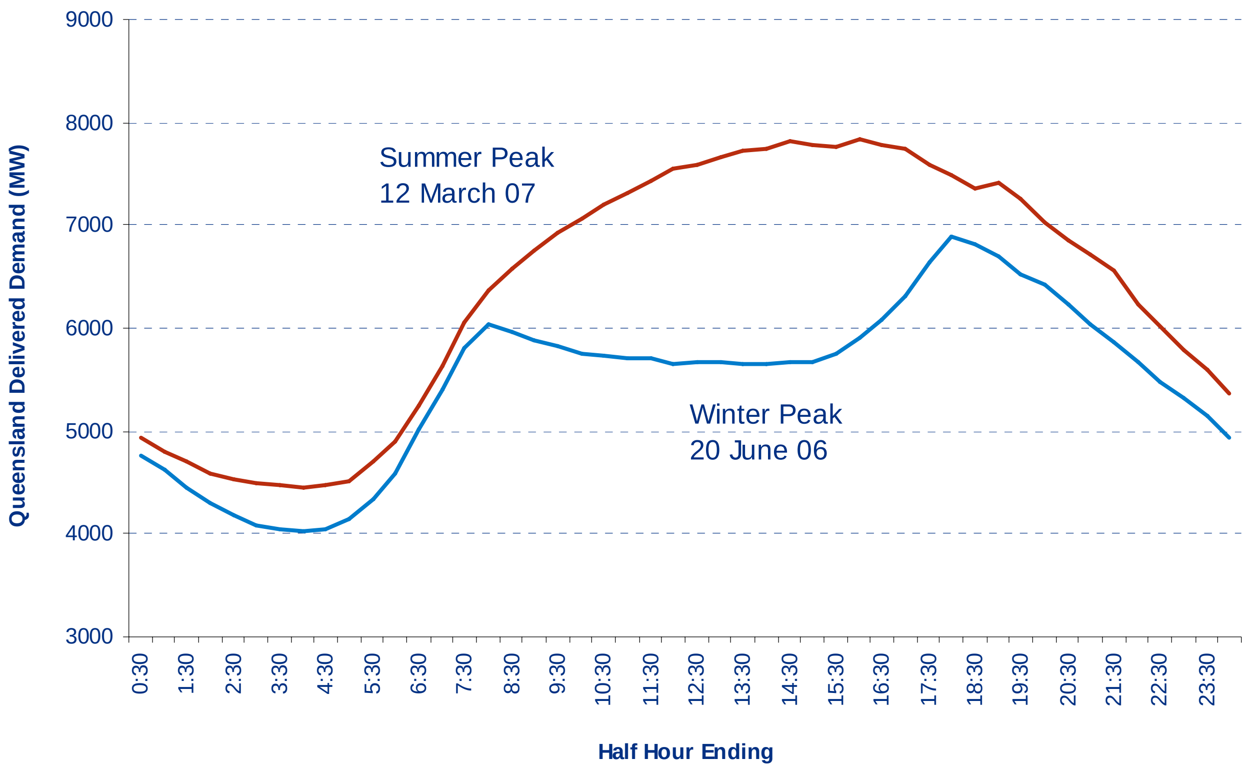
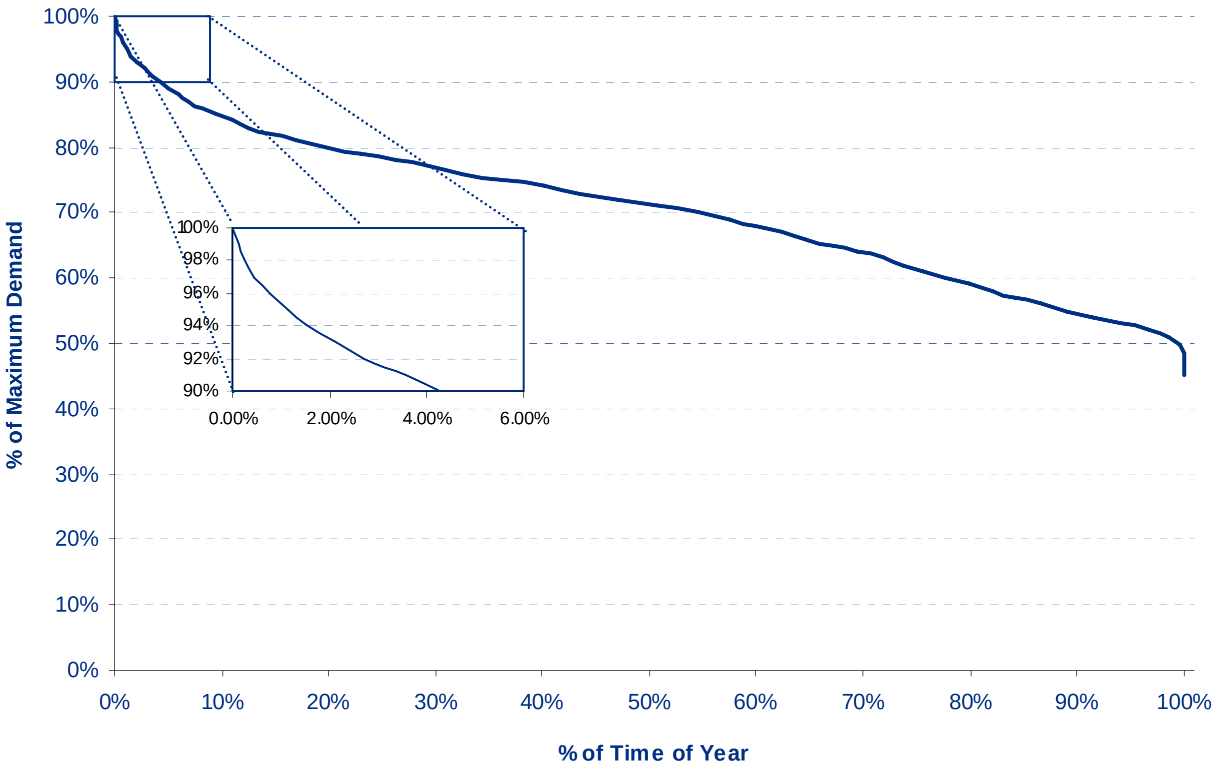


Figure 3.10: Cumulative Annual Load Duration 2006/07



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CHAPTER FOUR
Intra-regional committed network augmentations

4.1 Transmission Network

The 1700km long Queensland transmission network comprises 275kV transmission from Cairns in the north to Mudgeeraba in the south, with 110kV and 132kV systems providing transmission in local zones and providing limited backup to the 275kV network. Also, 330kV lines link Braemar, Middle Ridge, Millmerran and Bulli Creek to the New South Wales network.

The single line diagrams of the Queensland network as shown in the previous Annual Planning Report (APR) have been updated to include recently completed augmentations outlined in this Chapter. Figures 4.1 and 4.2 are single line diagrams showing the Queensland network.

4.2 Committed Transmission Projects

Table 4.1 lists transmission network developments commissioned since Powerlink's 2006 APR was published in June 2006.

Table 4.2 lists transmission network developments which are committed and under construction at June 2007.

Table 4.3 lists transmission connection works that have been commissioned since Powerlink's 2006 APR was published in June 2006.

Table 4.4 lists new transmission connection works for supplying loads which are committed and under construction at June 2007. These connection projects resulted from agreement reached with relevant connected customers, generators or Distribution Network Service Providers (DNSPs) as applicable.

Table 4.5 lists network replacements which are committed and under construction at June 2007.

Table 4.1: Commissioned Transmission Developments

Commissioned since June 2006

PROJECT	PURPOSE	ZONE LOCATION	DATE COMMISSIONED
Major Developments			
Belmont to Murarrie transmission reinforcement – Stage 2	Increase supply capability to the Brisbane CBD and Australia TradeCoast	Moreton South	September 2006
Goodna 275/110kV Substation	Increase supply capability to Ipswich	Moreton South	September 2006
Greenbank 275kV Substation and Greenbank to Maudsland 275kV line	Increase supply capability to the Gold Coast	Gold Coast	October 2006
Network Support Arrangements			
Contract with local generators to provide network support in north Queensland	Part of solution to maintain supply reliability to North Queensland	North	New arrangements established from mid 2005
Minor Developments			
Townsville South 50MVAr 132kV capacitor bank	Capacitive compensation to meet increasing reactive demand	Ross	September 2006
Gladstone South 50MVAr 132kV capacitor bank	Capacitive compensation to meet increasing reactive demand	Gladstone	December 2006
Greenbank 120MVAr 275kV capacitor bank; and Molendinar 50MVAr 110kV capacitor bank	Capacitive compensation to meet increasing reactive demand	Moreton South Gold Coast	October 2006

Table 4.2: Committed Transmission Developments

Committed and under construction at June 2007

PROJECT	PURPOSE	ZONE LOCATION	REQUIRED COMMISSIONING DATE
Major Developments			
Woree second 275/132kV transformer and line reconfiguration	Increase supply capability to Cairns	Far North	Winter 2008
Ross to Townsville South to Townsville East 132kV line and Townsville East 132/66kV Substation	Increase supply capability to the Townsville South and East areas	Ross	Summer 2007/08
Ross to Yabulu South 275kV line and Yabulu South Substation	Increase supply capability to Townsville	Ross	Summer 2008/09
Nebo to Pioneer Valley 132kV line	Increase supply capability to the Mackay to Proserpine area	North	Summer 2007/08
Broadsound to Nebo to Strathmore to Ross 275kV lines Strathmore 275kV SVC	Increase supply capability to North, Ross and Far North Queensland zones	Central West, North and Ross	Progressively from Summer 2007/08 to Summer 2009/10
Lilyvale to Blackwater 132kV line	Increase supply capability to Blackwater	Central West	Summer 2007/08
Bouldercombe to Pandoin 132kV line and Pandoin 132/66kV Substation	Increase supply capability to Rockhampton City and Keppel Coast	Central West	Summer 2009/10
Teebar Creek 275/132kV Substation	Increase supply capability to Wide Bay	Wide Bay	Summer 2007/08
Middle Ridge second 330/275kV transformer and Middle Ridge to Greenbank 330/275kV line (1)	Increase supply capability to South East Queensland	South West and Moreton South	Summer 2007/08
Abermain 275/110kV Substation	Increase supply capability to Ipswich	Moreton South	Summer 2008/09
Murarrie second 275/110kV transformer	Increase supply capability to the Brisbane CBD and Australia TradeCoast	Moreton South	Summer 2009/10

Notes:

(1) The Swanbank to Middle Ridge 110kV double circuit line was removed as part of the project.

Table 4.2: Committed Transmission Developments (Cont'd)

Committed and under construction at June 2007

PROJECT	PURPOSE	ZONE LOCATION	REQUIRED COMMISSIONING DATE
Minor Developments			
Edmonton 30MVAr 132kV capacitor bank	Capacitive compensation to meet increasing reactive demand	Far North	Summer 2008/09
El Arish 132/22kV Substation	Increase supply capability to Mission Beach	Far North	Summer 2008/09
Alligator Creek 132/33kV Substation expansion	Increase supply capability to Hay Point, Dalrymple Bay and south of Mackay	North	Summer 2008/09
Wurdong third 120MVAr 275kV capacitor bank	Maintain supply capability to Southern Queensland	Gladstone	Summer 2007/08
Palmwoods fourth 50MVAr 132kV capacitor bank	Maintain supply capability to Southern Queensland	Moreton North	Summer 2007/08
Molendinar second 275/110kV transformer	Increase supply capability to Gold Coast and Tweed Shire	Gold Coast	Summer 2007/08

Table 4.3: Commissioned Connection Works

Commissioned since June 2006

PROJECT	PURPOSE	ZONE LOCATION	DATE COMMISSIONED
King Creek 132kV Connection Switchyard	Supply for SunWater pumping stations on new Burdekin to Moranbah water pipeline	North	January 2007
QR Mindi Rail 132kV Supply	Increase supply capability to Goonyella rail system	North	May 2007
Stony Creek 132kV Connection Switchyard	Supply for SunWater pumping stations on new Burdekin to Moranbah water pipeline	North	June 2007
Blackwater 132/66kV Substation third transformer	Increase supply capability to Blackwater	Central West	November 2006
South Pine 110kV extension for Brendale	Increase supply capability to Brendale	Moreton North	March 2007
Algester 110/33kV Substation	New connection point to ENERGEX 33kV network	Moreton South	March 2007
Goodna 110/33kV and Sumner 110/11kV Substations	New connection points to ENERGEX 33kV and 11kV networks	Moreton South	October 2006
Belmont 110/33kV Substation third transformer	Increase supply capability to Wecker Road	Moreton South	November 2006

Table 4.4: Committed Connection Works

Committed and under construction at June 2007

PROJECT	PURPOSE	ZONE LOCATION	REQUIRED COMMISSIONING DATE
Woree 132kV extension for Cairns North	Increase supply capability to Cairns North	Far North	Summer 2007/08
Alligator Creek 132kV connection for Louisa Creek	Provide supply to new Ergon Energy substation	North	Summer 2008/09
Biloela 132/66kV transformer augmentation	Increase supply capability to Biloela	Central West	Summer 2007/08
Pandoin 132kV connection for Keppel	Provide supply to new Ergon Energy substation	Central West	Summer 200910
QAL 132/33kV Substation	New connection point to QAL	Gladstone	Summer 2008/09
Oakey 110/33kV Substation	New connection point to Ergon Energy	South West	Winter 2008
Loganlea 110kV extension for Browns Plains	Increase supply capability to Browns Plains	Moreton South	Summer 2007/08
Bundamba 110/11kV transformer augmentation	Increase supply capability to Bundamba	Moreton South	Summer 2009/10
Mudgeeraba 110/33kV Substation establishment	Increase supply capability to Mudgeeraba	Gold Coast	Summer 2007/08

Table 4.5: Committed Network Replacements

Committed and under construction at June 2007

PROJECT	PURPOSE	ZONE LOCATION	REQUIRED COMMISSIONING DATE
Major Replacements			
Tully to Innisfail 132kV line (Kareeya to Innisfail 132kV line replacement)	Maintain supply reliability to the Far North zone	Far North	Summer 2007/08
Innisfail to Edmonton 132kV line replacement	Maintain supply reliability to the Far North zone	Far North	Winter 2009
Bohle River to Townsville Power Station line replacement	Maintain supply reliability to the Townsville area	Ross	Summer 2007/08
Alligator Creek 132/33kV transformer replacement	Maintain supply reliability to Hay Point, Dalrymple Bay and south of Mackay	North	Summer 2008/09
Woolooga to Gin Gin overhead earthwire replacement	Maintain supply reliability to the Southern Queensland	Wide Bay	Winter 2007
Tarong Substation 275kV circuit breaker replacement	Maintain supply reliability to the South West zone	South West	Summer 2007/08
South Pine 110kV Substation replacement	Maintain supply reliability to the Moreton North zone	Moreton North	Summer 2009/10
West Darra 110kV Substation replacement	Maintain supply reliability to the Moreton South zone	Moreton South	Summer 2008/09
Belmont 110kV Substation replacement	Maintain supply reliability to the Moreton South zone	Moreton South	Winter 2009
Mudgeeraba Substation 110kV circuit breaker replacement	Maintain supply reliability to the Gold Coast zone	Gold Coast	Summer 2007/08

Figure 4.1: Existing 330/275/132/110kV Network June 2007 – North and Central Queensland

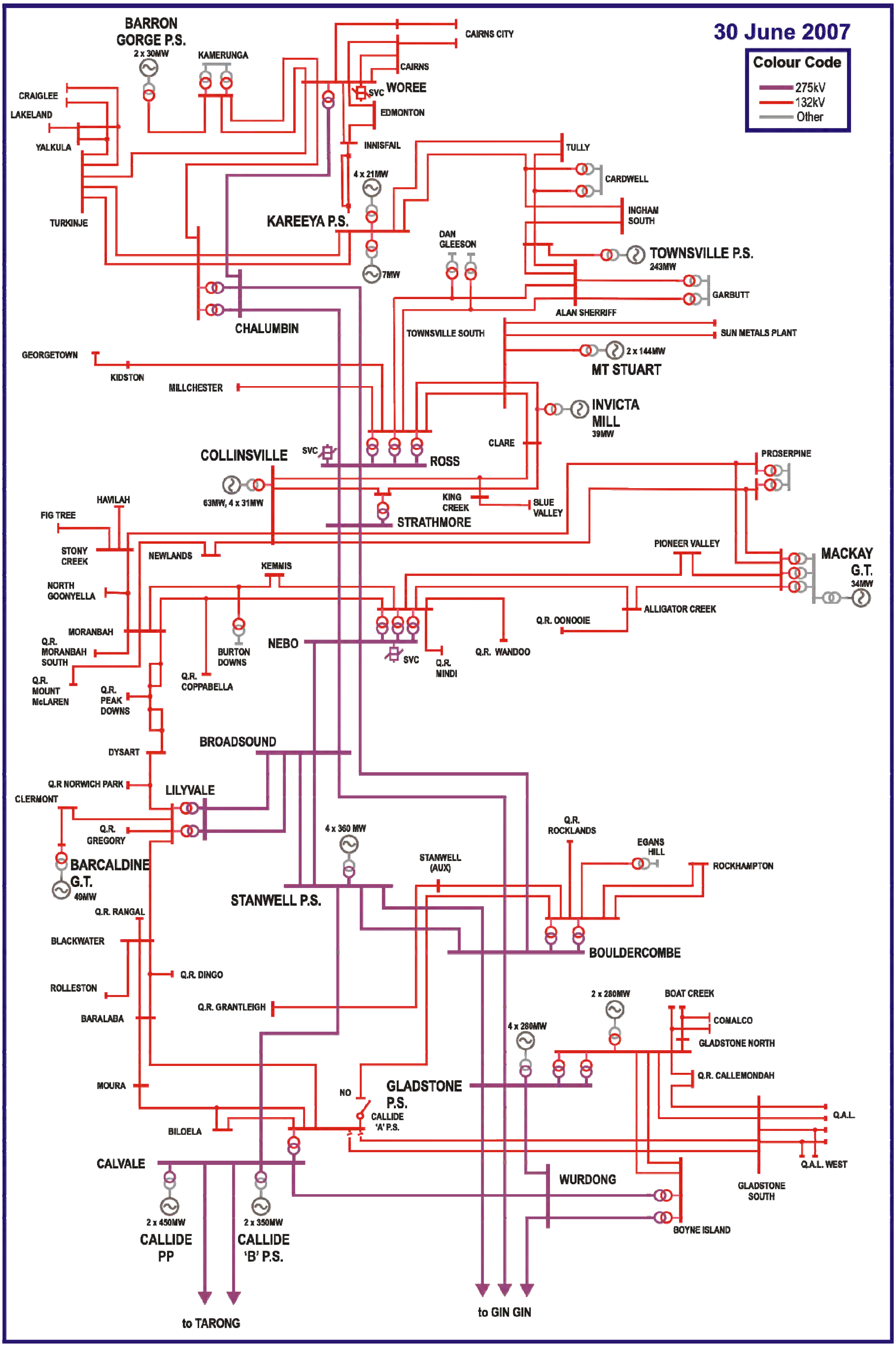
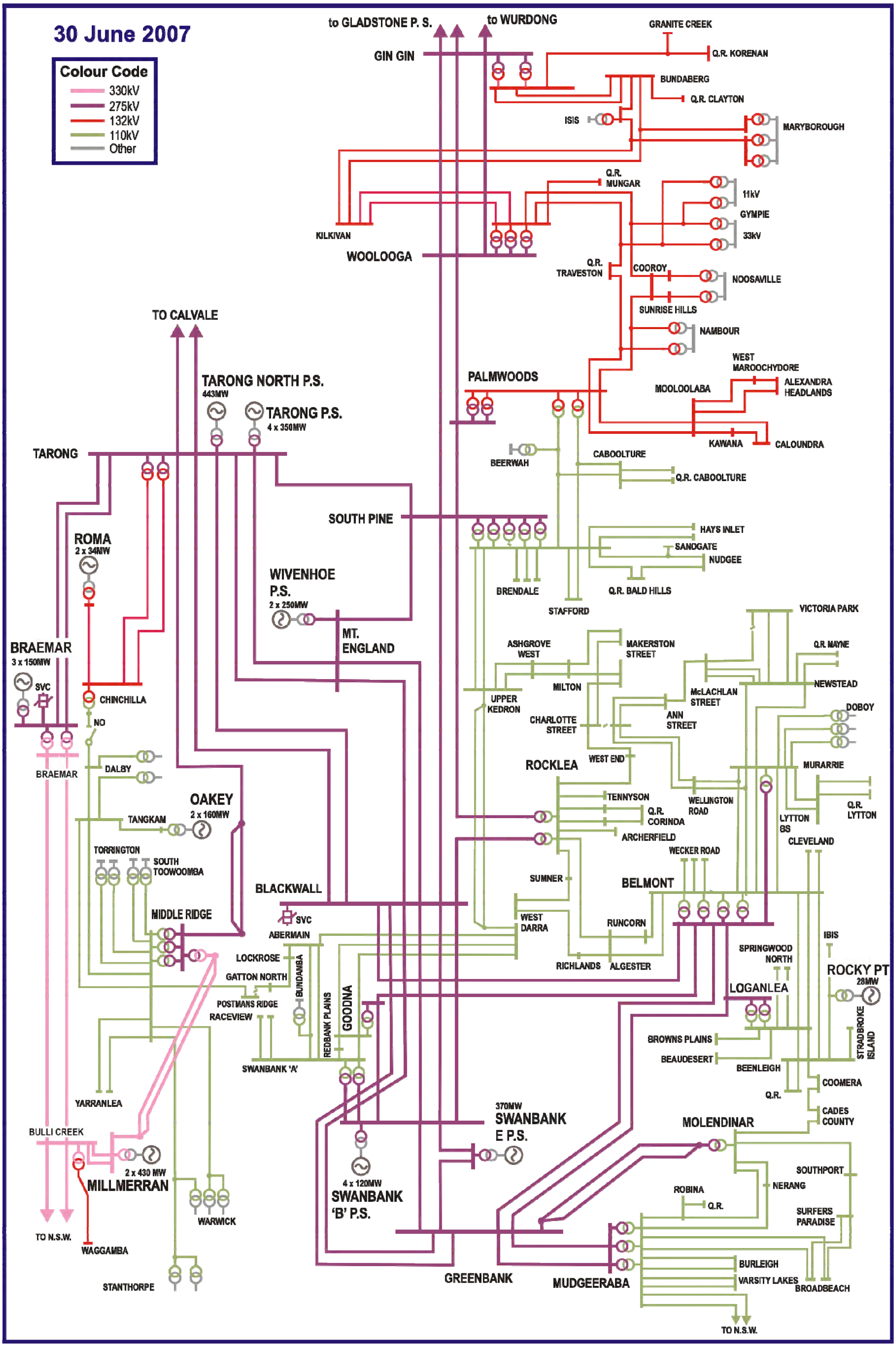


Figure 4.2: Existing 330/275/132/110kV network June 2007 – South Queensland



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CHAPTER FIVE

Intra-regional proposed network developments within five years

5.1 Introduction

The National Electricity Rules (NER) (Clause 5.6.2A(b)(3)) requires the Annual Planning Report (APR) to provide “a forecast of constraints and inability to meet the network performance requirements set out in NER Schedule 5.1 or relevant legislation or regulations of a participating jurisdiction over 1, 3 and 5 years”.

This chapter on proposed network developments provides this and other related information. It contains:

- A background on the factors that influence network capability;
- Sample network power flows at times of forecast Queensland maximum summer and winter demands under a range of interconnector flows and sample generation dispatch patterns within Queensland;
- A qualitative explanation of factors affecting power transfer capability at key grid sections on the Powerlink network;
- Identification of emerging limitations with the potential to affect supply reliability;
- A table summarising the outlook for network constraints and network limitations over a five year horizon;
- Details of those limitations for which Powerlink intends to implement action or initiate consultation with market participants and interested parties;
- A table summarising possible connection point proposals; and
- A table summarising works for assets reaching the end of their technical life.

Identification of forecast limitations in this chapter does not mean that there is a supply reliability risk. The NER requires identification of such limitations which are expected to arise some years into the future, assuming that demand for electricity continues to grow as outlined in this document. Early identification allows Powerlink to implement appropriate solutions, as outlined in this chapter, to maintain a reliable power supply to customers.

The capability of Powerlink's transmission network to meet forecast demand is dependent on a number of factors that are subject to considerable uncertainty.

In general terms, the Queensland transmission network is more highly utilised during summer than during winter. During the higher summer temperatures the reactive power requirements are greater, and transmission plant has lower power carrying capability. Also, high summer peak demands generally last for many hours, whereas winter peak demands are for short evening periods (as shown in Figure 3.9).

The location and pattern of power generation dispatch influence the power flows across most of the Queensland network. Future generation dispatch patterns and interconnector flows are uncertain in the deregulated electricity market and will also vary substantially, due to the effect of planned or unplanned outages of generation plant. Power flows on transmission network elements can also vary substantially with planned or unplanned outages of transmission lines and transformers. Power flow levels can also be higher at times of local area or zone peak demands, as distinct from those at the time of Queensland region maximum demand. Power flows can also be higher when embedded generation levels are lower than forecast.

This chapter outlines some of these sensitivities using illustrative network power flows over the next three years under a range of interconnector flows and sample generation dispatch patterns within Queensland. Qualitative explanation is also provided on the factors which impact power transfer capability at key grid sections on the Powerlink network, and on the cause of emerging limitations which may affect supply reliability.

5.2 Sample Winter and Summer Network Power Flows

Powerlink has selected 21 sample scenarios to illustrate possible network power flows for the forecast Queensland region summer and winter maximum demands over the period 2007 winter to 2009/10 summer.

Illustrative network power flows at forecast Queensland region (50% Probability of Exceedance (PoE)) winter and summer maximum demand forecast over the next three years are shown in Appendix A for the Medium Economic Growth Scenario demand forecast outlined in Chapter 3 of this report. These show possible network power flows under the range of import and export conditions on the Queensland/New South Wales Interconnector (QNI) as indicated. Network power flows in Appendix A are based on existing network configuration, committed projects and proposed new network assets (as outlined in Section 5.7) only, and assume the network is in its 'normal' or 'intact' state, that is, all network elements in service. Power flows can be higher than those levels during network or generation contingencies, during times of local area or zone peak demands and/or different generation dispatches.

This information is based on possible sample generation dispatch patterns to meet nominated forecast Queensland region maximum demand conditions and only provides an indication of potential network power flows. Actual network power flows can vary significantly for different load conditions and generator bidding behaviour. In providing this information, Powerlink has not attempted to predict market outcomes.

Appendix A also indicates where network flows are expected to exceed the relevant transfer capability for the system conditions analysed.

Sample conditions in Appendix A include:

Figure A1:	Generation & Load Legend for Figures A3 to A23
Figure A2:	Power Flow & Limits Legend for Figures A3 to A23
Figure A3:	Winter 2007 Qld Peak 400MW Northerly QNI Flow
Figure A4:	Winter 2007 Qld Peak Zero QNI Flow
Figure A5:	Winter 2007 Qld Peak 700MW Southerly QNI Flow
Figure A6:	Winter 2008 Qld Peak 300MW Northerly QNI Flow
Figure A7:	Winter 2008 Qld Peak Zero QNI Flow
Figure A8:	Winter 2008 Qld Peak 700MW Southerly QNI Flow
Figure A9:	Winter 2009 Qld Peak 300MW Northerly QNI Flow
Figure A10:	Winter 2009 Qld Peak Zero QNI Flow
Figure A11:	Winter 2009 Qld Peak 700MW Southerly QNI Flow
Figure A12:	Summer 2007/08 Qld Peak 300MW Northerly QNI Flow
Figure A13:	Summer 2007/08 Qld Peak Zero QNI Flow
Figure A14:	Summer 2007/08 Qld Peak 400MW Southerly QNI Flow
Figure A15:	Summer 2008/09 Qld Peak 300MW Northerly QNI Flow
Figure A16:	Summer 2008/09 Qld Peak Zero QNI Flow
Figure A17:	Summer 2008/09 Qld Peak 400MW Southerly QNI Flow
Figure A18:	Summer 2009/10 Qld Peak 300MW Northerly QNI Flow
Figure A19:	Summer 2009/10 Qld Peak Zero QNI Flow
Figure A20:	Summer 2009/10 Qld Peak 300MW Southerly QNI Flow
Figure A21:	Alternative South Queensland Generation Dispatch Winter 2007 Qld Peak 400MW Northerly QNI Flow
Figure A22:	Alternative South Queensland Generation Dispatch Winter 2007 Qld Peak Zero QNI Flow
Figure A23:	Alternative South Queensland Generation Dispatch Winter 2007 Qld Peak 400MW Southerly QNI Flow

The power flows shown in Figures A3 to A23 are a sample of possible generation dispatch and network power flows for the forecast region peak demand conditions nominated. The dispatch assumed is broadly based on the relative outputs of generators since the commencement of the National Electricity Market (NEM) but is not intended to imply a prediction of future market behaviour.

The sample power flows in Figures A3 to A23 include southerly power flows on the Terranora Interconnector which are based on expected levels to meet reliability requirements in northern New South Wales.

In addition to Figures A3 to A5 which illustrate possible network flows for winter 2007 peak loading conditions, alternative outlooks have been appended as Figures A21 to A23 which illustrate possible power flows under the scenario of reduced South East Queensland generation in response to drought related water conservation.

5.3 Network Transfer Capability

5.3.1 Location of Grid Sections and Observation Points

Powerlink has identified a number of grid sections that allow network capability and forecast limitations of the whole network to be assessed in a structured manner. For the current system, limit equations have been derived for each of these grid sections. These limit equations quantify the maximum secure power transfer across these grid sections. The maximum power transfer may be set by transient/dynamic stability, voltage stability, thermal plant ratings or protection relay load limits. National Electricity Market Management Company (NEMMCO) has incorporated these limit equations as part of constraints within the market dispatch process, National Electricity Market Dispatch Engine (NEMDE).

In addition to these grid sections, Powerlink also monitors power flows across several 'observation points'. These 'observation points' may be useful to define the maximum secure power transfer particularly under network outage conditions.

Figure A2 in Appendix A shows the location of grid sections (where limit equations apply) and 'observation points' on the Queensland network. Potential limitations where flows may reach transfer capability under some circumstances in the next three years are summarised in Table 5.8.

5.3.2 Determining Network Transfer Capability

The transfer capability across each grid section varies with different system operating conditions. Transmission limits in the NEM are not generally amenable to definition by a single number. Instead, Transmission Network Service Providers (TNSPs) define the capability of their network using multi-term equations. These equations quantify the relationship between system operating conditions and the network transfer capability, and are implemented into NEMMCO's market systems for the optimal dispatch of generation. This is relevant in Queensland as the network transfer capability is highly dependent on which generators are in service and their dispatch level.

This limit equation approach aims to maximise the transmission capability available to electricity market participants at any point in time depending on the prevailing system conditions.

The trade-off for this maximisation of network transfer capability is the complexity of analysis required to define network capability. The process of developing transfer limit equations from a large number of network analysis cases involves the use of regression techniques and is time consuming. It also involves a due diligence process by NEMMCO before these equations are implemented in the market dispatch processes.

The present limit equations derived by Powerlink, at the time of publication of this report, are provided in Appendix B. It should be noted that the limit equations will change over time with demand, generation and network development.

Such detailed and extensive analysis has not been carried out for future network and generation developments for this report. Section 5.4 gives a qualitative description of the main system conditions that affect the capability of each of the grid sections.

Table A1 in Appendix A shows the power flows at each of these grid sections for intact operation (that is, with all network elements in service) at the time of peak demand in the Queensland region, corresponding to the sample generation dispatch shown in Figures A3 to A20. It also shows where network flows are expected to exceed the relevant limit and the mode of instability that determines the limit.

5.4 Grid Section Performance

This section is a qualitative summary of the main system conditions that affect the transfer capability across key grid sections of the Queensland transmission network.

Powerlink has also provided a qualitative outlook for the likelihood that these grid sections will translate into restrictions on generator dispatch (that is, binding limits). This outlook is provided to assist readers to understand the information provided in Appendix A, and is in no way meant to imply that this outlook holds true for system conditions other than those in the sample power flows.

Network power flows and transfer capability are highly sensitive to actual demand and generator dispatch patterns, and embedded non-scheduled generation output and Powerlink makes no prediction of market outcomes in the information provided.

It should be noted that power flows across grid sections can be higher than shown in Figures A3 to A23 at times of local area or zone peak demands. However, the transmission capability may also be higher under such conditions depending on how generation or interconnector flow varies to meet the higher local demand levels.

For each of the grid sections discussed below, the proportion of time that the limit equation has recently bound is provided for two periods, namely from April to September 2006 (winter) and from October 2006 to March 2007 (summer).

This information on binding periods sourced from the NEM InfoServer includes all dispatch intervals in the relevant period. No attempt has been made to distinguish dispatch intervals when planned or forced outages may have affected network capability.

This binding constraint information is provided for the information of readers and is not intended to imply that the historical information represents a prediction of constraints in the future.

5.4.1 Far North Queensland Grid Section

The maximum power transfer across the Far North Queensland grid section is set by voltage stability associated with an outage of either a Ross to Chalumbin 275kV transmission circuit, or the 275kV transmission circuit from Chalumbin to Woree (Cairns area).

The present limit equations, derived by Powerlink for each of these critical contingencies is shown in Table B1 of Appendix B. The equations show that the following variables have the most significant effect on the transfer capability:

- Generation (MW) within the Far North zone;
- Generators on line within the Far North zone; and
- Capacitor banks on line within the Far North zone.

For the contingencies outlined above, the operation of local hydro generators as synchronous compensators provides voltage support and increases the secure power transfer capability.

Local hydro megawatt (MW) output reduces the network transfer capability, but more demand can be securely supported in the Far North zone. This is because the reduction in the grid section transfer capability is more than offset by the reduction in power transfers resulting from increased MW output by the local generators.

Information pertaining to the duration of constrained operation for the Far North Queensland grid section over the period April 2006 to March 2007 is summarised in Table 5.1.

Table 5.1: Far North Queensland Grid Section Constraint Times for April 2006 - March 2007

FNQ GRID SECTION	PROPORTION OF TIME CONSTRAINT EQUATION BOUND (%)	EQUATION BOUND (HOURS)
April to September 2006	0.24%	10.67
October 2006 to March 2007	0.03%	1.33

Power transfers across this grid section are forecast to be within the transfer capability of the network for the sample generation scenarios shown within Appendix A. This outlook is based on 50% PoE forecast demand conditions.

Power flows across this grid section can be higher than shown in Figures A3 to A23 at times of local area peak demands or during more severe weather than in 50% PoE forecast conditions. Flows can also be higher during non-availability or low output of the hydro generators, or if the output from embedded generators at sugar mills and the wind farm in North Queensland is lower than forecast. Powerlink and NEMMCO have implemented operational arrangements to minimise the occurrence of binding transfer capability during these conditions.

Powerlink has a committed project underway to install a second 275/132kV transformer at Woree and energise the second 275kV Chalumbin to Woree circuit currently operating at 132kV for operation at 275kV by summer 2008/09. This is addressed further in Section 5.5.1.

Further action to maintain the reliability of supply to the Far North zone may again be required from the 2010/11 summer onwards.

5.4.2 CQ-NQ Grid Section

The maximum power transfer across the Central Queensland to North Queensland (CQ-NQ) grid section is set by transient stability, voltage stability or thermal overload following a transmission or generation contingency.

The maximum transfer capability may be set by thermal ratings associated with an outage of a 275kV transmission circuit between Broadsound and Nebo, Nebo and Strathmore, or Strathmore and Ross Substations, under certain prevailing ambient conditions.

Power transfers may also be constrained by voltage stability limitations associated with the trip of one of the larger North Queensland gas turbines operating at high generation levels. Stability limitations associated with a 275kV transmission contingency can also constrain power flows.

Information pertaining to the duration of constrained operation for the CQ-NQ grid section over the period April 2006 to March 2007 is summarised in Table 5.2.

Table 5.2: CQ-NQ Grid Section Constraint Times for April 2006 - March 2007

CQ-NQ GRID SECTION (1)(2)	PROPORTION OF TIME CONSTRAINT EQUATION BOUND (%)	EQUATION BOUND (HOURS)
April to September 2006	0.24%	10.75
October 2006 to March 2007 (3)	0.76%	33.25

Notes:

(1) Powerlink has network support agreements with generators in North Queensland to manage power flows across this grid section within the transfer capability.

(2) The figures do not include occurrences of binding constraints associated with these network support agreements. NEMMCO does not consider that periods of congestion that are managed through a network support agreement contribute to the total number of hours of a binding intra-regional constraint.

(3) Between October 2006 to March 2007, the flow was controlled to avoid exceeding the CQ-NQ transfer capability by generation managed under the network support arrangements.

The existing network transfer capability is highly utilised, with limits reached at times of summer peak demands in North Queensland. This limitation is currently managed by network support contracts that Powerlink has with local North Queensland generators.

Power flows across this grid section can be higher than as shown in Figures A3 to A23 at times of local area or North Queensland peak demands or during more severe weather than in 50% PoE forecast conditions. Flows can also be higher during non-availability or low output of the hydro generators, or if the output from embedded generators at sugar mills and the wind farm in North Queensland is lower than forecast.

Powerlink identified that the combined capability of the CQ-NQ transmission network and local North Queensland generators will be fully utilised by summer 2007/08. Further augmentation is required by this time to ensure customers continue to receive a reliable electricity supply consistent with Powerlink's mandated reliability obligations.

In late 2005, Powerlink finalised regulatory processes for the following new large network assets to ensure supply reliability is maintained:

- Stage 1 - Construction of a 275kV transmission line between Broadsound and Nebo Substations, and 275kV static VAr compensator at Strathmore Substation by summer 2007/08;
- Stage 2 - Construction of a 275kV transmission line between Nebo and Strathmore Substations by summer 2008/09; and
- Stage 3 - Construction of a 275kV transmission line between Strathmore and Ross Substations by summer 2010/11 (now timed for summer 2009/10).

The timing of the 275kV transmission line between Strathmore and Ross (Stage 3) has advanced from late 2010 to late 2009 based on the 2006 and 2007 load forecast being higher than the 2005 forecast on which the Regulatory Test was based. The higher forecast demand includes specific load developments at the coal handling facility at Dalrymple Bay, new and expanding coal mines and increases to industrial plant in Townsville.

5.4.3 Gladstone Grid Section

The maximum power transfer across this grid section is set by the thermal rating of the 275kV lines between the Central West and Gladstone zones (usually the 275kV circuit between Calvale and Wurdong) and potentially the thermal rating of the Calvale 275/132kV transformer. The highest loadings on the Calvale to Wurdong 275kV circuit generally occur following a contingency of the Calvale to Stanwell 275kV circuit, or following a contingency of the Gladstone to Wurdong 275kV circuit.

The present equation, derived by NEMMCO, for the Gladstone grid section is shown in Table B3 of Appendix B. The NEMMCO equation predicts the flow on the critical Calvale to Wurdong 275kV circuit following an outage of the Calvale to Stanwell circuit.

If the rating would otherwise be violated following this contingency, then generation is re-dispatched to alleviate transfers across this line. To minimise the affect on the market, Powerlink updates the rating of the line to take account of the prevailing ambient weather conditions. The appropriate rating is passed to NEMMCO for implementation in NEMDE.

Powerlink has also implemented network switching and support strategies which can be utilised during times when transfers reach the capability of this grid section. The strategies also extend to managing the flow through the Calvale 275/132kV transformer within the rating under contingency conditions. These strategies have been implemented to minimise the effect of generation redispatch on the market.

Information pertaining to the duration of constrained operation for the Gladstone grid section over the period April 2006 to March 2007 is summarised in Table 5.3.

Table 5.3: Gladstone Grid Section Constraint Times for April 2006 - March 2007

GLADSTONE GRID SECTION (1)	PROPORTION OF TIME CONSTRAINT EQUATION BOUND (%)	EQUATION BOUND (HOURS)
April to September 2006	0.20%	8.58
October 2006 to March 2007	0.57%	25.08

Note:

(1) This constraint is managed by the Gladstone Limit Equation. Increasing Gladstone generation reduces the incidence of binding.

Power transfers are most likely to reach the transfer capability of this grid section under market dispatch scenarios that lead to high Callide generation and low Gladstone generation.

Further action would be required if potential major new industrial loads in the Gladstone area eventuate. Powerlink published a Final Report in November 2005 recommending options to address network limitations should any major load developments proceed within this area. As detailed in the Final Report, Powerlink identified the establishment of Larcom Creek 275/132kV Substation in the Gladstone State Development area by late 2009. Larcom Creek would form the first and a key component of the strategy to ensure reliability of supply to ongoing developments in the area.

5.4.4 CQ-SQ Grid Section

The maximum power transfer across the Central Queensland to South Queensland (CQ-SQ) grid section is set by transient and voltage stability following a transmission or generation contingency.

The voltage stability limit is set by insufficient reactive power reserves in the Central West and Gladstone zones following a contingency. More generating units on line within these zones increase the reactive power support and therefore the transfer capability.

The present voltage stability limit equations for the CQ-SQ limit are shown in Table B4 of Appendix B.

The equations show that the following variables have the most significant effect on the transfer capability:

- Number of generating units on line in the Central West and Gladstone zones; and
- Generation (MW) at the Gladstone power station.

Information pertaining to the duration of constrained operation for the CQ-SQ limit over the period from April 2006 to March 2007 is summarised in Table 5.4.

Table 5.4: CQ-SQ Grid Section Constraint Times for April 2006 - March 2007

CQ-SQ GRID SECTION	PROPORTION OF TIME CONSTRAINT EQUATION BOUND (%)	EQUATION BOUND (HOURS)
April to September 2006	5.03%	221.00
October 2006 to March 2007	4.65%	203.25 (1)

Note:

(1) The duration of binding events outlined in Table 5.4 include periods when spare capability across this grid section was fully utilised by the QNI or Terranora Interconnector transferring power south into NSW. These binding periods coincided with southerly flows on QNI.

Power flows across this grid section can be higher than shown in Figures A3 to A23 of Appendix A at times of more severe weather than 50% PoE forecast conditions and/or different generation patterns. The latter is the most variable and has the largest potential for increasing transfers across the grid section.

The introduction of additional plant within South Queensland, that displaces generation within Central or North Queensland, can reduce the level of power transfers across this grid section. The advent of large load developments within Central or North Queensland (not currently included in forecasts), without corresponding increases in North or Central Queensland generation, can also significantly reduce the levels of CQ-SQ transfers.

Powerlink has conducted planning analysis that has identified an emerging shortage in reactive reserves along the eastern corridor. Regulatory processes have recently been finalised to establish shunt capacitor banks at Wurdong on the 275kV bus and at Palmwoods on the 132kV bus by late 2007, in order to maintain the transfer capacity of 1900MW to the greater Brisbane load centre across the CQ-SQ grid section.

At transfers above 1900MW, the CQ-SQ transfer is limited by transient instability following a fault on a Calvale to Tarong 275kV circuit. Powerlink has identified that the capability of the CQ-SQ transmission network will be fully utilised by summer 2008/09. Further augmentation will be required by this time to ensure South Queensland customers continue to receive a reliable electricity supply consistent with Powerlink's mandated reliability obligations.

In this regard, Powerlink has commenced regulatory processes for a new large network asset by summer 2008/09. It has been recommended that a 350MVAr static VAr compensator be established at Woolooga Substation to increase the transfer limit.

5.4.5 Tarong Grid Section

The maximum power transfer across this grid section is set by voltage stability associated with loss of a large generating unit or a 275kV transmission circuit either between Central and Southern Queensland or between Tarong and the greater Brisbane load centre. The limitation results from insufficient reactive power reserves within South Queensland.

Depending on generation patterns and power system conditions, one of five critical contingencies can limit the maximum secure power transfer across this grid section. These contingencies are:

- Swanbank E generating unit;
- Woolooga to Palmwoods 275kV transmission circuit;
- Calvale to Tarong 275kV transmission circuit;
- Tarong to Blackwall 275kV transmission circuit; and
- Wivenhoe generating unit.

The present limit equations, derived by Powerlink, for the Tarong grid section are shown in Table B5 of Appendix B. The equations show that the following variables have the most significant effect on the transfer capability:

- Transfer on QNI and Generation (MW) within the South West zone;
- Number of generators on line in the Moreton North and South zones; and
- Generation (MW) within the Moreton North and South zones.

There is inter-dependence between the CQ-SQ transfer and the Tarong transfer capability. High flows between Central and Southern Queensland reduce the Tarong transfer capability.

Any increase in generation west of the grid section reduces the CQ-SQ power flow and increases the Tarong limit. Increasing generation east of the grid section reduces the transfer capability, but increases the overall amount of supportable South East Queensland demand. This is because the reduction in the transfer capability is more than offset by the reduction in power transfers resulting from increased generation east of the grid section.

Information pertaining to the duration of constrained operation for the Tarong grid section over the period April 2006 to March 2007 is summarised in Table 5.5.

Table 5.5: Tarong Grid Section Constraint Times for April 2006 - March 2007

TARONG GRID SECTION	PROPORTION OF TIME CONSTRAINT EQUATION BOUND (%)	EQUATION BOUND (HOURS)
April to September 2006	0.00%	0.00
October 2006 to March 2007	0.14%	6.00

Based on the sample generation scenarios shown within Appendix A, power flows across this grid section are forecast to increase steadily over time. These scenarios are based on 50% PoE demand forecasts with all generation plant being available within the Moreton North and South zones.

The Middle Ridge to Greenbank transmission reinforcement will be commissioned in summer 2007/08. This introduces two additional 275kV circuits to the Tarong grid section, thereby increasing the transfer capability.

Powerlink has identified that the capability of the Tarong grid section will be fully utilised by summer 2008/09. Further augmentation will be required by this time to ensure customers continue to receive a reliable electricity supply in the greater Brisbane load centre consistent with Powerlink's mandated reliability obligations.

In this regard, Powerlink has commenced regulatory processes for a new large network asset by summer 2008/09. Along with static reactive compensation in SEQ, a 350MVAr static VAr compensator is to be established at Greenbank substation.

Further generation capacity needed to meet future load in Queensland may locate in South West Queensland. This will increase the utilisation of the Tarong grid section and necessitate further increases in transfer capability. The likely option to address this need is referred to in Section 5.5.7.

5.4.6 Gold Coast Grid Section

The maximum power transfer across this grid section is set by voltage stability associated with loss of the Swanbank E generating unit or the 275kV circuit from Greenbank to Molendinar.

The present equation, derived by Powerlink, for the Gold Coast transfer capability is shown in Table B6 of Appendix B.

The equation shows that the following variables have the most significant effect on the transfer capability:

- Number of generating units on line in the Moreton North and South zones;
- Loading (MW and MVAr) of Terranora Interconnector;
- Capacitive compensation levels on the Gold Coast, Moreton North and South zones; and
- The diversity of the Gold Coast to the greater Brisbane load.

The voltage limits are higher when more Swanbank B or E units are on line. Increasing northerly flow on Directlink reduces the transfer capability, but increases the overall amount of supportable Gold Coast demand. This is because the reduction in the transfer capability is more than offset by the reduction in power transfers resulting from Directlink.

Information pertaining to the duration of constrained operation for the Gold Coast grid section over the period April 2006 to March 2007 is summarised in Table 5.6.

Table 5.6: Gold Coast Grid Section Constraint Times for April 2006 - March 2007

GOLD COAST GRID SECTION (1) (2)	PROPORTION OF TIME CONSTRAINT EQUATION BOUND (%)	EQUATION BOUND (HOURS)
April to September 2006	11.11%	488.00
October 2006 to March 2007	0.67%	29.42

Notes:

(1) Directlink was transferred to prescribed status in March 2006. The Terranora Interconnector, an 110kV double circuit transmission line between Mudgeeraba and Terranora, links the Queensland and New South Wales regions.

(2) The duration of binding events outlined in Table 5.6 include periods when spare capability across this grid section was fully utilised by the Terranora Interconnector transferring power into New South Wales.

Powerlink has recently completed a project to increase the transfer capability of the Gold Coast grid section. This project included the establishment of a new 275kV switching station at Greenbank, construction of double circuit 275kV transmission line from Greenbank to Maudsland and installation of reactive compensation at Greenbank.

Based on the sample generation scenarios shown within Appendix A, power flows across this grid section are forecast to increase steadily over time but remain below the transfer capability. These scenarios are based on 50% POE demand forecasts and expected flow on Directlink to meet reliability requirements in North New South Wales.

Powerlink has committed projects underway that increase the transfer capability of the Gold Coast grid section. These projects include the Middle Ridge to Greenbank transmission reinforcement, and the installation of reactive compensation at Greenbank and Molendinar by summer 2007/08.

The transfer capability across 275/110kV transformers within the Gold Coast area is expected to reach thermal ratings by the 2007/08 summer. A recommendation to address this emerging limitation is discussed in Section 5.5.8.

5.4.7 South West Queensland Grid Section

The South West Queensland (SWQ) grid section defines the capability of the transmission system to transfer power from generating stations located within South West Queensland (including import from QNI), to the rest of the state.

The capability of this grid section is currently set by the thermal rating of the Braemar 330/275kV transformers (following an outage of the parallel transformer) and voltage stability for an outage of a Braemar to Tarong 275kV circuit.

The Braemar limit equation applies to this grid section. This present equation for the Braemar transfer capability is shown in Table B7 of Appendix B. Information pertaining to the duration of constrained operation for the Braemar transfer capability over the period April 2006 to March 2007 is summarised in Table 5.7.

Table 5.7: Braemar Grid Section Constraint Times for April 2006 - March 2007

BRAEMAR GRID SECTION	PROPORTION OF TIME CONSTRAINT EQUATION BOUND (%)	EQUATION BOUND (HOURS)
April to September 2006	0.00%	0.00
October 2006 to March 2007	0.00%	0.00

The Middle Ridge to Greenbank transmission reinforcement will be commissioned in summer 2007/08. This introduces two additional 275kV circuits to the South West Queensland grid section.

The sample generation scenarios within Appendix A assume the commissioning of the 750MW Kogan Creek coal fired Power Station from summer 2007/08 onwards, (as discussed within Section 6.2). For these sample scenarios, power transfers are below the capability of the SWQ grid section.

The capability of the South West grid section is not expected to be reached prior to the advent of further new generation within the SWQ zone, (especially south west of the SWQ grid section). The capability of the SWQ grid section will then depend on the location, capacity and operation of the existing and new generation entrants.

This capability will be set by the thermal rating of the Middle Ridge 330/275kV transformer or Middle Ridge to Greenbank 275kV circuit, and/or voltage stability for an outage of a 275kV or 330kV circuit within SWQ or between SWQ and SEQ.

Due to strong load growth in SEQ, these limits may require augmentation to meet mandated reliability obligations to SEQ by 2011/12. This is discussed in Section 5.5.6.

5.4.8 Interconnector Limits (QNI and Terranora Interconnector)

The Queensland to New South Wales Interconnector (QNI) was designed and constructed of assets having plant ratings of at least 1000MW. However the actual transfer capability will vary from time to time depending on system conditions.

For intact system operation, the southerly transfer capability of QNI is most likely to be set by the following:

- Transient stability associated with loss of the largest load in Queensland;
- Transient stability associated with transmission faults in Queensland;
- Transient stability associated with transmission faults in the Hunter Valley;
- Thermal ratings of the 132kV transmission network within northern NSW; and
- Oscillatory stability upper limit of 1078MW (conditional).

For intact system operation, the combined northerly transfer capability of QNI and Terranora Interconnector are most likely to be set by the following:

- Transient and voltage stability associated with transmission faults in the Hunter Valley;
- Transient and voltage stability associated with the loss of generating units within Queensland;
- Transient stability associated with transmission faults in Queensland;
- Thermal ratings of the 330kV and 132kV transmission network in NSW; and
- Oscillatory stability upper limit of 700MW.

Powerlink and TransGrid are currently undertaking detailed studies to investigate whether an upgrade to QNI would be economically justifiable. This is discussed further within Section 6.2.3.

5.5 Forecast 'Reliability' Limitations

It is a condition of Powerlink's Transmission Authority that it meets licence and NER requirements relating to technical performance standards during intact and contingency conditions. Under its Transmission Authority, Powerlink must plan and develop its network so that it can supply forecast peak demand during a single network element outage.

Identification of forecast limitations in this chapter can therefore be viewed as 'triggers' for planning action, not indicators of a supply reliability risk. The NER requires identification of such limitations which are expected to arise some years into the future, assuming that demand for electricity continues to grow as forecast in this document. This forward planning allows Powerlink to implement appropriate solutions to maintain a reliable power supply to customers.

Powerlink will consult with Registered Participants and interested parties on feasible solutions identified through this process. Solutions may include provision of network support from existing and/or new generation, demand side management (DSM) initiatives (either from individual providers or aggregators) and network augmentations.

The information presented in this section provides advance notice of anticipated consultation processes and thereby extends the time available to interested parties to develop solutions. Further information will be provided during the relevant consultation process, if and when this is required (see Section 5.7 for current and anticipated consultation processes).

Solution providers should be aware that there is some uncertainty surrounding the timing in which action will be required to address some of the following emerging limitations. Timing is dependent on demand growth in the identified areas and developments in the wholesale electricity market.

5.5.1 Far North Queensland Zone

Voltage Control/Transformer Capability
Sufficient capability is forecast to be available in this zone until summer 2008/09, when an outage of the 275kV circuit between Chalumbin and Woree is forecast to result in voltage instability at times of high demand without action to augment supply. The thermal capability of the 132kV line between Chalumbin and Woree, during an outage of the adjacent 275kV circuit, is forecast to be reached by summer 2010/11 without action to augment supply.

These identified limitations are being addressed by a committed project comprising the installation of an additional transformer at Woree and energisation of the second Chalumbin to Woree circuit currently operating at 132kV for operation at 275kV by summer 2008/09 (refer Table 4.2).

Voltage limitations are forecast to recur in this zone from summer 2010/11 in the event of a critical contingency without action to augment supply.

A feasible network solution to the identified voltage limitation may involve the installation of a capacitor bank at Woree Substation at an approximate cost of $2 to $4 million.

Non-network solutions may include local generation and/or other DSM initiatives.

Supply to Mission Beach Area
Sufficient capability is forecast to be available until summer 2008/09. Due to ongoing demand growth, from summer 2008/09 an outage of one of the 22kV distribution lines from Tully 132/22kV Substation is forecast to result in unacceptably low voltage conditions in the Mission Beach area during summer peak demand periods without action to augment supply.

This identified limitation is being addressed by a committed project consisting of the construction of a 132/22kV substation at El Arish by summer 2008/09 (refer Table 4.2).

Supply to Edmonton/Gordonvale Area
Sufficient capability is forecast to be available until summer 2008/09. Due to ongoing demand growth from summer 2008/09, an outage of the Woree to Edmonton 132kV line is forecast to result in unacceptably low voltage conditions in the Edmonton/Gordonvale area during summer peak demand periods if action to augment supply is not undertaken.

This identified limitation is being addressed by a committed project consisting of the installation of a 30MVAr 132kV capacitor bank at Edmonton Substation by summer 2008/09 (refer Table 4.2).

5.5.2 Ross Zone

Supply to Northern and Western Townsville Area (Thuringowa)
Sufficient capability is forecast to be available until summer 2008/09 when thermal capability limitations are expected to arise in the 132kV line between Ross and Dan Gleeson under contingency conditions if action to augment supply is not undertaken.

This identified limitation is being addressed by a committed project consisting of the establishment of a new 132kV substation at Yabulu South and construction of a 275kV double circuit transmission line between Ross and Yabulu South for initial operation at 132kV by summer 2008/09 (refer Table 4.2).

Supply to Townsville South and CBD/Port Areas
Sufficient capability is forecast to be available until summer 2007/08 when thermal limitations are expected to arise in the 132kV transmission network between Ross and Townsville South Substations in the event of critical contingencies without action to augment supply. A committed project is underway to address this identified limitation comprising construction of a new 132kV double circuit transmission line from Ross to Townsville South Substations by summer 2007/08 (refer Table 4.2).

Thermal limitations are also expected to arise in the 66kV distribution network supplying the Townsville CBD/Port Area by summer 2007/08 without action to augment supply. A committed project is underway to address this identified limitation, comprising construction of a new 132/66kV substation at Townsville East and 132kV double circuit transmission from Townsville South Substation to Townsville East Substation by summer 2007/08 (refer Table 4.2).

Townsville Area 132/66kV Transformer Capability
Sufficient transformer capability is forecast to be available in the Townsville area until summer 2011/12, at which time limitations are forecast to arise under contingency conditions without action to augment supply. Thermal limitations are also forecast to occur in Ergon Energy's 66kV network by this timeframe without action to augment supply.

A feasible network solution may be the installation of a second 132/66kV transformer at Townsville East Substation at an approximate cost of $10 to $15 million.

Non-network solutions may include local generation and/or other DSM initiatives.

5.5.3 North Zone

Supply to Mackay/Proserpine Area
Sufficient capability is forecast to be available until summer 2007/08, at which time the Nebo-Pioneer Valley 132kV circuit is expected to reach its emergency thermal rating during an outage of the Nebo-Alligator Creek 132kV circuit if action to augment supply is not undertaken.

A committed project is underway to address this identified limitation. The project comprises construction of a 132kV double circuit transmission line between Nebo and Pioneer Valley Substations and reconfiguration of the existing 132kV circuit between Alligator Creek and Mackay Substations to connect into the Pioneer Valley Substation by summer 2007/08 (refer Table 4.2).

Supply to South Mackay Area
Electricity demand in the South Mackay area is forecast to increase sharply in the near term due to the expansion of the coal loading terminals at Dalrymple Bay and Hay Point and consequent increase in electrified rail traffic.

This forecast demand growth is expected to result in thermal limitations in the 132/33kV transformers at Alligator Creek Substation and the local 33kV distribution network during contingency conditions without action to augment supply.

A committed project is underway to address these identified limitations. The project comprises the expansion of Alligator Creek Substation by Powerlink to provide for the construction by Ergon Energy of a new 132kV double circuit line to Louisa Creek by summer 2008/09 (refer Table 4.2).

Supply to Bowen Area
Electricity demand in the Bowen Area may grow strongly due to possible expansion of the Abbot Point coal loading terminal and possible introduction of electrified rail traffic. Should these developments proceed within the five year outlook period, voltage and thermal limitations are expected to arise in the local 66kV distribution network if action to augment supply is not undertaken.

A feasible network solution may involve construction of a new 132kV line from either Strathmore or Proserpine Substations to a new 132/66kV substation in the Bowen area. The approximate cost of this option is $50 to $70 million.

Non-network solutions may include local generation and/or other DSM initiatives.

A consultation process to address this identified limitation is underway (refer Section 5.7.3).

CQ-NQ Transfer Limit
Summer peak electricity demand requirements in North and Far North Queensland are currently met by the transmission system operating in conjunction with local generators. This combined supply capability will be sufficient to reliably meet forecast electricity demand requirements until summer 2007/08.

A committed project is underway to address future requirements from late 2007 (refer Table 4.2). The project comprises a staged augmentation of the transmission network between Broadsound and Ross as follows:

- Construction of a 275kV transmission line between Broadsound and Nebo Substations and installation of a Static VAr Compensator at Strathmore by summer 2007/08;
- Construction of a 275kV transmission line between Nebo and Strathmore Substations by summer 2008/09; and
- Construction of a 275kV transmission line between Strathmore and Ross Substations by summer 2010/11, (now timed for summer 2009/10).

The timing of the 275kV transmission line between Strathmore and Ross (Stage 3) has advanced from summer 2010/11 to summer 2009/10 based on the 2006 and 2007 load forecast being higher than the 2005 load forecast used in the Regulatory Test. The higher forecast demand includes specific load developments at the coal handling facility at Dalrymple Bay, new and expanding coal mines and increases to industrial plant in Townsville.

5.5.4 Central West Zone

Supply to the Rockhampton Area
Sufficient capability is forecast to be available until summer 2009/10 when an outage of either Bouldercombe to Rockhampton circuit is forecast to cause an overload in the companion circuit. In addition, voltage and thermal limitations are forecast to arise in the event of single contingencies on the 66kV distribution network without action to augment supply.

A committed joint project with Ergon Energy is underway to address these identified limitations. The project comprises establishment of a new 132/66kV substation at Pandoin and construction of a new 132kV double circuit transmission line between Bouldercombe and Pandoin Substations by Powerlink, and establishment of a new 132/66kV substation at Keppel and construction of a new 132kV double circuit line between Pandoin and Keppel Substations by Ergon Energy, all by summer 2009/10 (refer Table 4.2).

Supply to Inland Central Queensland Area
Sufficient capability is forecast to be available until summer 2007/08 when the 132kV transmission capability between Callide, Biloela, Moura and Blackwater Substations is expected to be reached under contingency conditions if action to augment supply is not undertaken.

A committed project is underway to address this identified limitation, comprising construction of a 132kV transmission line between Lilyvale and Blackwater Substations by summer 2007/08 (refer Table 4.2).

Supply to Bowen Basin Coal Mining Area
Electricity demand in the Bowen Basin coal mining area may grow strongly due to possible new mining developments. Should these developments proceed within the five year outlook period, thermal limitations are expected to arise in the 132kV network supplying the area without action to augment supply.

A feasible network solution may involve construction of a new transmission line between Nebo and Kemmis or Moranbah. The approximate cost of this option is in the range of $20 to $60 million.

Non-network solutions may include local generation and/or other DSM initiatives.

5.5.5 Gladstone Zone

Supply to Gladstone Area
The Boyne Island aluminium smelter dominates the load in the Gladstone area, but there is also significant demand at the Queensland Alumina plant, Comalco Alumina Refinery, Boat Creek and Gladstone North Substations. Moreover, there continues to be several proponents considering additional developments in the area.

At the present time there are transmission limitations in the Gladstone zone and between Callide and Gladstone. These limitations are currently managed by operational strategies and redispatching generation.

Due to ongoing demand growth thermal limits of the 275/132kV transformers at Gladstone Substation will be reached after 2009/10, along with limitations in the 132kV network. In addition, the fault level at the Gladstone Substation 132kV bus has reached the existing plant rating. The required additional 275/132kV transformation capacity must take account of these fault level limitations as too the connection of any new generation in the Gladstone area.

Powerlink has previously consulted on network developments required to support demand increases in these areas. A feasible network solution may involve construction of a new 275/132kV substation in the Larcom Creek area to supply loads in the Gladstone State Development Area and northern Gladstone at an approximate cost of $40 to $55 million.

With regard to forecast thermal limits, non-network solutions may include local generation (provided fault levels are addressed) and/or other DSM initiatives.

Background load growth in the Gladstone area is also likely to cause the capability of the existing network between Callide and Gladstone to be reached by summer 2010/11 in the event of single contingencies without action to augment supply. A feasible network solution may involve construction of a new transmission line between Calvale and Wurdong Substations at an approximate cost of $70 to $90 million. Non-network solutions may include local generation (provided fault levels are addressed) and/or other DSM initiatives.

Any new and significant loads would also reinforce the necessity for network augmentation. The scope of augmentation/s would be largely driven by the size and location of the developments.

5.5.6 Wide Bay and South West Zones

Supply to Wide Bay Area

Sufficient capability is forecast to be available until summer 2007/08 when the transformer capacity at Gin Gin and the 132kV network supplying the Bundaberg, Isis, Maryborough and Kilkivan areas will need to be augmented to ensure peak demand requirements can continue to be met under contingency conditions.

A committed joint project with Ergon Energy is underway to address this identified limitation, comprising construction of a new 275/132kV substation at Teebar Creek by Powerlink and construction of a double circuit 132kV line from Teebar Creek to Aramara by Ergon Energy by summer 2007/08 (refer Table 4.2).

Supply to North Toowoomba Area

Sufficient capability is forecast to be available until early 2010. Due to ongoing demand growth in the northern Toowoomba area, thermal capability limitations are forecast to arise in Ergon Energy's 33kV networks supplying this area by winter 2010 if action to augment supply is not undertaken.

A feasible network solution may be the establishment of a new 110/33kV substation at Mt Kynoch and an associated 110kV line. Part of Powerlink's spare 275kV circuit between Murphys Creek and Middle Ridge may be used at 132kV to assist in this augmentation.

Non-network solutions may include local generation and/or other DSM initiatives.

CQ-SQ Transfer Limit

A committed project is underway to install capacitor banks at Wurdong and Palmwoods Substations by summer 2007/08 to maintain the existing capability of the network.

Powerlink has assessed there will then be sufficient capability available until the summer of 2008/09, when the combination of local generation and grid transfer capability will be insufficient to maintain reliability of supply to Southern Queensland customers during contingencies without action to augment supply.

In June 2007 Powerlink published a draft recommendation for a project to address this identified limitation, comprising the construction of a 350MVAr static VAr compensator at Woolooga Substation by summer 2008/09 (refer Section 5.7.3).

Voltage limitations are forecast to recur under contingency conditions unless action is taken to augment supply, with the timing dependent on the location of new generation.

Depending on future generation developments, feasible network solutions may include the establishment of a switching station and series capacitors near Auburn River (approximate cost $70 to $80 million) or additional transmission line development between central and southern Queensland (approximate cost $270 to $400 million).

Non-network solutions may include local generation and/or other DSM initiatives.

SWQ Transfer Limit

Due to ongoing strong demand growth in South East Queensland, the SWQ transfer limit is expected to be reached from summer 2011/12 onwards, depending on the location of new generation, if action to augment supply is not undertaken.

A feasible network solution may be the construction of a new transmission line between Braemar and Halys by summer 2011/12 at an approximate cost of $130 to $160 million.

Non-network solutions may include generation located in South East Queensland and/or other DSM initiatives.

5.5.7 Moreton North and South Zones

Sunshine Coast Voltage Control (Moreton North)
By summer 2009/10, growing demand on the Sunshine Coast will result in higher reactive power loadings, as well as greater reactive losses in the system due to increased transmission and transformer loadings.

The combined effect is an annual increase in reactive demand above that already being supplied through existing reactive devices. In addition, the sensitivity of the Sunshine Coast network increases to the point where the required reactive demand cannot be met through capacitor banks alone. This requires the need for dynamic reactive plant to form part of the solution.

Potential solutions include demand side management or the combination of capacitor banks and a static VAr compensator. The costs of these solutions are estimated to be in the range of $30 to $50 million. It is expected that the SVC recommended to be installed to increase the CQ-SQ transfer limit (refer Section 5.5.6) will assist in deferring the need for additional reactive plant.

Northern Sunshine Coast Area (Moreton North)
Bulk supply to the Sunshine Coast area is provided from 275/132kV substations at Woolooga and Palmwoods. Electricity is then transferred over ENERGEX's 132kV network to supply Gympie, Nambour, the Sunshine Coast and Caboolture.

Sufficient capability is forecast to be available until 2011/12 when thermal capability limitations are expected to arise in ENERGEX's 132kV network between Woolooga and Gympie during critical 275kV and 132kV network outages without action to augment supply.

In addition to current minor upgrades by ENERGEX, a feasible network solution may involve construction of a new 275/132kV substation in the Northern Sunshine Coast area at an approximate cost of $60 to $70 million.

Non-network solutions may include local generation and/or other DSM initiatives.

Sunshine Coast 132/110kV Transformer Capability
Caboolture and Beerwah Substations are supplied by ENERGEX's 110kV network from Palmwoods and South Pine Substations. The ability to supply Caboolture and Beerwah from Palmwoods Substation under a single credible contingency is forecast to be limited by 132/110kV transfer capacity at Palmwoods Substation by 2009/10.

A proposed new small network asset consisting of an additional 132/110kV transformer at Palmwoods Substation has been recommended to address this identified limitation at an estimated cost of $6.4 million (refer Section 5.7.4).

Supply to North Brisbane (Moreton North)
Significant demand growth is forecast to continue in the North Brisbane area as a result of population growth, new water pumping load and extensive commercial/industrial development such as the Brisbane Airport commercial precinct. As a result, thermal capability limitations are expected to arise in ENERGEX's 110kV network between South Pine and Nudgee under contingency conditions by summer 2009/10, if action to augment supply is not undertaken. A further thermal limitation is expected to arise in the transformer capacity at South Pine Substation in the next five years without action to augment supply.

A feasible network solution would involve construction of a transmission line between South Pine and the ENERGEX substation at Sandgate, at an approximate cost of $30 to $50 million.

Non-network solutions may include local generation and/or other DSM initiatives.

South East Queensland Voltage Control (Moreton North & South)
Growing demand in South East Queensland (SEQ) will result in higher reactive power loadings, as well as greater reactive losses in the system due to increased transmission and transformer loadings.

The combined effect is an annual increase in reactive demand above that already being supplied through existing reactive devices and ancillary service arrangements. Voltage stability limitations are expected to arise within SEQ without action to augment supply.

Potential solutions include DSM or a program of compensation in SEQ to keep pace with this growing requirement. The shunt capacitor option would cost approximately $10 to $15 million per year.

The 2005 consultation on supply to SEQ recommended the installation of capacitor banks at South Pine, Ashgrove West and Rocklea in summer 2009/10 and at Tarong, Mt England, South Pine, Belmont and Loganlea by summer 2010/11, subject to confirmation of scope and timing prior to implementation.

A review of reactive support requirements has identified the need to modify the scope and timing of some of these capacitor banks. The 120MVAr capacitor bank planned for installation at South Pine Substation by summer 2009/10 is now required by summer 2008/09, and a further 120MVAr capacitor bank is required at the same substation by summer 2009/10, rather than a 50MVAr capacitor bank by summer 2010/11 as originally planned. The capacitor banks planned for installation at Tarong, Mt England, Belmont and Loganlea Substations by summer 2010/10 are now required by summer 2009/10. The capacitor bank to be installed at Tarong Substation will be 200MVAr rather than 120MVAr and the capacitor bank for Belmont Substation will be 120MVAr rather than 50MVAr as originally anticipated.

Further static compensation in SEQ is also forecast to be required by summer 2010/11. A proposed new small network asset, consisting of a 120MVAr capacitor bank at Belmont Substation, has been recommended to address this identified limitation at an estimated cost of $2.75 million (refer Section 5.7.4).

To address voltage stability an acceptable balance between static and dynamic compensation in SEQ must be maintained. Sufficient capacity is forecast to be available until summer 2008/09, at which time voltage limitations are forecast to arise in the event of a critical contingency on transfer corridors into SEQ.

In June 2007 Powerlink made a final recommendation for a project to address this identified limitation, comprising the construction of a 350MVAr static VAr compensator at Greenbank Substation by summer 2008/09, and also the installation of a 50MVAr capacitor bank at Molendinar Substation and a 200MVAr capacitor bank at Greenbank Substation by summer 2007/08, followed by 200MVAr capacitor banks at Greenbank Substation by summer 2008/09 and 2009/10 (refer Section 5.7.3).

275/110kV Transformer Capability (Moreton South)
Demand in the Moreton South zone is forecast to grow at over 5% per annum over the next five years. This demand is supplied from the 110kV network which receives supply via the 275kV system. The 275/110kV transformer capacity must keep pace with demand growth to avoid unacceptable overloads following transformer outages.

Based on forecast demand growth, Powerlink has identified a 275/110kV transformer capacity limitation on the Murarrie transformer, where the overload during contingency conditions is forecast to become unacceptable by summer 2009/10 without action to augment supply.

A committed project is underway to address this identified limitation, consisting of the installation of a second 375MVA 275/110kV transformer at Murarrie Substation by summer 2009/10 (refer Table 4.4).

110/33kV and 110/11kV Transformer Capability (Moreton North & South)
Due to ongoing demand growth from summer 2009/10, an outage of the 110/11kV transformer at Bundamba Substation is forecast to result in the thermal capability of ENERGEX's 33kV network in the local area being exceeded during summer demand peak demand periods without action to augment supply.

A committed project is underway to address this identified limitation, consisting of the installation of a second 110/11kV transformer at Bundamba Substation by summer 2009/10 (refer Table 4.4).

Due to significant ongoing demand growth in the Moreton North and South zones, thermal capability limitations are forecast to arise in various parts of ENERGEX's 33kV and 11kV network and 110/33kV or 110/11kV transformation capacity in the next five year period if action to augment supply is not undertaken.

Possible network solutions include establishment of new 110/33kV or 110/11kV injection points, augmentation of existing transformation capacity (that is, additional transformers), or upgrade of ENERGEX's 33kV and 11kV network.

Non-network solutions may include local generation and/or other DSM initiatives.

Supply to Lockyer Valley
Sufficient capability is forecast to be available until early 2010. Due to ongoing demand growth, thermal capability limitations are forecast to arise in ENERGEX's 110kV network supplying Lockyer Valley by winter 2010 if action to augment supply is not undertaken.

A feasible network solution may be the establishment of a second 110kV supply to ENERGEX's Postmans Ridge Substation from Middle Ridge Substation.

Non-network solutions may include local generation and/or other DSM initiatives.

Supply to Ipswich Area
Demand growth in the Ipswich area is increasing rapidly due to significant residential, commercial and industrial development and further penetration of domestic air conditioning. A new 275/110kV substation has been commissioned at Goodna to help meet this load growth, but limitations are forecast to recur by summer 2008/09 under contingency conditions if action to augment supply is not undertaken.

A committed project is underway to establish a new 275/110kV substation at Abermain by summer 2008/09 to address this identified limitation (refer Section 4.2).

Supply to South Brisbane Area
The South Brisbane Area is defined in terms of this reliability requirement as the area east of West Darra and Goodna Substations, north to Murarrie and south to Logan City. Sufficient capability is forecast to be available in this area until summer 2010/11 when 110kV line limitations to Richlands, Algester and Runcorn Substations are forecast to occur under critical contingencies without action to augment supply.

A feasible network solution may involve the establishment of a new 275/110kV substation in the Larapinta area and associated 110kV transmission lines at an approximate cost of $50 to $70 million.

Non-network solutions may include local generation and/or other DSM initiatives.

Supply to South Brisbane, CBD and Eastern Suburbs
A thermal limitation is expected in the 275kV transmission line supplying the South Brisbane area from summer 2011/12 under contingency conditions without action to augment supply.

A feasible network solution may involve construction of a new 275kV transmission line from the Bundamba area to the South Brisbane area at an approximate cost of $50 to $70 million.

Non-network solutions may include local generation and/or other DSM initiatives.

Supply to South East Queensland
Power is supplied to SEQ from local generation and transmission connections from adjacent zones. The majority of power is transferred to the area via five 275kV circuits between Tarong and the wider Brisbane area.

Sufficient capability is forecast to be available until summer 2007/08 when increasing demand is expected to result in emerging reliability of supply limitations. Supply capability limitations will arise due to a combination of full utilisation of existing local generation sources and the inability to transfer additional power into SEQ on the existing transmission network without action to augment supply.

A committed project is underway to construct a new transmission line between Middle Ridge and Greenbank by summer 2007/08 to address this identified limitation (refer Table 4.2).

Limitations on the ability to transfer power into SEQ are forecast to recur from summer 2010/11 without action to augment supply.

Feasible network solutions may involve upgrading the Middle Ridge transformer and installing series reactors on the Millmerran to Middle Ridge 330kV transmission lines at an approximate cost of $10 to $15 million.

Non-network solutions may include local generation and/or other DSM initiatives.

Limitations on the ability to transfer power into SEQ are again forecast to arise from summer 2011/12 without action to augment supply.

A feasible network solution may involve the establishment of a new 275kV substation at Halys and the construction of a new double circuit transmission line between Halys and Blackwall Substations at an approximate cost of $200 to $230 million.

Non-network solutions may include local generation and/or other DSM initiatives.

5.5.8 Gold Coast Zone

275/110kV Transformer Capability
An outage of the Molendinar 275/110kV transformer is forecast to cause the capacity of the Mudgeeraba 275/110kV transformers to be exceeded by summer 2007/08 without action to augment supply.

A committed project comprising the installation of a second 375MVA 275/110kV transformer at Molendinar Substation is underway to address this identified limitation by summer 2007/08 (refer Section 4.2).

As demand continues to grow, the transformer capacity limit is forecast to re-emerge in this area by summer 2011/12 if action to augment supply is not undertaken. A feasible network solution may be the installation of a third 275/110kV transformer at Molendinar Substation at an estimated cost of $15 to $20 million.

Non-network solutions may include local generation and/or other DSM initiatives.

Supply to South Gold Coast
Capability limitations are expected to arise in the distribution network supplying the South Gold Coast area from summer 2010/11 if action to augment supply is not undertaken.

A feasible network solution may be upgrading or reinforcing the 110kV network in the southern Gold Coast area.

Non-network solutions may include network support from local generation and/or other DSM initiatives.

5.6 Summary of Forecast Network Limitations

Limitations discussed in Sections 5.4 and 5.5 have been summarised in Table 5.8.

This table provides an outlook (based on demand, generation and committed network development assumptions contained in Chapters 3, 4 and 5) for potential limitations in Powerlink's transmission network over a one, three and five year timeframe.

Table 5.8: Summary of Forecast Network Limitations

ANTICIPATED LIMITATION	REASON FOR CONSTRAINT OR LIMITATION	TIME LIMITATION MAY BE REACHED		
		1 YR OUTLOOK	3 YR OUTLOOK	5 YR OUTLOOK
Far North and Ross zones				
Far North Voltage Control / Transformer Capability	275kV outages in Far North Queensland may result in unacceptable voltage conditions and thermal overloading of the 132kV network		2008-10 Committed project in progress (1)	2010/11
Supply to Mission Beach Area	22kV outages in the Mission Beach area may result in unacceptable voltage conditions		2008/09 Committed project in progress (1)	
Supply to Edmonton / Gordonvale Area	Outage of the 132kV Woree-Edmonton line may result in unacceptable voltage conditions		2008/09 Committed project in progress (1)	
Supply to Northern and Western Townsville Area (Thuringowa)	Future 132kV network thermal capability limitations in meeting demand growth in northern and western Townsville		2008/09 Committed project in progress (1)	
Supply to Townsville South and CBD / Port Areas	Future 132kV and 66kV network thermal capability limitations in meeting growing potential new loads in the Townsville South and CBD/Port areas	Committed project in progress (1)		
Townsville Area 132/66kV Transformer Capability	Future 132/66kV transformer capability and 66kV network limitations in Townsville area under contingency conditions			2011/12
North zone				
Supply to Mackay / Proserpine Area	Due to demand growth, thermal limitations expected to arise in the Nebo-Pioneer Valley 132kV circuit under contingency conditions	Committed project in progress (1)		
Supply to South Mackay Area	Due to industrial demand growth, thermal limitations may occur in 132/33kV transformers at Alligator Creek as well as the 33kV distribution network under contingency conditions		2008/09 Committed project in progress (1)	
Supply to Bowen Area	Due to potential industrial load growth, voltage and thermal limitations may occur in local 66kV distribution network		2009/10 (4)	
CQ-NQ Transfer Limit	Voltage, dynamic instability, and thermal overloading may result from single contingencies during periods of high northern Queensland demand	2007-2009 Committed project in progress (1)		

Table 5.8: Summary of Forecast Network Limitations (Cont'd)

ANTICIPATED LIMITATION	REASON FOR CONSTRAINT OR LIMITATION	TIME LIMITATION MAY BE REACHED		
		1 YR OUTLOOK	3 YR OUTLOOK	5 YR OUTLOOK
Central West and Gladstone zones				
Supply to Rockhampton Area	Due to demand growth, an outage of one of the Bouldercombe-Rockhampton 132kV circuits may result in thermal overloading of the remaining circuit in service		2009/10 Committed project in progress (1)	
Supply to Inland Central Queensland Area	Due to demand growth, 132kV network between Callide, Biloela and Moura expected to reach thermal capability limitations in the event of a single contingency	Committed project in progress (1)		
Supply to Bowen Basin Coal Mining Area	Due to potential mining growth, thermal limitations may occur in the 132kV network supplying this area			2011/12(4)
Supply to Gladstone Area	Potential for overload of Calvale-Wurdong 275kV line and/or Calvale and Gladstone 275/132kV tie transformer	Currently managed by switching and support arrangements (3)	2009/10	2010/11
Wide Bay and South West zones				
Supply to Wide Bay Area	Demand growth may result in voltage control and thermal limitations during an outage of the 132kV network between Bundaberg and Woolooga	Committed project in progress (1)		
Supply to North Toowoomba Area	Due to demand growth, thermal capability limitations are expected in the 33kV network supplying this area		2010	
CQ-SQ Transfer Limit	Continued demand growth in SQ may give rise to binding transfer limits for flows between CQ and SQ	Committed project in progress (1)	2008/09 (2)	
SWQ Transfer Limit	Continued demand growth in SEQ may lead to SWQ transfer limit being reached			2011/12

Table 5.8: Summary of Forecast Network Limitations (Cont'd)

ANTICIPATED LIMITATION	REASON FOR CONSTRAINT OR LIMITATION	TIME LIMITATION MAY BE REACHED		
		1 YR OUTLOOK	3 YR OUTLOOK	5 YR OUTLOOK
Moreton North and South zones				
Sunshine Coast Voltage Control	Increasing reactive demand due to demand growth likely to require action to satisfy voltage control standards		2009/10	
Northern Sunshine Coast Area	Demand growth may result in thermal limitations in ENERGEX's 132kV network between Woolooga and Gympie during a critical 275kV or 132kV outage			2011/12
Sunshine Coast 132/110kV Transformer Capability	Transformer limitation forecast in supplying Caboolture and Beerwah Substation from Palmwoods Substation under contingency conditions		2009/10 (2)	
Supply to North Brisbane	Demand growth may result in thermal limitations in ENERGEX's 110kV network and Powerlink 275/110kV transformers		2009/10	
South East Queensland Voltage Control	Increasing reactive demand due to demand growth likely to require program of action to satisfy voltage control standards.		2008-10 Committed projects in progress (1) (2)	
275/110kV Transformer Capability	Due to demand growth, future 275/110kV transformer capability limitations are anticipated		2009/10 Committed project in progress (1)	
110/33kV and 110/11kV Transformer Capability	Due to demand growth, future 110kV transformer limitations and 33kV and 11kV line limitations are anticipated at multiple locations		2009/10 Committed project in progress (1)	
Supply to Lockyer Valley	Due to demand growth, thermal capability limitations are forecast to arise in ENERGEX's 110kV network supplying this area		2010	
Supply to Ipswich Area	Demand growth is forecast to result in 275/110kV transformer capability limitation in Ipswich area	Committed project in progress (1)		
Supply to South Brisbane Area	Due to demand growth, thermal capability limitations are expected in the 110kV network supplying this area			2010/11
Supply to South Brisbane, CBD and Eastern Suburbs	Demand growth is forecast to result in thermal limitation in 275kV line supplying South Brisbane area			2011/12
Supply to South East Queensland	High demand growth expected to result in limitations in supply to entire SEQ area	Committed project in progress (1)		2010-12

Table 5.8: Summary of Forecast Network Limitations (Cont'd)

ANTICIPATED LIMITATION	REASON FOR CONSTRAINT OR LIMITATION	TIME LIMITATION MAY BE REACHED		
		1 YR OUTLOOK	3 YR OUTLOOK	5 YR OUTLOOK
Gold Coast zone				
275/110kV Transformer Capability	Due to demand growth, Mudgeeraba 275/110kV transformers expected to reach thermal capacity limitations in the event of an outage of the Molendinar 275/110kV transformer	Committed project in progress (1)		2011/12
Supply to South Gold Coast	Demand growth is forecast to result in capability limitations in the distribution network supplying this area			2010/11

Notes:

(1) Refer Tables 4.2 and 4.4 - Committed Augmentations.

(2) Refer to Section 5.7 - Proposed Network Developments.

(3) Other action may be required if new loads occur in the Gladstone area.

(4) The actual timing of the forecast limitation will be driven by major industrial developments.

5.7 Proposed Network Developments

Network development to meet forecast demand depends on the location and capacity of generation developments and the pattern of generation dispatch in the competitive electricity market. Uncertainty about the generation pattern creates uncertainty about the power flows on the network and subsequently, which parts of the network will experience limitations. This uncertainty is a feature of the competitive electricity market and has been particularly evident in the Queensland region, where a significant amount of new large generation capacity has entered the market over the past few years. Following the recent commissioning of major new generators, a new pattern of generation and power flows is becoming more evident although this is likely to change again following any further announcement of new generating plant.

The previous section of this report outlined forecast limitations that may arise in Powerlink's transmission network in the near future. The possible timing and effect of these limitations is dependent on demand growth and market developments.

This section focuses on those limitations for which Powerlink intends to implement action or initiate consultation with Registered Participants and interested parties in the near future. Information is also provided on potential connection point proposals.

It should be noted that the information provided in this section regarding Powerlink's network development plans may change and should therefore be confirmed with Powerlink before any action is taken based on this information.

5.7.1 Processes for Proposed Network Developments

Sections 5.4-5.6 of this report identified anticipated network limitations and constraints that may arise in the Queensland transmission network over the next five years. Where action is considered necessary, Powerlink will:

- Notify Registered Participants of anticipated limitations within the timeframe required for action;
- Seek information from Registered Participants and interested parties on feasible non-network solutions to address anticipated constraints;
- Powerlink's general approach is to seek input, via the APR, on potential solutions to network limitations which may result in new small network assets. Those that cannot be identified for inclusion in the APR will be the subject of separate consultation with Registered Participants and interested parties;
- For emerging network limitations which may result in new large network assets, Powerlink's approach is to issue detailed information papers outlining the limitations to assist in identifying non-network solutions;
- Carry out detailed analysis to determine feasible network solutions that Powerlink may propose to address identified network constraints;
- Consult with Registered Participants and interested parties on all genuine and feasible alternatives (network and non-network) and recommended solutions; and
- In the event a regulated solution (network or network support) is found to satisfy the AER's Regulatory Test, Powerlink will implement the recommended solution.

Alternatively, Powerlink may undertake network augmentations under the 'funded augmentation' provisions of the NER.

5.7.2 Proposed New Large Network Assets

Proposals for new large network assets are progressed under the provisions of Clause 5.6.6 of the NER.

Powerlink carries out separate consultation processes for each proposed new large network asset. Summary information is provided in this APR. Interested parties are referred to consultation documents published on Powerlink's website for further information.

Information on other network limitations that could result in a recommendation to implement a new large network asset, but where consultation on alternative solutions is still underway, is provided in Section 5.7.3.

Committed New Large Network Assets

Interested parties are advised that during 2006/07, Powerlink finalised regulatory processes associated with the new large network assets outlined in Table 5.9.

Table 5.9: New Large Network Assets Finalised In 2006/07

PROJECT NAME	DESCRIPTION OF WORKS	COST	EXPECTED COMMISSIONING DATE
Thuringowa Area	Ross-Yabulu South 275kV line (initially operated at 132kV) and 132kV substation at Yabulu South	$39.4M	Summer 2008/09
Rockhampton City / Keppel Coast Area (1)	Bouldercombe-Pandoin 132kV line and 132kV substation at Pandoin	$36.8M	Summer 2009/10

Note:

(1) Joint project with Ergon Energy. Only Powerlink works and costs included in Table 5.9.

5.7.3 Consultation - Proposed New Large Network Assets

Consultations Underway

Network limitations have been identified that could give rise to a requirement for a proposed new large network asset at a number of locations. Table 5.10 provides a summary of the status of action to address future supply requirements, in various areas around the State.

Table 5.10: Consultations Underway

AREA	PUBLICATION OF REQUEST FOR INFORMATION PAPER	PUBLICATION OF APPLICATION NOTICE	PUBLICATION OF FINAL REPORT
Bowen	April 2006	Anticipated Late 2007	Anticipated Early 2008
Southern Queensland	October 2006	June 2007	Anticipated August / September 2007
South Eastern Queensland	October 2006	April 2007	June 2007

Anticipated Consultation Processes
Other consultation processes likely to be initiated in the next twelve months are summarised in Table 5.11.

Table 5.11: Consultation Likely Within 12 Months

LOCATION (1)
Gladstone
North Sunshine Coast
South West to South East Queensland
North Brisbane
South Brisbane
South Gold Coast
QNI Upgrade (2)

Notes:

(1) For further details on each of these limitations refer to Sections 5.4 and 5.5

(2) Based on market benefits (not a reliability limitation)

Emerging limitations other than those listed will be monitored and Powerlink will initiate action, including consultation with interested parties, should this be required.

5.7.4 Outline of Proposed New Small Network Assets

This section outlines proposed network augmentations which are required to be progressed under the provision of Clause 5.6.6A of the NER (new small network assets - capitalisation value between $1 million and $10 million). At the time of publication of this report, Powerlink has developed plans for the proposed new small network augmentations listed in Table 5.12 to the point where they can be consulted on through this document.

Table 5.12: Proposed New Small Network Assets

PROPOSED NEW SMALL NETWORK ASSET	DATE TO BE OPERATIONAL	CAPITAL COST
Palmwoods 132/110kV transformer	Summer 2009/10	$6.40M
Belmont 275kV 120MVAr capacitor bank	Summer 2010/11	$2.75M

Further details on each of these proposed new small network assets, including purpose, possible alternatives and the reasons that Powerlink is recommending these augmentations proceed are provided in Appendix D.

Registered Participants and interested parties are invited to make submissions regarding these proposed augmentations and any non-network options they consider to be an alternative. The closing date for submissions is 27 July 2007. Submissions should be addressed to:

Manager Network Assessments
Powerlink Queensland
PO Box 1193
Virginia Queensland 4014
networkassessments@powerlink.com.au

If there are any material changes required following consideration of submissions, Powerlink will publish its conclusions and a revised recommendation. If no changes are required, Powerlink will proceed to implement these proposed new small network assets in the required timeframes. Other proposed new small network assets will be subject to separate assessment and consultation as per Clause 5.6.6A of the NER, if commitment is required prior to the publication of the 2008 Annual Planning Report.

5.7.5 Connection Point Proposals

Table 5.13 lists connection works that may be required over the next few years. Planning of new or augmented connections involves consultation between Powerlink and the connecting party, determination of technical requirements and completion of connection agreements. New connections can result from joint planning with the relevant DNSP or be initiated by generators or customers.

Table 5.13: Possible Connection Works

POTENTIAL PROJECT	PURPOSE	ZONE	POSSIBLE COMMISSIONING DATE
Townsville East 132/66kV transformer augmentation	Increase transformer capacity to meet growing demands	Ross	Summer 2011/12
Clare 132kV feeder bay for Millchester	Additional supply to Ergon Energy's Millchester Substation	Ross	Winter 2012
QR Bolingbroke 132kV rail supply	New supply to Queensland Rail substation	North	Winter 2008
QR Mackay Ports 132kV rail supply	New supply to Queensland Rail substation	North	Summer 2008/09
Pioneer Valley 132/66kV transformer augmentation	Increase transformer capacity to meet growing demand	North	Summer 2011/12
Rio Tinto Aluminium Refinery Cogeneration connection	Connection of new power station	Gladstone	Summer 2009/10
Blackwater 132kV bay for Emerald	New supply to Ergon Energy's Emerald Substation	Central West	Winter 2010
Origin Energy Darling Downs Power Station connection	Connection of new power station	South West	Summer 2008/09
Origin Energy Spring Gully Power Station 275kV or 330kV connection	Connection of new power station	South West	Summer 2008/09
Middle Ridge 110kV connection for Mt Kynoch	New supply to Ergon Energy's Mt Kynoch Substation	South West	Summer 2009/10
South Pine 110kV bays for Griffin	New supply to ENERGEX's Griffin Substation	Moreton North	Summer 2009/10
Middle Ridge 110kV connection for Postmans Ridge	Second supply to ENERGEX's Postmans Ridge Substation	South West and Moreton North	Summer 2009/10
Palmwoods 132kV bays for Pacific Paradise	New supply to ENERGEX's Pacific Paradise Substation	Moreton North	Summer 2010/11
Ferny Hills 110/33kV Substation	New supply point for ENERGEX's 33kV network	Moreton North	Summer 2011/12
Asia Pacific Seamless Tubes connection	Connection of new industrial plant	Moreton South	Summer 2009/10
West Darra 110/11kV Substation	New connection point to ENERGEX to cater for increasing demand growth	Moreton South	Winter 2010
Daisy Hill 110/11kV Substation	New connection point to ENERGEX to cater for increasing demand growth	Moreton South	Summer 2010/11
Larapinta 110/33kV Substation	New supply point for ENERGEX's 33kV network	Moreton South	Summer 2010/11
Rochedale 110/11kV Substation	New connection point to ENERGEX to cater for increasing demand growth	Moreton South	Summer 2011/12
Molendinar 110/33kV transformer augmentation	Increase transformer capacity to meet growing demand	Gold Coast	Summer 2009/10
Molendinar 110kV bays for Bundall	Connect two new ENERGEX 110kV circuits to Bundall	Gold Coast	Summer 2010/11

5.8 Proposed Network Replacement

In addition to developing its network to meet forecast electricity demand, Powerlink is also required to maintain the capability of its existing network. Powerlink undertakes asset replacement projects when assets are determined to reach the end of their technical life. Table 5.14 lists potential replacement works over the value of $5 million that may occur in the next five years.

The identification of potential replacement projects does not indicate a supply reliability risk. Replacement programs are planned some years into the future to allow Powerlink to schedule works such that it can continue to provide a reliable power supply to customers.

Table 5.14: Possible Replacement Works

POTENTIAL PROJECT	ZONE	POSSIBLE COMMISSIONING DATE
Turkinje Substation primary plant	Far North	Summer 2008/09
Kareeya Substation primary plant	Far North	Summer 2010/11
Clare Substation primary plant	Ross	Winter 2009
Ingham to Yabulu 132kV line replacement	Ross	Summer 2009/10
Cardwell to Ingham 132kV line replacement	Ross	Winter 2010
Tully to Cardwell 132kV line replacement	Ross	Summer 2010/11
Garbutt to Alan Sherriff 132kV line life extension	Ross	Winter 2012
Collinsville Substation primary plant	North	Winter 2009
Mackay Substation primary plant	North	Summer 2009/10
Moranbah Substation primary plant	North	Winter 2010
Proserpine Substation primary plant	North	Winter 2012
Blackwater Substation primary plant	Central West	Winter 2010
Rockhampton Substation primary plant	Central West	Winter 2010
Bouldercombe to Larcom Creek 275kV line life extension	Central West / Gladstone	Summer 2010/11
Callide A Substation primary plant	Central West	Summer 2010/11
Moura Substation primary plant	Central West	Summer 2011/12
Gladstone Substation primary plant	Gladstone	Summer 2011/12
Wurdong to South Pine 275kV line earthwire replacement	Gladstone / Wide Bay / Moreton North	Progressively from winter 2010
Swanbank A Substation primary plant	Moreton South	Winter 2009
Richlands Substation primary plant	Moreton South	Summer 2009/10
Swanbank B Substation primary plant	Moreton South	Winter 2010
Belmont Substation transformer replacements	Moreton South	Summer 2010/11

CHAPTER SIX

Other relevant planning issues

6.1 Existing and Committed Generation Developments

6.1.1 Generation

Generation in Queensland is a combination of coal fired, gas turbine and hydro electric generators. With the advent of Kogan Creek Power Station, the largest proportion of total generation capacity has shifted from Central Queensland to South Queensland. Within South Queensland, generation capacity is higher in the south west than in the south east.

Table 6.1 summarises the existing and committed power stations connected or to be connected to the Powerlink transmission network, including the non-scheduled market generators at Invicta and Koombooloomba as well as the scheduled embedded generators at Barcaldine and Roma.

Information in this table has been provided by the owners of the generators and is consistent with information provided to National Electricity Market Management Company (NEMMCO) for its 2007 Statement of Opportunities (SOO). It should be noted that the capacities shown in this table are based on the registered installed capacity and no adjustment has been made for temporary storage of generating units in the event of continued drought conditions in South East Queensland.

Table 6.1: Generation Capacity

Existing and Committed Plant Only Connected to Queensland Transmission Network Including Embedded Market Scheduled Generators

LOCATION	CAPACITY MW GENERATED (1)					
	WINTER 2007	SUMMER 2007/08	WINTER 2008	SUMMER 2008/09	WINTER 2009	SUMMER 2009/10
Coal Fired						
Collinsville	187	187	187	187	187	187
Stanwell	1,440	1,440	1,440	1,440	1,440	1,440
Gladstone	1,680	1,680	1,680	1,680	1,680	1,680
Callide A (2)	0	0	0	0	0	0
Callide B	700	700	700	700	700	700
Callide Power Plant	900	900	900	900	900	900
Tarong North	443	443	443	443	443	443
Tarong	1,400	1,400	1,400	1,400	1,400	1,400
Swanbank B	480	480	480	480	480	480
Kogan Creek	0	724	744	724	744	724
Millmerran	860	860	860	860	860	860
TOTAL – Coal Fired	8,090	8,814	8,834	8,814	8,834	8,814
Gas Fired						
Townsville (Yabulu)	243	232	243	232	243	232
Mt Stuart (Townsville)	288	260	288	260	288	260
Mackay	34	34	34	34	34	34
Barcaldine	49	49	49	49	49	49
Roma	68	54	68	54	68	54
Oakey	320	276	320	276	320	276
Swanbank E	370	350	370	350	370	350
Braemar	450	450	450	450	450	450
Hydro Electric						
Barron Gorge	60	60	60	60	60	60
Kareeya (including Koombooloomba)	95	95	95	95	95	95
Wivenhoe (3)	655	500	500	500	500	500
Sugar Mills						
Invicta	39	39	39	39	39	39
TOTAL – Other Than Coal	2,671	2,399	2,516	2,399	2,516	2,399
TOTAL – ALL STATIONS	10,761	11,213	11,350	11,213	11,350	11,213
Interconnectors						
Queensland to New South Wales Import Capability	500	500	500	500	500	500

Notes:

(1) Source: NEMMCO and Powerlink. The capacities shown are at the generator terminals and are therefore greater than power station net sent out nominal capacity due to station auxiliary loads and step-up transformer losses. The capacities are nominal as the available rating depends on ambient conditions. Some additional overload capacity is available at some power stations depending on ambient conditions.

(2) Callide A Power Station is in storage awaiting future use in CS Energy's Oxyfuel Clean Coal Project.

(3) Wivenhoe Power Station is shown at its full capacity (500MW), however output can be limited depending on water storage in the upper dam.

(4) Information on the combined QNI plus Terranora interconnectors is provided within Section 6.2.2.

6.2 Changes to Supply Capability

6.2.1 Generation

Since Powerlink's 2006 Annual Planning Report (APR) was published there have been two changes to generation connected to the transmission network.

Braemar Power Pty Ltd has commissioned a 3 x 150MW open cycle gas turbine (OCGT) power station at Braemar Substation near Dalby.

CS Energy is completing construction and commissioning of the Kogan Creek 750MW coal fired power station. Full commercial operation of this station is expected by late 2007.

Powerlink has not been advised of any other commitments to new generating capacity since the 2006 APR. However, Powerlink is aware of several well advanced gas generation proposals within the Surat Basin area, some of which may be committed at the time of publishing this report.

6.2.2 Interconnectors

Table 6.1 also includes combined northerly flow capability for the Queensland/New South Wales Interconnector (QNI) and the Terranora Interconnector.

The combined QNI plus Terranora Interconnector maximum northerly capability is set by voltage stability, transient stability, oscillatory stability and the thermal capability of the 330kV network in New South Wales.

In addition, the combined QNI plus Terranora Interconnector maximum northerly capability can also be constrained by intra-regional constraints in Northern New South Wales and South West Queensland.

Based on the above, the combined northerly capability of QNI plus Terranora interconnectors is nominated as 500MW for the purposes of the generation capacity schedule shown in Table 6.1.

It should be noted however, that the capability of QNI in both directions varies significantly depending on the status of plant and load conditions in both New South Wales and Queensland.

For these reasons, QNI capability is regularly reviewed, particularly when new generation enters the market (for example Kogan Creek). It should also be noted that the capability of QNI is distinctly asymmetric with the southerly capability much larger than the northerly capability.

6.2.3 Interconnector Upgrades

As part of joint planning activities, Powerlink and TransGrid are in the process of investigating options for upgrading the capability of QNI and identifying benefits to the National Electricity Market (NEM) associated with upgrade options.

In October 2005, Powerlink and TransGrid reported to the market on the outcomes of a cost benefit study into an upgrade of QNI. This pre-feasibility study was aimed at determining whether a QNI upgrade of around 200MW can generate enough economic benefits to satisfy the Australian Energy Regulator (AER) Regulatory Test.

This pre-feasibility study indicated that an investment of $120 million to achieve an upgrade of around 150 to 200MW was likely to generate sufficient benefits to satisfy the AER Regulatory Test based on an optimum economic timing of late 2009.

Subsequently, there have been a number of new generators committed in New South Wales which change the benefits and the optimum economic timing of a QNI upgrade (see discussion below).

As part of separate studies related to these investigations, Powerlink and TransGrid also determined that certain lower cost incremental options generated sufficient market benefits to satisfy the Regulatory Test. These lower cost options consisted of works within northern New South Wales comprising the installation of a phase shifting regulator at Armidale and uprating of one of the existing Armidale to Tamworth 330kV circuits.

The installation of the Armidale phase angle regulator addresses QNI southerly constraints associated with thermal ratings across the northern New South Wales Armidale to Kempsey feeder 965. The Armidale to Tamworth 330kV uprating project addresses northerly constraints across the combined QNI and Terranora interconnectors associated with thermal ratings across the existing Armidale to Tamworth circuit 86.

TransGrid has completed approval processes for both of these projects and is proceeding with these works.

Following encouraging results from the 2005 pre-feasibility studies, Powerlink and TransGrid have also jointly moved forward with a program of detailed technical and market studies to define the scope and costs of other upgrade options.

The Powerlink and TransGrid studies have followed three main streams:

- Establishing the technical parameters of the series compensation, high voltage direct current (HVDC) and high voltage alternating current (HVAC) options for augmenting QNI;
- Determining the physical impacts of series compensation on generation located near to the interconnection; and
- Market modelling of upgrade options to quantify potential benefits to the market.

Powerlink and TransGrid have completed substantial work with all three of the above streams.

As part of the detailed market simulation studies, Powerlink and TransGrid have carried out investigations of the sensitivity of input assumptions and market development scenarios to the net economic benefits of an upgrade.

These sensitivity studies indicate that the commitment of new generating capacity in either Queensland or New South Wales can materially affect the optimum timing of an upgrade. This is because the deferral of new generating capacity is one of the major benefits of an upgrade, and the commitment of new plant can alter the outcomes of the study.

In late 2006, an announcement was made in relation to the construction of a new 400MW combined cycle gas turbine (CCGT) unit within the Wollongong area (Tallawarra) for completion by 2008/09. Studies carried out by Powerlink and TransGrid incorporating this new committed development, delays the optimal timing of a QNI upgrade to around 2011 (compared to the 2009 timing indicated by the earlier pre-feasibility studies).

Commitment of additional new generating plant in New South Wales (or further south) may further defer the timing of a QNI upgrade. Conversely, the commitment of new generation within Queensland may bring forward the optimum upgrade timing.

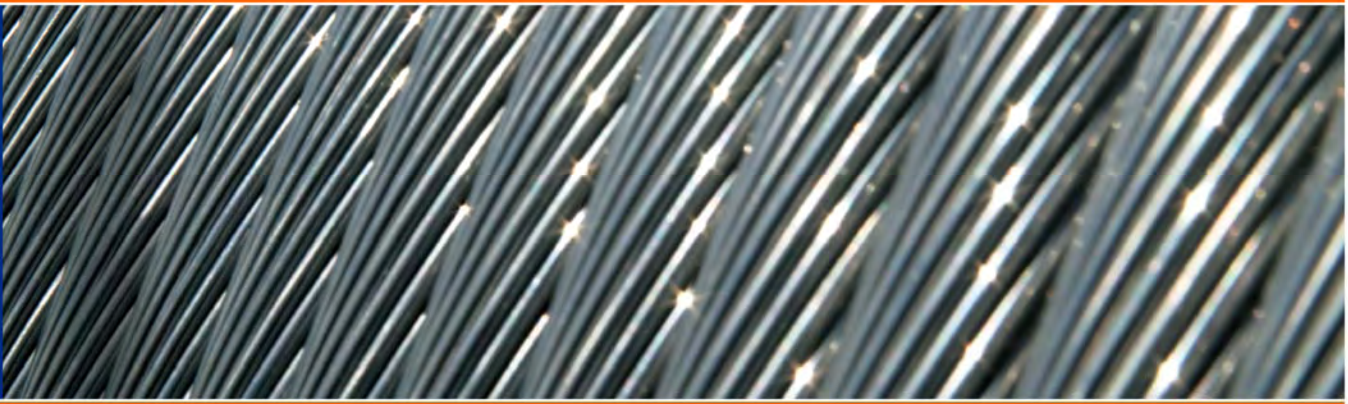
Powerlink and TransGrid are currently in the process of determining the effects on market benefits and optimum upgrade timing of the recently announced Uranquinty (600MW) and Munmorah (660MW) power stations.

Powerlink and TransGrid are aiming to report the outcomes of the detailed technical and economic studies in the later part of 2007. If these studies indicate an optimal upgrade timing of 2010 or earlier, Powerlink and TransGrid would move to the National Electricity Rules consultation and approvals processes. If the indicative optimal timing is beyond 2010, it is considered premature to move to that phase.

6.3 Supply Demand Balance

The outlook for the supply demand balance for the Queensland region was published in the NEMMCO 2006 SOO in October 2006. As part of the normal annual planning cycle, NEMMCO will publish a revised outlook in the 2007 SOO. Interested parties who require information regarding the future supply demand balance will need to consult this document.

APPENDICES



A	Estimated Network Power Flows
B	Limit Equations
C	Estimated Maximum Short Circuit Levels
D	Proposed Small Network Assets
E	Forecast of Connection Points
F	Temperature and Diversity Corrected Area Demands
G	Historical Validation of Current Queensland Forecasting Model
H	Queensland Native Demand
I	Abbreviations

APPENDIX A - ESTIMATED NETWORK POWER FLOWS

Appendix A illustrates 21 sample grid power flows (figures A3 to A23) for the Queensland region for each summer and winter over three years from winter 2007 to summer 2009/2010. Each sample shows possible grid power flows at the time of winter or summer region 50%PoE forecast peak demand, with a range of import and export conditions on the Queensland/New South Wales Interconnector (QNI).

The sample power flows include southerly power flows on the Terranora Interconnector that are based on the expected levels to meet reliability requirements in northern New South Wales.

In addition to figures A3 to A5 which illustrate possible network flows for winter 2007 peak loading conditions, additional outlooks have been included (figures A21 to A23) which illustrate possible power flows during a reduced South East Queensland generation scenario to conserve water.

Sample conditions in Appendix A include:

Table A.1: Summary of Figures A3 to A20 - Possible Grid Power Flows and Limit Stability States

GRID SECTION (1)	FIGURE	ILLUSTRATIVE GRID POWER FLOWS (MW) AND LIMIT STABILITY AT QUEENSLAND REGION PEAK LOAD TIME (2)(3) 2007 WINTER A3 / A4 / A5	2008 WINTER A6 / A7 / A8	2009 WINTER A9 / A10 / A11	2007/08 SUMMER A12 / A13 / A14	2008/09 SUMMER A15 / A16 / A17	2009/10 SUMMER A18 / A19 / A20	LIMIT DUE TO (4)
'Far North' Transfer								
Ross into Chalumbin 275kV (2 circuits) Tully into Kareeya 132kV (2 circuits) Tully to Innisfail & Woree 132kV (2 circuits from Summer 2008/09)	Flow Stability	158 / 158 / 158 S / S / S	164 / 164 / 164 S / S / S	171 / 171 / 170 S / S / S	211 / 211 / 211 S / S / S	267 / 266 / 266 S / S / S	280 / 280 / 280 S / S / S	V
'CQ-NQ' Transfer								
Bouldercombe into Nebo 275kV (1 circuit) Broadsound into Nebo 275kV (2 circuits, 3rd from Summer 2007/08) Dysart to Peak Downs 132kV (2 circuits)	Flow Stability	550 / 550 / 495 S / S / S	605 / 605 / 605 S / S / S	637 / 637 / 637 S / S / S	899 / 900 / 899 S / S / S	941 / 940 / 940 S / S / S	957 / 810 / 664 S / S / S	Tr V Th
'Gladstone' Transfer								
Bouldercombe into Gladstone 275kV (2 circuits) Calvale into Wurdong 275kV (1 circuit) Callide A into Gladstone South 132kV (2 circuits)	Flow Stability	1220 / 1108 / 1074 S / S / S	1000 / 1156 / 1018 S / S / S	1011 / 1119 / 871 S / S / S	735 / 744 / 725 S / S / S	683 / 717 / 697 S / S / S	655 / 801 / 831 S / S / S	Th
'CQ-SQ' Transfer								
Wurdong into Gin Gin 275kV (1 circuit) Gladstone into Gin Gin 275kV (2 circuits) Calvale into Tarong 275kV (2 circuits)	Flow Stability	1348 / 1587 / 1756 S / S / S	1012 / 1256 / 1555 S / S / S	1151 / 1242 / 1811 S / S / S	1467 / 1421 / 1554 S / S / S	1378 / 1462 / 1533 S / S / S	1369 / 1551 / 1796 S / S / S	Tr V
'Tarong' Transfer								
Tarong to South Pine, Mt England & Blackwall 275kV(5 circuits) Middle Ridge to Greenbank 275kV (2 circuits from Summer 2007/08)	Flow Stability	3045 / 2920 / 2531 S / S / S	3422 / 3316 / 2872 S / S / S	3456 / 3428 / 2949 S / S / S	3733 / 3754 / 3434 S / S / S	3799 / 3756 / 3613 S / S / S	4079 / 4003 / 3822 S / S / S	V
'Gold Coast' Transfer								
Greenbank into Mudgeeraba 275kV (2 circuits) Greenbank into Molendinar 275kV (2 circuits from Summer 2007/08) Coomera into Cades County 110kV (1 circuit)	Flow Stability	774 / 774 / 774 S / S / S	815 / 815 / 815 S / S / S	864 / 864 / 864 S / S / S	886 / 886 / 885 S / S / S	942 / 941 / 941 S / S / S	1047 / 1047 / 1047 S / S / S	V

Table A.1: Summary of Figures A3 to A20 - Possible Grid Power Flows and Limit Stability States (Cont'd)

GRID SECTION (1)	FIGURE	ILLUSTRATIVE GRID POWER FLOWS (MW) AND LIMIT STABILITY AT QUEENSLAND REGION PEAK LOAD TIME (2)(3)						LIMIT DUE TO (4)
		2007 WINTER A3 / A4 / A5	2008 WINTER A6 / A7 / A8	2009 WINTER A9 / A10 / A11	2007/08 SUMMER A12 / A13 / A14	2008/09 SUMMER A15 / A16 / A17	2009/10 SUMMER A18 / A19 / A20	
'SWQ' Transfer								
Braemar into Tarong 275kV (2 circuits) Middle Ridge into Tarong 275kV (1 circuit) Middle Ridge to Greenbank 275kV (2 circuits from Summer 2007/08)	Flow Stability	880 / 648 / 179 S / S / S	1423 / 1184 / 608 S / S / S	1723 / 1316 / 599 S / S / S	1586 / 1630 / 1190 S / S / S	1710 / 1577 / 1384 S / S / S	1954 / 1770 / 1472 S / S / S	Th

Notes:

(1) The Grid Sections defined are as illustrated in Figure A2. X into Y - the MW flow between X and Y measured at the Y end; X to Y - the MW flow between X and Y measured at the X end.

(2) Grid power flows are derived from the assumed generation dispatch cases shown in Figures A3 to A20. The flows are estimated for system intact (that is all network circuits in service), and are based on existing network configurations, committed projects, and proposed new assets in Chapter 5. Power flows within each grid section can be higher at times of local zone peak.

(3) S = Stable condition, U = Unstable condition.

(4) Tr = Transient stability limit, V = Voltage stability limit and Th = Thermal limit.

Table A.2: Transformer Capacity and Estimates of Loading of 275kV Substations

275KV SUBSTATION (1) (2)	POSSIBLE MVA LOADING AT QUEENSLAND REGION PEAK (4)(5)						DEPENDENCE OTHER THAN LOCAL LOAD		OTHER COMMENTS
NO. TRANSFORMERS X MVA NAMEPLATE RATING (3)	WINTER 2007	WINTER 2008	WINTER 2009	SUMMER 2007/08	SUMMER 2008/09	SUMMER 2009/10	SIGNIFICANT DEPENDENCE ON	MINOR DEPENDENCE ON	
Woree 275/132kV (1x375MVA)	99	135	153	157	215	252	Barron Gorge generation	Kareeya generation	Winter 2008 - 2nd 375MVA transformer
Chalumbin 275/132kV (2x200MVA)	48	15	60	102	54	52	Barron Gorge and Kareeya generation	Townsville & Mt Stuart generation	
Ross 275/132kV (2x250 & 1x200MVA)	104	151	105	224	228	279	Mt Stuart, Townsville & Invicta generation	Collinsville generation	
Strathmore 275/132kV (1x375MVA)	45	48	78	39	86	53	Collinsville & Invicta generation	Townsville & Mt Stuart generation	
Nebo 275/132kV (2x200 & 1x250MVA)	238	287	278	366	349	351	Mackay GT generation	Collinsville generation	
Bouldercombe 275/132kV (2x200MVA)	147	147	152	216	201	226			
Lilyvale 275/132kV (2x375MVA)	180	187	197	207	205	229	Barcaldine generation	CQ-NQ flow	
Calvale 275/132kV (1x250MVA)	236	237	239	235	236	184	Central Queensland generation		
Gin Gin 275/132kV (2x120MVA)	185	149	162	167	169	180	132kV transfers to/from Woolooga	CQ-SQ flow	132kV network can have open points to reduce loading
Teebar Creek 275/132kV (2x375MVA)	0	106	115	136	144	154	132kV transfers to/from Woolooga	CQ-SQ flow	New Substation Summer 2007/08 - 2x375MVA transformers
Woolooga 275/132kV (2x120 & 1x250MVA)	257	200	219	205	227	242	132kV transfers to/from Gin Gin / Teebar Creek	CQ-SQ flow	
Palmwoods 275/132kV (2x375MVA)	338	348	384	362	398	408	132/110kV transfers to/from South Pine & Woolooga	CQ-SQ flow	
South Pine 275/110kV (2x375, 1x250 & 1x200MVA)	807	829	866	978	1020	1117	110kV transfers to/from Rocklea & Palmwoods	CQ-SQ flow & Swanbank generation	Summer 2009/10 - 2nd 200MVA transformer and 3rd 375MVA transformer
Rocklea 275/110kV (2x375MVA)	450	443	456	528	549	546	110kV transfers to/from South Pine and Belmont	110kV transfers to/from Swanbank & Swanbank B generation	

Table A.2: Transformer Capacity and Estimates of Loading of 275kV Substations (Cont'd)

275KV SUBSTATION (1) (2)	POSSIBLE MVA LOADING AT QUEENSLAND REGION PEAK (4)(5)						DEPENDENCE OTHER THAN LOCAL LOAD		OTHER COMMENTS
NO. TRANSFORMERS X MVA NAMEPLATE RATING (3)	WINTER 2007	WINTER 2008	WINTER 2009	SUMMER 2007/08	SUMMER 2008/09	SUMMER 2009/10	SIGNIFICANT DEPENDENCE ON	MINOR DEPENDENCE ON	
Belmont 275/110kV (2x250 & 2x200MVA)	611	642	693	778	810	835	110kV transfers to/from Loganlea	110kV transfers to/from Rocklea	
Murarrie 275/110kV (1x375MVA)	245	275	259	323	333	342	110kV transfers to/from Belmont		
Swanbank 275/110kV (1x250 & 1x240MVA)	268	299	164	356	181	181	110kV transfers to/from South Pine, Millmerran and Oakey GT generation	110kV transfers to/from Rocklea & Swanbank B generation	
Abermain 275/110kV (1x375MVA)	0	0	212	0	234	243	110kV transfers to/from Swanbank & Goodna	Tarong flow	New Substation Summer 2008/09 - 1x375MVA transformer
Goodna 275/110kV (1x375MVA)	191	218	190	269	225	199			
Loganlea 275/110kV (2x375MVA)	440	477	490	541	568	577	110kV transfers to/from Belmont	110kV transfers to/from Molendinar & Mudgeeraba	
Molendinar 275/110kV (1x375MVA)	313	462	489	526	550	587	110kV transfers to/from Loganlea & Mudgeeraba	Directlink	Summer 2007/08 - 2nd 375MVA transformer
Mudgeeraba 275/110kV (3x250MVA)	474	404	433	447	490	520	110kV transfers to/from Molendinar & Directlink	110kV transfers to/from Loganlea	
Middle Ridge 275/110kV (3x250MVA)	292	275	284	312	295	203	Oakey GT generation	Swanbank B generation	
Tarong 275/132kV (2x90MVA)	62	74	76	80	82	35	Roma generation		
Tarong 275/66kV (2x90MVA)	39	40	41	41	42	44			

Notes:

(1) Not included are the 275/132kV tie transformers within the Power Station switchyard at Gladstone. Loading on these transformers vary considerably with local generation.

(2) Also not included are 330/275kV transformers located at Braemar and Middle Ridge substations. Loading on these transformers are dependent on QNI transfer and south west Queensland generation output.

(3) Nameplate based on present ratings. Cyclic overload capacities above nameplate ratings are assigned to transformers based on ambient temperature, load cycle patterns and transformer design.

(4) Substation loadings are derived from the assumed generation dispatch cases shown within Figures A3 to A20. The loadings are estimated for system normal (i.e. all network elements in service), and are based on existing network configurations, committed projects, and proposed new assets in Chapter 5. MVA loadings for transformers depend on power factor, and may be different under other generation patterns, outage conditions, local or zone peak demand times or different availability of local and downstream capacitor banks.

(5) Substation loadings are the maximum of each of the northerly/zero/southerly QNI scenarios for each year/season shown within the assumed generation dispatch cases in Figures A3 to A20.

Figure A.1: Generation and Load Legend for Figures A3 to A23

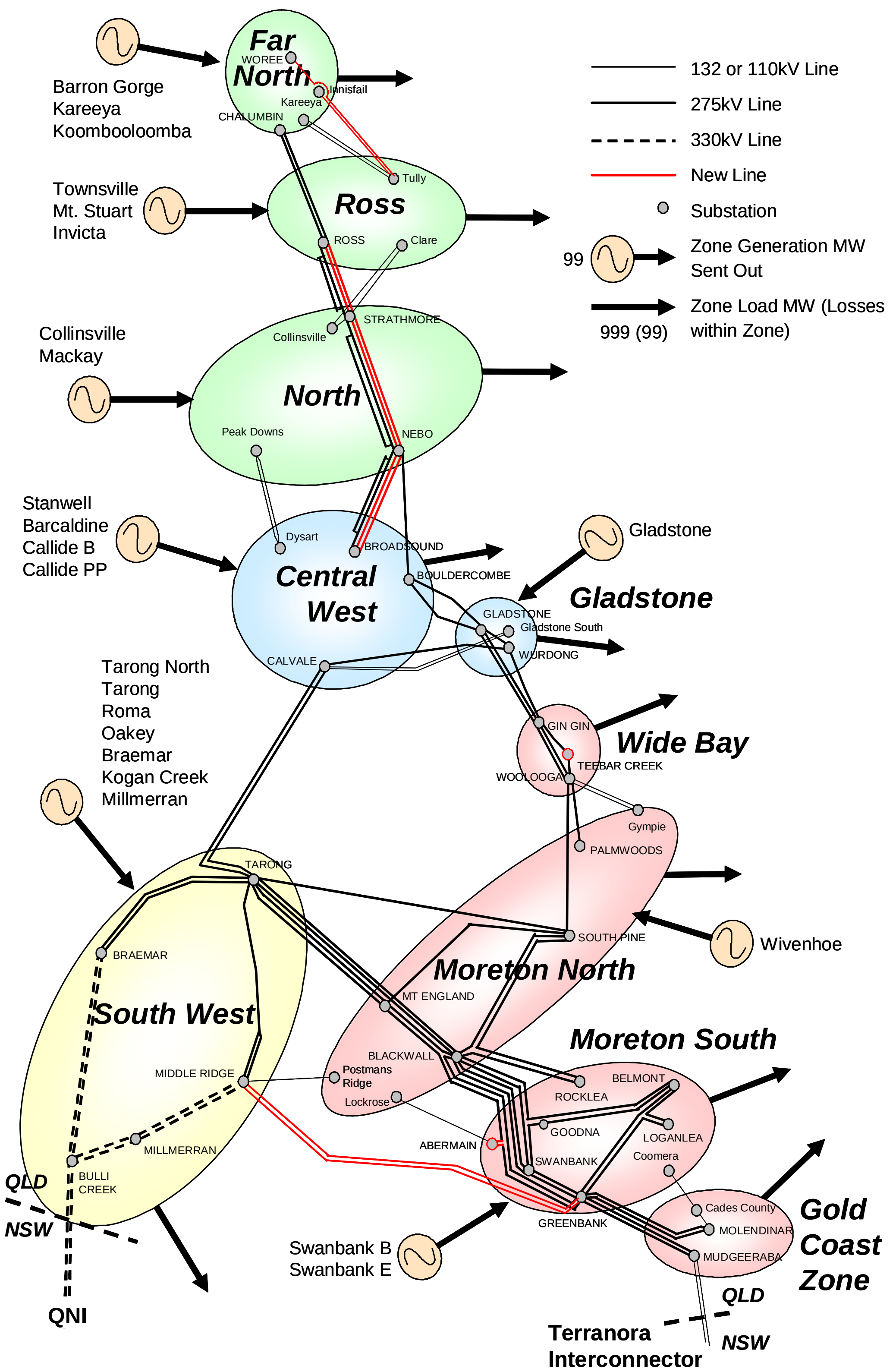


Figure A.2: Power Flow and Limits Legend for Figures A3 to A23

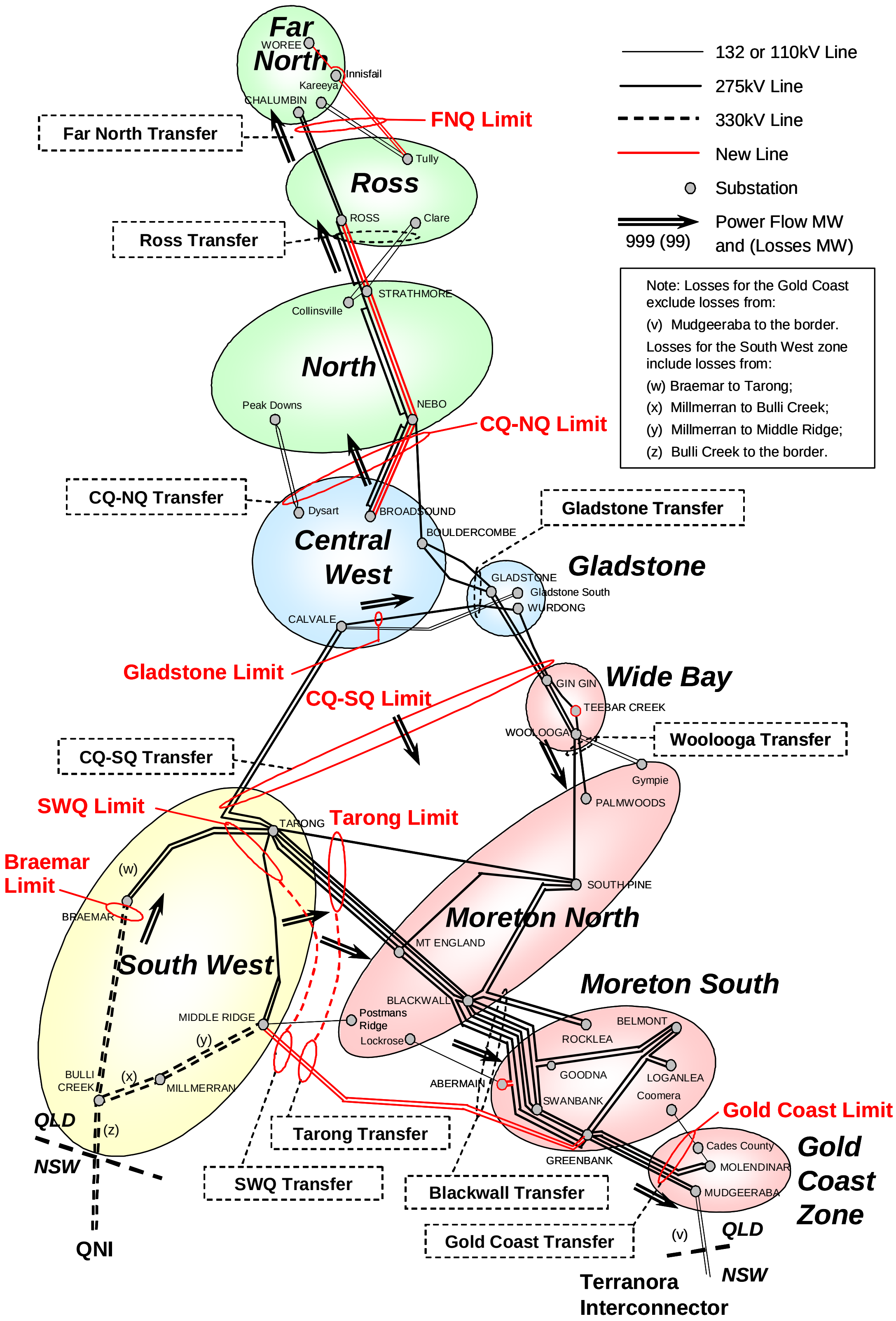


Figure A.3: Winter 2007 Qld Peak 400MW Northerly QNI Flow

Total Gen Sent-Out…………..	7213	MW
Total Load…………………..	7123	MW
Total Losses…………………..	358	MW
QNI Northerly Flow………….	400	MW
Terranora Southerly Flow……	132	MW

Note:
The sample power flow information in each of the Figures A3 to A23 is provided as an indication of possible network flows and losses under only one possible assumed generation and load condition. It is not intended as a prediction of market outcomes.

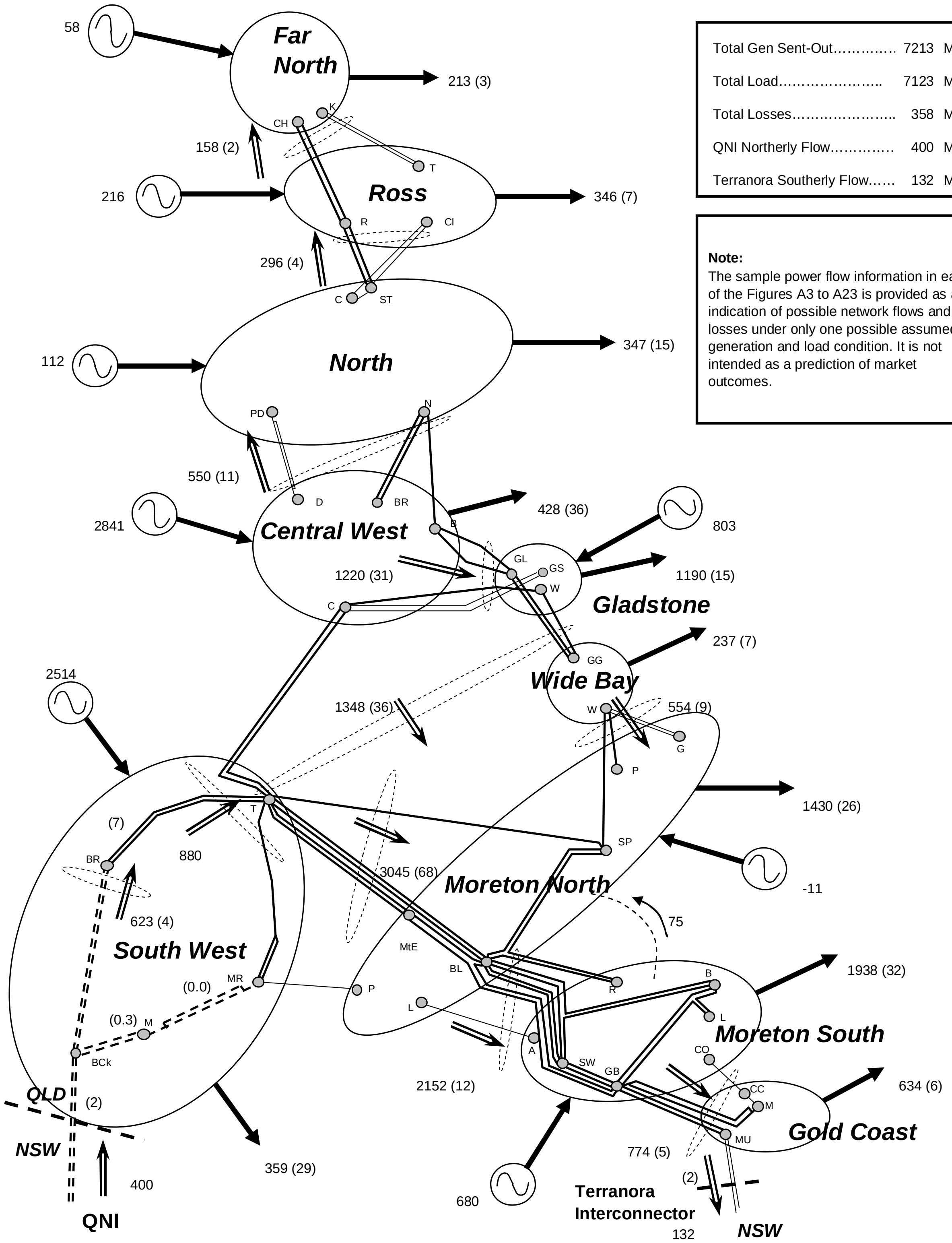
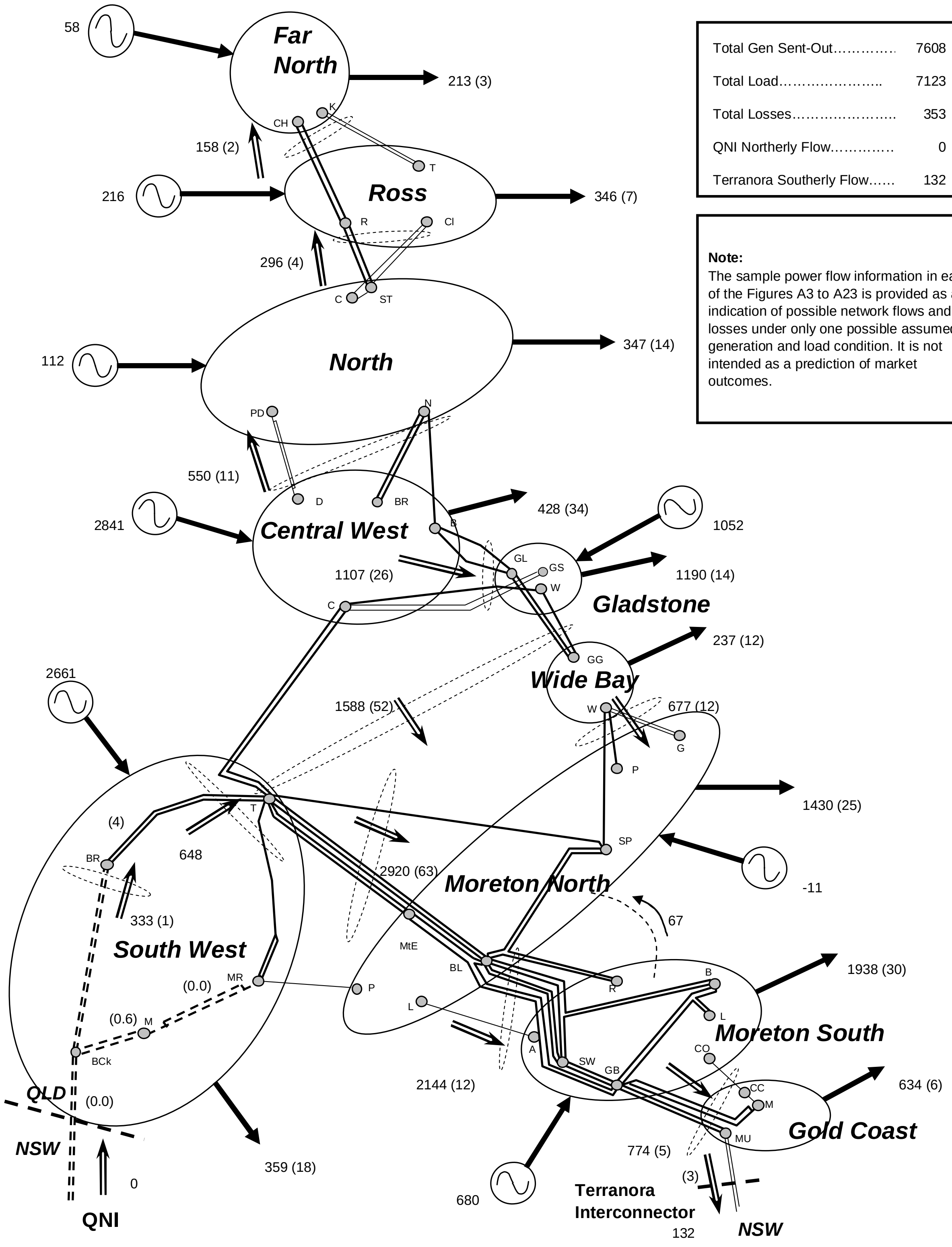


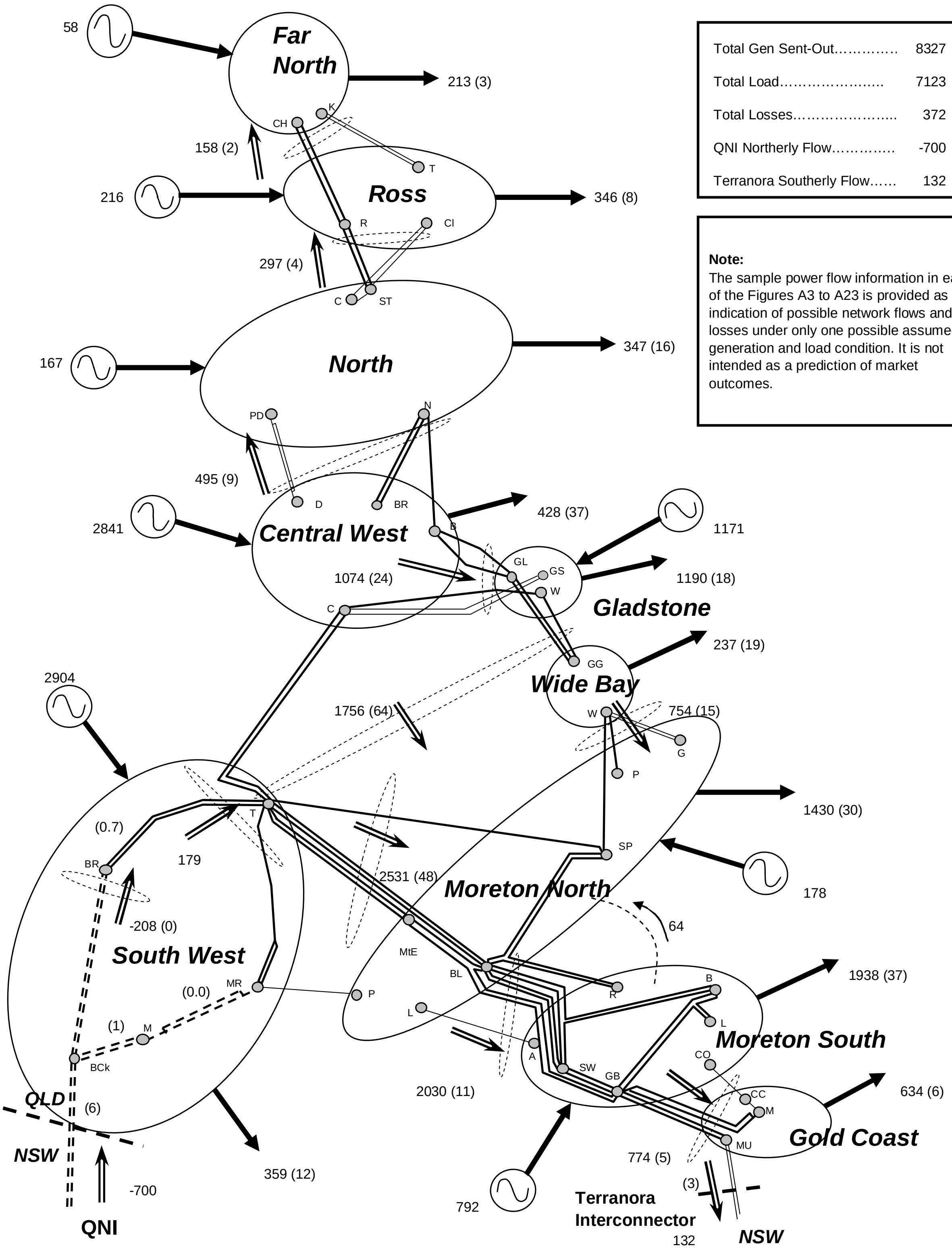
Figure A.4: Winter 2007 Qld Peak Zero QNI Flow



Total Gen Sent-Out…………..	7608	MW
Total Load…………………..	7123	MW
Total Losses…………………..	353	MW
QNI Northerly Flow………….	0	MW
Terranora Southerly Flow……	132	MW

Note:
The sample power flow information in each of the Figures A3 to A23 is provided as an indication of possible network flows and losses under only one possible assumed generation and load condition. It is not intended as a prediction of market outcomes.

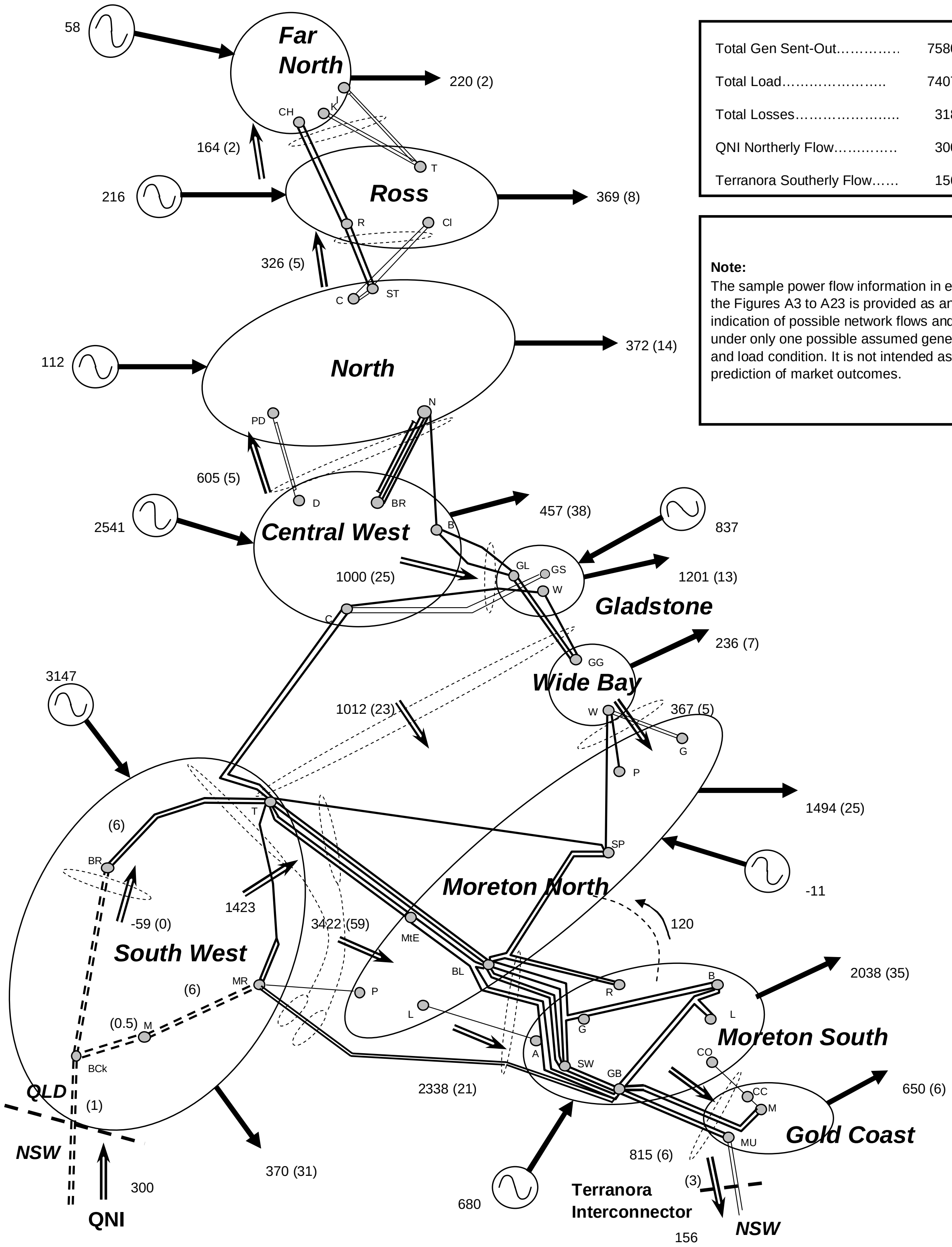
Figure A.5: Winter 2007 Qld Peak 700MW Southerly QNI Flow



Total Gen Sent-Out…………..	8327	MW
Total Load………………….	7123	MW
Total Losses…………………..	372	MW
QNI Northerly Flow…………..	-700	MW
Terranora Southerly Flow……	132	MW

Note:
The sample power flow information in each of the Figures A3 to A23 is provided as an indication of possible network flows and losses under only one possible assumed generation and load condition. It is not intended as a prediction of market outcomes.

Figure A.6: Winter 2008 Qld Peak 300MW Northerly QNI Flow



Total Gen Sent-Out.............	7580 MW
Total Load.......................	7407 MW
Total Losses......................	318 MW
QNI Northerly Flow.............	300 MW
Terranora Southerly Flow......	156 MW

Note:
The sample power flow information in each of the Figures A3 to A23 is provided as an indication of possible network flows and losses under only one possible assumed generation and load condition. It is not intended as a prediction of market outcomes.

Figure A.7: Winter 2008 Qld Peak Zero QNI Flow

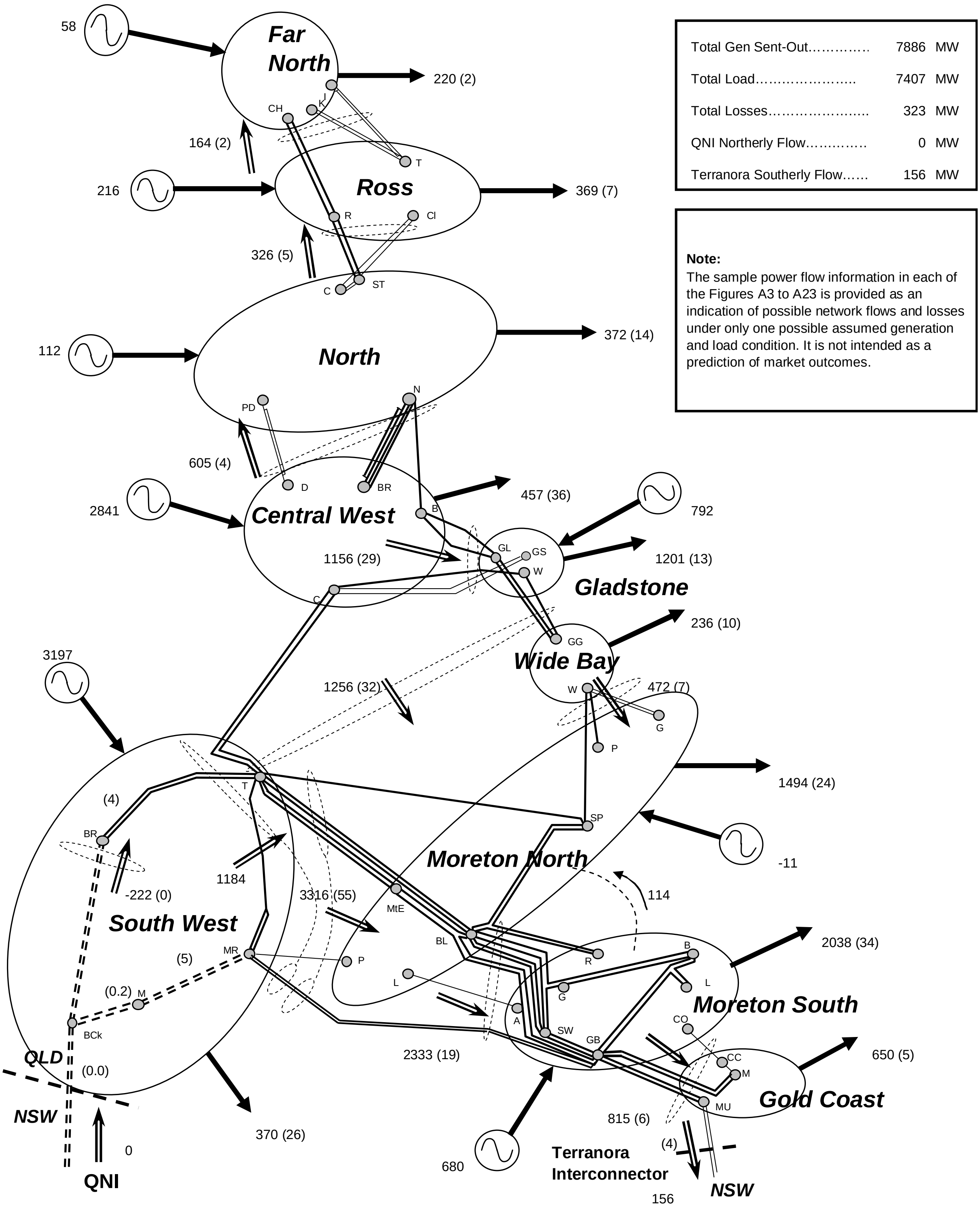


Figure A.8: Winter 2008 Qld Peak 700MW Southerly QNI Flow

Total Gen Sent-Out.............	8623	MW
Total Load......................	7407	MW
Total Losses......................	361	MW
QNI Northerly Flow.............	-700	MW
Terranora Southerly Flow......	156	MW

Note:
The sample power flow information in each of the Figures A3 to A23 is provided as an indication of possible network flows and losses under only one possible assumed generation and load condition. It is not intended as a prediction of market outcomes.

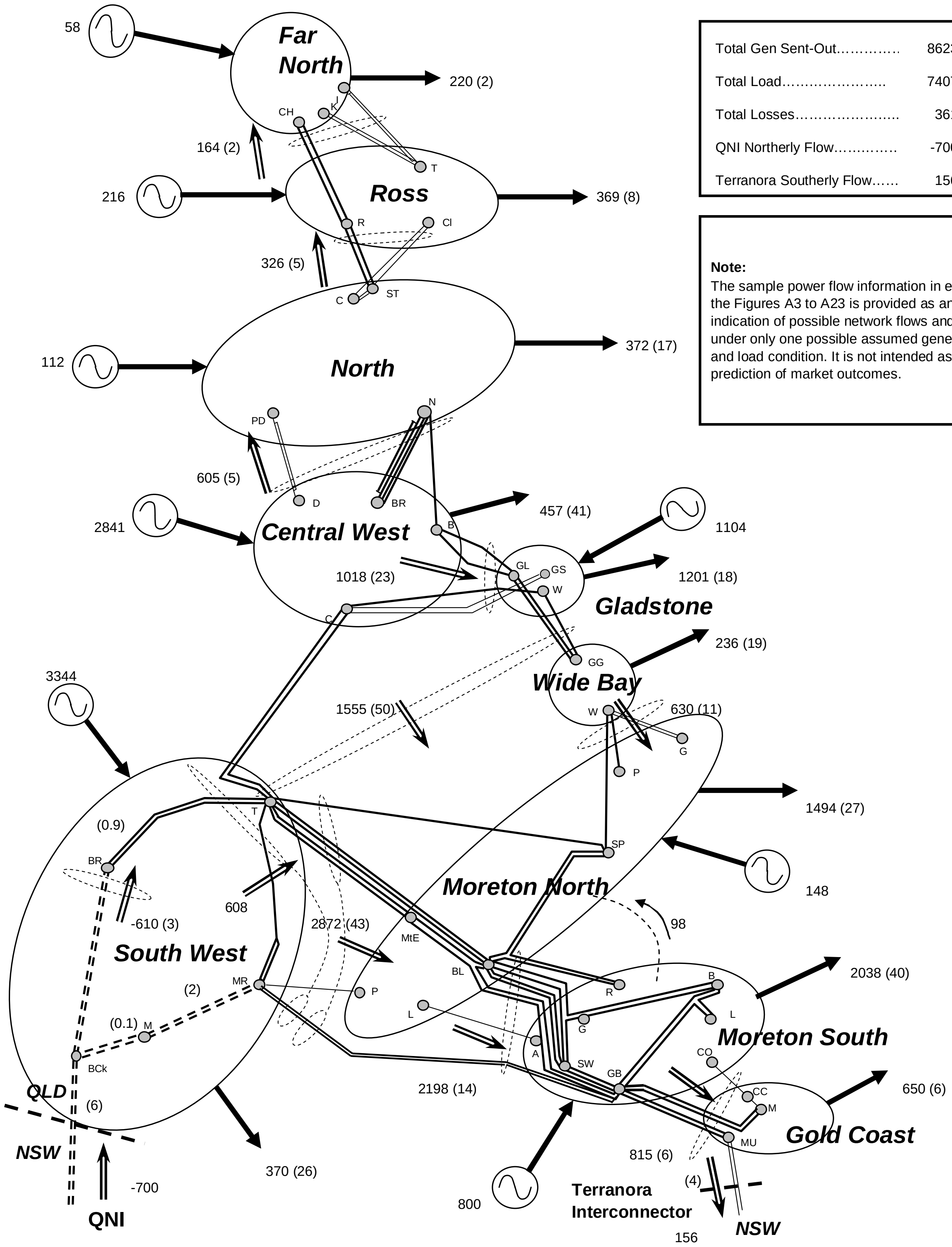
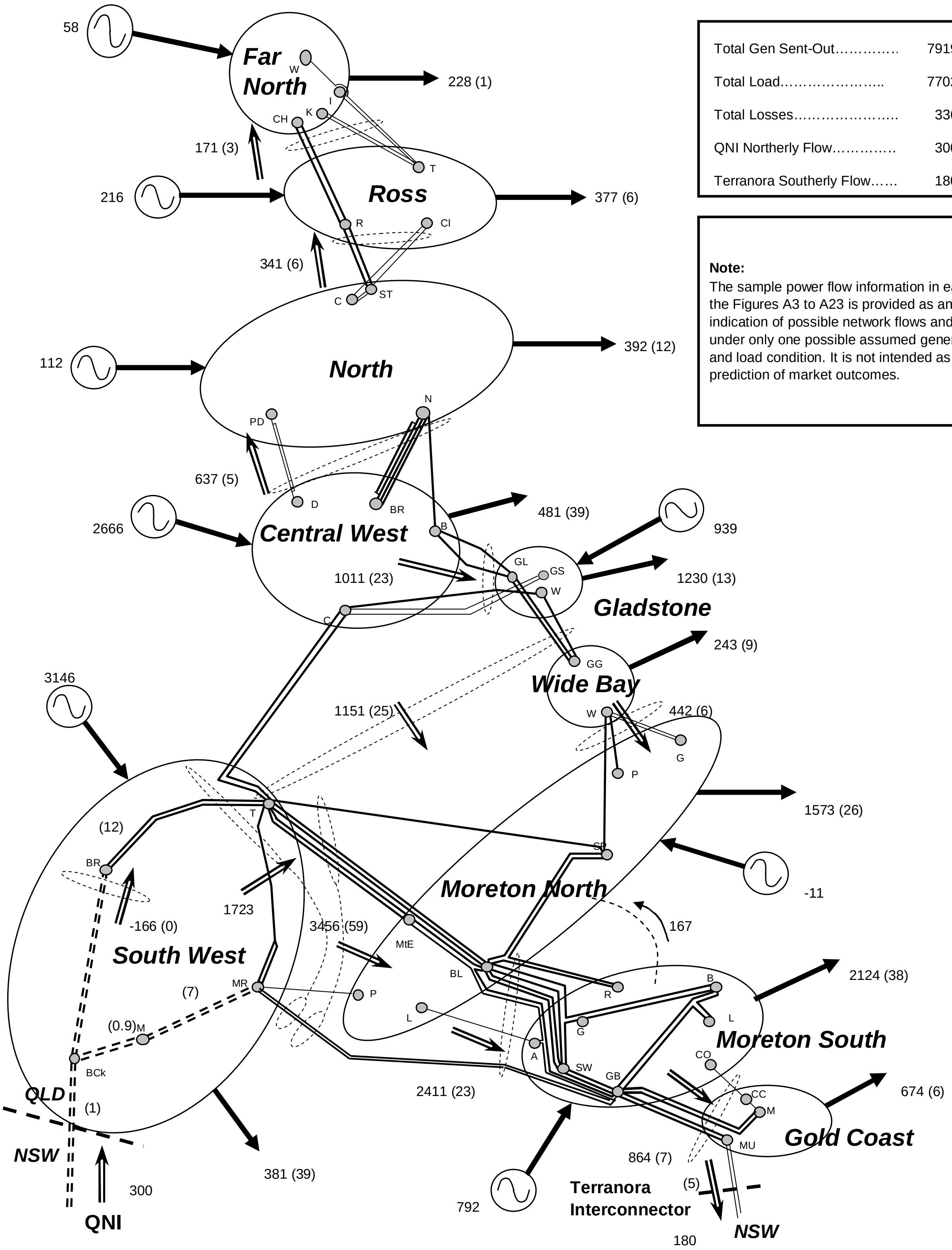


Figure A.9: Winter 2009 Qld Peak 300MW Northerly QNI Flow



Total Gen Sent-Out…………..	7919	MW
Total Load…………………..	7702	MW
Total Losses………………….	336	MW
QNI Northerly Flow…………..	300	MW
Terranora Southerly Flow……	180	MW

Note:
The sample power flow information in each of the Figures A3 to A23 is provided as an indication of possible network flows and losses under only one possible assumed generation and load condition. It is not intended as a prediction of market outcomes.

Figure A.10: Winter 2009 Qld Peak Zero QNI Flow

Total Gen Sent-Out…………..	8219	MW
Total Load…………………..	7702	MW
Total Losses…………………	336	MW
QNI Northerly Flow…………..	0	MW
Terranora Southerly Flow……	180	MW

Note:
The sample power flow information in each of the Figures A3 to A23 is provided as an indication of possible network flows and losses under only one possible assumed generation and load condition. It is not intended as a prediction of market outcomes.

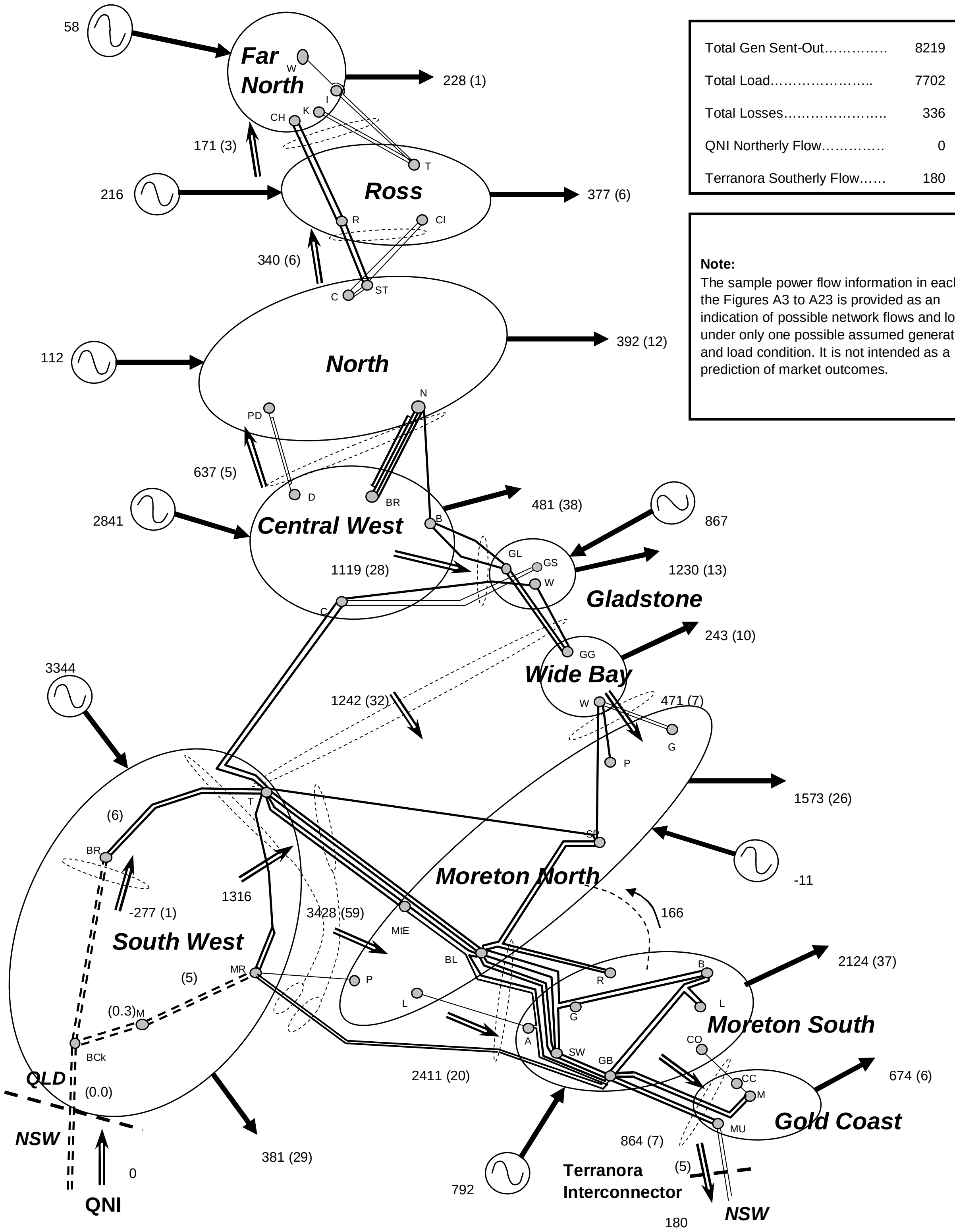


Figure A.11: Winter 2009 Qld Peak 700MW Southerly QNI Flow

Total Gen Sent-Out…………..	8977 MW
Total Load…………………..	7702 MW
Total Losses…………………	395 MW
QNI Northerly Flow………….	-700 MW
Terranora Southerly Flow……	180 MW

Note:
The sample power flow information in each of the Figures A3 to A23 is provided as an indication of possible network flows and losses under only one possible assumed generation and load condition. It is not intended as a prediction of market outcomes.

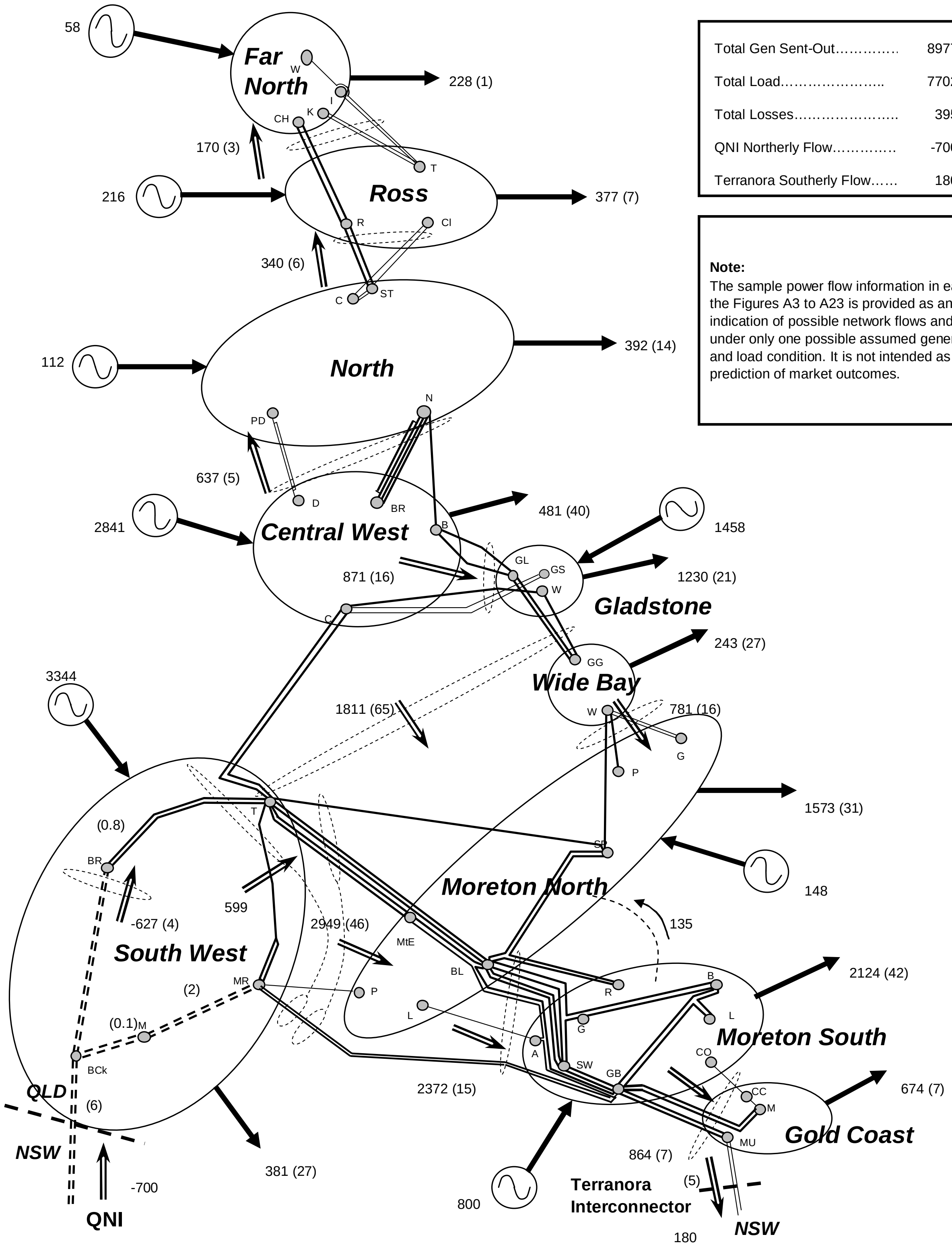
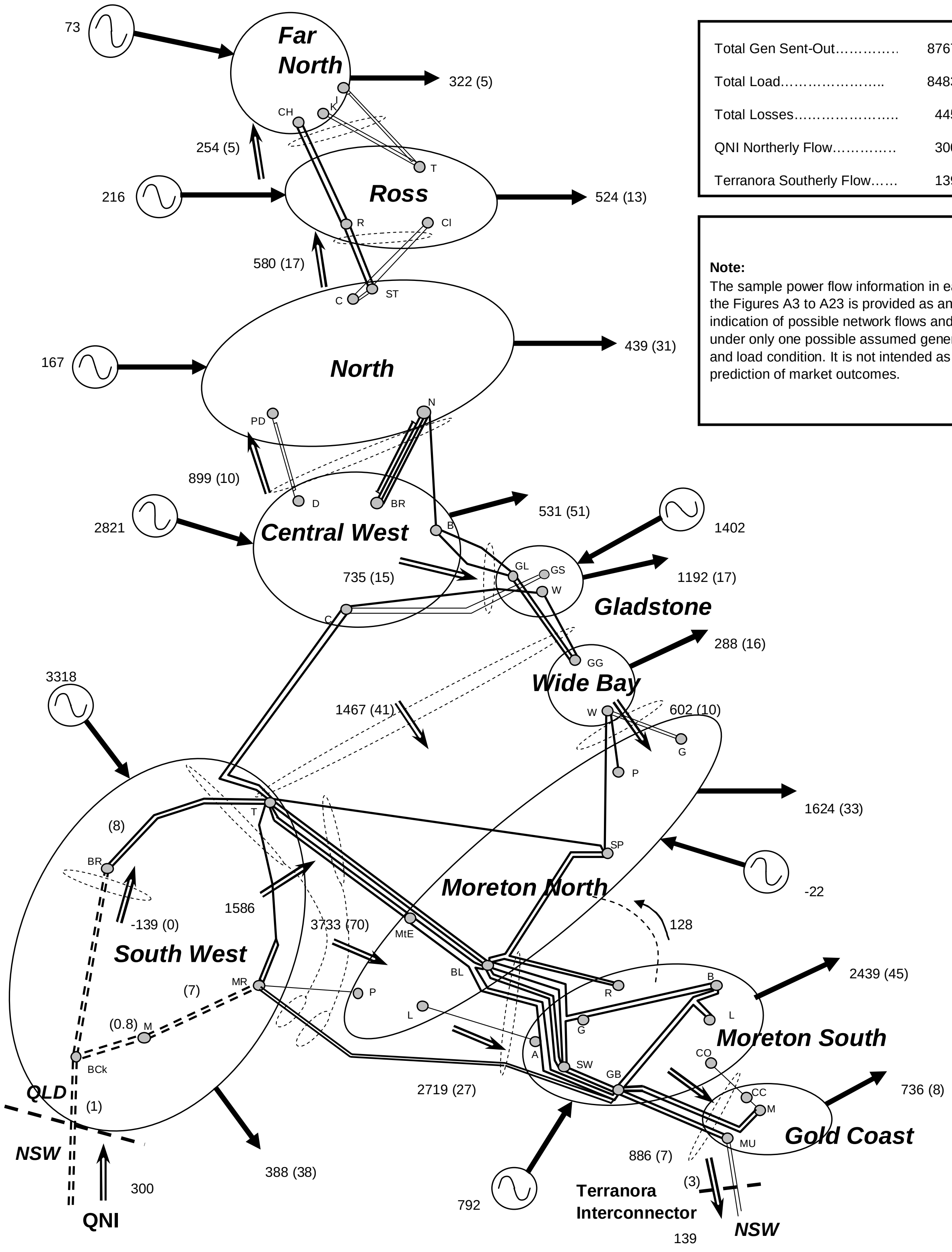


Figure A.12: Summer 2007/08 Qld Peak 300MW Northerly QNI Flow



Total Gen Sent-Out…………..	8767	MW
Total Load…………………..	8483	MW
Total Losses…………………..	445	MW
QNI Northerly Flow…………..	300	MW
Terranora Southerly Flow……	139	MW

Note:
The sample power flow information in each of the Figures A3 to A23 is provided as an indication of possible network flows and losses under only one possible assumed generation and load condition. It is not intended as a prediction of market outcomes.

Figure A.13: Summer 2007/08 Qld Peak Zero QNI Flow

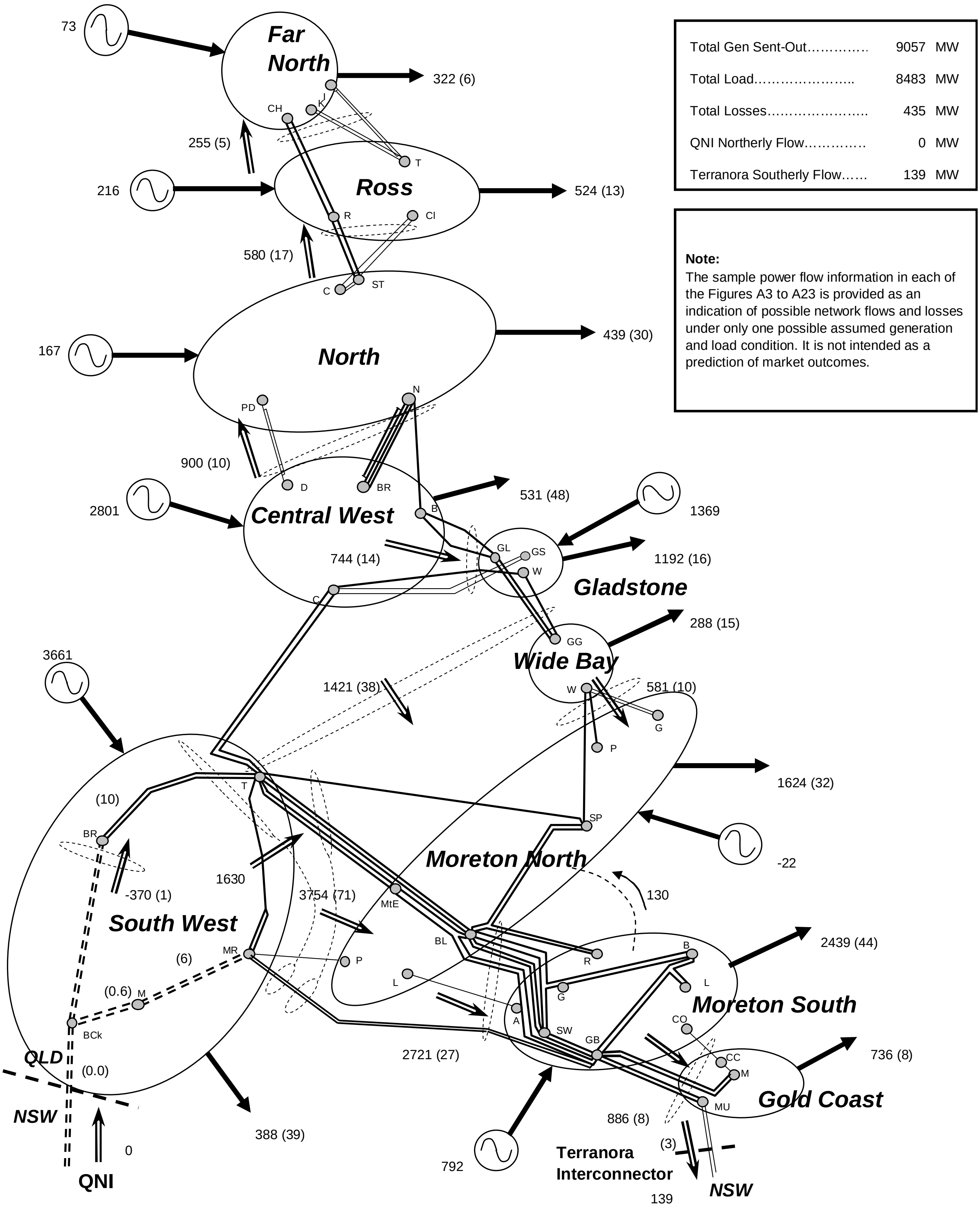
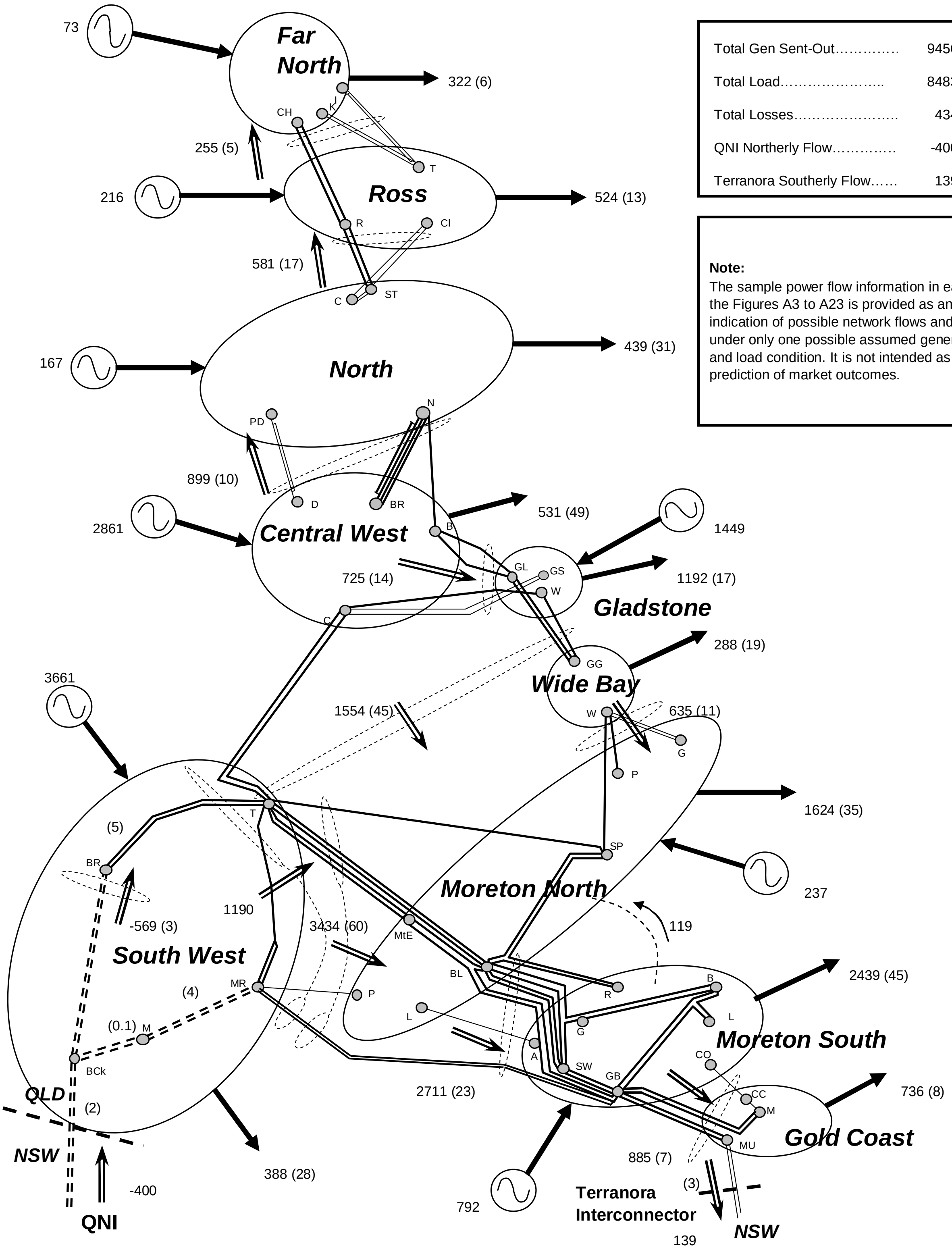


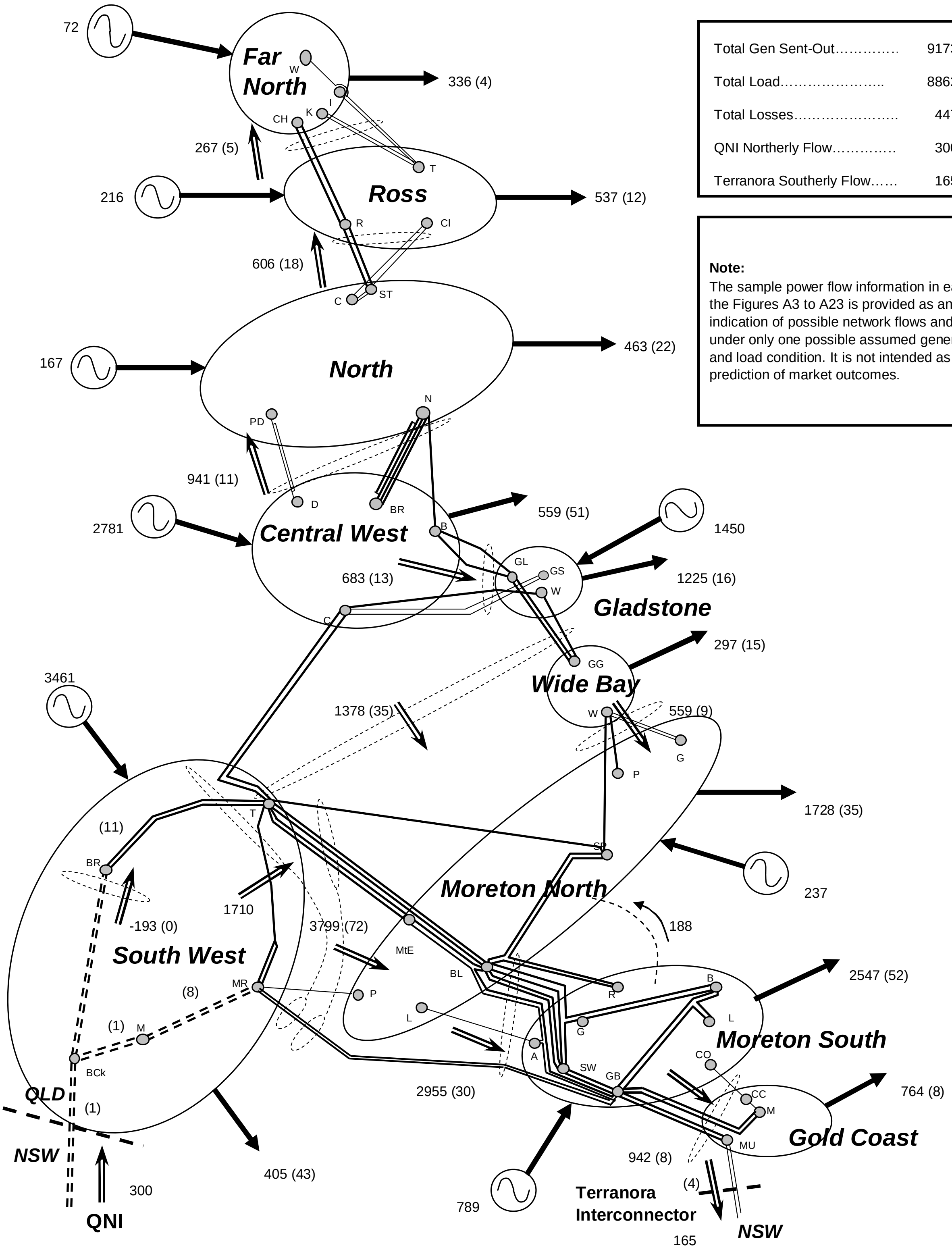
Figure A.14: Summer 2007/08 Qld Peak 400MW Southerly QNI Flow



Total Gen Sent-Out…………..	9456 MW
Total Load…………………..	8483 MW
Total Losses………………….	434 MW
QNI Northerly Flow………….	-400 MW
Terranora Southerly Flow……	139 MW

Note:
The sample power flow information in each of the Figures A3 to A23 is provided as an indication of possible network flows and losses under only one possible assumed generation and load condition. It is not intended as a prediction of market outcomes.

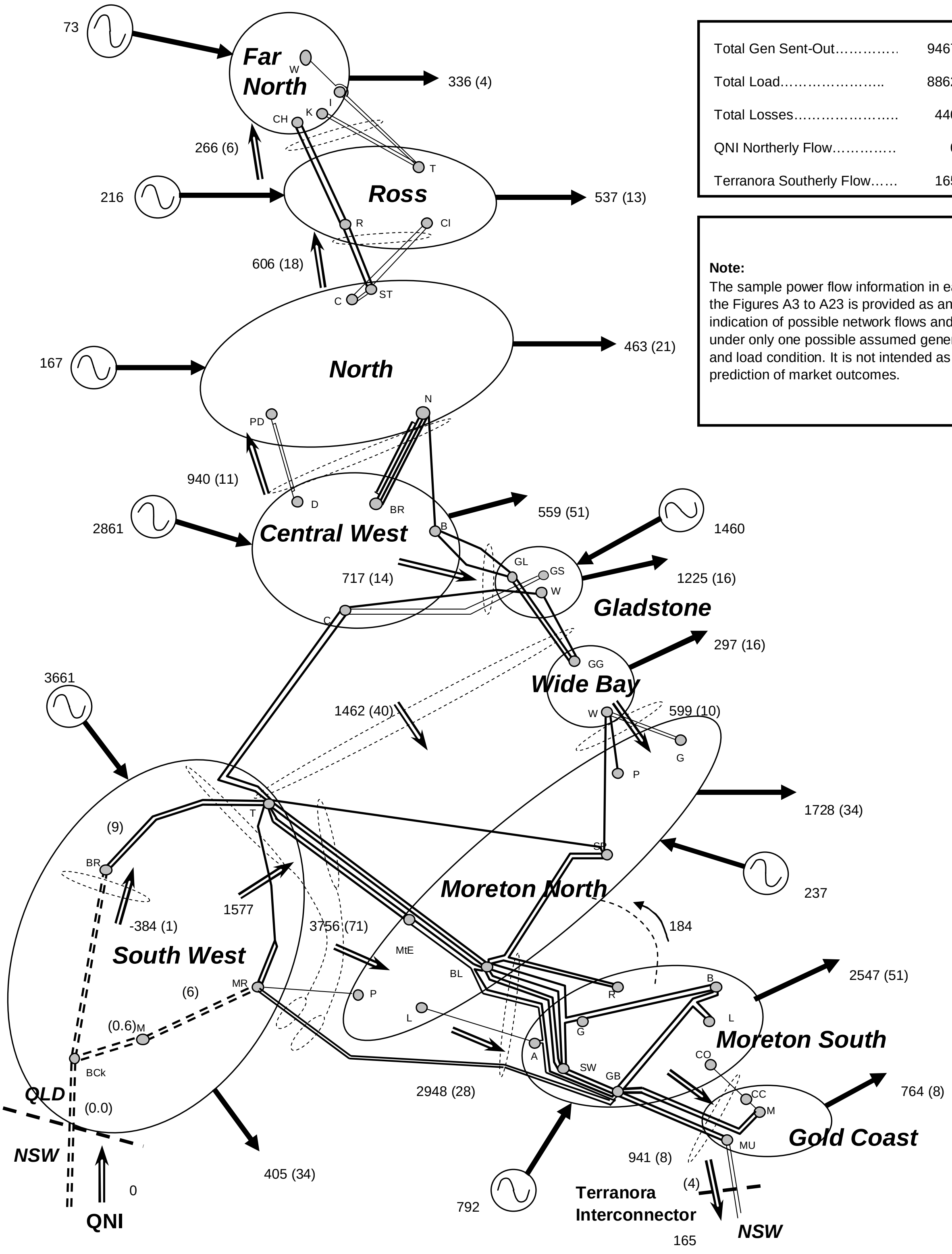
Figure A.15: Summer 2008/09 Qld Peak 300MW Northerly QNI Flow



Total Gen Sent-Out…………..	9173	MW
Total Load…………………..	8862	MW
Total Losses…………………..	447	MW
QNI Northerly Flow…………..	300	MW
Terranora Southerly Flow……	165	MW

Note:
The sample power flow information in each of the Figures A3 to A23 is provided as an indication of possible network flows and losses under only one possible assumed generation and load condition. It is not intended as a prediction of market outcomes.

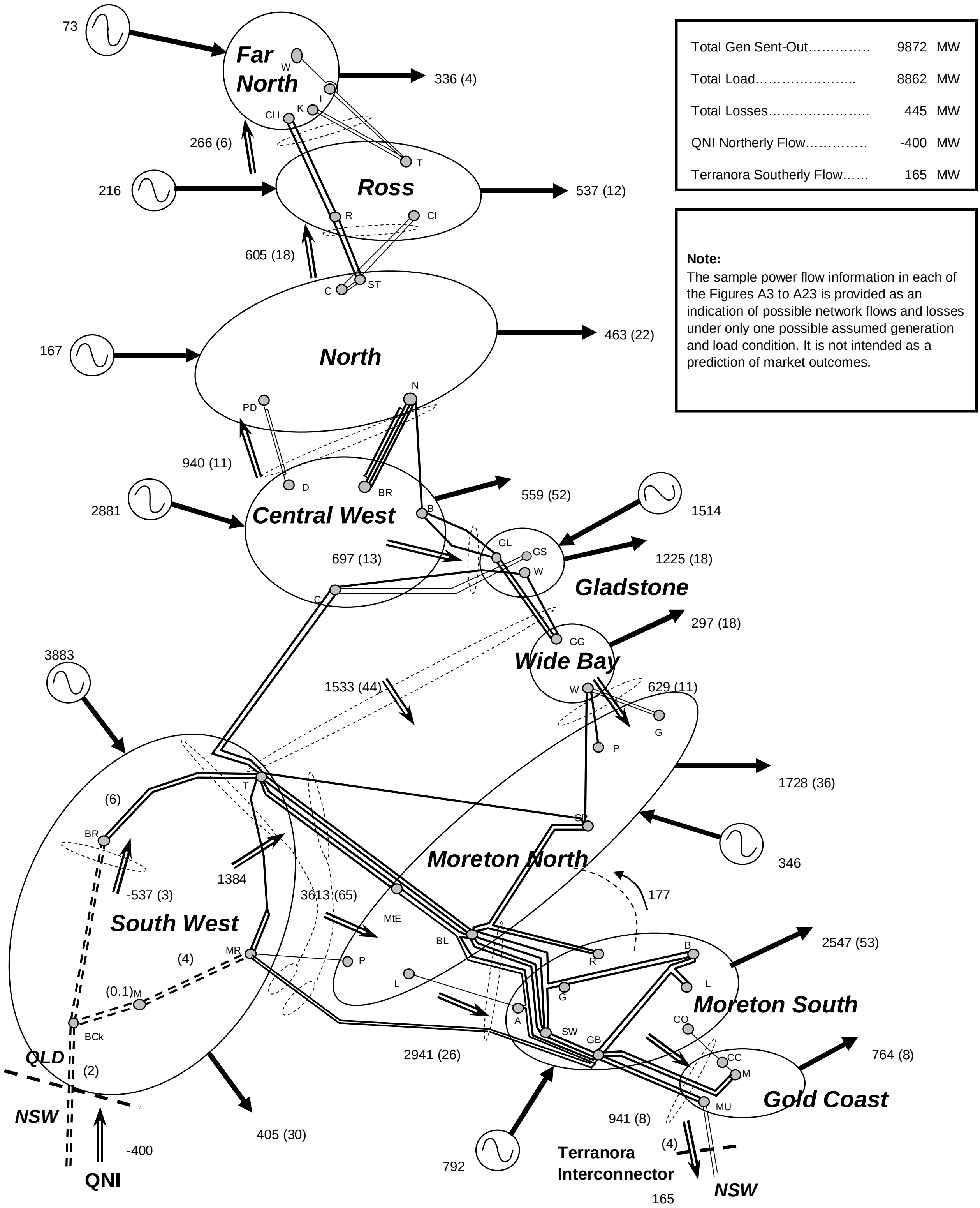
Figure A.16: Summer 2008/09 Qld Peak Zero QNI Flow



Total Gen Sent-Out…………..	9467	MW
Total Load…………………..	8862	MW
Total Losses…………………..	440	MW
QNI Northerly Flow…………..	0	MW
Terranora Southerly Flow……	165	MW

Note:
The sample power flow information in each of the Figures A3 to A23 is provided as an indication of possible network flows and losses under only one possible assumed generation and load condition. It is not intended as a prediction of market outcomes.

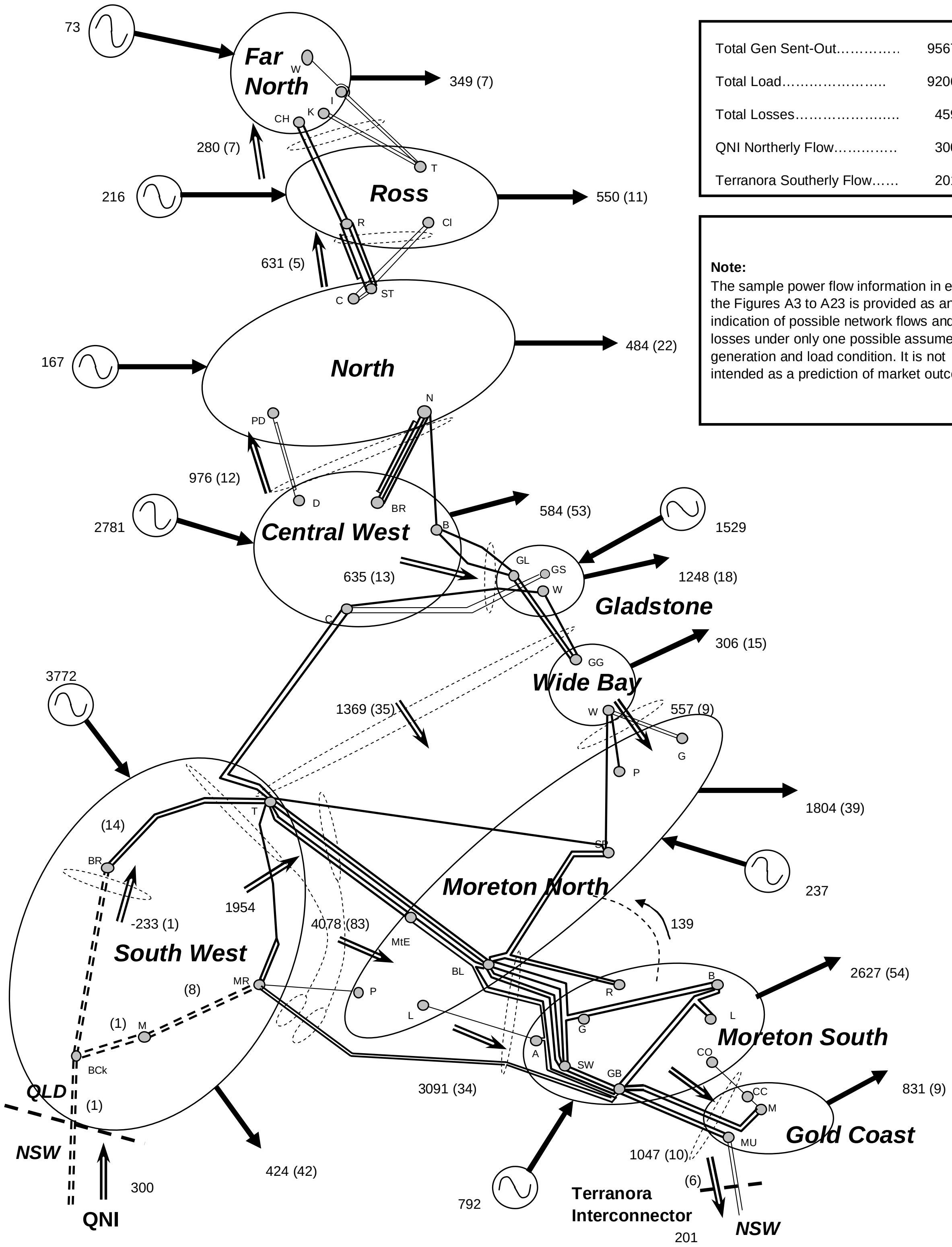
Figure A.17: Summer 2008/09 Qld Peak 400MW Southerly QNI Flow



Total Gen Sent-Out…………..	9872	MW
Total Load…………………..	8862	MW
Total Losses…………………..	445	MW
QNI Northerly Flow…………..	-400	MW
Terranora Southerly Flow……	165	MW

Note:
The sample power flow information in each of the Figures A3 to A23 is provided as an indication of possible network flows and losses under only one possible assumed generation and load condition. It is not intended as a prediction of market outcomes.

Figure A.18: Summer 2009/10 Qld Peak 300MW Northerly QNI Flow



Total Gen Sent-Out…………	9567 MW
Total Load…………………	9206 MW
Total Losses…………………	459 MW
QNI Northerly Flow…………	300 MW
Terranora Southerly Flow……	201 MW

Note:
The sample power flow information in each of the Figures A3 to A23 is provided as an indication of possible network flows and losses under only one possible assumed generation and load condition. It is not intended as a prediction of market outcomes.

Figure A.19: Summer 2009/10 Qld Peak Zero QNI Flow

Total Gen Sent-Out.............	9858 MW
Total Load.......................	9206 MW
Total Losses......................	451 MW
QNI Northerly Flow.............	0 MW
Terranora Southerly Flow......	201 MW

Note:
The sample power flow information in each of the Figures A3 to A23 is provided as an indication of possible network flows and losses under only one possible assumed generation and load condition. It is not intended as a prediction of market outcomes.

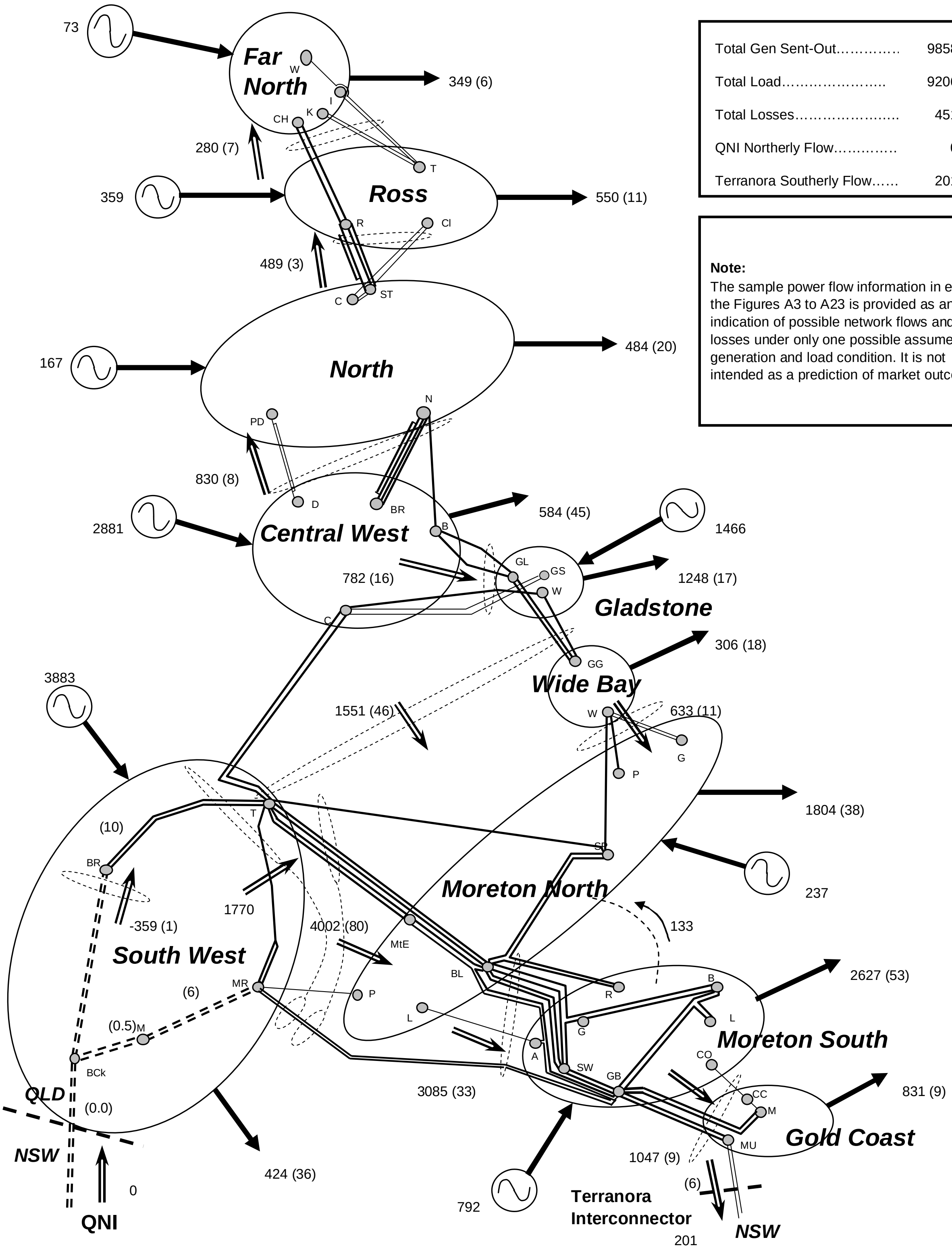
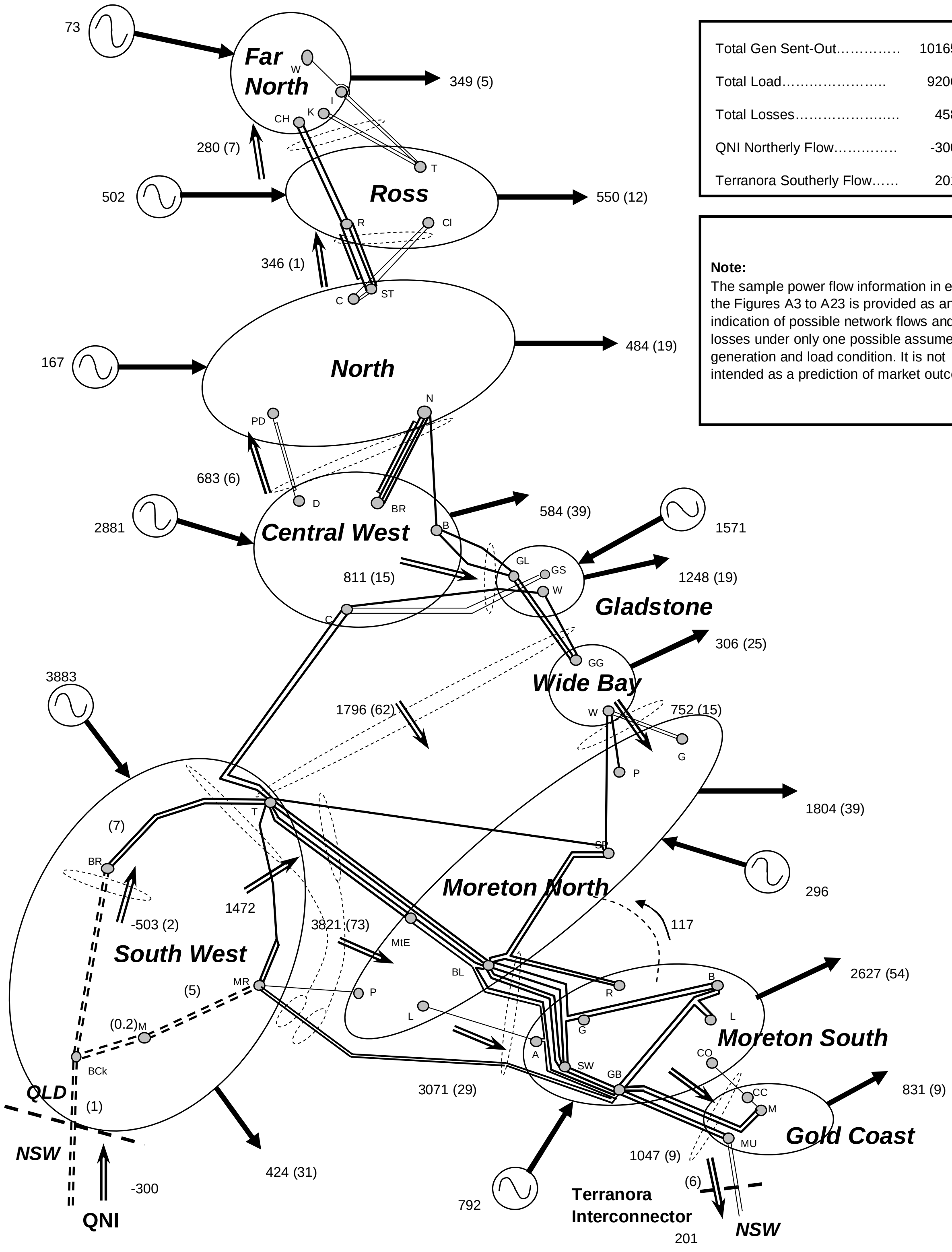


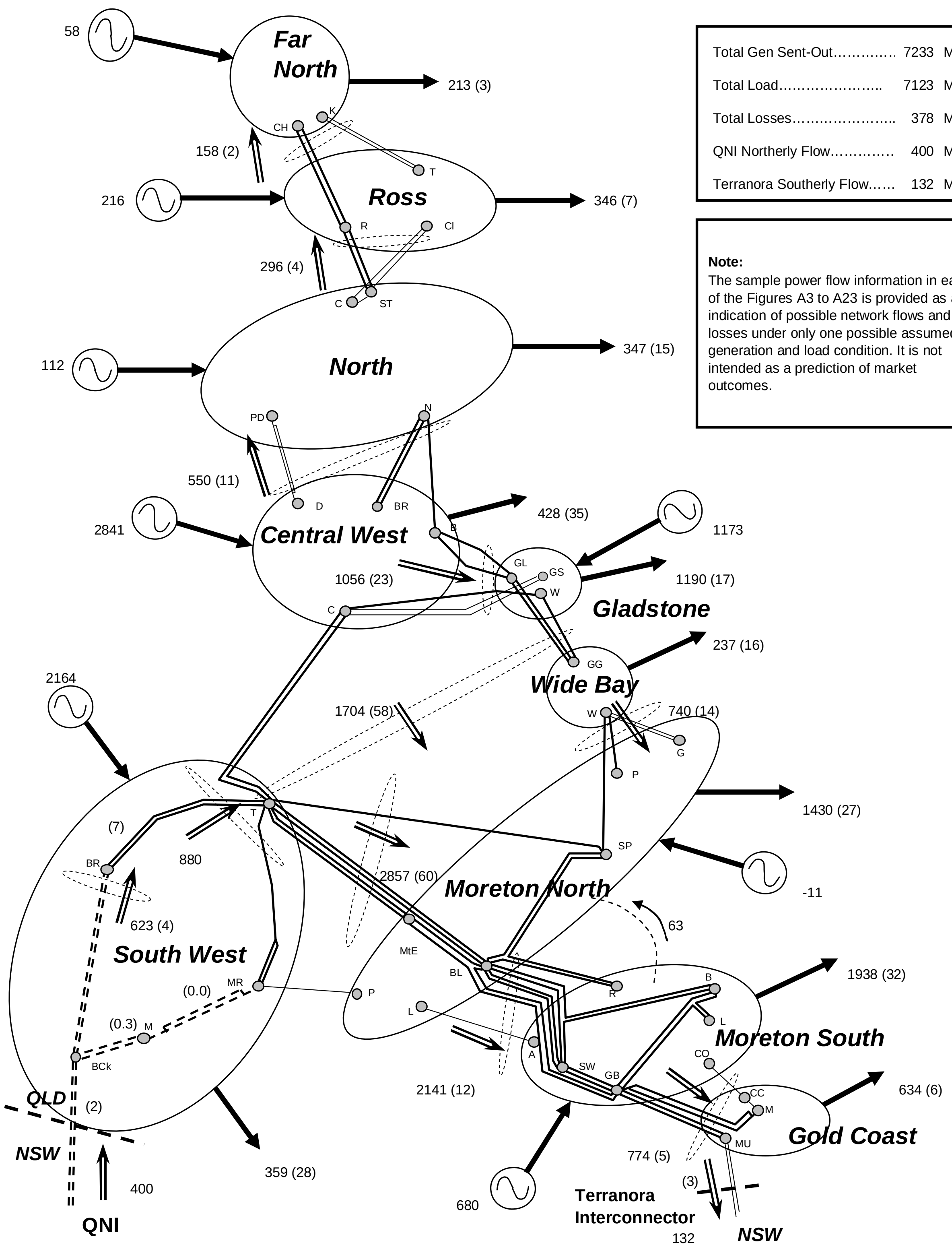
Figure A.20: Summer 2009/10 Qld Peak 300MW Southerly QNI Flow



Total Gen Sent-Out..............	10165	MW
Total Load......................	9206	MW
Total Losses.....................	458	MW
QNI Northerly Flow.............	-300	MW
Terranora Southerly Flow......	201	MW

Note:
The sample power flow information in each of the Figures A3 to A23 is provided as an indication of possible network flows and losses under only one possible assumed generation and load condition. It is not intended as a prediction of market outcomes.

Figure A.21: Alternative South Queensland Generation Dispatch Winter 2007 Qld Peak 400MW Northerly QNI Flow



Total Gen Sent-Out…………..	7233	MW
Total Load…………………..	7123	MW
Total Losses…………………..	378	MW
QNI Northerly Flow………….	400	MW
Terranora Southerly Flow……	132	MW

Note:
The sample power flow information in each of the Figures A3 to A23 is provided as an indication of possible network flows and losses under only one possible assumed generation and load condition. It is not intended as a prediction of market outcomes.

Figure A.22: Alternative South Queensland Generation Dispatch Winter 2007 Qld Peak Zero QNI Flow

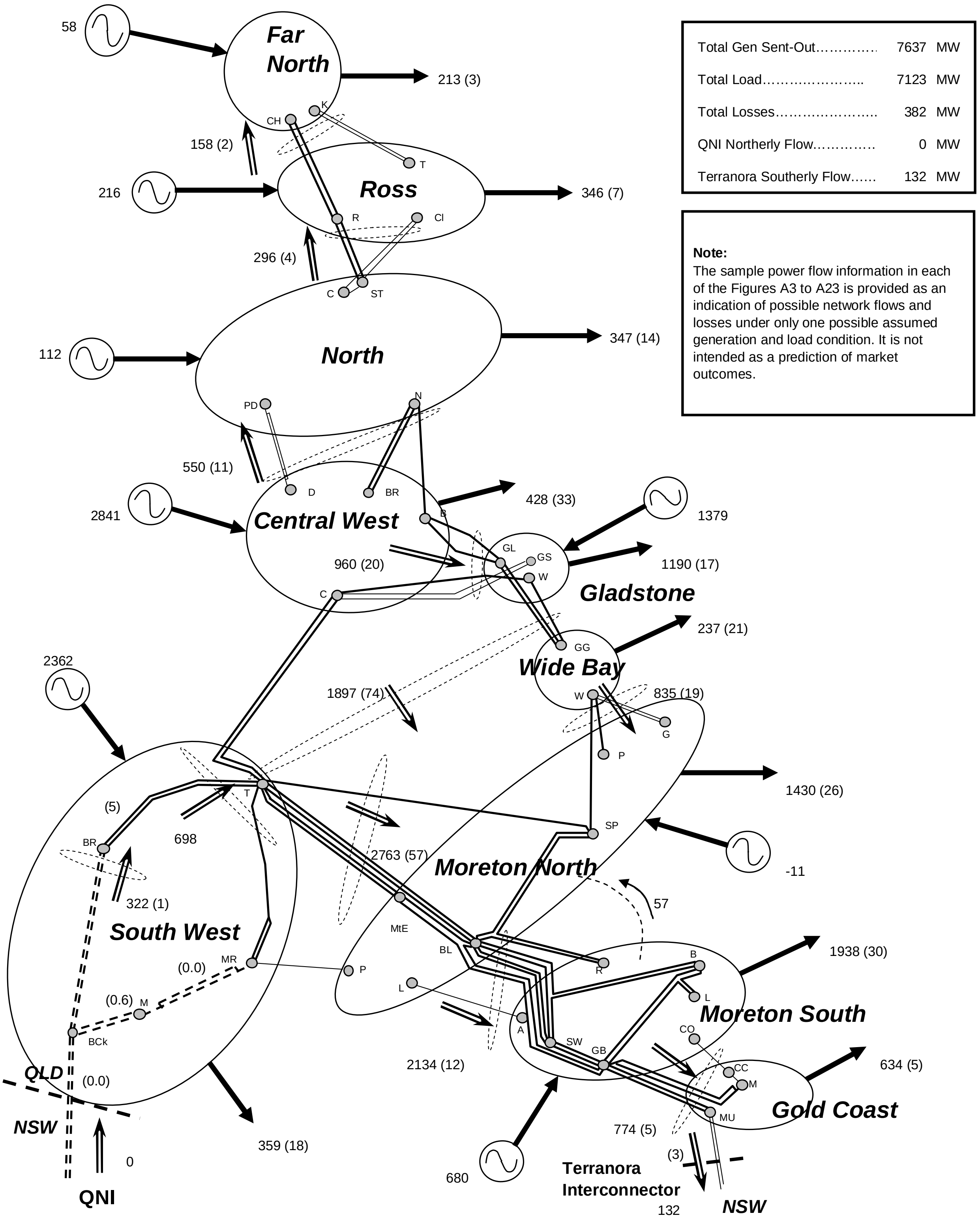
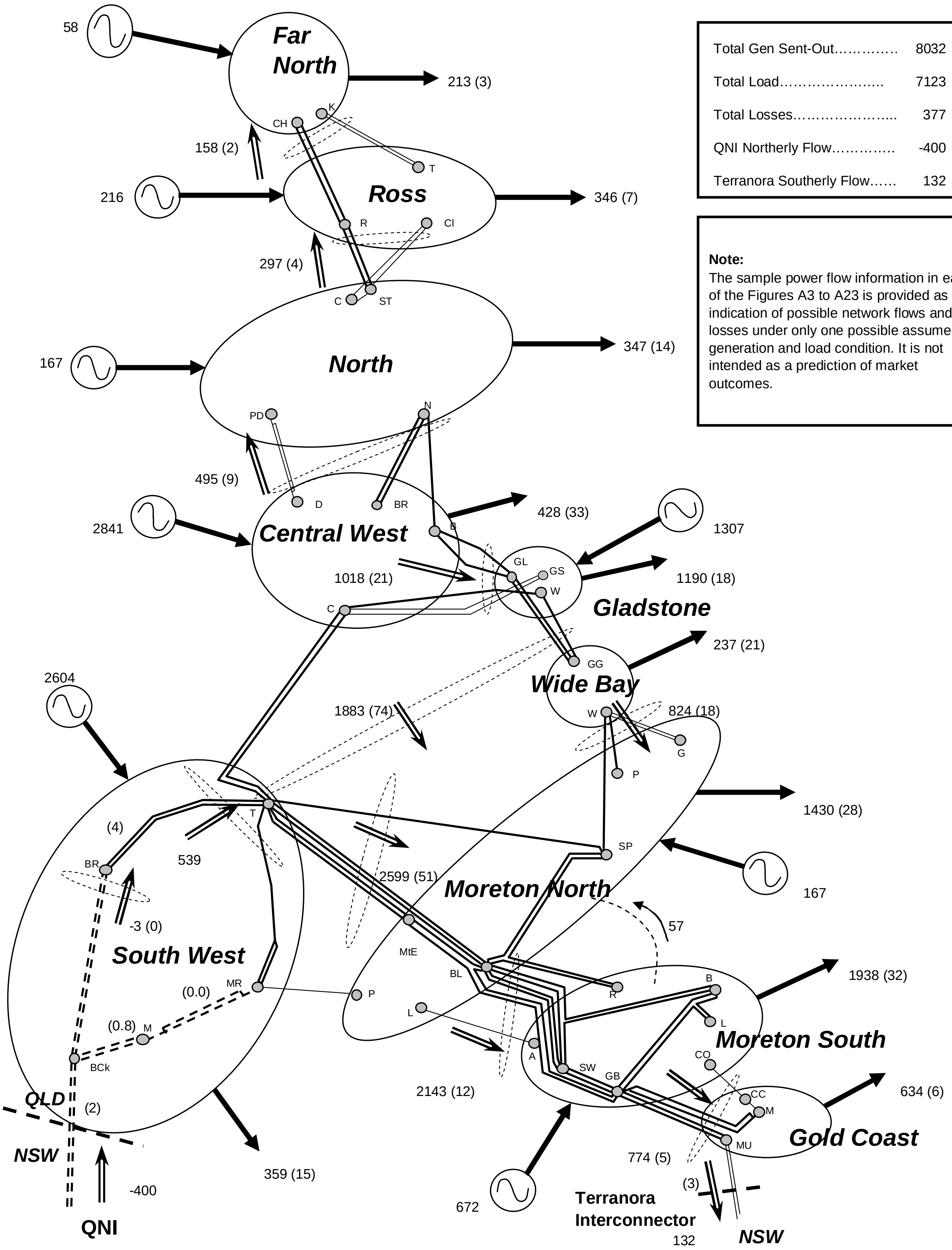


Figure A.23: Alternative South Queensland Generation Dispatch Winter 2007 Qld Peak 400MW Southerly QNI Flow



Total Gen Sent-Out…………..	8032 MW
Total Load…………………..	7123 MW
Total Losses…………………..	377 MW
QNI Northerly Flow…………..	-400 MW
Terranora Southerly Flow……	132 MW

Note:
The sample power flow information in each of the Figures A3 to A23 is provided as an indication of possible network flows and losses under only one possible assumed generation and load condition. It is not intended as a prediction of market outcomes.

APPENDIX B - LIMIT EQUATIONS

This appendix contains the Queensland intra-regional limit equations derived by Powerlink and valid at the time of publication. NEMMCO's market systems may also contain other limit equations for the Queensland region. These other equations are derived for thermal limits and are maintained by NEMMCO. The NEMMCO derived Gladstone thermal limit equation is included in this appendix and it is referred to in Section 5.4.3.

It should be noted that these equations are continually under review to take into account changing market and network conditions.

Please contact Powerlink to confirm the latest form of the relevant limit equation.

Table B.1: Far North Queensland Voltage Stability Equations

MEASURED VARIABLE	COEFFICIENT	
	EQUATION 1 CHALUMBIN-WOREE CONTINGENCY	EQUATION 2 ROSS-CHALUMBIN CONTINGENCY
Constant Term (Intercept)	241	264
Total generation at Barron Gorge PS	-0.6026	-0.6841
Number of Barron Gorge units online (synchronous compensator)	2.0551	-
Total MW generation at Kareeya PS (Units 1-5)	-0.7224	-0.6859
4 Kareeya units (excluding K5) online (0 or 1)	8.4158	5.7651
3 Kareeya units (excluding K5) online (0 or 1)	7.3440	4.5683
2 Kareeya units (excluding K5) online (0 or 1)	4.9800	2.9972
1 Kareeya unit (excluding K5) online (0 or 1)	3.8541	2.1297
Total MW generation at Collinsville PS	0.1439	0.1419
Total MW generation at Mt Stuart PS	0.2395	0.2107
Number of Mt Stuart units online (0,1 or 2)	-	4.1095
Total MW generation at Townsville PS	0.2395	0.2163
Number of Townsville units online (0 or 1)	-	2.5485
Reactive Output of Woree SVC (MVAr)	-0.1141	-0.0374

Table B.2: Central to North Queensland Stability Equations

MEASURED VARIABLE	COEFFICIENT	
	EQUATION 1 (1) TOWNSVILLE AREA GT ONLINE	EQUATION 2 (2) NO TOWNSVILLE AREA GT ONLINE
Constant Term (Intercept)	990	900
Total MW of largest NQ gas turbine	-1	-
Total generation at Collinsville 132kV PS	-0.25	0.5
Reactive Output of Ross SVC (MVArs)	-0.5	-
Number of 120MVAr capacitor banks online at Nebo (0, 1 or 2)	85	-
Number reactors online at Nebo (0, 1, 2 or 3)	-14	-
Equation Upper Limit	990	990

Notes:

(1) Equation 1 is applicable if any of Townsville or Mt. Stuart generating units are online.

(2) Equation 2 is applicable if Townsville and both Mt. Stuart generating units are not online.

Table B.3: Prediction of Post Contingent MVA Flow on the Calvale-Wurdong Circuit

MEASURED VARIABLE	COEFFICIENT
System normal flow on Calvale-Wurdong (MVA)	1
System normal flow on Calvale-Stanwell (MW)	0.652

Table B.4: Central to South Queensland Voltage Stability Equations

MEASURED VARIABLE	COEFFICIENT	
	EQUATION 1 (1) CALVALE-TARONG CONTINGENCY	EQUATION 2 (2) CALVALE-TARONG CONTINGENCY
Constant Term (Intercept)	1227.3	1217.2
Total generation at Gladstone 275kV PS	0.0731	0.0812
Number of Gladstone 275kV units online	72.2846	70.3649
Total generation at Gladstone 132kV PS	0.1062	0.1152
Number of Gladstone 132kV units online	75.8105	73.3362
Number of Callide B units online	47.7783	54.0629
Number of Callide C units online	74.2664	86.2947
(Calvale 275kV p.u. voltage - 1.07) x 1000	1.1843	0.8860
(Gladstone 275kV p.u. voltage - 1.07) x 1000	-1.5421	-1.5181
Equation Lower Limit	1750	1750
Equation Upper Limit	1900	1900

Notes:

(1) Equation 1 preserves the required MVAr margin at Gladstone 275kV.

(2) Equation 2 preserves the required MVAr margin at Calvale 275kV.

Table B.5: Tarong Voltage Stability Equations

MEASURED VARIABLE	COEFFICIENT				
	EQUATION 1 Swanbank E Contingency (1)	EQUATION 2 Woolooga-Palmwoods Contingency	EQUATION 3 Calvale-Tarong Contingency	EQUATION 4 Tarong-Blackwall Contingency	EQUATION 5 Wivenhoe Contingency (2)
Constant Term (Intercept)	1202	1158	569	1158	1149
Total generation at Gladstone PS (H7 & T5)	-0.0379	-0.0486	-	-0.0316	-0.0304
Total generation at Callide PS (B and C)	0.0995	0.1001	0.0974	0.1049	0.1061
Total generation at SWQ Zone (3)	0.4578	0.4634	0.7043	0.4443	0.4605
Total generation at Moreton North and Moreton South Zones (4)	-	-0.3406	-0.1758	-0.3276	-
Generation at Swanbank E PS	-0.5242	-	-	-	-
Total generation at Moreton North and Moreton South Zones excluding Swanbank E	-0.3529	-	-	-	-
Generation from highest generating Wivenhoe unit	-	-	-	-	-0.6006
Total generation at Moreton North and Moreton South Zones excluding highest generating Wivenhoe unit	-	-	-	-	-0.3215
Directlink active power transfer (MW - positive is into Qld)	-0.1051	-0.1150	-0.1130	-0.1033	-0.1092
Directlink reactive power transfer (MVAr - positive is into Qld)	0.2558	0.2503	-	0.2577	0.2495
Number of Tarong units online	36.9249	33.4403	7.7695	32.7626	36.5852
Number of Tarong North units online	41.7297	46.5472	12.0000	44.1412	46.4309
Number of Swanbank B units online	18.5522	14.8978	7.6616	14.6021	13.3460
Number of Wivenhoe units online	48.6082	44.4911	23.1946	42.9670	38.7511
Number of Swanbank E units online	-	78.4652	40.9726	78.4848	75.6345
Number of 120MVAr capacitor banks available (5)	29.0991	28.0439	14.3411	28.5672	28.6051
Number of 50MVAr capacitor banks available (6)	14.1663	14.3969	6.3958	14.2778	14.5813
Equation Lower Limit	2800	3000	2500	3000	2900

Notes:

(1) This limit is only applicable if Swanbank E generator is online.

(2) This limit is only applicable if either of the Wivenhoe units is generating.

(3) Total generation within the SWQ zone summated at Tarong, Tarong North, Roma, Braemar, Oakey, Millmerran, Kogan Creek and QNI power transfer (positive MW is into Qld).

(4) Total generation within the Moreton North and Moreton South zones summated at Wivenhoe, Swanbank B and Swanbank E power stations.

(5) There are currently 13 capacitor banks sized 120MVAr which may be available within the relevant area.

(6) There are currently 33 capacitor banks sized 50MVAr which may be available within the relevant area.

Table B.6: Gold Coast Voltage Stability Equation

MEASURED VARIABLE	COEFFICIENT
Constant Term (Intercept)	1000
Moreton North and Moreton South load to Gold Coast load Ratio (1)	-110
Number of Wivenhoe units online	13.3471
Number of Swanbank B units online	7.6785
Number of Swanbank E units online	26.7207
Terranora Interconnector active power transfer (MW - positive is into Qld)	-0.7996
Terranora Interconnector reactive power transfer (MVAr - positive is into Qld)	0.2479
Number of Mudgeeraba 110kV capacitor banks available	10.0109
Number of Mudgeeraba 275kV capacitor banks available	16.6693
Number of Molendinar 110kV capacitor banks available	9.3817
Number of Moreton South 110kV capacitor banks online	4.9680
Number of Moreton South 275kV capacitor banks online	10.4727
Number of Moreton North 110kV capacitor banks online	4.0675
Number of Moreton North 275kV capacitor banks online	8.5241

Notes:

(1) This variable is bound between 5.0 and 5.8.

Table B.7: Braemar Thermal and Voltage Stability Equation

MEASURED VARIABLE	COEFFICIENT
Constant Term (Intercept)	1125
Offset [applied depending on the unavailability of southern Queensland capacitive support including generator lagging capability and 275kV and 110kV capacitor banks]	-100

APPENDIX C - ESTIMATED MAXIMUM SHORT CIRCUIT LEVELS

Tables C.1 to C.3 show estimates of the three phase and single phase to earth short circuit levels in the Powerlink transmission network in the period 2007 to 2009. They also show the short circuit interruption capacity of the lowest rated circuit breaker(s) at each location.

This information should be taken only as an approximate guide to conditions at each location. The effects of some of the more significant embedded non-scheduled generators are included as noted in the tables. However, other embedded non-scheduled generators have been excluded. Some of these excluded generators are also noted in the tables. As a result, fault levels may be higher at some locations than shown. Interested parties needing to consider the effects of their proposals on system short circuit levels should consult Powerlink and/or the relevant Distribution Network Service Provider (DNSP) for detailed information.

The short circuit level calculations were determined:

- Using a simple system model, in which generators are represented as a voltage source of 110% of nominal voltage behind sub-transient reactance; and
- With system loads and all shunt admittances not represented.

The short circuit levels shown in Tables C.1 to C.3 have been determined on the basis of the generation capacity shown in Table 6.1 (together with any noted embedded non-scheduled generators) and on the network development as at the end of each calendar year. These network models are based on the existing network configuration, committed projects and proposed new network assets (as proposed in Chapter 5).

The fault levels determined assume the grid is in its ‘normal’ or ‘intact’ state, that is, all network elements in service. Exceptions to this include potential open points at Belmont 110kV, South Pine 110kV, and Gladstone South 132kV substations. These open points may be necessary to keep the maximum short circuit level below the critical circuit breaker ratings. These open points have been taken into account in the estimates in Tables C.1 to C.3.

At some locations where the short circuit level appears to be above the switchgear rating, the critical switchgear is required to interrupt only a portion of the total fault current and that portion is less than the switchgear rating over the three year outlook period.

No account has been taken of short circuit interruption capability of switchgear in the distribution systems.

Table C.1: Estimated Maximum Short Circuit Levels – Southern Queensland - Powerlink Transmission Network 2007 to 2009 (1) (5) (6)

SUBSTATION	VOLTAGE KV	CB FAULT RATING (LOWEST KA)	FAULT LEVELS					
			3 PHASE 2007 KA	3 PHASE 2008 KA	3 PHASE 2009 KA	L – G 2007 KA	L – G 2008 KA	L – G 2009 KA
Abermain	275	40.0	-	16.32	16.31	-	15.96	15.96
Abermain	110	31.5	13.89	20.25	20.12	13.89	22.56	22.45
Algester	110	40.0	19.03	19.04	18.98	18.92	19.15	19.12
Ashgrove West	110	25.0	19.60	19.82	18.65	18.31	18.43	17.70
Belmont	275	31.5	17.47	17.48	17.45	18.23	18.32	18.39
Belmont (4)	110	25.0	27.50	27.51	27.46	33.25	33.34	33.54
Blackwall	275	50.0	24.31	24.32	24.30	27.23	27.52	27.55
Braemar	330	50.0	17.64	17.64	17.64	17.80	17.80	17.80
Braemar	275	40.0	23.45	23.45	23.45	24.49	24.49	24.49
Bulli Creek	330	50.0	16.66	16.66	16.66	13.16	13.16	13.16
Bulli Creek	132	40.0	3.67	3.67	3.67	4.14	4.14	4.14
Bundamba	110	40.0	12.78	15.75	15.68	11.64	14.38	14.34
Gin Gin	275	31.5	10.30	10.30	10.28	8.51	8.61	8.60
Gin Gin	132	21.9	8.84	8.84	8.83	8.97	9.01	9.00
Goodna	275	40.0	17.92	18.00	17.97	17.92	18.07	18.06
Goodna	110	40.0	19.99	22.88	22.59	21.96	24.53	24.31
Greenbank	275	40.0	22.23	22.23	22.21	22.98	24.10	24.10
Kogan Creek	275	40.0	17.91	17.91	17.91	17.84	17.84	17.84
Loganlea	275	50.0	15.36	15.36	15.34	15.26	15.36	15.40
Loganlea (3)	110	25.0	18.05	18.05	18.04	21.44	21.46	21.58
Middle Ridge	330	NO CB	12.59	12.59	12.59	12.17	12.18	12.18
Middle Ridge	275	40.0	17.61	17.61	17.61	17.59	17.60	17.60
Middle Ridge	110	26.2	18.82	18.82	18.82	22.26	22.26	22.26
Millmerran Switchyard	330	50.0	17.50	17.50	17.50	18.73	18.73	18.73

Table C.1: Estimated Maximum Short Circuit Levels – Southern Queensland - Powerlink Transmission Network 2007 to 2009 (1) (5) (6) (Cont'd)

SUBSTATION	VOLTAGE KV	CB FAULT RATING (LOWEST KA)	FAULT LEVELS 3 PHASE 2007 KA	3 PHASE 2008 KA	3 PHASE 2009 KA	L – G 2007 KA	L – G 2008 KA	L – G 2009 KA
Molendinar	275	40.0	8.33	8.33	8.33	7.94	7.96	7.97
Molendinar	110	40.0	19.96	19.96	19.95	24.51	24.52	24.59
Mt England	275	31.5	22.77	22.82	22.82	22.66	22.83	22.90
Mudgeeraba	275	31.5	9.58	9.58	9.58	9.46	9.48	9.48
Mudgeeraba	110	31.5	18.69	18.69	18.69	22.61	22.62	22.62
Murarrie	275	40.0	13.33	13.34	13.32	13.08	13.11	13.17
Murarrie	110	40.0	22.81	22.81	22.78	25.60	25.63	25.85
Oakey	110	40.0	10.66	10.66	10.66	11.76	11.76	11.76
Palmwoods	275	31.5	8.19	8.19	8.13	8.14	8.18	8.17
Palmwoods	132	21.8	12.51	12.51	12.34	14.68	14.71	14.60
Palmwoods	110	NO CB	5.54	5.54	5.46	5.84	5.84	5.78
Redbank Plains	110	31.5	17.47	19.30	19.14	16.65	17.93	17.84
Richlands	110	18.3	13.75	13.76	13.71	14.39	14.42	14.39
Rocklea	275	40.0	13.54	13.54	13.53	12.56	12.65	12.64
Rocklea	110	40.0	22.71	22.78	22.50	26.41	26.49	26.24
Runcorn	110	21.9	17.74	17.75	17.71	18.13	18.84	18.83
South Pine	275	31.5	18.83	18.85	18.80	19.70	19.75	20.48
South Pine East	110	40.0	26.60	26.71	19.94	32.31	32.43	22.74
South Pine West	110	40.0	-	-	20.95	-	-	26.41
Sumner	110	40.0	15.41	15.43	15.33	15.32	15.34	15.28
Swanbank A (3) (4)	110	18.3	16.72	18.41	18.31	14.66	15.94	15.89
Swanbank B	275	31.5	23.65	23.69	23.66	27.38	27.65	27.64
Swanbank E	275	40.0	23.16	23.19	23.16	26.25	26.50	26.49
Tangkam	110	40.0	12.51	12.51	12.51	11.59	11.59	11.59

Table C.1: Estimated Maximum Short Circuit Levels – Southern Queensland - Powerlink Transmission Network 2007 to 2009 (1) (5) (6) (Cont'd)

SUBSTATION	VOLTAGE KV	CB FAULT RATING (LOWEST KA)	FAULT LEVELS 3 PHASE 2007 KA	3 PHASE 2008 KA	3 PHASE 2009 KA	L – G 2007 KA	L – G 2008 KA	L – G 2009 KA
Tarong (4)	275	31.5	30.45	30.45	30.45	33.41	33.42	33.43
Tarong	132	31.5	5.27	5.27	5.27	5.62	5.62	5.62
Tarong	66	21.9	14.00	14.00	14.00	15.37	15.37	15.37
Teebar Creek	275	40.0	7.00	7.00	6.98	6.64	6.80	6.79
Teebar Creek	132	40.0	9.58	9.59	9.57	10.50	10.56	10.55
Tennyson	110	40.0	14.92	14.95	14.83	14.58	14.60	14.53
Upper Kedron	110	40.0	22.24	22.63	20.52	18.23	18.39	17.23
West Darra (Bus 1)	110	40.0	16.65	21.43	20.96	13.55	17.34	17.12
West Darra (Bus 2)	110	40.0	13.57	13.59	13.52	12.57	12.59	12.55
Woolooga	275	31.5	9.23	9.24	9.20	8.88	10.08	10.05
Woolooga	132	21.9	12.43	12.43	12.34	13.54	14.31	14.23

Notes:

(1) Short circuit levels are estimated maximum levels assuming 110% of nominal voltage behind sub-transient reactance, neglecting loads, shunt admittances and other passive elements.

(2) Powerlink switchgear ratings - no account taken of distribution switchgear.

(3) Analysis for these locations allows for operation with open points to keep short circuit levels below switchgear ratings.

(4) The lowest rated circuit breaker(s) at these locations are required to interrupt short circuit current which is less than the maximum fault current and below the circuit breaker rating.

(5) Fault level contributions to the Powerlink network from sugar mills, other than Invicta and Rocky Point, are not included in these tables.

(6) Fault level contributions to the Powerlink network from embedded non-scheduled generators are not included in these tables. Excluded generators include, but may not be limited to, Windy Hill wind generators, Wivenhoe small hydro generator, Stapylton biomass, and possible Moranbah coal seam methane gas turbines.

Table C.2: Estimated Maximum Short Circuit Levels - Central Queensland - Powerlink Transmission Network 2007 to 2009 (1) (4) (5)

SUBSTATION	VOLTAGE KV	CB FAULT RATING (LOWEST KA)	FAULT LEVELS 3 PHASE 2007 KA	3 PHASE 2008 KA	3 PHASE 2009 KA	L - G 2007 KA	L - G 2008 KA	L - G 2009 KA
Baralaba	132	15.3	4.57	4.58	4.37	3.73	3.74	3.62
Biloela	132	40.0	7.63	7.64	6.67	7.69	7.70	6.87
Blackwater	132	12.3	5.32	5.34	5.29	6.29	6.31	6.26
Bouldercombe	275	31.5	16.42	16.64	16.60	16.01	16.15	16.24
Bouldercombe	132	25.0	10.14	10.17	10.12	11.53	11.56	11.78
Broadsound	275	31.5	9.74	10.05	10.03	7.86	7.98	7.97
Callemondah	132	31.5	20.48	20.50	20.30	20.95	20.98	20.87
Callide A Power Station	132	12.3	10.81	10.83	8.92	10.93	10.94	8.67
Calvale	275	31.5	19.86	19.89	19.67	22.25	22.28	22.06
Calvale	132	NO CB	10.79	10.80	8.68	11.02	11.03	9.12
Dingo	132	31.5	2.62	2.62	2.59	2.76	2.76	2.74
Dysart	132	19.9	4.07	4.08	4.08	4.71	4.71	4.71
Egans Hill	132	NO CB	6.56	6.69	6.67	6.75	6.79	6.81
Gladstone	275	31.5	19.41	19.47	19.41	21.92	21.97	21.92
Gladstone (3)	132	31.5	26.02	26.05	25.82	31.96	32.00	31.77
Gladstone South	132	40.0	16.96	16.98	16.68	17.01	17.15	17.19
Grantleigh	132	31.5	2.44	2.45	2.44	2.54	2.55	2.54
Gregory	132	31.5	7.85	7.92	7.88	9.20	9.26	9.22
Lilyvale	275	40.0	5.06	5.13	5.11	5.18	5.22	5.21
Lilyvale	132	25.0	8.20	8.27	8.23	9.88	9.95	9.91
Moura	132	12.3	3.91	3.92	3.71	4.19	4.19	4.03
Norwich Park	132	40.0	3.29	3.30	3.29	2.51	2.51	2.51
Pandoin	132	40.0	-	-	5.36	-	-	5.68

Table C.2: Estimated Maximum Short Circuit Levels - Central Queensland - Powerlink Transmission Network 2007 to 2009 (1) (4) (5) (Cont'd)

SUBSTATION	VOLTAGE KV	CB FAULT RATING (LOWEST KA)	FAULT LEVELS					
			3 PHASE 2007 KA	3 PHASE 2008 KA	3 PHASE 2009 KA	L - G 2007 KA	L - G 2008 KA	L - G 2009 KA
Rockhampton	132	12.3	6.63	6.65	6.63	6.97	6.98	6.98
Rocklands	132	40.0	6.20	6.22	6.20	5.55	5.56	5.60
Stanwell Switchyard	275	31.5	17.66	17.90	17.88	19.36	19.56	19.58
Stanwell Switchyard	132	31.5	4.98	4.99	4.97	4.61	4.61	4.62
Wurdong	275	31.5	15.60	15.63	15.60	14.94	14.96	14.94

Notes:

(1) Short circuit levels are estimated maximum levels assuming 110% of nominal voltage behind sub-transient reactance, neglecting loads, shunt admittances and other passive elements.

(2) Powerlink switchgear ratings - no account taken of distribution switchgear.

(3) The lowest rated circuit breaker(s) at these locations are required to interrupt short circuit current which is less than the maximum fault current and below the circuit breaker rating.

(4) Fault level contributions to the Powerlink network from sugar mills, other than Invicta and Rocky Point, are not included in these tables.

(5) Fault level contributions to the Powerlink network from embedded non-scheduled generators are not included in these tables. Excluded generators include, but may not be limited to, Windy Hill wind generators, Wivenhoe small hydro generator, Stapylton biomass, and possible Moranbah coal seam methane gas turbines.

Table C.3: Estimated Maximum Short Circuit Levels - Northern Queensland - Powerlink Transmission Network 2007 to 2009 (1) (3) (4)

SUBSTATION	VOLTAGE KV	CB FAULT RATING (LOWEST KA)	FAULT LEVELS					
			3 PHASE 2007 KA	3 PHASE 2008 KA	3 PHASE 2009 KA	L - G 2007 KA	L - G 2008 KA	L - G 2009 KA
Alan Sherriff	132	40.0	10.18	10.53	10.60	11.19	11.51	11.59
Alligator Creek	132	31.5	4.17	4.18	4.18	4.68	5.09	5.09
Burton Downs	132	19.3	4.60	4.61	4.61	4.50	4.51	4.51
Cairns	132	12.1	4.96	5.07	5.09	6.72	6.83	6.86
Cardwell	132	19.3	2.78	2.83	2.87	2.19	2.27	2.60
Chalumbin	275	21.9	3.34	3.46	3.49	3.59	3.74	3.76
Chalumbin	132	31.5	6.43	6.25	6.37	7.39	7.28	7.39
Clare	132	8.8	6.42	6.56	6.57	6.19	6.27	6.28
Collinsville	132	15.3	11.30	11.62	11.62	12.89	13.19	13.19
Coppabella	132	31.5	2.82	2.82	2.82	3.18	3.19	3.19
Dan Gleeson	132	40.0	9.77	10.02	10.08	10.91	11.12	11.18
Edmonton	132	40.0	4.47	4.65	4.68	5.58	5.82	5.84
El Arish	132	40.0	-	3.25	3.27	-	3.87	3.90
Garbutt	132	NO CB	8.72	8.96	9.01	9.23	9.43	9.48
Ingham South	132	40.0	2.59	2.60	2.80	2.83	2.84	3.10
Innisfail	132	40.0	3.37	2.84	2.85	3.87	3.44	3.46
Invicta	132	19.3	4.79	4.86	4.86	4.40	4.44	4.44
Kamerunga	132	15.3	3.92	4.05	4.07	4.78	4.91	4.93
Kareeya	132	10.9	6.35	6.24	6.38	7.33	7.26	7.39
Kemmis	132	40.0	5.21	5.24	5.24	5.90	5.93	5.92
King Creek	132	40.0	4.77	4.83	4.84	3.95	3.97	3.97
Mackay	132	15.7	5.90	5.91	5.91	6.44	6.46	6.45
Mindi	132	40.0	4.76	4.80	4.80	4.05	4.08	4.08
Moranbah	132	15.3	5.64	5.65	5.64	6.77	6.77	6.77

Table C.3: Estimated Maximum Short Circuit Levels - Northern Queensland - Powerlink Transmission Network 2007 to 2009 (1) (3) (4) (Cont'd)

SUBSTATION	VOLTAGE KV	CB FAULT RATING (LOWEST KA)	FAULT LEVELS					
			3 PHASE 2007 KA	3 PHASE 2008 KA	3 PHASE 2009 KA	L - G 2007 KA	L - G 2008 KA	L - G 2009 KA
Moranbah South	132	40.0	4.41	4.41	4.41	4.29	4.29	4.29
Mt McLaren	132	31.5	1.86	1.86	1.86	2.05	2.05	2.05
Nebo	275	31.5	8.12	8.58	8.56	8.59	9.07	9.06
Nebo	132	21.9	10.67	10.87	10.86	12.10	12.35	12.34
Newlands	132	31.5	3.07	3.07	3.07	3.12	3.12	3.12
North Goonyella	132	19.3	3.16	3.15	3.15	2.61	2.61	2.61
Oonooie	132	31.5	2.96	2.97	2.97	3.40	3.46	3.46
Peak Downs	132	40.0	4.36	4.36	4.36	3.93	3.93	3.93
Pioneer Valley	132	40.0	6.11	6.14	6.14	6.61	6.67	6.66
Proserpine	132	21.9	3.55	3.56	3.55	3.76	3.77	3.77
Ross	275	31.5	5.50	5.91	5.91	6.49	6.89	6.89
Ross	132	31.5	12.19	12.99	13.10	14.62	15.56	15.69
Stony Creek	132	40.0	3.57	3.58	3.58	3.44	3.44	3.44
Strathmore	275	50.0	6.08	7.37	7.37	6.62	7.74	7.74
Strathmore	132	40.0	10.68	11.16	11.16	11.68	12.05	12.05
Townsville East	132	40.0	9.78	10.13	10.19	10.31	10.58	10.61
Townsville South	132	21.9	12.08	12.66	12.74	15.26	15.87	15.96
Townsville Gas Turbine Power Station	132	31.5	7.85	9.44	9.15	8.71	10.25	9.97
Tully	132	31.5	3.81	4.19	4.23	3.72	4.36	4.45
Turkinje	132	15.7	3.82	2.51	2.53	4.33	2.91	2.93
Wandoo	132	40.0	4.13	4.16	4.16	2.95	2.97	2.97

Table C.3: Estimated Maximum Short Circuit Levels - Northern Queensland - Powerlink Transmission Network 2007 to 2009 (1) (3) (4) (Cont'd)

SUBSTATION	VOLTAGE KV	CB FAULT RATING (LOWEST KA)	FAULT LEVELS					
			3 PHASE 2007 KA	3 PHASE 2008 KA	3 PHASE 2009 KA	L - G 2007 KA	L - G 2008 KA	L - G 2009 KA
Woree	275	50.0	2.38	2.79	2.81	2.84	3.47	3.48
Woree	132	40.0	5.01	5.23	5.26	6.87	7.21	7.24
Yabulu South	132	40.0	-	10.18	10.48	-	9.91	10.47

Notes:

(1) Short circuit levels are estimated maximum levels assuming 110% of nominal voltage behind sub-transient reactance, neglecting loads, shunt admittances and other passive elements.

(2) Powerlink switchgear ratings - no account taken of distribution switchgear.

(3) Fault level contributions to the Powerlink network from sugar mills, other than Invicta and Rocky Point, are not included in these tables.

(4) Fault level contributions to the Powerlink network from embedded non-scheduled generators are not included in these tables. Excluded generators include, but may not be limited to, Windy Hill wind generators, Wivenhoe small hydro generator, Stapylton biomass, and possible Moranbah coal seam methane gas turbines.

APPENDIX D - PROPOSED SMALL NETWORK ASSETS

D.1 Palmwoods 132/110kV Transformer Augmentation

Project Name:	Palmwoods 132/110kV Transformer Augmentation
Proposed Timing:	Summer 2009/10
Estimated Cost:	$6.40 million

Background

Palmwoods and South Pine Substations supply the Caboolture/Beerwah area via the ENERGEX 110kV network. Due to ongoing demand growth in the area, the transfer capacity from Palmwoods is forecast to be limited by the 132/110kV transformer ratings from summer 2009/10 under a single credible contingency.

Powerlink has reliability and quality of supply obligations under the National Electricity Rules (NER), its Transmission Authority and connection agreements with customers. It is a condition of Powerlink's Transmission Authority that it meets licence and NER requirements relating to technical performance standards during intact and contingency conditions. Under its Transmission Authority, Powerlink plans and develops its network to supply forecast peak demand during a single network element outage. Without action, Powerlink will be unable to meet these obligations. Therefore the proposed solution is classified as a reliability augmentation.

All regulated network augmentations are required to satisfy the Regulatory Test promulgated by the Australian Energy Regulator (AER). For a reliability augmentation, this test requires that a proposed solution minimises the present value cost of meeting objective performance standards compared with other feasible alternatives.

Network Options Considered

Option 1: Palmwoods Transformer Augmentation
Under this option, it is proposed the existing 60MVA 132/110kV transformers at Palmwoods be paralleled and their thermal rating be increased by adding cooling fans and a new 125MVA 132/110kV transformer be installed.

These works would commence in late 2008 to meet the required commissioning date of summer 2009/10.

The total cost of this option is $6.40 million.

Option 2: Palmwoods Circuit Breakers and Transformer Augmentation
This option is installation of 110kV circuit breakers to the two Palmwoods 132/110kV transformers.

These works would commence in late 2008 to meet the required commissioning date of summer 2009/10.

The total cost of this option is $3.0 million.

Additional works would be required by summer 2012/13 to address other future supply requirements. These works would comprise Palmwoods transformer augmentation as per Option 1.

The total cost of these additional works is $6.40 million.

Option 3: Caboolture West 275/110kV Substation Establishment
This option establishes a 275/110kV substation (2 x 375MVA) west of Caboolture, which would supply the total Caboolture and Beerwah load and provide load injection into South Pine.

These works would commence in early 2008 to meet the required commissioning date of summer 2009/10.

The total cost of this option is $36.48 million, including the cost for new transformers.

Option 4: Non-Network Options Considered

Powerlink is not aware of any demand side management initiatives, local generation developments or other non-network solutions that could address the future supply requirements by the required timing of summer 2009/10.

Summary of Options and Economic Analysis

There are three feasible options that are capable of addressing the future supply requirements for the Caboolture/Beerwah area by summer 2009/10. The present value cost of each of these options was calculated over a period of 15 years. The results of this economic analysis for the medium growth forecast are summarised in Table D.1 and Table D.4.

Table D.1: Summary of Economic Analysis for Medium Growth for Palmwoods Transformer Augmentation

OPTIONS	PRESENT VALUE COST (MEDIUM GROWTH)	RANKING
1. Palmwoods Transformer Augmentation	$3.67M	1
2. Palmwoods Circuit Breakers and Transformer	$4.12M	2
3. Caboolture West 275/110kV Substation Establishment	$20.91M	3
4. Non-network options	N/A	N/A

A range of market scenarios were also considered including demand growth at rates associated with high and low range estimates of economic growth rates in Queensland. The results of the scenario analysis are contained in Table D.2 and D.4. The possible introduction of new generation in the Caboolture/Beerwah area is expected to produce similar results as low demand growth rates. As a result, no generation investments were considered in formulating scenarios for economic analysis.

Table D.2: Summary of Scenario Analysis for Palmwoods Transformer Augmentation

	OPTION ONE PALMWOODS TRANSFORMER AUGMENTATION		OPTION TWO PALMWOODS CIRCUIT BREAKERS AND TRANSFORMER		OPTION THREE CABOOLTURE WEST 275/110KV SUBSTATION	
	PV $M	RANKING	PV $M	RANKING	PV $M	RANKING
Scenario A Medium Growth	3.67	1	4.12	2	20.91	3
Scenario B High Growth	4.16	1	4.74	2	23.72	3
Scenario C Low Growth	3.21	1	3.55	2	18.32	3

The sensitivity of the present value calculations to key input variables such as discount rate and capital costs (variation of +/- 15%) has been examined and the results are summarised in Table D.3. Sensitivity to the commissioning date was not examined, as all options are required to be in service from summer 2009/10 to meet forecast peak load.

Table D.3: Results of Sensitivity Analysis for Palmwoods Transformer Augmentation

	DISCOUNT RATE					
	7%		9%		11%	
	BEST RANKED OPTION	FREQUENCY OF WINS	BEST RANKED OPTION	FREQUENCY OF WINS	BEST RANKED OPTION	FREQUENCY OF WINS
Scenario A Medium Growth	1	100%	1	100%	1	100%
Scenario B High Growth	1	100%	1	100%	1	100%
Scenario C Low Growth	1	100%	1	100%	1	99%

The result of the analysis is that Option 1, transformer augmentation at Palmwoods, minimises the present value cost of addressing the network limitation in all cases, and as such is considered to satisfy the Regulatory Test.

This project has no material impact on other transmission networks.

Recommendation

It is recommended to parallel the existing 60MVA 132/110kV transformers at Palmwoods, add cooling fans and install a new 125MVA 132/110kV transformer in parallel with the existing transformers by summer 2009/10.

Table D.4: Cash Flow for Palmwoods Transformer Augmentation

SCENARIO A		MEDIUM GROWTH FORECAST														
		1 07/08	2 08/09	3 09/10	4 10/11	5 11/12	6 12/13	7 13/14	8 14/15	9 15/16	10 16/17	11 17/18	12 18/19	13 19/20	14 20/21	15 21/22
Option 1		***Palmwoods Transformer Augmentation***														
==> TUOS		0.000	0.000	0.000	0.705	0.696	0.686	0.677	0.667	0.658	0.649	0.639	0.630	0.620	0.611	0.602
==> PV of TUOS	$3.67															
Total for Option 1	**$3.67**															
Option 2		***Palmwoods Circuit Breakers and Transformer***														
==> TUOS		0.000	0.000	0.000	0.331	0.326	0.322	1.023	1.009	0.995	0.981	0.967	0.954	0.940	0.926	0.912
==> PV of TUOS	$4.12															
Total for Option 2	**$4.12**															
Option 3		***Caboolture West 275/110kV Substation Establishment***														
==> TUOS		0.000	0.000	0.000	4.022	3.968	3.915	3.861	3.807	3.754	3.700	3.647	3.593	3.539	3.486	3.432
==> PV of TUOS	$20.91															
Total for Option 3	**$20.91**															

Table D.4: Cash Flow for Palmwoods Transformer Augmentation (Cont'd)

SCENARIO B		HIGH GROWTH FORECAST														
		1 07/08	**2 08/09**	**3 09/10**	**4 10/11**	**5 11/12**	**6 12/13**	**7 13/14**	**8 14/15**	**9 15/16**	**10 16/17**	**11 17/18**	**12 18/19**	**13 19/20**	**14 20/21**	**15 21/22**
Option 1		***Palmwoods Transformer Augmentation***														
==> TUOS		0.000	0.000	0.705	0.696	0.686	0.677	0.667	0.658	0.649	0.639	0.630	0.620	0.611	0.602	0.592
==> PV of TUOS	$4.16															
Total for Option 1	**$4.16**															
Option 2		***Palmwoods Circuit Breakers and Transformer***														
==> TUOS		0.000	0.000	0.331	0.326	0.322	1.023	1.009	0.995	0.981	0.967	0.954	0.940	0.926	0.912	0.898
==> PV of TUOS	$4.74															
Total for Option 2	**$4.74**															
Option 3		***Caboolture West 275/110kV Substation Establishment***														
==> TUOS		0.000	0.000	4.022	3.968	3.915	3.861	3.807	3.754	3.700	3.647	3.593	3.539	3.486	3.432	3.378
==> PV of TUOS	$23.72															
Total for Option 3	**$23.72**															

Table D.4: Cash Flow for Palmwoods Transformer Augmentation (Cont'd)

SCENARIO C		LOW GROWTH FORECAST														
		1 07/08	2 08/09	3 09/10	4 10/11	5 11/12	6 12/13	7 13/14	8 14/15	9 15/16	10 16/17	11 17/18	12 18/19	13 19/20	14 20/21	15 21/22
Option 1		***Palmwoods Transformer Augmentation***														
==> TUOS		0.000	0.000	0.000	0.000	0.705	0.696	0.686	0.677	0.667	0.658	0.649	0.639	0.630	0.620	0.611
==> PV of TUOS	$3.21															
Total for Option 1	**$3.21**															
Option 2		***Palmwoods Circuit Breakers and Transformer***														
==> TUOS		0.000	0.000	0.000	0.000	0.331	0.326	0.322	1.023	1.009	0.995	0.981	0.967	0.954	0.940	0.926
==> PV of TUOS	$3.55															
Total for Option 2	**$3.55**															
Option 3		***Caboolture West 275/110kV Substation Establishment***														
==> TUOS		0.000	0.000	0.000	0.000	4.022	3.968	3.915	3.861	3.807	3.754	3.700	3.647	3.593	3.539	3.486
==> PV of TUOS	$18.32															
Total for Option 3	**$18.32**															

D.2 Belmont 275kV Shunt Capacitor Bank

Project Name:	Belmont 120MVAr, 275kV Shunt Capacitor Bank
Proposed Timing:	Summer 2010/11
Estimated Cost:	$2.75 million

Background

Belmont 275/110kV Substation supplies part of Brisbane CBD, Murarrie and the Australia TradeCoast (Brisbane Port), Redlands Shire, coastal areas and part of the Richlands, Algester and Runcorn area.

Summer peak electricity demand in South East Queensland has grown rapidly in recent years and is forecast to continue at a high rate over coming years due to increased temperature sensitivity and increases in underlying demand.

Reactive power demand (the need for voltage support) is expected to rise in response to the significant demand growth, increased use of air conditioners, and higher reactive power losses on the electricity transmission and distribution system (due to higher transformer and line loadings).

System studies show that 120MVAr of static reactive support will be needed at Belmont 275/110kV Substation by summer 2010/11 to ensure supply reliability can continue to be maintained to customers during very hot summer weather conditions (10% Probability of Exceedance). This static reactive compensation is necessary to supplement static and dynamic sources already planned and/or installed.

Powerlink has reliability and quality of supply obligations under the National Electricity Rules (NER), its Transmission Authority and connection agreements with customers. It is a condition of Powerlink's Transmission Authority that it meets licence and NER requirements relating to technical performance standards during intact and contingency conditions. Under its Transmission Authority, Powerlink plans and develops its network to supply forecast peak demand during a single network element outage. Without action, Powerlink will be unable to meet these obligations. Therefore the proposed solution is classified as a reliability augmentation.

All regulated network augmentations are required to satisfy the Regulatory Test promulgated by the AER. For a reliability augmentation, this test requires that a proposed solution minimises the present value cost of meeting objective performance standards compared with other feasible alternatives.

Network Options Considered

Option 1: 275kV Shunt Capacitor Bank

Under this option it is proposed to install a 120MVAr 275kV capacitor bank at Belmont Substation to meet increased South East Queensland reactive power requirements in summer 2010/11.

Construction of the capacitor bank would commence in late 2009 to meet the required commissioning date of summer 2010/11.

The total cost of this option is $2.75 million.

Option 2: 275kV Static VAr Compensator (SVC)

The increased reactive demand could also be met by the installation of a 275kV SVC at Belmont by summer 2010/11. The SVC would need to have a capacity of 120MVAr to achieve the same result as the capacitor bank described in Option 1.

Construction of the SVC would commence in 2009 to meet the required commissioning date of summer 2010/11.

The total cost of this option is $24.0 million.

Option 3: Customer Connected Capacitor Banks
It would be feasible for customers in the South East Queensland area to install capacitor banks to overcome the forecast network loading limitations. However, Powerlink has no evidence of any proposals for the necessary customer-connected capacitor banks.

Option 4: Non-Network Options Considered
Powerlink is not aware of any demand side management initiatives, local generation developments or other non-network solutions that could address the future supply requirements by the required timing of summer 2010/11.

Summary of Options and Economic Analysis
There are two feasible options that are capable of supplying the additional reactive demand in South East Queensland by summer 2010/11. The present value cost of each of these options was calculated over a period of 15 years. The results of this economic analysis for the medium growth forecast are summarised in Table D.5.

Table D.5: Summary of Economic Analysis for Medium Growth for Belmont Shunt Capacitor Bank

OPTIONS		PRESENT VALUE COST (MEDIUM GROWTH)	RANKING
1.	Shunt Capacitor Bank	$1.38M	1
2.	Static VAr Compensator	$12.05M	2
3.	Customer connected capacitor bank	N/A	N/A
4.	Non-network options	N/A	N/A

A range of market scenarios were also considered including demand growth at rates associated with high and low range estimates of economic growth rates in Australia. Economic analysis and the results of these scenarios are in Tables D.6 and D.8. The possible introduction of new generation in the south east Queensland area is expected to produce similar results as low demand growth rates. As a result, no generation investments were considered in formulating scenarios for the economic analysis.

Table D.6: Summary of Scenario Analysis for Belmont Shunt Capacitor Bank

	OPTION ONE SHUNT CAPACITOR BANK		OPTION TWO STATIC VAR COMPENSATOR	
	PV $M	RANKING	PV $M	RANKING
Scenario A Medium Growth	1.38	1	12.05	2
Scenario B High Growth	1.57	1	13.75	2
Scenario C Low Growth	1.20	1	10.48	2

The sensitivity of the present value calculations to key input variables such as discount rate and capital costs (variation of +/- 15%) has been examined and the results are summarised in Table D.7. Sensitivity to the commissioning date was not examined, as both options are required to be in service by summer 2010/11 to meet forecast peak load.

Table D.7: Results of Sensitivity Analysis for Belmont Shunt Capacitor Bank

	DISCOUNT RATE					
	7%		9%		11%	
	BEST RANKED OPTION	FREQUENCY OF WINS	BEST RANKED OPTION	FREQUENCY OF WINS	BEST RANKED OPTION	FREQUENCY OF WINS
Scenario A Medium Growth	1	100%	1	100%	1	100%
Scenario B High Growth	1	100%	1	100%	1	100%
Scenario C Low Growth	1	100%	1	100%	1	100%

The result of the analysis is that Option 1, the installation of a 275kV shunt capacitor bank at Belmont Substation minimises the present value cost of addressing the network limitation in all cases, and as such is considered to satisfy the Regulatory Test.

This project has no material impact on other transmission networks.

Recommendation

It is recommended that a 120MVAr, 275kV capacitor bank be installed at Belmont Substation by summer 2010/11, to meet increased reactive requirements in South East Queensland.

Table D.8: Cash Flow for Belmont Shunt Capacitor Bank

SCENARIO A		MEDIUM GROWTH FORECAST														
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
		07/08	**08/09**	**09/10**	**10/11**	**11/12**	**12/13**	**13/14**	**14/15**	**15/16**	**16/17**	**17/18**	**18/19**	**19/20**	**20/21**	**21/22**
Option 1		***Shunt Capacitor Bank***														
==> TUOS		0.000	0.000	0.000	0.000	0.303	0.299	0.295	0.291	0.287	0.283	0.279	0.275	0.271	0.267	0.263
==> PV of TUOS	$1.38															
Total for Option 1	**$1.38**															
Option 2		***Static VAr Compensator***														
==> TUOS		0.000	0.000	0.000	0.000	2.646	2.611	2.575	2.540	2.505	2.470	2.434	2.399	2.364	2.328	2.293
==> PV of TUOS	$12.05															
Total for Option 2	**$12.05**															

Table D.8: Cash Flow for Belmont Shunt Capacitor Bank (Cont'd)

SCENARIO B		HIGH GROWTH FORECAST														
		1 07/08	2 08/09	3 09/10	4 10/11	5 11/12	6 12/13	7 13/14	8 14/15	9 15/16	10 16/17	11 17/18	12 18/19	13 19/20	14 20/21	15 21/22
Option 1		***Shunt Capacitor Bank***														
==> TUOS		0.000	0.000	0.000	0.303	0.299	0.295	0.291	0.287	0.283	0.279	0.275	0.271	0.267	0.263	0.259
==> PV of TUOS	$1.57															
Total for Option 1	**$1.57**															
Option 2		***Static VAr Compensator***														
==> TUOS		0.000	0.000	0.000	2.646	2.611	2.575	2.540	2.505	2.470	2.434	2.399	2.364	2.328	2.293	2.258
==> PV of TUOS	$13.75															
Total for Option 2	**$13.75**															

Table D.8: Cash Flow for Belmont Shunt Capacitor Bank (Cont'd)

SCENARIO C		LOW GROWTH FORECAST														
		1 07/08	**2 08/09**	**3 09/10**	**4 10/11**	**5 11/12**	**6 12/13**	**7 13/14**	**8 14/15**	**9 15/16**	**10 16/17**	**11 17/18**	**12 18/19**	**13 19/20**	**14 20/21**	**15 21/22**
Option 1		***Shunt Capacitor Bank***														
==> TUOS		0.000	0.000	0.000	0.000	0.000	0.303	0.299	0.295	0.291	0.287	0.283	0.279	0.275	0.271	0.267
==> PV of TUOS	$1.20															
Total for Option 1	**$1.20**															
Option 2		***Static VAr Compensator***														
==> TUOS		0.000	0.000	0.000	0.000	0.000	2.646	2.611	2.575	2.540	2.505	2.470	2.434	2.399	2.364	2.328
==> PV of TUOS	$10.48															
Total for Option 2	**$10.48**															

APPENDIX E - FORECAST OF CONNECTION POINTS

Tables E.1 and E.2 show the ten year forecasts of summer and winter demand at connection points, or groupings of connection points, coincident with the time of forecast total Queensland region summer and winter maximum demand.

Groupings of some connection points are used to protect the confidentiality of specific customer loadings.

It should be noted that generally connection points will have their own summer and winter maximum loadings at times other than coincident with Queensland region maximum and these may be significantly higher than as shown in the tables.

In Tables E.1 and E.2 the zones in which connection points are located are allocated by abbreviation as follows:

FN	Far North Zone
Ross	Ross Zone
North	North Zone
CW	Central West Zone
Glad	Gladstone Zone
WB	Wide Bay Zone
SW	South West Zone
MN	Moreton North Zone
MS	Moreton South Zone
GC	Gold Coast

Table E.1: Forecasts of Connection Point Demands (MW) Coincident With State Summer Maximum Demand

CONNECTION POINTS	ZONE	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17
Abermain 110kV (Lockrose, Wulkuraka BS and QR)	MN	39.59	44.12	45.53	47.11	62.97	65.65	68.25	71.24	71.45	71.67
Abermain 33kV	MS	124.56	127.09	119.19	112.94	107.72	111.41	109.43	112.92	114.40	115.89
Alan Sheriff 132kV	Ross	19.70	20.61	21.56	22.56	23.60	24.69	25.83	27.02	28.27	29.52
Algester 33kV	MS	102.25	105.20	108.34	99.64	102.80	92.49	95.67	98.89	102.43	105.97
Alligator Creek 33kV	North	36.54	41.06	46.75	47.79	48.82	49.86	50.89	51.91	52.92	53.94
Ashgrove West 33kV	MN	73.18	75.29	77.26	79.90	82.77	86.25	116.74	121.13	125.94	130.74
Belmont 110kV (Cleveland and Capalaba North)	MS	148.45	150.28	154.96	163.06	180.39	187.92	195.20	202.64	210.78	218.93
Biloela 66kV	CW	30.98	32.75	34.26	35.04	35.83	36.61	37.39	38.16	38.93	39.70
Blackwater 66kV	CW	86.61	88.81	91.06	93.32	95.64	98.02	100.46	102.98	105.55	108.13
Bundamba 110kV	MS	8.05	14.01	24.75	25.45	26.24	27.22	32.91	34.16	39.75	45.34
Cairns 22kV	FN	79.76	78.90	82.48	86.01	89.70	93.54	97.56	101.75	106.12	110.49
Cairns City 132kV	FN	75.16	70.18	74.00	77.61	81.40	85.38	89.56	93.94	98.55	103.16
Cairns North 132kV	FN	0.00	13.32	13.32	13.91	14.53	15.18	15.86	16.57	17.30	18.04
Cardwell 22kV	Ross	4.11	4.24	4.37	4.49	4.61	4.73	4.86	4.98	5.10	5.23
CBD East 110kV	MS	428.98	439.91	434.45	450.77	542.77	567.65	575.14	607.32	630.09	652.85
CBD South 110kV	MS	57.88	59.54	60.97	62.92	65.03	67.61	70.08	72.59	75.33	78.08
CBD West 110kV	MN	128.52	154.22	159.62	171.91	176.34	181.97	170.21	179.23	184.62	190.02
Clare 66kV	Ross	54.41	55.69	56.83	57.97	59.10	60.24	61.38	62.52	63.84	65.16
Collinsville 66kV	North	11.41	11.40	11.39	11.39	11.38	11.38	11.37	11.37	11.36	11.36
Dan Gleeson	Ross	89.44	92.14	94.96	97.92	101.00	104.24	107.62	111.16	114.86	118.56
Dysart 66kV	CW	38.23	38.54	42.34	48.23	48.50	48.78	49.05	49.33	49.60	49.87
Edmonton 22kV	FN	27.62	29.02	30.40	31.84	33.35	34.94	36.60	38.33	40.16	41.98
Egans Hill 66kV	CW	63.78	66.22	68.65	71.03	73.41	75.78	78.14	80.50	82.85	85.20
Garbutt 66kV	Ross	113.77	115.57	117.41	119.30	121.25	123.24	125.29	127.39	129.55	131.71
Gin Gin 132kV (Bundaberg)	WB	125.29	128.13	131.19	134.39	137.68	141.11	144.69	148.38	152.27	156.16
Gladstone 132kV (Boat Creek and Comalco)	Glad	70.78	92.98	93.83	96.53	97.18	97.82	98.45	99.07	99.69	100.30
Gladstone North 132kV	Glad	29.94	37.63	45.96	45.95	45.93	45.91	45.89	45.87	55.44	65.01
Gladstone South 66kV	Glad	57.17	59.90	62.60	64.71	66.78	68.80	70.75	72.64	74.44	76.24

Table E.1: Forecasts of Connection Point Demands (MW) Coincident With State Summer Maximum Demand (Cont'd)

CONNECTION POINTS	ZONE	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17
Goodna 33kV	MS	99.77	109.22	117.75	121.02	124.98	129.54	125.43	129.54	134.07	138.60
Ingham 66kV	Ross	17.62	18.02	18.44	18.86	19.29	19.73	20.18	20.64	21.11	21.59
Innisfail 22kV	FN	29.95	31.02	32.03	33.07	34.15	35.27	36.42	37.61	38.84	40.07
Kamerunga 22kV	FN	42.07	44.00	45.82	47.63	49.45	51.26	53.08	54.90	56.72	58.53
Larapinta 33kV	MS	0.00	0.00	0.00	37.37	38.48	34.90	36.01	37.11	38.33	39.54
Lilyvale 132 kV (Barcaldine and Claremont)	CW	29.24	35.29	41.34	41.95	42.56	43.17	43.77	44.38	44.99	45.59
Lilyvale 66kV	CW	86.26	88.06	91.04	93.94	96.83	99.71	102.58	105.44	108.28	111.12
Loganlea 110kV	MS	421.07	456.96	500.41	514.04	542.42	553.08	583.71	597.66	618.68	639.69
Loganlea 33kV	MS	115.13	118.62	93.86	84.91	78.56	92.45	94.33	96.53	102.51	108.49
Mackay 33kV	North	123.73	129.74	77.86	80.13	82.41	84.68	86.94	89.15	91.36	93.56
Middle Ridge 110kV	SW	246.42	256.46	270.42	280.69	291.47	301.81	312.17	322.33	332.52	342.71
Middle Ridge 110kV (Postmans Ridge and Gatton)	MN	40.51	41.85	41.26	42.41	43.66	45.70	47.18	48.68	50.33	51.99
Molendinar 110kV	GC	412.00	426.09	456.49	473.20	501.10	516.82	541.15	572.86	603.39	633.92
Moranbah 66kV and 11kV	North	97.43	103.53	109.93	115.86	122.51	128.50	133.83	134.50	134.84	135.18
Moura 66kV	CW	41.64	42.45	43.26	44.04	44.81	45.58	46.34	47.10	47.86	48.61
Mudgeeraba 110kV	GC	324.17	338.12	374.65	391.06	397.75	421.99	435.58	452.65	467.74	482.83
Murarrie 110kV (Doboy, Lytton, Lytton QR and Wakerley)	MS	243.06	252.27	272.24	292.07	303.71	315.94	325.05	320.26	330.39	340.51
Nebo 11kV	North	3.20	3.34	3.48	3.63	3.77	3.91	4.05	4.18	4.32	4.46
Newlands 66kV	North	19.45	19.77	20.09	20.42	20.62	20.83	21.03	21.24	21.45	21.67
Palmwoods 132kV and 110kV	MN	306.57	318.62	334.87	348.94	365.30	383.38	400.25	416.73	435.66	454.59
Pioneer Valley	North	11.55	12.07	63.99	66.64	69.28	71.93	74.57	77.21	79.85	82.49
Proserpine 66 kV	North	52.24	55.48	60.77	62.69	64.63	66.59	68.57	70.55	72.56	74.57
Redbank Plains 11kV	MS	15.41	16.01	11.95	12.45	13.00	13.64	14.28	14.93	15.65	16.36
Richlands 33kV	MS	108.26	117.53	125.04	120.88	124.23	133.35	145.02	149.09	149.45	149.82
Rockhampton 66kV	CW	117.85	124.29	129.01	140.12	145.11	149.72	154.32	158.53	162.73	166.93
Rocklea 110kV (Archerfield)	MS	61.98	62.59	64.15	66.14	68.30	82.93	85.89	88.91	92.21	95.51
Ross 132 kV (Kidston and Georgetown)	Ross	45.60	47.37	48.09	48.82	49.56	50.32	51.09	51.87	52.67	53.47

Table E.1: Forecasts of Connection Point Demands (MW) Coincident With State Summer Maximum Demand (Cont'd)

CONNECTION POINTS	ZONE	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17
Runcorn 33kV	MS	62.23	67.86	67.84	78.22	73.90	76.08	78.71	81.40	84.35	87.30
South Pine 110kV	MN	867.53	919.21	965.17	1005.02	1056.65	1106.26	1150.15	1193.92	1239.74	1285.57
Sumner 11kV	MS	27.90	28.44	29.13	22.84	23.52	24.36	25.15	25.95	31.27	36.59
Sun Water Pumps (King Creek)	North	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Sun Water Pumps (Stony Creek)	North	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Swanbank 110kV (Raceview)	MS	96.36	99.10	102.03	105.43	108.50	112.16	115.61	119.48	123.29	127.10
Tangkam 110kV (Dalby and Oakey)	SW	12.41	15.37	16.53	17.68	18.84	20.01	21.17	22.34	23.51	24.67
Tarong 132kV (Chinchilla and Roma)	SW	76.44	79.10	81.21	83.91	86.66	89.45	92.28	95.16	98.08	100.99
Tarong 66 kV (Wide Bay)	SW	36.16	37.47	38.78	40.10	41.41	42.73	44.05	45.38	46.70	48.03
Tennyson 33kV	MS	154.45	160.49	172.31	179.26	165.41	168.78	174.31	179.91	186.11	192.30
Townsville South 66kV	Ross	84.89	88.14	91.51	94.99	98.58	102.30	105.82	109.47	113.26	117.04
Tully 22kV	Ross	14.23	14.65	15.03	15.42	15.82	16.23	16.65	17.08	17.52	17.97
Turkinje 132kV (Craiglee and Lakeland)	FN	19.32	18.46	18.66	18.87	19.07	19.28	19.48	19.69	19.90	20.10
Turkinje 66kV	FN	48.12	50.53	52.31	54.08	56.34	58.12	59.90	61.68	63.46	65.24
Waggamba 132kV (Bulli Creek)	SW	16.78	17.18	17.59	18.00	18.42	18.85	19.29	19.75	20.21	20.67
Wecker Road 33kV (Belmont)	MS	153.09	159.06	164.41	165.62	124.14	129.53	138.05	143.54	149.55	155.55
West Darra 11kV	MS	0.00	0.00	0.00	25.90	26.68	27.64	28.56	29.48	30.49	31.50
Woolooga 132 kV (Killivan)	WB	161.12	167.07	173.04	179.01	185.00	190.99	196.99	203.00	209.02	215.04
Woolooga 132kV (Gympie)	MN	168.13	175.28	180.31	189.39	197.23	206.56	215.75	225.90	236.37	246.84
Direct Connected Industrial Loads (SunMetals, QLD Nickel, Invicta Load - Ross, and BSL, QAL - Glad)	Various	1110.45	1111.96	1123.41	1145.30	1166.19	1212.91	1219.10	1225.33	1231.58	1237.83
Transmission Grid Connected Mining Loads (Rolleston - CW, Burton Downs - N, Goonyella North - N, Hail Creek - N)	Various	54.82	62.08	64.40	64.81	65.22	65.64	66.06	66.46	66.87	67.28
Transmission Grid Connected Queensland Rail Substations (Dingo, Grantleigh, Gregory, Norwich Park, Rangal, Rocklands - CW, and Coppabella, Moranbah South, Mt McLaren, Oonooie, Peak Downs, Wandoo - North, and Callemondah - Glad, and Korenan, Mungar - WB, Mindi - North and Corinda - MS)	Various	78.79	72.97	74.01	75.05	76.10	77.16	78.22	79.25	80.29	81.33
TOTAL QLD SUMMER PEAK	**-**	**8,483**	**8,862**	**9,206**	**9,557**	**9,900**	**10,272**	**10,595**	**10,914**	**11,263**	**11,612**

Table E.2: Forecasts of Connection Point Demands (MW) Coincident With State Winter Maximum Demand

CONNECTION POINTS	ZONE	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Abermain 110kV (Lockrose, Wulkuraka BS&QR)	MN	39.0	42.6	43.9	45.4	47.2	59.3	61.8	64.3	67.0	66.7
Abermain 33kV	MS	109.2	109.5	111.5	104.7	99.1	94.9	97.9	96.0	98.7	99.7
Alan Sheriff 132kV	Ross	12.1	12.7	13.3	13.9	14.5	15.2	15.9	16.6	17.4	18.2
Algester 33kV	MS	0.0	79.6	82.0	84.8	76.9	79.3	73.5	76.0	78.4	80.9
Alligator Creek 33kV	North	30.9	35.3	40.4	46.6	47.4	48.3	49.1	50.0	50.8	51.6
Ashgrove West 33kV	MN	69.6	70.5	72.5	74.6	77.5	80.3	83.6	100.8	104.4	108.1
Belmont 110kV (Cleveland, Capalaba North)	MS	150.8	154.4	156.0	160.7	168.1	184.6	192.2	199.9	207.2	214.9
Biloela 66kV	CW	27.2	27.2	28.4	29.2	29.3	29.3	29.4	29.4	29.5	29.5
Blackwater 66kV	CW	80.5	87.1	88.6	90.0	91.5	92.9	94.4	95.9	97.5	99.0
Bundamba 110kV	MS	7.1	11.9	13.6	22.6	23.4	24.2	25.1	30.9	32.1	37.6
Cairns 22kV	FN	46.7	49.3	48.6	50.9	53.2	55.5	58.0	60.5	63.2	66.0
Cairns City 132kV	FN	41.6	43.0	39.4	40.8	42.1	43.4	44.7	46.1	47.5	49.0
Cairns North 132kV	FN	0.0	0.0	8.4	8.4	8.8	9.2	9.6	10.1	10.5	11.0
Cardwell 22kV	Ross	2.9	2.9	3.0	3.0	3.0	3.0	3.1	3.1	3.1	3.2
CBD East 110kV	MS	235.5	257.0	255.4	259.8	270.7	359.4	376.8	382.1	405.0	418.4
CBD South 110kV	MS	33.4	33.9	34.8	35.7	37.0	38.3	39.8	41.2	42.6	44.1
CBD West 110kV	MN	76.2	81.2	100.6	107.1	110.0	112.8	116.2	110.8	116.6	119.6
Clare 66kV	Ross	48.5	50.7	52.4	53.3	54.1	55.0	55.9	56.7	57.6	58.7
Collinsville 66kV	North	9.7	13.1	13.3	13.5	13.7	13.9	14.2	14.4	14.6	14.8
Dan Gleeson	Ross	62.9	64.3	65.8	67.4	69.0	70.8	72.6	74.5	76.5	78.5
Dysart 66kV	CW	39.6	43.4	43.9	48.1	54.4	54.9	55.4	55.9	56.4	56.9
Edmonton 22kV	FN	21.2	22.2	23.3	24.4	25.6	26.8	28.1	29.4	30.8	32.3
Egans Hill 66kV	CW	43.0	43.5	44.1	44.6	45.2	45.7	46.2	46.7	47.2	47.8
Garbutt 66kV	Ross	89.9	91.1	92.2	93.4	94.6	95.9	97.2	98.5	99.9	101.2
Gin Gin 132kV (Bundaberg)	WB	93.0	93.1	96.0	99.2	102.6	106.0	109.7	113.5	117.5	121.7
Gladstone 132kV (Boat Creek & Comalco)	Glad	71.4	72.2	100.2	101.2	104.1	104.9	105.7	106.4	107.2	108.0
Gladstone North 132kV	Glad	29.9	29.9	37.6	45.9	45.9	45.9	45.9	45.8	45.8	55.4
Gladstone South 66kV	Glad	57.8	52.1	54.3	56.4	57.8	59.2	60.4	61.6	62.6	63.4

Table E.2: Forecasts of Connection Point Demands (MW) Coincident With State Winter Maximum Demand (Cont'd)

CONNECTION POINTS	ZONE	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Goodna 33kV	MS	80.9	84.2	87.8	99.5	102.6	105.9	109.6	106.6	109.8	113.2
Ingham 66kV	Ross	11.2	11.2	11.3	11.4	11.4	11.5	11.5	11.6	11.7	11.7
Innisfail 22kV	FN	14.3	14.6	15.0	15.3	15.6	15.9	16.2	16.6	16.9	17.3
Kamerunga 22kV	FN	33.9	35.3	36.8	38.2	39.5	40.9	42.3	43.6	45.0	46.4
Larapinta 33kV	MS	0.0	0.0	0.0	0.0	31.8	32.7	29.9	30.9	31.7	32.6
Lilyvale 132 kV (Barcaldine & Claremont)	CW	23.9	23.9	29.2	34.6	34.7	34.9	35.1	35.3	35.4	35.6
Lilyvale 66kV	CW	66.3	73.2	79.8	82.2	84.5	86.8	89.1	91.4	93.7	96.0
Loganlea 110kV	MS	354.3	383.2	437.3	445.1	461.8	487.0	495.0	524.2	535.9	552.9
Loganlea 33kV	MS	109.5	107.7	88.2	89.4	82.0	75.7	89.4	91.3	93.2	98.0
Mackay 33kV	North	74.2	77.5	80.8	63.6	65.6	67.6	69.6	71.6	73.6	75.6
Middle Ridge 110kV	SW	233.9	241.6	248.5	259.1	266.1	273.6	280.7	287.7	294.5	301.4
Middle Ridge 110kV (Postmans Ridge and Gatton)	MN	42.0	42.7	43.1	42.0	43.2	44.3	46.0	47.4	48.7	50.0
Molendinar 110kV	GC	339.3	347.3	359.4	388.0	404.1	421.6	440.0	460.5	486.1	509.1
Moranbah 66kV and 11kV	North	97.3	99.7	105.7	111.9	117.7	124.2	130.0	135.2	135.4	135.3
Moura 66kV	CW	39.5	40.1	40.7	41.3	41.9	42.5	43.0	43.6	44.2	44.7
Mudgeeraba 110kV	GC	294.4	302.4	314.2	346.0	360.1	372.7	389.6	402.9	418.1	431.4
Murarrie 110kV (Doboy, Lytton, Lytton QR, Wakerley)	MS	193.2	200.1	215.0	223.3	242.0	251.6	261.2	268.8	264.3	271.5
Nebo 11kV	North	1.9	2.0	2.0	2.1	2.1	2.2	2.3	2.3	2.4	2.5
Newlands 66kV	North	22.8	23.1	23.4	23.7	24.0	24.3	24.5	24.8	25.0	25.3
Palmwoods 132kV and 110kV	MN	281.7	294.6	306.6	322.8	336.8	352.1	368.7	385.1	399.9	416.6
Pioneer Valley	North	5.6	5.7	5.8	18.0	18.9	19.8	20.6	21.5	22.4	23.2
Proserpine 66 kV	North	42.9	45.1	47.8	52.8	54.0	55.1	56.2	57.3	58.5	59.6
Redbank Plains 11kV	MS	19.4	19.9	20.6	15.9	16.6	17.4	18.2	19.1	19.9	20.8
Richlands 33kV	MS	75.3	81.8	93.4	95.4	93.1	95.7	102.7	111.9	114.7	115.0
Rockhampton 66kV	CW	75.0	79.1	82.5	84.6	93.2	95.6	97.7	99.8	101.5	103.2
Rocklea 110kV (Archerfield)	MS	39.4	31.1	31.5	32.3	33.5	34.6	41.7	43.2	44.6	46.1
Ross 132 kV (Kidston and Georgetown)	Ross	24.8	39.9	41.5	42.1	42.7	43.3	43.9	44.5	45.1	45.8

Table E.2: Forecasts of Connection Point Demands (MW) Coincident With State Winter Maximum Demand (Cont'd)

CONNECTION POINTS	ZONE	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Runcorn 33kV	MS	117.9	63.5	65.2	67.2	75.9	72.3	74.5	77.1	79.5	82.1
South Pine 110kV	MN	750.9	791.0	828.4	867.9	904.5	946.6	986.7	1026.1	1062.5	1098.9
Sumner 11kV	MS	19.6	19.7	20.0	20.6	15.1	15.5	16.1	16.6	17.1	20.4
Sun Water Pumps (King Creek)	North	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Sun Water Pumps (Stony Creek)	North	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Swanbank 110kV (Raceview)	MS	77.3	79.5	81.8	84.7	87.9	89.4	92.3	95.2	98.0	100.8
Tangkam 110kV (Dalby and Oakey)	SW	7.5	8.1	10.3	10.9	11.5	12.1	12.7	13.3	13.9	14.5
Tarong 132kV (Chinchilla and Roma)	SW	62.4	63.2	64.1	64.0	64.9	65.7	66.6	67.5	68.4	69.3
Tarong 66 kV (Wide Bay)	SW	39.1	38.8	39.9	41.0	42.1	43.2	44.2	45.3	46.4	47.5
Tennyson 33kV	MS	167.3	163.3	169.2	179.6	187.7	169.2	172.6	178.5	184.1	189.8
Townsville South 66kV	Ross	19.3	20.4	21.2	22.0	22.9	23.8	24.7	25.5	26.4	27.3
Tully 22kV	Ross	3.9	4.0	4.2	4.3	4.4	4.5	4.6	4.7	4.9	5.0
Turkinje 132kV (Craiglee and Lakeland)	FN	15.9	16.1	15.5	15.7	16.0	16.2	16.5	16.7	17.0	17.2
Turkinje 66kV	FN	39.1	39.5	40.5	40.9	41.3	42.1	42.5	42.9	43.4	43.8
Waggamba 132kV (Bulli Creek)	SW	18.1	18.5	19.0	19.4	19.8	20.3	20.7	21.2	21.7	22.2
Wecker Road 33kV (Belmont)	MS	137.8	150.2	156.1	162.0	163.8	117.6	122.7	131.7	136.7	142.0
West Darra 11kV	MS	0.0	0.0	0.0	0.0	20.9	21.6	22.3	23.1	23.8	24.5
Woolooga 132 kV (Killivan)	WB	141.4	141.1	145.6	150.1	154.6	159.1	163.6	168.2	172.7	177.3
Woolooga 132kV (Gympie)	MN	170.6	171.8	178.2	184.4	194.4	202.8	212.6	222.4	233.0	243.2
Direct Connected Industrial Loads (SunMetals, QLD Nickel, Invicta Load - Ross, and BSL, QAL - Glad)	Various	1098.6	1115.2	1106.7	1128.1	1149.9	1160.9	1212.7	1218.9	1225.2	1231.5
Transmission Grid Connected Mining Loads (Rolleston - CW, Burton Downs - N, Goonyella North - N, Hail Creek - N)	Various	32.3	45.6	51.7	53.4	53.8	54.1	54.4	54.8	55.1	55.4
Transmission Grid Connected Queensland Rail Substations (Dingo, Grantleigh, Gregory, Norwich Park, Rangal, Rocklands - CW, and Coppabella, Moranbah South, Mt McLaren, Oonooie, Peak Downs, Wandoo - North, and Callemondah - Glad, and Korenan, Mungar - WB, Mindi - North and Corinda - MS)	Various	76.3	74.9	72.3	73.2	74.0	74.9	75.8	76.7	77.5	78.4
TOTAL QLD WINTER PEAK	**-**	**7,123**	**7,407**	**7,702**	**7,997**	**8,293**	**8,552**	**8,857**	**9,124**	**9,368**	**9,629**

APPENDIX F - TEMPERATURE AND DIVERSITY CORRECTED AREA DEMANDS

For analysis of the dependence of summer and winter daily maximum demands on ambient temperature conditions across parts of Queensland, eight weather station records are used, as shown in Table F.1.

Table F.1: Reference Temperatures at Associated PoE Conditions

WEATHER STATION	AVERAGE DAILY TEMPERATURE PERCENTILES (°C) (1)					
	SUMMER			WINTER		
	10% POE	50% POE	90% POE	10% POE	50% POE	90% POE
Cairns (2)	32.1	30.4	29.1	25.9	24.8	23.7
Townsville (2)	32.0	30.4	29.8	25.7	24.2	23.2
Mackay	30.9	29.3	28.3	11.3	12.4	13.5
Rockhampton	32.6	30.7	29.3	10.2	11.6	12.9
Bundaberg	30.2	28.8	27.7	10.5	11.7	13.0
Toowoomba	29.0	27.0	25.3	4.7	6.0	7.0
Archerfield (Brisbane)	30.5	28.4	27.3	9.6	10.9	12.3
Coolangatta	29.0	27.1	24.5	9.3	10.6	12.2

Notes:

(1) Taken as the average of the maximum temperature on the day and the minimum temperature during the prior night/morning.

(2) In these areas winter demand increases with higher ambient temperature.

Observed temperature sensitivities are determined by linear regression of the daily maximum demands against daily average temperatures on working weekdays. These observations are listed in Table F.2.

As shown in Table F.2, sensitivity of demand to ambient temperature is much higher in summer compared to winter across Queensland.

Table F.2: Observed Temperature Sensitivity of Daily Peak Demands

	DEMAND CHANGE DEPENDENCE ON AVERAGE DAILY TEMPERATURE (MW PER °C) (1)			
	SOUTH EAST	SOUTH WEST	NORTHERN NON-INDUSTRIAL	CENTRAL NON-INDUSTRIAL
Summer				
1997/98	39	4.8	22	10.3
1998/99	42	4.6	18	10.9
1999/00	40	4.8	23	11.5
2000/01	63	7.0	24	16.2
2001/02	66	5.0	28	14.3
2002/03	78	7.0	32	18.2
2003/04	111	8.6	37	17.8
2004/05	126	9.0	35	19.0
2005/06	162	11.1	40	24.1
2006/07	146	11.9	41	23.8
Winter				
1998	-40	-6.3	4.2	
1999	-36	-6.1	6.0	
2000	-48	-6.9	(2)	(3)
2001	-39	-6.3	6.9	
2002	-40	-6.3	8.8	
2003	-46	-6.7	7.0	
2004	-44	-7.4	3.8	
2005	-46	-6.6	6.8	
2006	-56	-9.2	(2)	

Notes:

(1) Over summer, the working weekdays in the period mid November to mid March are analysed and the holiday period from Christmas to the first week of January is excluded. Over winter, the working weekdays in the period mid May to early September are analysed. In summer, if the previous day is hotter during a hot period, a 25% weighting of that day's average temperature is included, to capture higher remnant heat in buildings. Similarly, in winter, if the previous day is colder during a cold period, a 25% weighting of that day's average temperature is included.

(2) Poor correlation of data in this winter.

(3) Poor correlation of data over most winters. Accordingly, this area's demand is taken to be relatively insensitive to winter temperatures.

The historical coincidence factor averages developed for each of these areas and for the major industrial loads, are used to enable overall correction of Queensland region summer and winter demands, as shown in Tables F.3, F.4 and F.5

Table F.3: Area Summer 50% PoE Demand Temperature Corrections & Coincidence Ratios at State Peak Demand

	SOUTH EAST (1)	SOUTH WEST (2)	NORTHERN NON-INDUSTRIAL (3)	CENTRAL NON-INDUSTRIAL (4)	MAJOR INDUSTRIAL (5)
Actual Peak Demands					
1997/98	2,591	244	842	686	893
1998/99	2,757	254	845	662	900
1999/00	2,946	268	887	704	1,017
2000/01	2,977	282	911	744	1,037
2001/02	3,120	284	1,044	801	1,062
2002/03	3,383	303	980	769	1,085
2003/04	3,846	340	1,079	831	1,108
2004/05	4,024	358	1,089	883	1,110
2005/06	4,149	401	1,140	925	1,141
2006/07	4,302	396	1,202	970	1,180
Temperature Corrected Area Peak Demand					
1997/98	2,590	247	860	686	
1998/99	2,700	265	868	684	
1999/00	2,804	267	938	720	
2000/01	2,999	303	946	779	
2001/02	3,197	298	991	801	N/A (6)
2002/03	3,376	314	1,005	806	
2003/04	3,713	333	1,060	833	
2004/05	4,073	360	1,083	908	
2005/06	4,246	406	1,137	968	
2006/07	4,421	395	1,216	935	
Historical average ratio of demand at time of Qld region peak to area corrected peak	99.6%	93.8%	94.3%	93.5%	95.1%

Notes:

(1) South East Queensland is taken here as Moreton North, Moreton South and Gold Coast compared to Archerfield (Brisbane) temperatures.

(2) South West Queensland is taken as the South West zone and is compared to Toowoomba temperatures.

(3) Northern non-industrial is taken as Far North, Ross and North zones less the SunMetals and Queensland Nickel industrial loads, and is compared to Townsville temperatures.

(4) Central non-industrial is taken as Central West, Gladstone and Wide Bay zones less the Boyne Island Smelter and QAL industrial loads and is compared to Rockhampton temperatures.

(5) Industrial is taken here as the sum of SunMetals, Queensland Nickel, Boyne Island Smelter and QAL direct connected industrial loads.

(6) These major industrial loads are not significantly sensitive to temperature.

Table F.4: Area Winter 50% PoE Demand Temperature Corrections and Coincidence Ratios at State Peak Demand

	SOUTH EAST	SOUTH WEST	NORTHERN NON-INDUSTRIAL	CENTRAL NON-INDUSTRIAL	MAJOR INDUSTRIAL
Actual Peak Demands					
1998	2,617	283	733	623	895
1999	2,769	297	731	665	921
2000	2,992	318	776	709	1,021
2001	2,975	313	781	735	1,052
2002	2,999	307	796	710	1,060
2003	3,325	322	806	739	1,068
2004	3,504	350	813	797	1,099
2005	3,731	368	840	792	1,130
2006	3,882	373	850	783	1,162
Temperature Corrected Area Peak Demand					
1998	2,696	294	732		
1999	2,775	302	725		
2000	2,963	320	776		
2001	3,036	329	783	N/A	N/A
2002	3,078	325	816		
2003	3,327	329	815		
2004	3,511	365	821		
2005	3,713	372	848		
2006	3,882	409	850		
Historical average ratio of demand at time of Qld region peak to area corrected peak	98.5%	91.3%	89.5%	95.2%	96.2%

Table F.5: Queensland Region Actual and 50% PoE Temperature and Diversity Corrected Peak Demands

SUMMER	ACTUAL	CORRECTED	WINTER	ACTUAL	CORRECTED
1997/98	5,184	5,123	1998	5,021	5,073
1998/99	5,330	5,264	1999	5,233	5,218
1999/00	5,620	5,580	2000	5,609	5,606
2000/01	5,830	5,890	2001	5,731	5,748
2001/02	6,183	6,170	2002	5,671	5,801
2002/03	6,336	6,404	2003	6,066	6,088
2003/04	7,020	6,857	2004	6,366	6,394
2004/05	7,282	7,337	2005	6,553	6,652
2005/06	7,388	7,688	2006	6,891	6,878
2006/07	7,832	7,935	-	-	-

APPENDIX G - HISTORICAL VALIDATION OF CURRENT QUEENSLAND FORECASTING MODEL

Compared to other states in the National Electricity Market (NEM), Queensland's load distribution is decentralised with less than 60% near Brisbane in the south east corner of the state. A significant amount of Queensland's load and load growth is industrial, scattered across the state with an emphasis on the mining industry.

Diverse load and weather patterns across the state require load forecasting methods to be applied to five distinct groups of loads before combining in a way that accounts for the appropriate weather and load diversity between these groups.

There are three parts to Powerlink's load forecasting process:

- Initial load forecasts are supplied from customers, which is generally referred to as a 'bottom up' approach to load forecasting;
- An independent forecast is provided based on econometric and air-conditioning models, which is referred to as a 'top down' approach; and
- Adjustments to the customer forecasts are made, if appropriate, to ensure consistency with the broader economic signals, air-conditioning surveys and historical diversity and temperature sensitivity observations.

A useful way to check the validity of such a model is to look at the forecast in the last (2006) Annual Planning Report (APR) for the most recent summer (2006/07) and compare this to what actually occurred. If the model is valid then any variance should be explainable through variance in the components that make up the model. In particular, the inputs or assumptions to each component used for the 2006 APR should be compared with the actual observed input to explain the corresponding change in load.

The actual delivered peak demand in Queensland for summer 2006/07 was 7,832MW which, as explained in Appendix F, becomes 7,935 MW after temperature and diversity correction. This is 295MW (3.6%) below the 2006 APR forecast of 8,230MW. To explain this variance it is necessary to refer to various components that make up the forecast.

New Embedded Non-Scheduled Generation

Over the last couple of years, new significant non-scheduled embedded generation has been added into Queensland's distribution network, with combined capacity of just over 100MW. These generators include Rocky Point, Pioneer Mill, Oakey Creek, German Creek and Daandin. During the 2006/07 summer this new generation was operating at over 50% capacity, with about 60MW output at the time of state summer peak demand.

As much of this new non-scheduled embedded generation came on line a year earlier than expected, this contributed to the actual demand being lower than expected in the 2006 APR forecasts.

The forecasts supplied in this 2007 APR have been reduced to allow for an expected output of these generators of 72MW at the time of state summer peak demand and 47 MW at the time of state winter peak demand.

It should be noted that, unlike the generators mentioned above most of the numerous existing embedded sugar mills throughout Queensland have limited bagasse storage facilities and do not generate at typical times of state summer or winter peak demands.

Delays in New Block Loads

A number of new block loads that were expected to be on line by summer 2006/07 were delayed but are expected to be operational by summer 2007/08. These delayed loads include an industrial load, two coal handling loads and two mining load increases. These amount to about 50MW.

Greater than Normal Diversity

Due to its large size, Queensland normally experiences significant diversity in weather patterns across the state. Queensland's 2006/07 summer peak demand did not coincide the peak load in South East Queensland for the second consecutive year. Given that South East Queensland represents nearly 60% of the state load this reduced the peak state load below where it would otherwise have been.

Appendix F describes how the state demand is broken into five components for the purpose of temperature correcting demands. Based on the same five components, Table G2 below lists the ratios of each component's demand at the time of actual state peak demand compared to the component's own non-coincident peak demand, temperature corrected where appropriate. It shows the extent of diversity across the state over the last ten summers in terms of coincidence factors. The diversity for summer 2006/07 (96.2% coincidence) was lower than the average (97.1% coincidence).

Table G2: Queensland Summer Peak Demand Diversity (1)

YEAR	SOUTH EAST	SOUTH WEST	NORTH NON INDUSTRIAL	CENTRAL NON INDUSTRIAL	INDUSTRIAL	QLD DIVERSITY
97/98	100.06%	97.02%	96.32%	93.29%	99.08%	98.3%
98/99	102.29%	91.09%	92.93%	93.00%	98.11%	98.5%
99/00	104.18%	99.29%	87.69%	88.49%	95.66%	98.1%
00/01	99.27%	89.02%	95.27%	85.27%	98.12%	96.2%
01/02	96.71%	86.52%	104.66%	95.52%	97.18%	97.5%
02/03	100.22%	94.69%	93.35%	88.60%	92.37%	96.3%
03/04	103.60%	101.88%	88.04%	98.18%	97.78%	99.7%
04/05	98.80%	97.03%	93.88%	97.25%	90.90%	96.7%
05/06	94.99%	86.54%	91.57%	93.91%	92.36%	93.5%
06/07	96.04%	94.99%	98.80%	101.57%	89.78%	96.2%
Average	99.62%	93.81%	94.25%	93.51%	95.13%	97.1%

Note:

(1) Diversity is expressed by a coincidence factor. Coincidence factors greater than 100% imply that the actual area demand at the time of state peak demand exceeded the temperature and diversity corrected area peak.

Reduced Pumping Loads

Drought conditions across much of Southern Queensland have meant that water pumping loads, have generally been lower than in previous summers and lower than as forecast in the 2006 APR.

Reduced Population Growth

Queensland's annual population growth as recently reported by the Australian Bureau of Statistics for the year ending 30 September 2006 shows a sudden drop from 2.3% in the previous year to 1.9%, predominately caused by a reduction in migration to Queensland.

Queensland's Mild Summer

Queensland's 2006/07 summer was mild over the entire state. South East Queensland (as measured at Archerfield) had its lowest average summer temperature since 1999/00 with only three days above the 50% PoE temperature of 28.4°C. South West Queensland, Central Queensland and North Queensland had their lowest average summer temperatures since 1999/00, 2000/01 and 2001/02 respectively.

The table below shows summer average temperatures for Queensland over the last ten years.

Table G3: Queensland Average Summer Temperatures (°C)

YEAR	ARCHERFIELD	TOOWOOMBA	ROCKHAMPTON	TOWNSVILLE
97/98	26.12	23.41	27.67	28.09
98/99	24.68	21.09	26.86	27.80
99/00	22.68	19.94	25.46	26.87
00/01	24.39	22.09	25.75	26.71
01/02	25.58	23.87	28.54	29.27
02/03	24.41	21.96	26.97	28.31
03/04	26.01	23.31	27.77	28.77
04/05	25.09	22.56	27.27	28.39
05/06	26.20	24.12	28.42	28.65
06/07	24.00	21.75	26.22	27.27
10 Year Average	24.9	22.4	27.1	28.0
50 Year Average	25.3	21.6	26.9	27.8

Table G3 shows that overall the 2006/07 summer was the mildest since 2000/01, which was prior to the recent period of rapid increase in domestic air conditioning load.

While diversity and temperature correction has been carried out on summer 2006/07 peak demand as described in Appendix F, such a mild summer may have resulted in a situation where many people have exercised some constraint in their use of air conditioning, following extensive use in the previous hot 2005/06 summer. Consequently, this may have contributed to lower loads and lower load sensitivity to temperature than would otherwise be expected in a more typical summer.

Latent Air Conditioning Load

Recent surveys have shown that the increase in the number of residences with new air conditioning installed in South East Queensland in 2006 fell to about half the record increase of the previous year, well below expectations of the previous survey and as assumed in the 2006 APR forecast. This may have been influenced by the mild winter 2006 conditions.

However, air-conditioning unit sales during 2006 fell to a much lesser degree relative to the previous year. In accordance with the surveys, this suggests that substantial upgrading or additional air-conditioning units by existing users continued at recent high levels.

The surveys continue to show that in South East Queensland, many households without air-conditioning intend to install and many existing users intend to upgrade or add air conditioners, over the next one to two years. After this a saturation effect is expected to take over on both counts.

APPENDIX H - QUEENSLAND NATIVE DEMAND

Native demand refers to the actual demand delivered into the distribution networks and to transmission connected consumers. Referring to Figure 3.1, it is the sum of delivered demand (energy) from a Transmission Network Service Provider (TNSP) from embedded scheduled and significant non-scheduled embedded generation. In the case of Queensland, non-scheduled embedded generation includes sugar mill co-generation, thermal landfill and biomass generation.

The native demand presented in the tables below is the same demand presented in Chapter Three but with non-scheduled embedded generation added (significant non-scheduled embedded generation as agreed with NEMMCO). The prediction of future non-scheduled generation is based on historical information, plus a knowledge of any committed generation planned for the network.

Table H.1: Peak Summer Native Demand (MW)

SUMMER FORECASTS	HIGH GROWTH SCENARIO			MEDIUM GROWTH SCENARIO			LOW GROWTH SCENARIO		
	10% POE	50% POE	90% POE	10% POE	50% POE	90% POE	10% POE	50% POE	90% POE
07/08	9,253	8,789	8,510	9,010	8,561	8,290	8,806	8,368	8,105
08/09	9,806	9,307	9,005	9,416	8,940	8,651	9,081	8,623	8,346
09/10	10,332	9,798	9,473	9,787	9,284	8,978	9,335	8,858	8,568
10/11	11,053	10,478	10,129	10,165	9,635	9,312	9,592	9,096	8,794
11/12	11,542	10,933	10,561	10,535	9,978	9,638	9,807	9,293	8,980
12/13	12,144	11,495	11,097	10,935	10,350	9,992	10,067	9,534	9,208
13/14	13,137	12,448	12,026	11,286	10,673	10,298	10,299	9,746	9,408
14/15	13,723	12,990	12,541	11,633	10,992	10,599	10,514	9,942	9,591
15/16	14,311	13,535	13,059	12,012	11,341	10,929	10,742	10,150	9,787
16/17	14,900	14,080	13,576	12,391	11,690	11,260	10,970	10,359	9,983

Table H.2: Peak Winter Native Demand (MW)

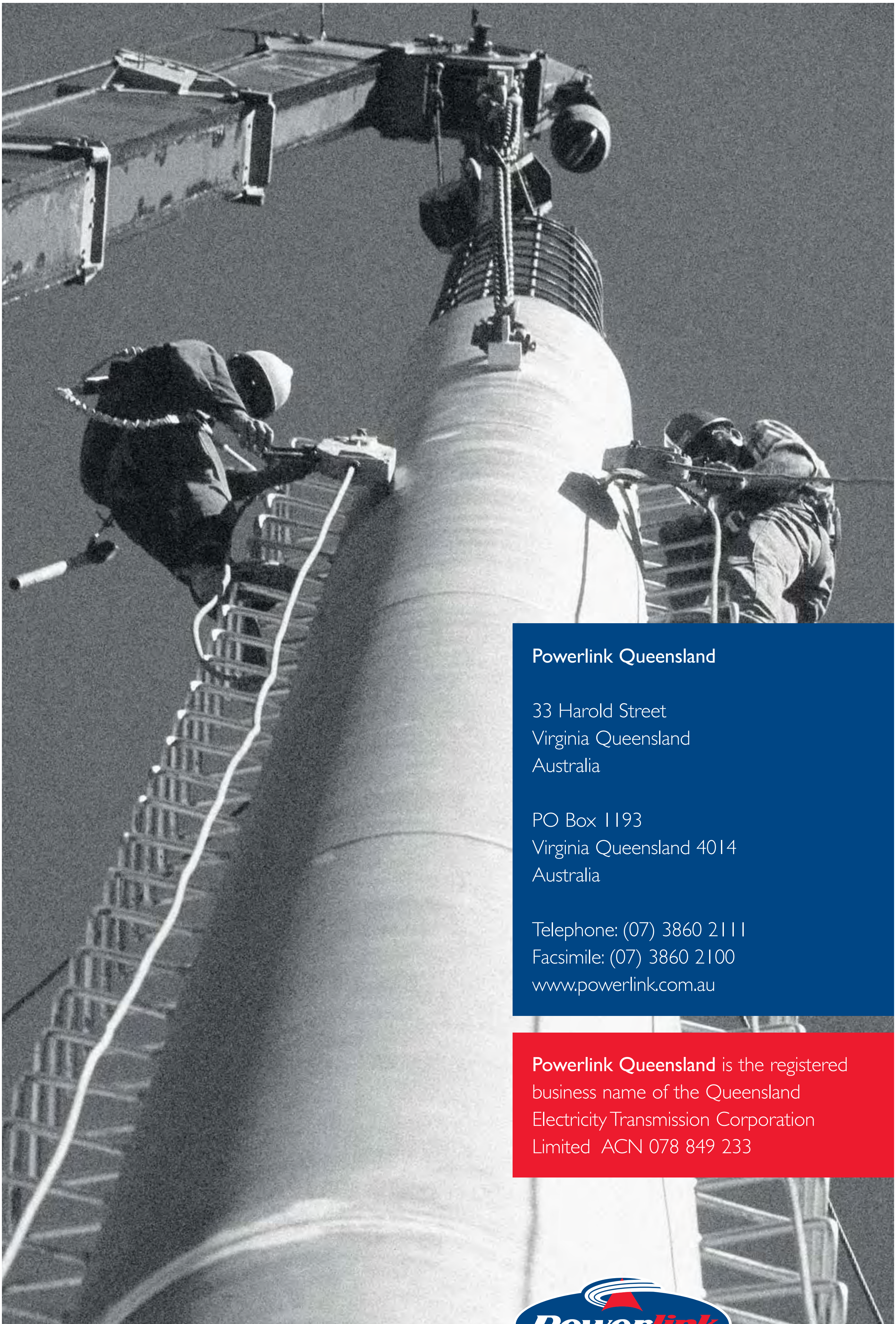
WINTER FORECASTS	HIGH GROWTH SCENARIO			MEDIUM GROWTH SCENARIO			LOW GROWTH SCENARIO		
	10% POE	50% POE	90% POE	10% POE	50% POE	90% POE	10% POE	50% POE	90% POE
2007	7,484	7,346	7,247	7,311	7,176	7,081	7,180	7,049	6,955
2008	7,925	7,778	7,674	7,599	7,460	7,360	7,334	7,201	7,105
2009	8,427	8,272	8,161	7,900	7,755	7,652	7,506	7,370	7,273
2010	8,955	8,790	8,671	8,200	8,050	7,943	7,679	7,540	7,441
2011	9,552	9,379	9,253	8,500	8,346	8,234	7,829	7,689	7,587
2012	10,055	9,871	9,738	8,764	8,605	8,489	7,943	7,802	7,698
2013	10,602	10,409	10,266	9,075	8,910	8,790	8,121	7,977	7,871
2014	11,618	11,414	11,263	9,346	9,177	9,051	8,251	8,105	7,996
2015	12,125	11,912	11,751	9,595	9,421	9,291	8,345	8,198	8,086
2016	12,687	12,462	12,291	9,861	9,682	9,546	8,424	8,276	8,162

Table H.3: Forecast Native Energy (GWh)

YEAR	HIGH GROWTH SCENARIO	MEDIUM GROWTH SCENARIO	LOW GROWTH SCENARIO
07/08	50,642	49,148	47,975
08/09	53,495	51,080	49,150
09/10	56,381	52,923	50,277
10/11	60,647	55,010	51,628
11/12	63,514	56,897	52,599
12/13	67,142	59,063	53,893
13/14	72,469	60,943	55,001
14/15	77,935	62,703	55,919
15/16	81,505	64,653	56,891
16/17	85,293	66,603	57,687

APPENDIX I – ABBREVIATIONS

AER	Australian Energy Regulator
ANTS	Annual National Transmission Statement
APR	Annual Planning Report
CB	Circuit Breaker
CBD	Central Business District
CCGT	Combined Cycle Gas Turbine
CQ	Central Queensland
DNSP	Distribution Network Service Provider
DSM	Demand Side Management
FNQ	Far North Queensland
GSP	Gross State Product
GT	Gas Turbine
GWh	Gigawatt hour, one million kilowatt hours
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current
IRPC	Inter Regional Planning Committee
JPB	Jurisdictional Planning Body
kA	kiloamperes, one thousand amperes
kV	kilovolts, one thousand volts
MVAr	Megavar, megavolt amperes reactive, one thousand kilovolt amperes reactive
MW	Megawatt, one thousand kilowatts
NER	National Electricity Rules
NEM	National Electricity Market
NEMMCO	National Electricity Market Management Company
NEMDE	National Electricity Market Dispatch Engine
NIEIR	National Institute of Economic and Industrial Research
NNS	Northern New South Wales
NTFP	National Transmission Flow Path
NSW	New South Wales
PV	Present Value
NQ	North Queensland
OCGT	Open Cycle Gas Turbine
PoE	Probability of Exceedance
PSS	Power System Stabiliser
QNI	Queensland/New South Wales Interconnector
SCADA	Supervisory Control and Data Acquisition
SEQ	South East Queensland
SOO	Statement of Opportunities, published annually by NEMMCO
SQ	South Queensland
SVC	static VAr compensator
SWQ	South West Queensland
TNSP	Transmission Network Service Provider



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