NETWORK MANAGEMENT PLAN

> Network Safety and Reliability

> Chapter 1

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1 OVERVIEW

The objective of the Network Management Plan (the Plan) is to provide a framework that will ensure Essential Energy's distribution system provides an adequate, reliable and safe supply of quality electrical network services to customers. Essential Energy is committed to ensuring the safe operation of the distribution network.

In accordance with the *Electricity Supply (Safety and Network Management) Regulation 2008* (NSW), Essential Energy has developed a number of plans that cover the efficient and safe delivery of electricity supply to our customers, including; the Network Safety and Reliability Plan, Customer Installation Safety Plan, Network Management Plan, Public Electrical Safety Awareness and Bush Fire Risk Management Plan.

1.1 Scope of the Plan

In accordance with the requirements of the *Electricity Supply (Safety and Network Management) Regulation 2008* (NSW), Essential Energy has developed a network management plan consisting of four chapters as outlined below:

Network Management Plan			
Chapter 1: Network Safety and Reliability CEOP8029	**Chapter 2:** Customer Installation Safety CEOP8004	**Chapter3:** Public Electrical Safety Awareness CEOP8005	**Chapter 4:** Bush Fire Risk Management CEOP8022

Figure 1: Structure of the Network Management Plan

Each chapter has been developed as a separate document which can be interpreted independently, but considered as a part of one contiguous document, in-line with the intent of the legislation.

This Chapter of the Network Management Plan, Chapter One: Network Safety and Reliability, has been prepared in accordance with the requirements of the *Electricity Supply (Safety and Network Management) Regulation 2008* (NSW) and outlines Essential Energy's objectives for managing the network, incorporating the design principles, planning requirements, asset management strategy and overall safety and network management.

The Plan demonstrates Essential Energy's commitment to safety and provides details of Essential Energy's policies and procedures with regard to:

- Safe work practices
- The design, construction, operation and maintenance of the electricity network
- The planning process
- Asset management
- Risk management
- Demand management
- Customer technical service standards
- System reliability
- Analysis of hazardous events
- The procedures to be implemented in emergency situations

- Competency requirements for anyone who works on or near the electricity network
- Strategies for ensuring compliance with competency standards
- The reporting requirements in relation to maintenance, reliability, demand management and safety.

2 ESSENTIAL ENERGY'S NETWORK

2.1 Subtransmission and Distribution System

Essential Energy is a NSW Government-owned corporation, with responsibility for building, operating and maintaining Australia's largest electricity network. It delivers essential network services to more than 800,000 homes and businesses across 95 per cent of NSW, parts of southern Queensland and northern Victoria.

As part of the NSW Government's energy industry reforms, on 1 July 2012 Essential Energy transitioned to a new operating model, with a common Board and Chief Executive Officer appointed to the three NSW electricity distribution businesses – Essential Energy, Ausgrid and Endeavour. Under this model Essential Energy remains a stand-alone corporation, with a focus on the delivery of operational services across its network area.

Essential Energy's network covers a large and diverse area of 737,000 km^2 with more than 200,000 kilometres of powerlines and around 1.4 million power poles spanning from Bega to Tweed Heads, west to Broken Hill and south to the River Murray. The network extends into authorised supply areas of Queensland and Victoria.

The following map shows the Essential Energy distribution area:

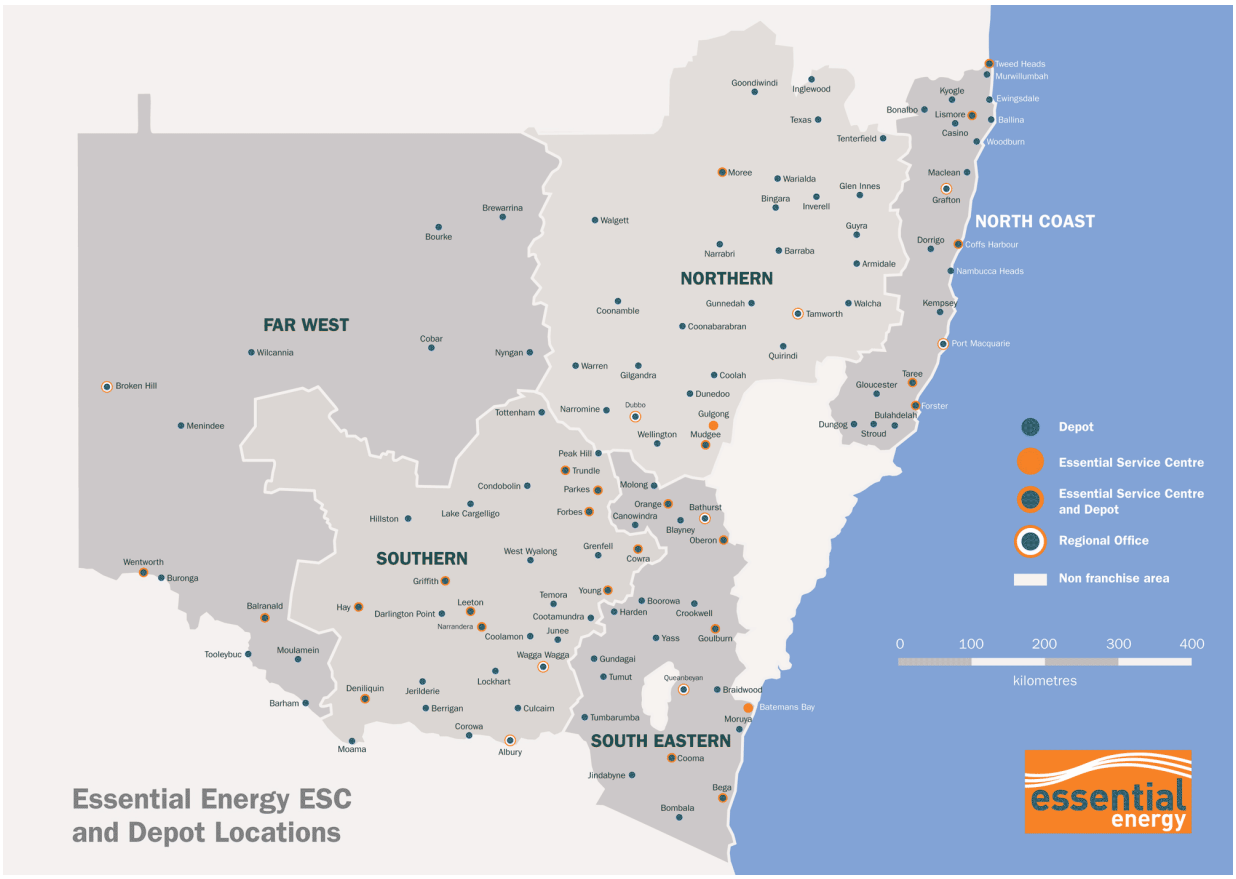
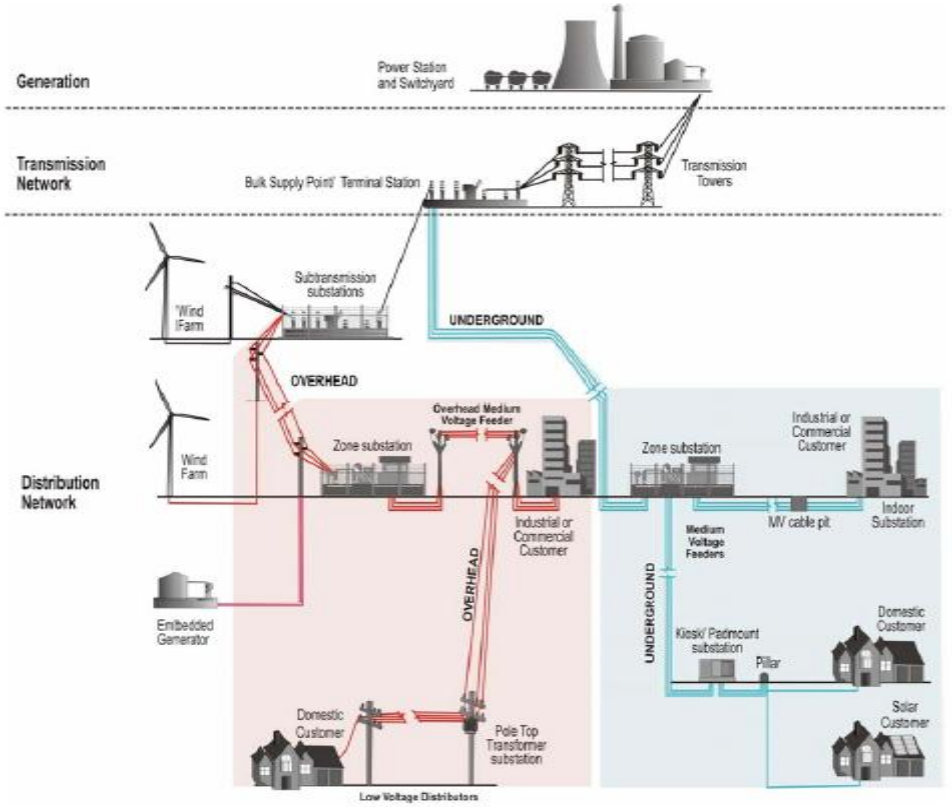


Figure 2: Essential Energy Network Coverage

Essential Energy's electricity network is one component of an integrated system by which electricity is generated and delivered to customers. Some parts of the supply network are relatively uncomplicated, as typified by radial networks in rural remote locations, while others have more complex interconnected arrangements.

Essential Energy's typical network arrangement is shown in the electricity network map below.



Source: ENA Customer Guide to Electricity Supply)

Figure 3: Typical arrangement of the Electricity Distribution Network

The electricity distribution network consists of a large number of asset types across different voltage levels. Starting with subtransmission lines, electricity is taken from the transmission network, owned by transmission network service providers, to zone substations. There are almost 400 zone substations and subtransmission substations. These range in transformer capacity from 180 MVA down to 1 MVA. Major zone substations are normally located on land owned by Essential Energy, with the transmission and distribution lines generally constructed on easements acquired across private or public land.

The majority of Essential Energy's 132 kV, 110kV, 66 kV and 33 kV zone substations have two or more transformers installed and are remotely monitored and controlled by Supervisory Control and Data Acquisition (SCADA) and Distribution System Automation (DSA) systems. This enhances the system control functionality during normal operation and also in times of emergency. Essential Energy also uses intelligent devices placed strategically within the distribution network to help identify and isolate faults on the network to minimise damage to the network and supply disruption.

At the zone substations, electricity is transformed down to distribution high voltages of 22kV or 11kV and then distributed by distribution feeders to a point close to the customer premise, known as a distribution substation. There are around 135,000 distribution substations, located throughout the network on poles, footpaths, reserves or within customer premises, which then reduce the voltage to a lower voltage supply of 400 volts three phase, or 230 volts single phase.

Electrical loads on the network range from large single customers, such as mines, cotton gins, abattoirs, feedlots, irrigation pumps and shopping complexes, to urban commercial and residential centres, rural farms and villages, or remote Single Wire Earth Return (SWER) connected customers. While the majority of customers are connected to the low voltage network, customers can be connected at any voltage level from 132 kV down to low voltage (400/230 volts).

Also interspersed within the distribution network, is a growing number of embedded generator sites of varying output capacities, which need to be operationally integrated within the network.

At most customer sites, metering is installed to monitor electricity consumption and facilitate accurate billing. In NSW, the responsibility of billing rests with the retailer. There is a relationship between the customer, the retailer and Essential Energy (the Network Service provider). This requires a new customer apply for “connection” to the network and provide sufficient detail to determine suitability for connection, along with an agreement with a retailer to provide “electricity supply”.

Specific details of conditions around customer connection services based on the type of customer are contained in the Customer Connection Contract. Details of this can be found on the Essential Energy website (www.essentialenergy.com.au).

As a network business Essential Energy faces the challenge of providing value to stakeholders and customers while meeting the increased capacity and availability of the network driven by a growing population with changing lifestyle choices.

Around 33 per cent of Essential Energy’s existing asset base was installed during the regional expansion period of the 1950s and 1960s. Through sound asset management processes and systems Essential Energy manages these assets and keeps pace with technological change by investing in smarter, more efficient technologies, and improving business processes and systems wherever possible.

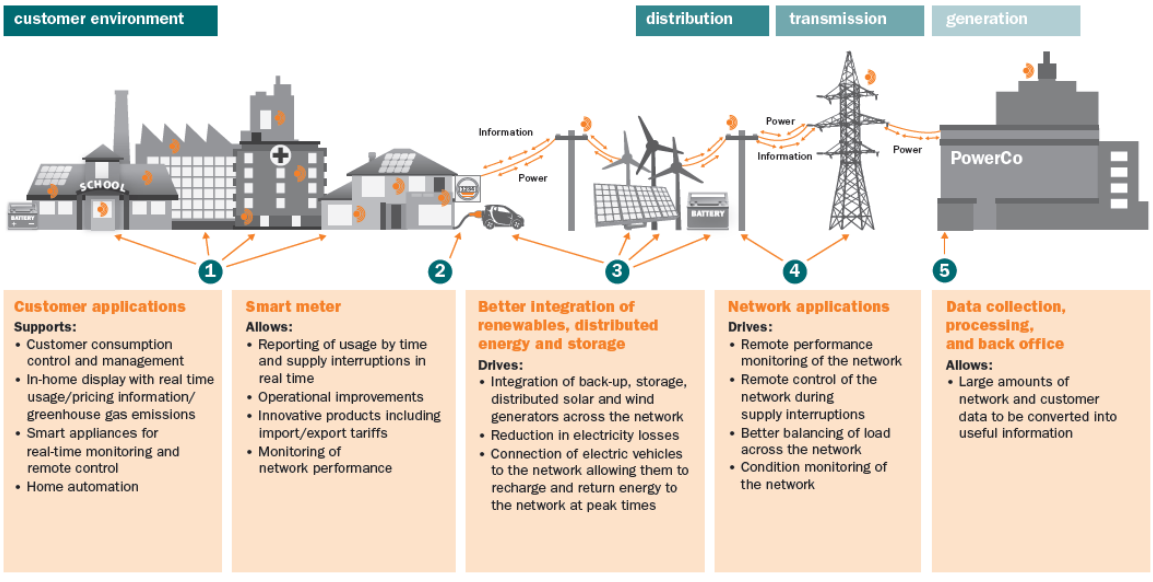


Figure 4: Essential Energy's Network Technology Environment

Where it makes good business sense, Essential Energy is investing in technology to support an improved network offering energy saving options for customers. The underlying principle is that a smarter, more adaptable and flexible network can provide sustainable energy solutions into the future.

To enable the company to effectively operate such a diverse and geographically dispersed network, Essential Energy has more than 4000 employees based across over 100 local depots and regional offices strategically located throughout NSW, meeting the day-to-day operation and maintenance requirements of the business and providing emergency response.

As such, Essential Energy is one of regional NSW's largest employers and utilises two regional operations control centres to manage the day-to-day operations of the network, dispatch, and supply interruptions and restoration.

Essential Energy is committed to the provision of high quality customer service through continuous improvement of communication and interaction with the regional and rural communities in which it operates. The company provides 24-hour fault call centres, supporting the business' commitment to provide accurate and courteous handling of customer requests, complaints and enquiries.

Essential Energy maintains extensive engineering records of assets and utilises a number of processes and systems in maintaining and operating the network, including:

- Geographical Information System (GIS)
- Asset Management System (WASP)
- Works Scheduling System (Redback)
- SCADA (System control and data acquisition)
- POWERON and CENIC (network management and network information system)
- COGNOS (reporting system)
- TotalSAFE (database of safety, operating and performance related issues)
- Policy Library and Objective (document management system)
- Customer Information System (CIS)
- PeopleSoft (Financial and HR system)
- Corporate website, www.essentialenergy.com.au, and intranet, Essentialnet.

Essential Energy also manages and maintains extensions or alterations to the network driven by specific customer requirements, such as when customers apply to connect to the electricity distribution network, increase the electricity taken from the distribution network or need to extend the network.

For a house or small business, this may only mean arranging the installation of a dedicated service line from the new premise to the nearest powerline. For larger projects such as residential subdivisions or industrial/commercial developments, this may involve alterations to the electricity network itself in order to meet projected power supply needs, which may also have a flow-on incremental impact on upstream augmentation requirements.

In most cases, the construction of shared assets in urban areas are exclusively managed by Essential Energy, however, dedicated assets can result in different arrangements. *The Electricity Supply Act 1995* gives electricity customers the right to choose who carries out the works involved in the connection process otherwise known as contestable works.

Essential Energy is fully accredited to perform any part of the connection process, or customers can choose a suitably qualified person from a list of independent Accredited Service Providers (ASPs) to complete the work, This accreditation ensures the distribution network and the customer connection to the network remain reliable and safe.

More information on the list of independent ASPs can be found on the NSW Department of Trade and Investment, Regional Infrastructure and Services (DTIRIS) website, or by contacting Essential Energy.

3 FRAMEWORK OF THE PLAN

3.1 Introduction

Essential Energy has developed the Network Management Plan (the Plan) in line with our overall Asset Management Framework. The Framework provides a consistent and integrated approach towards safety, reliability and quality of supply to enable effective service standards for customers.

The Framework aligns asset planning with service delivery priorities, integrating service delivery, planning, capital investment, operations, maintenance, replacement and disposal strategies in accordance with the NSW Government's strategic approach to physical asset planning and management, Total Asset Management (TAM).

The key elements of this Framework ensure that Essential Energy is able to effectively and efficiently:

- Meet customers' requirements for service delivery
- Comply with Essential Energy's policies, standards and procedures regarding the condition and performance of assets maintenance or improvement
- Maintain the operating capability (and hence the value) of the network.

3.2 Objective of Chapter 1 of the Network Management Plan

The objective of this chapter of the Plan - Chapter 1: Network Safety and Reliability - is to provide a systematic approach to planning and managing Essential Energy's assets. This ensures that the condition and performance of the subtransmission and distribution network assets are effectively monitored, maintained and developed in accordance with customer and stakeholder expectations, ensuring an adequate, reliable and safe supply of electricity.

3.3 Structure of Chapter 1 of the Network Management Plan

An outline of the high level structure of Chapter 1 of the Plan is:

- Network Development (Planning)
- Asset Management
- Safety and Emergency Management
- Network Performance and Licence Compliance
- Code, Standards and Guidelines.

3.4 Specific Stakeholder Requirements

3.4.1 Development and amendment of plans

Essential Energy updates CEOP8029 Network Management Plan Chapter 1: Network Safety and Reliability at least annually in accordance with the requirements of the Director-General, the *Electricity Supply (Safety and Network Management) Regulation 2008* (NSW), and the Commissioner, Part 5, Section 66 & 67 of the *Electrical Safety Act 2002* (QLD) and Part 9, Division two, Section 166 of the *Electrical Safety Regulation 2002* (QLD).

The annual update and audit is carried out prior to 1 October each year. Subsequent updates and audits are carried out as required by the NSW Director-General or the Commissioner.

In developing and updating this chapter, Essential Energy has considered input from:

- Unions who are broadly representative of employees in Essential Energy's QLD distribution area
- Principal or Primary Contractors with Essential Energy for the performance of electrical and other work in the Essential Energy QLD distribution area.

Essential Energy's CECM1000.04 Consultation, Communication and Performance Reporting HSE manual outlines the requirements for employee, Union and Principal Contractor consultation.

3.4.2 Lodgement and Implementation of Plans

3.4.2.1 New South Wales

In accordance with the *Electricity Supply (Safety and Network Management) Regulation 2008* (NSW), Essential Energy, has lodged and implemented the following documents forming the Network Management Plan as required by the Director-General:

- CEOP8029 Network Management Plan Chapter 1: Network Safety and Reliability
- CEOP8004 Network Management Plan Chapter 2: Customer Installation Safety Plan
- CEOP8005 Network Management Plan Chapter 3: Public Electrical Safety Awareness Plan
- CEOP8022 Network Management Plan Chapter 4: Bush Fire Risk Management Plan.

3.4.2.2 Queensland

In accordance with Section 166 of the *Electrical Safety Regulation 2002* (QLD), Essential Energy submits to the Commissioner each year a copy of the Safety Management System in its current form and a certificate in the approved form from an accredited auditor.

If the Commissioner requests a modification to the Safety Management System, Essential Energy will, by the specified date, submit to the Commissioner a copy of the modified Safety Management System and a certificate in the approved form from an accredited auditor.

3.4.3 Availability of plans

CEOP8029 Network Management Plan Chapter 1 - Network Safety and Reliability incorporates the Safety Management System requirements of the *Electrical Safety Act 2002* (QLD) and the *Electrical Safety Regulation 2002* (QLD).

The plans are available at Essential Energy offices throughout NSW via the company's intranet, upon request from Essential Energy Call Centres on 13 23 91, or by accessing the Essential Energy website essentialenergy.com.au.

3.5 Schedule of reports to the NSW Director-General

In accordance with the *Electricity Supply (Safety and Network Management) Regulation 2008* (NSW), Essential Energy provides the following reports to the NSW Director-General:

Report	Report Prepared in Accordance With	Due Date
Network Management Plan Chapters 1-4	Electricity Supply (Safety and Network Management) Regulation 2008, Part 4, Clause 15	As required by Director-General
Further Reports to be submitted to Director-General	Electricity Supply (Safety and Network Management) Regulation 2008, Part 5, Clause 22	As required by Director-General
Electricity System Development Review	Demand Management for Electricity Distributors NSW Code of Practice September 2004, Clause 6	31 May 2012
Electricity Network Performance Report (ENPR)	Electricity Supply (Safety and Network Management) Regulation 2008, Part 5, Clause 21	30 September 2012
Demand Management Reporting (included in ENPR)	Demand Management for Electricity Distributors NSW Code of Practice September 2004, Clause 10	30 September 2012
Customer Installation Safety Report (included in ENPR)	Installation Safety Management Code of Practice December 1997, Appendix 1	30 September 2012
Annual SENI Report (included in ENPR)	In accordance with Distribution Network Service Provider (DNSP) Licence Conditions Clause 18.6	30 September 2012
SENI Reporting – Major Incidents	In accordance with DNSP Licence Conditions Clause 18.6	Within 24 hours

4 NETWORK DEVELOPMENT (PLANNING)

This section describes the planning process employed for assessing the adequacy of the subtransmission and distribution system and the need for development, including network augmentation requirements; demand management methodologies; system reliability planning standards; asset renewal and asset maintenance planning.

4.1 Corporate Planning

As a State-Owned Corporation (SOC), Essential Energy is required by legislation to provide to the shareholder an annual Statement of Corporate Intent (SCI). The SCI describes the nature and purpose of Essential Energy's capital and operating and maintenance expenditure program and its relationship to the corporate strategic plan. These corporate objectives are enhanced by the capital investment and operating and maintenance program.

Asset strategic planning is fundamental to the processes of effective asset management and is an integral element of Essential Energy's overall business planning cycle. Implicit in these activities is the linkage between the overall corporate objectives; network service delivery objectives and strategies; implementation of industry best practices, asset management plans, capital investment and maintenance programs; and the associated needs of customers and stakeholders.

In order to respond appropriately to the needs of stakeholders, a range of individual processes interrelate to form the overall network asset planning process. These processes include:

- Network augmentation
- Demand management
- Reliability, quality and security of supply planning
- Asset renewal planning
- Asset maintenance.

Together, these processes produce an overall investment plan and related program of works. It should be noted that these investments incorporate assets with a long life and no alternative use, which implies substantial financial risk which needs to be managed from an economic and regulatory perspective. Essential Energy's commitment is to a strictly commercial approach to capital investment decisions on meeting statutory, regulatory or distribution licence condition requirements to maintain a safe, secure, reliable and high quality supply of electricity to meet customer requirements.

4.2 Planning Process

The development of sound network asset management strategies are fundamental for prioritising and efficiently allocating capital and operating expenditure to projects that will lead to improved network performance and utilisation of assets in an environmentally responsible and safe manner.

The network planning process incorporates strategic development of the network and the medium and long-term capital investment requirements of Essential Energy in order to maintain adequate capacity and security of supply to meet customer needs. This involves detailed asset management strategic planning documents including a Capital Investment Strategic Plan that comprises network augmentation; demand management; reliability, quality and security of supply; asset renewal; and asset maintenance, as represented in the figure below:

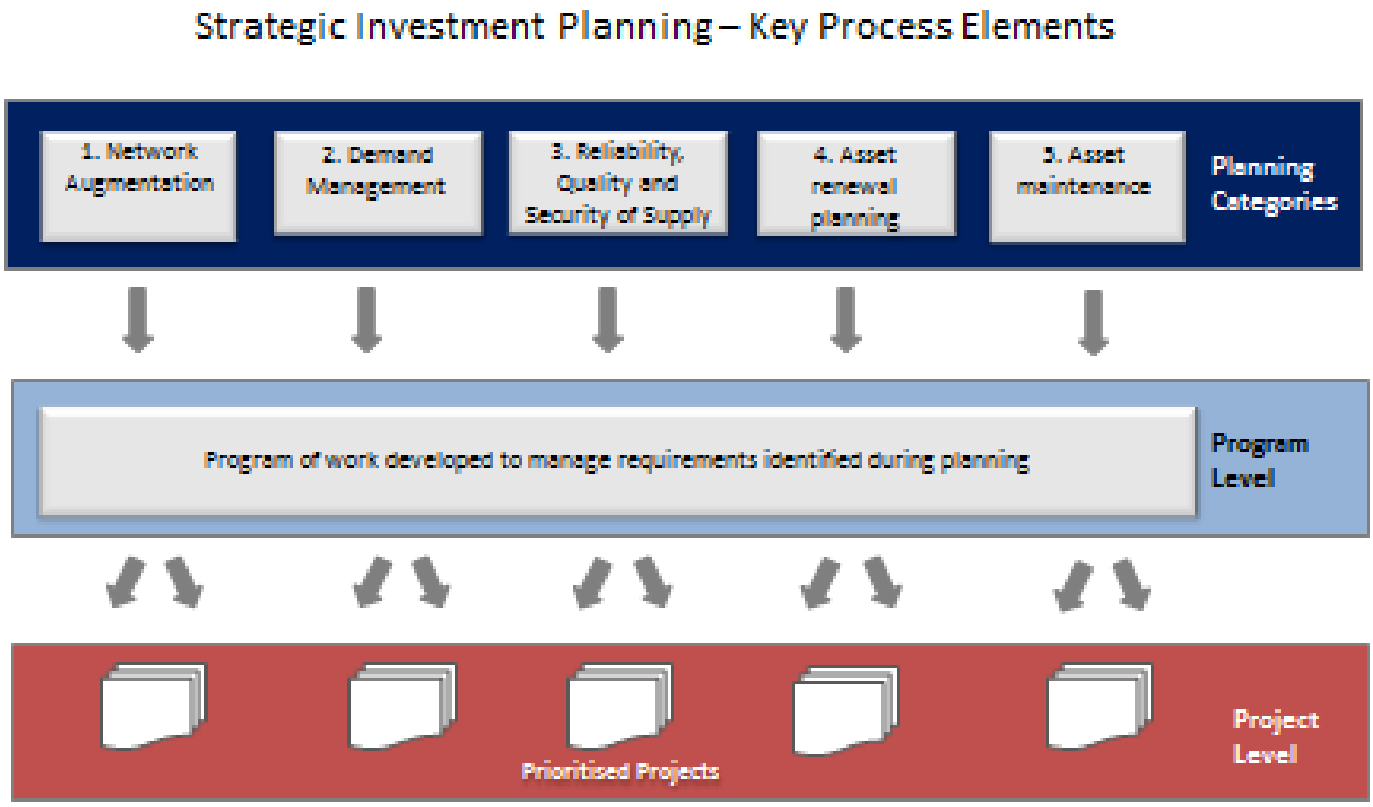


Figure 5: Planning Process

Other requirements around risk management are incorporated in other plans, such as the Safety and Operating Plan, Public Electrical Safety Awareness Plan, Bushfire Risk Management Plan and Customer Installation Safety Plan.

The planning process determines the required level of annual expenditure and provides forecasts for medium-term network expenditure requirements. As with any medium-term planning, the first years of the plan will represent firmer plans that either have commenced, or are in the process of being implemented, while the later years will be based on projections and forecast requirements. These later plans are representative only of the type of works anticipated and are refined as the time horizon progresses.

Projects subsequent to the asset planning process will be at various stages of development and approval, but are incorporated in the seven year horizon of the Network Asset Management Plan (NAMP) which is also reviewed prior to the commencement of each financial year.

4.3 Design Planning Criteria

The NSW Licence Conditions published by the Minister for Energy has specific design planning criteria, including:

- Input standards to be used for planning the network
- Requirements for load forecasting and contingency planning methodologies intended to achieve operational outcomes.

Design planning criteria incorporates the licence conditions into a combination of standards applied by Essential Energy to review and plan the network for future growth to achieve the required standards of system security, reliability and quality of supply.

Network planning criteria is established for:

- Permissible loading capacities of plant and network components under normal and emergency conditions
- Permissible voltage regulation limits
- Adequate equipment selection
- Appropriate security of supply design criteria for the network.

Security of supply is determined primarily by the design and configuration of the network which, in turn, is determined by the network planning policies and criteria adopted by Essential Energy. It is determined by the extent of duplication or redundancy of primary serial elements and their associated secondary protection and control systems. It is a key factor influencing the reliability of supply. Other factors include:

- Effectiveness of preventative maintenance programs
- Effectiveness of operational procedures
- Type of terrain and local climatic conditions
- Quality of network components.

Planning criteria differs across asset classes, feeder categories, voltage levels and location in the network, reflecting the different conditions and equipment in service. The criteria adopted have significant implications on the level of capital expenditures as it dictates network configuration and the types of switchgear, controls (manual or automated) and protection equipment used.

The main planning criteria of design, security levels, voltage regulation and equipment selection are detailed in Essential Energy's document CEOP8003 Subtransmission and Distribution Network Planning Criteria and Guidelines. The planning target security levels and the plant loading information are consistent with the licence conditions, accepted international practice and published Australian or international standards, and provide an objective framework within which network development can be planned and against which overall security levels can be assessed and reported.

4.3.1 Application of Planning Criteria

Implementation of the security of supply requirements of the revised licence conditions necessitated a detailed review of planning targets, specific projects to be developed, and the capital expenditure requirements, for compliance to be achieved by June 2014.

4.3.1.1 System adequacy under normal network configuration

Essential Energy's network in normal configuration must be able to meet peak energy demands and remain within permissible component current ratings and voltage limits. Where loading on components has reached, or will reach the maximum capacity available and does not accord with Essential Energy's design planning criteria, network augmentation or new assets will be built.

Demand Management and Non-Network Alternatives (DM and NNA) offer substantial potential to achieve capacity and power quality required of the electricity network at reduced costs, however, to achieve this efficiently requires ongoing development and integration of the business' DM knowledge and processes.

Essential Energy is committed to providing positive outcomes for customers now and in the future and will achieve this through proactive and efficient promotion, development and implementation of DM and NNA as outlined in the DM strategy. The DM Strategy incorporates:

- Enhancement of business cases to further enable DM and NNA as a primary element of the planning process and as a broad-based strategy
- Efficient development and refinement of DM and NNA based technical skills, experience and solutions
- Enabling and encouraging external stakeholder involvement
- Reduction of peak demand through the implementation of prudent DM and NNA initiatives
- Optimising DM and NNA performance and value, now and in the future.

4.3.1.2 Security of supply under abnormal network configuration

The level and timing of growth related capital expenditure is influenced by security of supply considerations at both the subtransmission and distribution voltage levels under abnormal network operating conditions. Essential Energy's network planning criteria for the subtransmission network, zone substations, and the major distribution network in regional centres is aimed at limiting the load at risk to N-1* conditions in accordance with the distribution licence conditions. Where loading on components has reached, or will reach, levels that do not accord with Essential Energy's N-1 planning criteria, network augmentation or new assets will be built.

*N-1 allows resilience in the network, ensuring there is at least one independent backup component.

4.3.1.3 Voltage and current constraints

Subtransmission and distribution feeders are deemed to be voltage constrained when the voltage regulation criterion is exceeded during the peak demand period. Capacity constraints can often coincide with voltage constraints on some feeders.

Voltage regulation is a critical component in the growth related program at a distribution level. Due to the distances to some load centres and the original choice of lower voltages, such as 11 kV and 12.7 kV Single Wire Earth Return (SWER) in some areas, voltage regulation will continue to be a major driver for replacement.

Voltage regulators are installed on long rural distribution lines to manage voltage regulation levels. Essential Energy plans to continue to install additional regulators where voltage degradation has occurred.

Voltage regulators are economically used by Essential Energy, however, they have technical limitations in solving voltage regulation issues and can be practically difficult to install due to cascading effects. Ultimately higher voltages and additional substations are required to strengthen the network.

4.4 Network Augmentation

A major driver of capital expenditure relates to the augmentation of network capacity to meet additional demand growth. To respond to the growth in demand across the network, Essential Energy uses well-developed and documented network planning and development processes, consistent with distribution network practices elsewhere, to ensure that customers are provided with cost effective energy services. This explores non-traditional means of service provision, such as demand management and distributed generation.

Essential Energy's centralised network management group and the regional network planning groups develop efficient capital works programs based on the requirements of the Network Augmentation Plan and the standard organisational wide capital investment policies and procedures. This is complimented by local regional requirements relating to customer-driven needs and the condition of the local network. This approach is considered best practice.

The need for network augmentation in the first instance is established by assessing the capability of the network to deliver requirements based on planning and development processes to ensure the following:

- Adequate network capacity is available to meet power transfer requirements
- Electrical and thermal design ratings of equipment (under normal and overload conditions) are not exceeded
- Supply security (and reliability) is in accordance with distribution licence conditions and published standards
- Quality of supply meets published standards and system voltage regulation levels are maintained within acceptable standard limits
- Acceptable safety standards are maintained
- Environmental constraints are satisfied.

The network augmentation planning process is an integral part of asset management. One of the main purposes of network planning is to ensure an optimal balance of capital and recurrent expenditure, such that maintenance, renewal and augmentation of the electricity distribution network deliver the required level of services, at an optimal cost.

In some cases, Essential Energy's network planning and capital investment framework is driven by technical drivers, rather than pure economic drivers. This is primarily due to the mandatory requirements of network performance distribution licence conditions (refer Attachment A and Attachment B) and other legislative requirements, and the inherent geographical/topographical challenges in maintaining standards of system security, reliability and quality of supply in rural areas of the State.

Growth related capital expenditure forecasts are the result of a process involving the application of a planning methodology that includes:

- Consideration of legislative, regulatory and related codes of practice requirements
- Analysis of current loading levels and predicted load growth
- Results of network planning studies
- Application of documented planning criteria
- Identification of network constraints
- Identification of augmentation and demand management options
- External consultation
- Cost-benefit assessment
- Assessment of historical expenditures
- Future network growth related work program and the required levels of capital investment needed to maintain ongoing capacity in the medium-term term.

Time lags between drivers and actual investment, and the amount of risk accepted by Essential Energy, also have a major bearing on the amount of capital per unit of growth.

These planning processes produce a detailed annual capital expenditure program for growth related capital works and sets priorities.

4.4.1 The main drivers for growth related investments

4.4.1.1 Rate and location of Peak Demand Growth (forecast)

The peak demand placed upon an electricity network is influenced by many factors, such as economic activity, customer activity, the type of customer installations connected to the network, and the extremes of weather conditions. The growth rate of peak demand (and customer connections) drives much of the need for growth related investment in the network. Accordingly higher investment levels are needed to ensure that additional capacity keeps pace with higher growth in load and to remedy elements of the network that are heavily loaded.

Changes to the growth rate of peak demand will result in changes to the expenditure required for demand driven subtransmission and distribution capacity augmentation and extensions, security of supply, land and easement acquisitions.

Essential Energy develops peak summer and winter demand forecasts for the base, high and low growth economic scenarios.

These forecast rates of growth in peak demand for the whole network can be used to carry out a high-level check for consistency of the growth capital projections, which should reasonably reflect the base economic growth rates projected.

Similarly, demand is influenced by diversity, where peaks on downstream parts of the network occur at different times resulting in a more diversified load at higher network voltage levels. While the summer peak demand may be growing at the average coincident system-wide level, the actual peak demand growth at the local zone substation or regional area is in many instances much higher than this. It is these local forecasts of loading and network utilisation that tend to drive the specific need for the capital expenditure requirement, rather than the coincident system peak demand.

The high growth corridors include the north-eastern area of New South Wales (including the mid-north and far-north coastal strips), south-east coastal strip and some major regional centres, which represent some of the fastest growing areas of the state in terms of residential and commercial development, with expansion forecast to continue.

4.4.1.2 Penetration of Air Conditioning

The penetration of air-conditioning is driven by heat and weather factors. This means that summer load demands have a high correlation with ambient temperature due to air-conditioning (and refrigeration) loads.

Winter load demands are relatively less sensitive to ambient temperature due to the penetration of gas hot water and heating in many parts of the network.

The summer peak demand is composed of a base load and a temperature-sensitive load. This means that on a few very hot days in summer, the network loading can increase by 40 per cent above base loading (recorded at times of less extreme heat). This extreme peak loading occurs for less than one per cent of the year.

Diversity is lost with air-conditioning load. On hotter days, customers will use their air-conditioning systems at the same time resulting in an uncontrollable and undiversified peak for demand. The high rates of air-conditioning penetration have now led to unexpectedly high summer demand peaks in some parts of the network, which have been designed for winter peaks where equipment ratings are higher and less limiting.

The figure below illustrates the impact of temperature on the peak demand placed on the Essential Energy network. Specifically, it shows the difference in the demand curve on adjacent days between a mild and extreme summer day at a bulk supply point (located in a coastal region), effectively demonstrating the impact of air-conditioning.

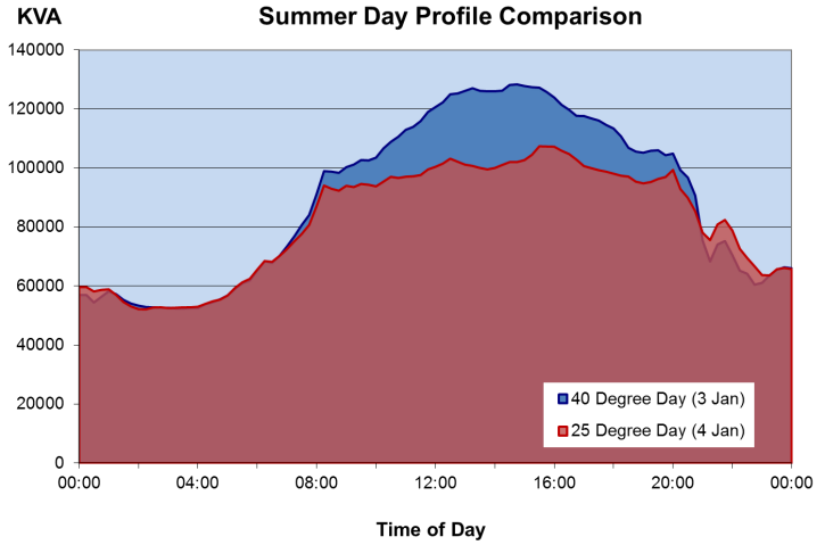


Figure 6: Impact of a mild and a hot summer day on network demand

4.4.1.3 Summer Peak

Due to the increase in air-conditioning installations, some parts of the network, particularly those areas supplying larger population centres, display a gradual shift from a short and sharp evening winter peak to an afternoon summer peak driven by high ambient temperatures, with a substantially different (flatter) load curve..

The occurrence of an afternoon peak during the hottest part of summer is more onerous on the distribution network than the evening winter peaks, as system ratings of electrical equipment are reduced at higher ambient temperatures.

For example, on average the summer name plate capacity of power transformers is around 10 per cent lower than winter capacity. This is because of hotter temperatures and the fact that the summer peak typically lasts three to four hours longer than the winter peak. There is now approximately 50 per cent of Essential Energy's zone substations that are summer peaking, compared to 34.3 per cent in 2000-01.

All of this can result in severe stress on electrical infrastructure, requiring augmentation and reinforcement to be implemented earlier to maintain existing risk profiles. It is a key driver and consideration when evaluating growth related capital expenditure.

4.4.1.4 Customer Connection Growth

Customer connections represent new physical connections to the Essential Energy network.

The projection of residential customers takes into account dwelling construction projection and population growth trends. It is anticipated that the number of new residential customer connections will continue at an average rate of around 1.5 per cent per annum to 2019-20 under the base growth scenario. These increases are driven by strong development and population growth in the coastal areas of the network, reflecting the national demographic trend to seaside residential development. Areas in and around the major regional centres have also been growing at a higher rate than the average across Essential Energy.

Customer driven connection assets are required to be constructed for each new customer connected to the network. This work is partly funded by Essential Energy and partly by the new connecting customer or developer.

A new customer connection will generally result in immediate investment of capital required for distribution network extensions, for the high voltage and low voltage distribution asset categories. Each smaller load connection also has a flow-on incremental impact on upstream augmentation needs, including upgrades and new asset construction. These shared assets in an urban area are funded by Essential Energy whereas larger commercial/business customers will often require new distribution substation which may attract a customer contribution.

4.4.1.5 Asset utilisation

Another major driver of growth related capital expenditure is the potential for increased demand to extend the utilisation of the network beyond acceptable limits that may result in the erosion of security (and reliability) of supply. Higher utilisation of the network means a reduced capability of the network to cope with extreme weather conditions.

There is a need to maintain prudent levels of asset utilisation. In some parts of the network, particularly the north-eastern part of the network which is forecast to experience above average levels of demand growth, the levels of utilisation are approaching the upper limits of safe and efficient operating practices. This will necessitate the construction of new assets, and the augmentation of existing, assets to avoid utilisation rates exceeding these bounds.

Additionally, assets age more quickly with higher utilisation, necessitating higher levels of capital expenditure to replace network components. Ultimately this will have a detrimental impact on reliability over time, unless addressed through augmentation of the network.

While in general the greater the use of the system relative to the underlying investment, the lower the price to the end user, any further increase in asset utilisation at the subtransmission and zone substation levels is not consistent with good asset management practice. The reason for this is that while higher utilisation implies a more efficient use of system (capacity), this could also imply greater difficulty in taking equipment out of service for maintenance and repair without compromising system reliability and security (the impact of system configuration aside).

4.4.1.6 Load forecasting

In order for a network to be expanded economically and efficiently, it is both prudent and necessary to take a long term view which considers the existing and proposed assets and also the conditions to which those assets might be exposed over their service life.

Essential Energy develops expenditure forecasts using detailed programs of work at the subtransmission, zone substation and high voltage distribution feeder level based on proven asset management methodologies. Expenditure at the distribution network level is assessed on a case by case basis and incorporates the projected rate of growth in customer connections, historical expenditures and average replacement costs per asset class.

The company offsets its calculated growth related capital expenditure by the portion of capital expenditure undertaken in other asset management categories, such as asset renewal, with the secondary purpose of capacity augmentation.

Essential Energy's approach and methodology used to forecast growth related investments and programs to be implemented over a planning period is in accordance with industry best practice and takes into consideration the main drivers: peak demand growth; customer growth; and general load patterns in each specific network area. By analysing the actual trends in load development for the individual supply sub-areas in conjunction with distribution and sub-transmission network requirements to service load centres, new construction is carried out as effectively as possible.

The company's load forecasting methodology to consider new construction, augmentation and the energy requirements of an area are based on the following types of information:

- Actual normalised system demand data
- Actual normalised energy data and load factor
- Population demography and Local Council Land Use Strategy
- NSW Department of Urban Affairs and Planning – Regional Planning Strategies
- Known future significant spot loads
- Known future significant developments
- Likely technology impacts
- Bureau of Meteorology historical weather data
- Relevant econometric model data
- Likely influences of demand side management initiatives, energy efficiency strategies and alternative energy sources or energy substitution.

The level of analysis applied in each case is generally commensurate with the impact and timing of projected expenditure. In the first instance, Essential Energy uses a linear regression model as a screening test and then applies a more detailed multi-variable linear regression methodology to constraints which drive significant network augmentation investment to refine the timing (based on availability of data).

The linear regression/projection methodology is used for long term influences with appropriate adjustments for any significant short term influences that may be identified for the load under consideration. Separate demand trends for summer and winter forecasts are also given, based on known 'normalised' monthly peak demands ('normalised' infers peak demand was not 'artificial' due to load transfer, miscalculation or other non-standard variances).

4.4.1.7 System Planning Studies

Demand forecasts provide the source data for system load-flow analysis. This enables comparisons to be made between the existing installed network capacity, network configuration, and utilisation of individual plant items, against the design planning criteria, required network capacity, configuration and utilisation, in order to identify network thermal and voltage constraints. This information is then used to predict the most technically acceptable solution and the cost of augmentation to meet network growth. Commercially available power systems analysis software is used for this purpose.

4.4.1.8 Community Consultation

An alternative to augmentation of the network is to apply demand side management techniques. Demand management aims to reduce network demand though conscious activity. It may result in works required by Essential Energy or it may relate to external projects which have had some promotion or facilitation by Essential Energy. Essential Energy's network planning processes are designed to comply with the Code of Practice Demand Management for Electricity Distributors.

This aspect of network planning involves significant consultation with customers, community, interested parties, energy service providers and transmission network service providers in order to develop the least cost option for the provision of energy services to cater for the projected load.

The information in the annual Electricity System Development Review (ESDR) allows customers and energy service providers to consider whether they may be able to assist in addressing the network constraint through the implementation of demand management. Each subtransmission and zone substation is monitored and analysed to ensure that there is sufficient capacity to cover a single credible contingency. Plans for each substation are developed and updated annually as part of the ESDR publication.

For situations where network constraints exist, Essential Energy engages in market-based development and evaluation of options for electricity system support (such as demand management, distributed generation and storage options), at the same time and in the same manner as network investments. This approach actively seeks to minimise barriers and disincentives to the adoption of particular demand management options.

The decision to apply demand management or to augment the network remains an issue of economic efficiency, technical feasibility, application of sound industry commercial practice and determining the optimum means of providing supply capacity to customers. Generally, the impact of demand management is to influence the timing of augmentation projects by the deferral of capital expenditure requirements.

4.5 Demand Management

Demand management (DM) investigations are an integral part of Essential Energy's network planning and investment decision process. As new customers are connected to the electricity distribution network, and existing customers increase their electrical loading, it may be necessary to extend or augment the existing network.

Network load grows through two major causes - new customer connections and increased electrical loading of existing customers. From the energy source side of the connection point, the electrical demand impacts of new customers and growth in existing customers' loads on the existing shared network is similar and can cause operational issues such as:

> Voltage degradation

- Limitations on thermal current ratings of power lines
- Decreased reliability and security of supply
- Reduction in quality of supply.

These issues can result in the potential need to augment the existing network to restore adequate levels of supply performance, however, the construction or augmentation of network assets may not be the optimum method of delivering network services. If the reason for augmenting the network is to increase capacity, an alternative is to modify the electrical loading on the network such that the existing electrical infrastructure can supply the customers' requirements.

This technique - demand management (DM) - involves investigating alternatives to network augmentations to meet electrical energy demand requirements DM aims to reduce network demand though conscious activity. It covers a range of actions to alter the level or pattern of consumption of energy, the source of energy, or the use of the distribution network. Traditional methods of DM have been the switching of controllable load or transferring time of peak usage, however, it may also involve promotion or facilitation of external projects by Essential Energy such as:

- Energy efficiency - includes activities that reduce the amount of energy consumed in meeting end-user needs, such as lighting, heating/cooling and power
- Load management - includes activities designed to reduce peak load on the electricity system as a whole, or in particular parts of the system. Examples include customer power factor correction, curtailable or interruptible load agreements, off-peak hot water control systems, fuel substitution, time of use tariffs, hydrogen storage systems, water storage systems to reduce pump sizes, other energy storage systems, cycling of air-conditioning and smart-house systems
- Distributed or embedded generation - refers to electricity generation that is connected within a customer's or distributor's network rather than traditional upstream centralised generation.

DM can involve working directly with single customers, or in groups, to modify their energy use, and with third party energy service providers in the provision of energy and network support services.

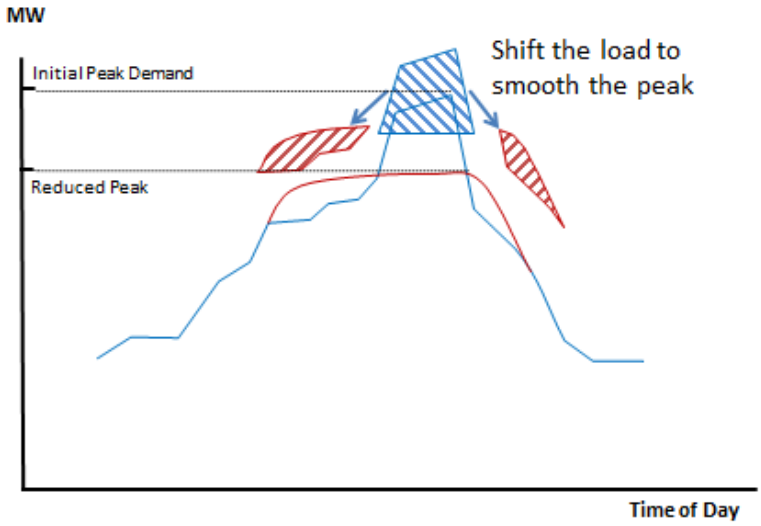


Figure 7: Example: Load Management - Modified Demand Curve

The overall objective of network planning is to achieve required outcomes at least cost, while at the same time maintaining the desired quality, security and reliability of electricity supply to all customers. Essential Energy's Demand Management Strategy incorporates obligations under the Distribution Network Service Provider Licence imposed by the *Electricity Supply Act 1995* (NSW), and the *National Electricity Rules*.

The National Electricity Rulesprovides guidance to distributors on how to meet licence obligations through the market-based development and evaluation of feasible options for electricity system support (including demand management, embedded generation and storage options).

4.5.1.1 Demand Management Process

DM strategies are specifically investigated by Essential Energy for major asset categories including:

- Construction of new zone and subtransmission substations and subtransmission lines, including the installation of new power transformers and associated substation equipment or new subtransmission line conductor or cables
- Major augmentation of existing zone and subtransmission substations and subtransmission lines, including the upgrading of existing power transformers or associated substation equipment or the upgrading of existing subtransmission line conductor or cables that substantially increases the capacity of the substation or line
- Construction of a new major distribution system including distribution development associated with new zone substations.

Projects of a minor nature generally do not require DM assessment as there is often no real benefit.

A market-based approach is employed by Essential Energy when constraints emerge for these types of system assets. The two key opportunities to use market mechanisms in electricity system development are: the improvement of information gathering and identification of options; and in the testing for, and selection of, the best option for network development.

The framework adopted by Essential Energy ensures its rigorous application over all appropriate major electricity system augmentation projects is built on three main protocols:

- Disclosure Protocol - a process for informing the market by disclosing appropriate information concerning the current and future state of the electricity supply system
- Specification Protocol - a process for fully and consistently specifying the constraint in the electricity supply system. This is a higher level of detail required when action is being taken to address a specific constraint
- Evaluation Protocol - a process for fairly and consistently evaluating proposals to overcome this constraint.

The Disclosure Protocol requires Essential Energy to prepare and publish a Distribution Annual Planning Report (DAPR) annually. This document provides forecast peak load data and capacity information for all zone substations and, where appropriate, supply regions, and discloses identified network constraints forecast to occur within five years and possible generic system support options. This information provides the basis for consultation and ensures competitive neutrality by providing customers and third party energy service proponents with comparable access to the information required to develop alternative proposals, and whether they may be able to assist Essential Energy in addressing the network constraint through the implementation of DM.

The Specification Protocol requires Essential Energy to consult with customers and interested parties in relation to specific system constraints and options to address them, including specifying the level and timing of system support required. Essential Energy will issue a formal Request for Proposals or some other direct approach to the market, for electricity system support or demand reduction for each constraint area or part of the network identified.

The Evaluation Protocol provides third parties with confidence that their proposals will be given due consideration in the evaluation of proposals. All conforming options are evaluated and ranked on the basis of total annualised cost of providing the system support, adjusted to account for the relative risk profile of options. Essential Energy will publicly announce the recommended option(s) resulting from the evaluation and the annualised cost of the recommended option(s).

The Review discloses information on Essential Energy's transmission substations and zone substations within the company's subtransmission system having a primary supply voltage of 33,000 Volts or above, as well as information on primary distribution feeder limitations. The review includes the following information:

- Technical information
- Historical loads
- Future forecasts
- Likely system constraints
- Simple diagrams of the subtransmission system surrounding each major supply region.

Essential Energy reports DM activities as part of the annual Electricity Network Performance Report. The DM section of the report outlines Essential Energy's approach and strategies with specific reference to:

- Demand management projects that have been investigated in response to expected network constraints and which have either been approved for implementation or determined to be non - viable
- Costs and benefits of demand management activities, including estimates of peak demand reduction achieved, years of deferment, expected reduction in capital investment and any associated CO^2 reductions.

Essential Energy maintains a Register of Interested Parties. Any party requesting to be added to this Register will be kept informed of developments relating to supply constraints.

For registration as an Interested Party or to request a copy of Essential Energy's DAPR please contact Essential Energy's Forecasting and Demand Management Manager on 13 23 91 or email: dmcoordinator@essentialenergy.com.au

4.6 Reliability, Quality and Security of Supply

Essential Energy is focussed on ensuring that reliability, quality and security of supply is best practice for all areas and, in particular, the predominantly rural, overhead line network.

The level of network performance experienced by customers is determined by capital, maintenance and operating cost decisions made.

As Essential Energy's asset management approach for reliability improvement is largely driven by the rural nature of the network, it is important to understand what this means and how it relates to maintaining service levels.

Essential Energy's network is approximately 200,000 kilometres in length, of which 98 per cent of the total line length consists of overhead line construction and over 96 per cent of the total high voltage line length is located in rural areas. In terms of industry average, Essential Energy has a greater portion of overhead distribution lines which in turn, has the greatest impact on the reliability of supply as it is significantly less reliable than the underground equivalent due to exposure to environmental factors such as weather, lightning, bushfires and vegetation growth.

Generally the number of faults/interruptions experienced on an overhead feeder is related to its length. The longer the feeder the more faults that can be expected to occur. Interruptions of the 11 kV and 22 kV distribution systems represent over 80 per cent of all outages and the greatest proportion of minutes lost per customer. While altering the infrastructure type can have a significant impact on reliability, this would also have a major impact on capital and operating expenditure, as undergrounding is far more expensive.

Historically, environmental factors on the radial overhead system dominate and account for the greatest number of outage causes. The harsher the environment, the higher the level of expenditure required to achieve a consistent level of reliability. Similarly, over 99 per cent of all distribution substations are pole-mounted. Pole-mounted distribution substations are the most economical, yet least reliable, type of distribution substation, predominantly due to their exposure to environmental factors.

4.6.1 Reliability Standards

The NSW Minister for Energy has published Licence Conditions which incorporate, Design, Reliability and Performance Criteria to facilitate the delivery of a safe and reliable supply of electricity. The Reliability Standards are underpinned by the Design Planning Criteria (Attachments A and B) to provide a basis for the assessment of performance and to ensure that the minimum average reliability performance is maintained for the distribution network.

Essential Energy is committed to maintaining network service levels compatible with the requirements of the distribution licence conditions, to address identified customer requirements, to improve the reliability and quality at certain locations within the network that underperform when compared to licence condition standards, and to maintain the overall average network supply reliability and quality.

Essential Energy's Electricity Supply Standard (CEOP8026 Supply Standards) provides details of the objectives Essential Energy has adopted in relation to the various system characteristics that influence quality, reliability and security of electricity supply. Its purpose is to give customers an insight into the performance of the distribution system and the actions taken by Essential Energy to manage and minimise interference and interruptions to supply.

The reliability of the system can be qualified in terms of a variety of performance measures, which reflect reliability from a customer perspective. The level of reliability is related to the extent, number and duration of loss of electricity supply to customers.

Essential Energy measures the performance of its distribution system in accordance with the following reliability measures:

> System Average Interruption Duration Index (SAIDI) normalised which measures the total number of minutes, on average, that a customer on a distribution network is without electricity in a year; and

> System Average Interruption Frequency Index (SAIFI) normalised which measures the average number of times a customer's supply is interrupted per year.

Essential Energy is required to maintain a minimum average level of reliability performance, by feeder category, across the network. In any financial year, the company must not exceed the annual average time customers may experience sustained loss of supply (SAIDI) or the annual average number of interruptions customers may experience (SAIFI) that apply to the feeder categories (excluding momentary interruptions).

Essential Energy's goal for reliability is based on:

> Maintaining average reliability performance across the network for the urban, short rural and long rural feeder types to the SAIDI targets set in the licence conditions

> Improving individual feeder reliability performance SAIDI across the network towards the licence standards

> Improving the reliability performance of worst served customers.

SAIDI actual versus target results are detailed below:

Feeder Type	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
Urban Target	140	137	134	131	128	125	125	125
Urban Actual	103	114	80	110	69	66	80	73
Short Rural Target	340	332	324	316	308	300	300	300
Short Rural Actual	304	239	233	285	204	245	238	237
Long Rural Target	750	740	730	720	710	700	700	700
Long Rural Actual	609	497	431	483	384	493	478	450

Table 1: SAIDI normalised Average Standards - Actual and Target Results

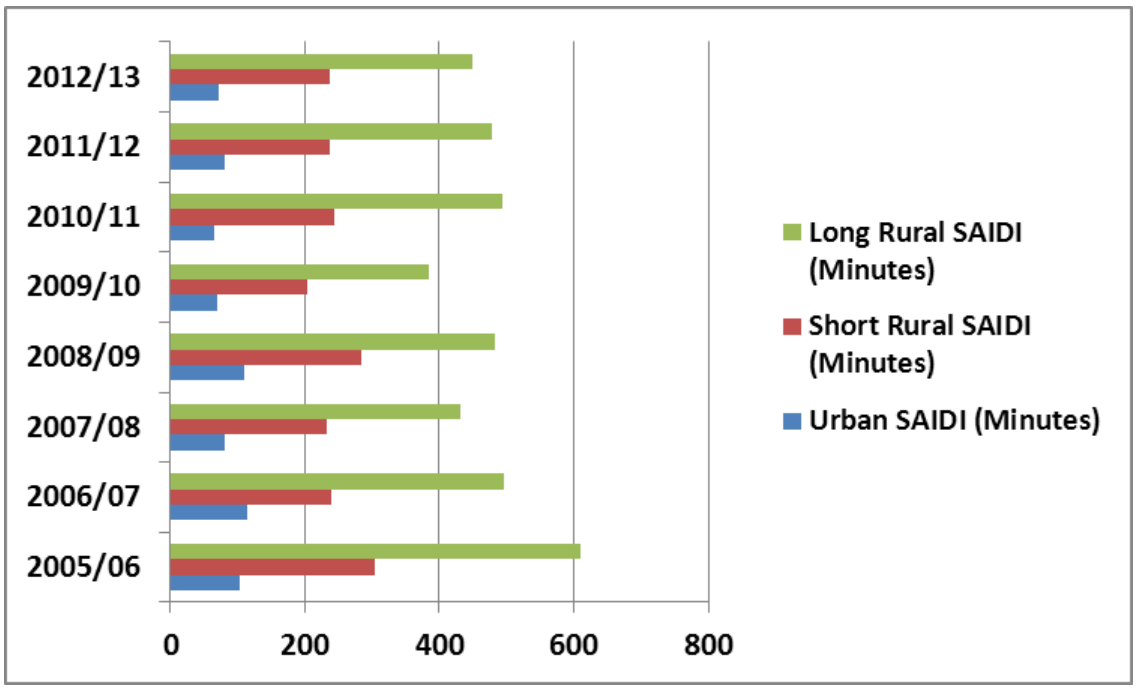


Figure 8: SAIDI normalised Reliability

Similarly, Essential Energy's goal for reliability surrounding the frequency of interruptions is:

> Maintaining average reliability performance across the network for the urban, short rural and long rural feeder types to the SAIFI targets set in the licence conditions

> Improving individual feeder reliability performance SAIFI across the network towards the licence standards

> Improving the reliability performance of worst served customers.

SAIFI actual versus target results are detailed below:

Feeder Type	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
Urban Target	2	1.96	1.92	1.88	1.84	1.8	1.8	1.8
Urban Actual	1.45	1.36	1.21	1.36	1.04	0.85	1.16	0.86
Short Rural Target	3.3	3.24	3.18	3.12	3.06	3.0	3.0	3.0
Short Rural Actual	2.75	2.47	2.42	2.58	2.19	2.38	2.21	1.94
Long Rural Target	5	4.9	4.8	4.7	4.6	4.5	4.5	4.5
Long Rural Actual	4.25	3.82	3.50	3.47	2.88	3.37	3.28	2.94

Table 2: SAIFI normalised Average Standards – Actual and Target Results

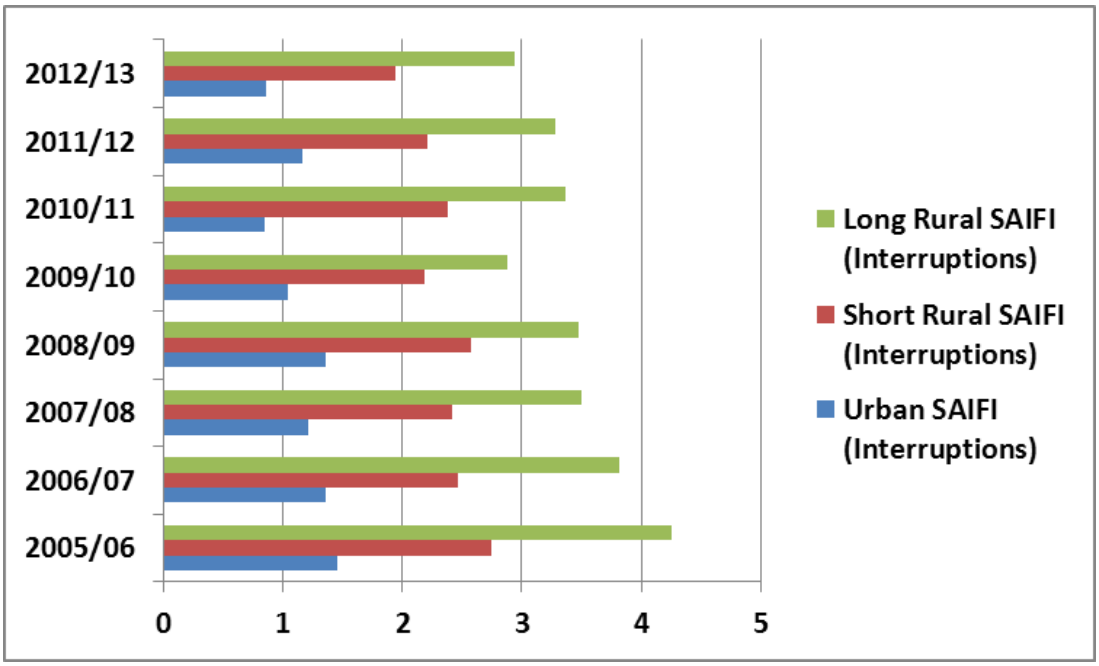


Figure 9: SAIFI normalised Average Standards

A proactive approach to reliability improvement management will continue into the next regulatory period - meeting the expectations of stakeholders whilst delivering value and reliability gains to customers.

There are a variety of reasons why some customers receive lower service levels in some areas of the rural network. The most significant is remoteness within Essential Energy's vast service area, the length of the supplying infrastructure, network configuration and design, low customer density, the condition of asset components, aggressive environments such as vegetation and storms, and the cost of improving reliability.

4.6.1.1 Individual Feeder Standards

To ensure that all customers receive a minimum standard of reliability performance, the licence conditions contain individual feeder standards for both SAIDI and SAIFI.

Essential Energy is equally focussed on meeting the individual feeder standards licence requirements, which is demonstrated by the proactive remediation work that has already been carried out on individual feeder improvement projects. As a way of incremental improvement, Essential Energy continually rehabilitates poor performing feeder segments.

Feeder Type	Minutes per Customer
Urban	400
Short Rural	1000
Long Rural	1400

Table 3: SAIDI Individual Feeder Licence Condition Standards

Feeder Type	Number per Customers
Urban	6
Short Rural	8
Long Rural	10

Table 4: SAIFI Individual Feeder Licence Condition Standards

Essential Energy employs a structured reliability remediation program designed to proactively address the principle causes of interruptions in rural feeders, which includes a combination of the following initiatives depending on requirements:

- Advancing the replacement of bare overhead conductors and pole top hardware
- Extensive program of recloser and sectionaliser installation and replacement
- Constructing or reinforcing tie-feeder capacity to other rural feeders
- Constructing new small rural zone substations
- Reviewing the coordination of feeder protection devices.

4.6.1.2 Worst Performing Feeder Segments

The Design Reliability and Performance Licence Conditions set performance standards for average reliability at a system and feeder level. These averaged reliability performance metrics may not reflect the experience of customers on the worst performing feeder segments.

Essential Energy's worst performing feeder segment program aims to provide a reasonable level of reliability performance to pockets of worst served customers. This program complements the Licence Conditions to ensure the reliability performance of all customers is considered.

4.7 Asset Renewal

Maintaining or improving, network performance in accordance with distribution licence conditions requires a physical network in good condition. Essential Energy has an Asset Management Strategy which incorporates a long-term asset renewal plan and associated programs.

Essential Energy's asset renewal program compromises two main types of expenditure: asset refurbishment and asset replacement. In each case, the need for asset renewal is substantially driven by the condition and age of the asset.

4.7.1 Economic Drivers for Renewal

The economic life of an asset is the most common method employed in the electricity industry to determine the requirement for replacement of an asset. In general terms, it is the period over which the future economic benefits or service potential of an asset is expected to be received. To a significant extent, the economic life is guided by the technical (or engineering) lifespan of the asset but tempered based on experience of the commerciality of retaining these assets in service beyond their expected life.

For most assets, operating, maintenance and other costs will increase with age. This implies that the commercial (or economic) life, and accordingly the optimal timing for asset renewal, is when the incremental cost of maintaining the existing asset for one or more years exceeds the equivalent annualised cost of a replacement item over its lifetime. Where this occurs, it would be more cost effective and commercially viable to replace the asset, than to continue to maintain the existing asset.

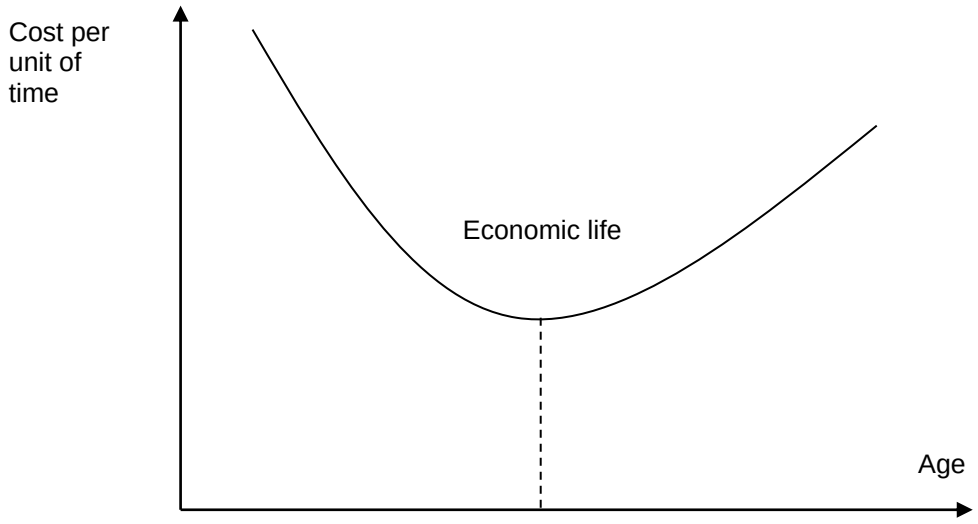


Figure 10: Economic Life Profile

This is therefore a trade-off between operating expenditure and capital expenditure in deciding to renew or maintain assets, based on economic drivers. For higher value assets, where the engineering life is exceeded and the asset is still technically adequate, the concept of a commercial life is particularly relevant.

4.7.2 Technical Drivers for Renewal

However, in the majority of cases it is the assessment of risk, where the condition and age of an asset is judged to give rise to potential failure with major safety and reliability implications, which will be the key reason to require replacement.

In this case, Essential Energy generally considers that an asset is to have reached the end of its life and is replaced when it is considered unfit for its purpose, as part of an ongoing business activity or function. Accordingly, the key determinants of the technical life of assets, and the main drivers that influence the renewal of assets for Essential Energy may include the following:

- Physical condition
- Aging
- Excessive defects
- Construction deficiencies, robustness of the original asset design and materials and methods used
- Type of faults
- Past standard and regularity of inspection, maintenance and repairs carried out
- Load growth and demographic changes
- Uprating due to voltage regulation, thermal constraints or fault duty
- Compliance with reliability, security and quality of supply standards and licence conditions
- Industry accepted technical standards and codes
- Mechanical and/or electrical stresses imposed on equipment
- Environmental factors
- Climatic service conditions
- Obsolescence or technological improvements
- Availability of spares.

Essential Energy has strategies to ensure the timely renewal of system assets based on all of these factors. With the increasing size and increasing average age of the overall asset base, this is particularly important.

4.7.3 Overall Asset Renewal Strategy

Essential Energy's overall strategy for asset renewal involves:

- Ensuring that deteriorating assets are scheduled for renewal following routine inspection and/or condition assessment
- Balancing asset renewal and maintenance approaches to ensure that expenditures are optimised
- Spreading the demand for asset renewal over a manageable period to mitigate the financial impact on the business and on prices for customers.

Essential Energy would not normally implement universal programs for the bulk replacement of system assets that have reached the end of their normal engineering lives. Rather the approach to identifying and prioritising renewal requirements, and the actual decision to renew all, or part, of an asset or group of assets, is typically founded on a range of factors, including:

- Deterioration of condition identified during routine inspections and condition monitoring programs
- Historical failure statistics, where available
- Assessed risk of failure
- Asset reliability and quality of supply performance and compliance
- Environmental, infrastructure security or safety considerations
- Asset age relative to accepted nominal engineering lives
- Analysis of the commercial investment opportunity
- Implementation of specific initiatives.

In order to reduce the risk of failure and increase the service life of assets, Essential Energy has developed inspection, monitoring and testing regimes to verify the condition and serviceability of individual asset classes, their components, and also of high value equipment.

4.8 Asset Maintenance

The aim of asset maintenance planning is to ensure optimal balancing of capital and recurrent expenditure to ensure that maintenance and asset renewal deliver the required level of service at the best possible cost. The maintenance of ageing assets that remain in service becomes more resource intensive over time due to the decline in the condition of the assets, which in turn results in an increase in the inspection and maintenance expenditure to maintain the serviceability of the asset.

Asset planning takes into account that operating and maintenance programs are influenced by the level of capital expenditure undertaken to refurbish or replace poorly performing, deteriorating, and ageing assets. The purpose of asset inspection and maintenance planning is to provide a safe network, while maintaining a balance between the condition of system assets, the incidence of premature failure, asset reliability, operational life, service objectives and compliance obligations, and reducing the demand on expenditure.

Over the whole life of an asset operating costs can accumulate to an amount which substantially exceeds the initial purchase cost, therefore, attention to the cost and effectiveness of the organisation's inspection and maintenance regime is essential to the overall asset management strategy. An important consideration of this is that while improvements in the efficiency and effectiveness of inspection and maintenance programs can offer significant benefit, maintenance neglected is not maintenance avoided, as this will only defer liability and increase risk.

4.8.1 Maintenance Strategy

Essential Energy's Maintenance Strategy consists of the following strategic elements:

- Asset condition is actively monitored
- Testing, preventative and corrective maintenance is employed
- Asset data is captured through maintenance practices
- Essential spare parts are actively managed
- Risk-based techniques are employed to prioritise maintenance activity.

Essential Energy's strategies, work programs, and future expenditure requirements for each asset class and equipment category incorporates incremental inspection, vegetation control and maintenance works programs based on the identification and assessment of new risks and consolidation of known defects.

The inspection and assessment processes are commensurate with the operational environment and required performance of the equipment. Maintenance activities and programs are based on defects identified, and actions recommended, as part of the routine inspection program.

The most appropriate strategy for the network asset will depend on:

- The type of asset to be inspected and maintained
- The consequences of breakdown or non-performance of the asset
- The availability of resources to execute the maintenance.

Essential Energy uses a number of industry accepted best practices to identify potential defects for the particular asset class concerned. These practices have been developed with reference to the Electricity Supply Act, Industry Codes of Practice and the New South Wales Government Total Asset Management requirements and comprise of the following:

4.8.1.1 Periodic inspection and maintenance

This involves undertaking inspection, vegetation clearing, and maintenance work on a fixed time basis. This type of work practice is appropriate for asset classes where condition based maintenance cannot be applied.

4.8.1.2 Condition based maintenance

This involves analysing information obtained from condition monitoring programs and measuring the extent of degradation to determine when maintenance is required, or plan for replacement before failure occurs. This work practice is usually applied to high value equipment, such as power transformers and zone substation equipment. An example is the taking of oil samples for dissolved gases to indicate internal insulation failure.

4.8.1.3 Preventative Maintenance

This involves undertaking maintenance to prevent or minimise deterioration of equipment in service, or halt any decay process in progress. The application of chemical treatments to wood poles to deter fungal decay is an example.

The type and frequency of inspection and tests of the subtransmission and distribution system are detailed in each individual asset management plan for each asset class. Irrespective of the particular maintenance practice, Essential Energy's workforce planning and scheduling procedures ensure that the most efficient approach is taken in consolidating work packages, such as the formation of specific feeder based programs to ensure that both the number and duration of planned outages is minimised in terms of potential impact on the capacity and availability of the network to customers.

5 ASSET MANAGEMENT

This section describes the asset management strategies employed in the design, construction, operation and maintenance of the sub transmission and distribution system that ensures Essential Energy's assets are effectively and efficiently managed.

5.1 Asset Management Policy

The key corporate policy is the Asset Management Policy which describes Essential Energy's commitment to the management of its assets and commitment to:

- Make asset management an important part of standard business practice
- Comply with relevant legislation, regulations, codes and licences
- Safeguard and maintain Essential Energy assets
- Record and monitor asset use
- Insure assets against loss, theft or damage within risk management guidelines
- Follow corporate guidelines when purchasing or disposing of assets
- Comply with safety and environmental requirements
- Seek the best possible balance between performance, costs and risk over the asset's life.

5.2 Asset Management Strategy

Essential Energy is continually reviewing the performance of its network to ensure optimal outcomes are achieved in line with customers' expectations of system reliability and quality of supply. This involves the development and review of Asset Management Strategies, Policies and Procedures for the construction, maintenance, refurbishment and replacement of all network assets.

Essential Energy's Asset Management Strategy is based on the NSW Government's strategic approach to physical asset planning and management - Total Asset Management (TAM) - which aligns asset planning with service delivery priorities. The content of this chapter of the Network Management Plan - Chapter 1: Network Safety and Reliability - outlines the company's approach to network safety and reliability which links the Network Planning Framework to the development of the Network Asset Management Plan (NAMP), consistent with TAM guidelines.

The British Standards Institution's (BSI) specification for the optimised management of physical assets (PAS 55 framework) provides similar guidance for a whole-life management system for physical assets in demonstrating competence, establishing improvement priorities and connecting strategic plans to operational needs.

While compliance with this particular standard is not required and has not been sought, notably PAS 55 has become internationally recognised and has now been adopted by the International Standards Organisation (ISO) as the basis for development of the new ISO 55000 series of international standards for Asset Management, anticipated for release in 2014.

Essential Energy will continue to monitor the development of standards that have the potential to influence business practices, improve efficiency and increase customer satisfaction in line with key stakeholder expectations.

A summary of the alignment of Essential Energy's current framework with the PAS 55 framework is provided in Table 55: Alignment with PAS 55.

Main sections of PAS 55	Essential Energy documents, processes, systems and activities used to undertake asset management as specified in the PAS 55
Organisational strategic plan	Essential Energy's Strategy Statement - CECS1000
Asset management Policy	Asset Management Policy – CECP1004
Asset management strategies	Network Strategy documents > Reliability Strategy > Quality of Supply Strategy > Demand Management Strategy > Intelligent Networks Strategy. The NAMP provides an overview of the network management strategies.
Asset management objectives	The NAMP defines the overall asset management objective. Each individual Asset Management Plan (AMP) captures stakeholder requirements and specific objectives for the AMP.
Asset management plans (AMPs)	Essential Energy has 13 AMPs and one vegetation management plan that constitutes a suite of asset management plans.
Organisational values, functional standards, required processes	Strategy Statement - CECS1000 (priorities) Relevant internal and external standards and regulations.
Acquire, utilise, maintain, renew/dispose	The NAMP outlines the asset management process and the life-cycle activities. Each AMP details the lifecycle strategies developed to meet the performance targets and stakeholder requirements.
Portfolio of assets – Network assets	Each AMP details asset capabilities and asset data (numbers, type and other asset related data)
Performance and condition monitoring	Each AMP details asset condition and capability, performance requirements and improvement activities.
Continual improvement	The NAMP provides a high level overview of the improvement process and initiatives to be developed. Each AMP details relevant improvement plans and asset management initiatives to improve the asset management process. The Corporate Dashboard captures organisational KPIs and improvement initiatives.
Asset management enablers and controls	Essential Energy procedures, systems and databases – the asset management framework details asset management enablers, data sources, control systems, management processes and information sources.

Table 5: Alignment with PAS 55

5.3 Network Asset Management Plan

The Network Asset Management Plan (NAMP) describes how Essential Energy takes a long-term view in managing its assets to deliver the required service levels to customers connected to the electrical network. The NAMP summarises the asset management strategies and plans to be employed over the life of the assets and identifies the performance targets required to meet the needs and expectations of customers, community, shareholder and other stakeholders, and to comply with applicable statutory and regulatory requirements.

The NAMP is the principle reference document for asset managers, senior managers and key stakeholders, and all employees associated with the asset management process. It conforms to the principles set out in the NSW Total Asset Management (TAM) Policy. The NAMP provides a consolidated overview of all the asset management plans and summarises the resources, key outcomes and strategies undertaken to manage the network to the required service levels.

Essential Energy's strategy for Network Asset Management has resulted in the development of a framework which incorporates a set of best practice procedures for Strategic Network Management. The key elements of this framework and how they interrelate are represented in the figure below.

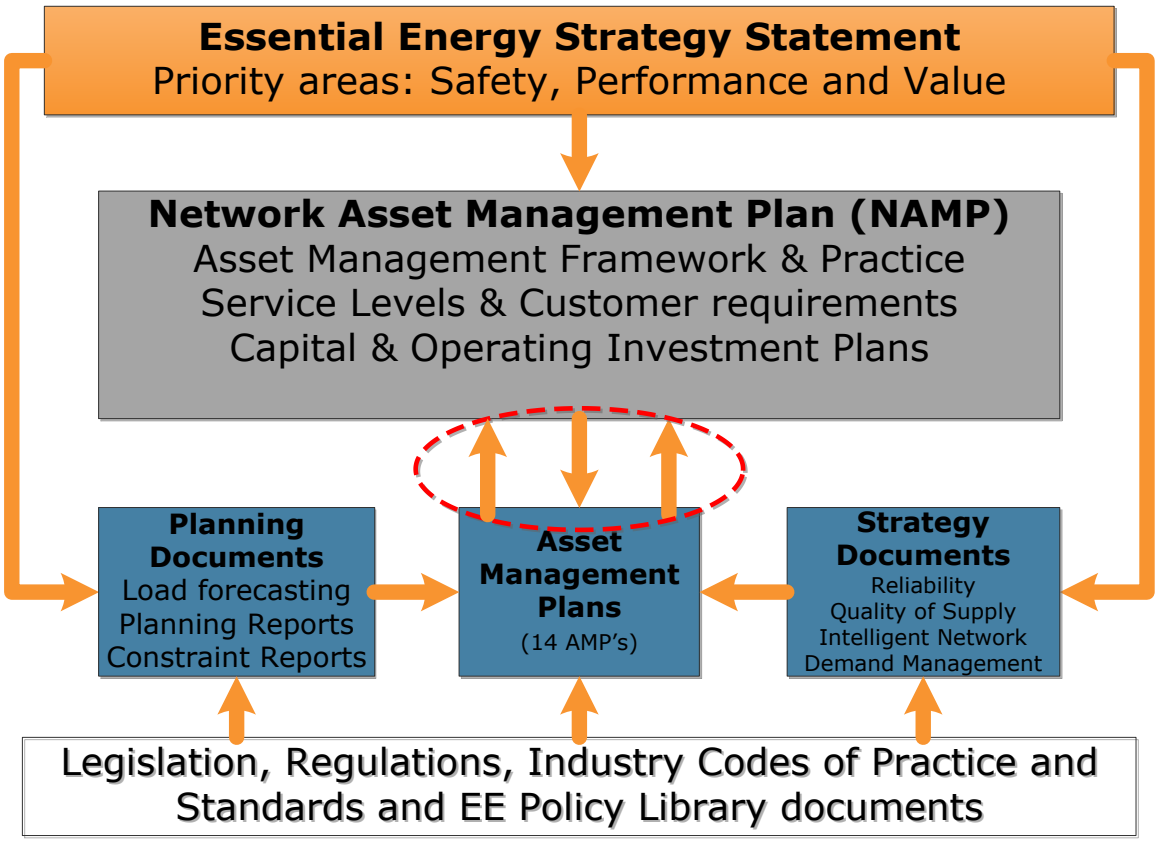


Figure 11: Asset Management Framework

5.4 Individual Asset Management Plans

Individual Asset Management Plans (AMPs) have been developed for specific asset classes with a view to operating, maintaining and renewing the assets within the class in the most cost effective manner, whilst providing a specific level of service based on stakeholder requirements and asset capability. These classes are listed below:

>	Distribution Overhead Feeders	CEOM8018.01
>	Customer Connections	CEOM8018.03
>	Distribution Substations	CEOM8018.04
>	Network Underground Systems	CEOM8018.05
>	Subtransmission Overhead Feeders	CEOM8018.06
>	Telecommunication Bearer Equipment	CEOM8018.07
>	Load Control Equipment	CEOM8018.08
>	SCADA and DSA equipment	CEOM8018.09
>	Generation	CEOM8018.10
>	Subtransmission Transformers	CEOM8018.11
>	Subtransmission Equipment	CEOM8018.12
>	Metering	CEOM8018.13
>	Public Lighting Equipment	CEOM8018.14
>	Vegetation Management	CEOM8018.15

5.4.1 Asset Management Framework

The Asset Management Framework pprovides an overview of the asset management environment as set out in the overarching Network Asset Management Plan (NAMP). In particular, it provides an overview of Essential Energy's mission, vision and corporate objectives, the business' capital governance and asset management practices, relevant responsibilities and accountabilities, key policies, standards, processes and systems.

Each AMP uses a consistent methodology to describe specific details of the business' obligations relating to the management of the particular asset, and the relevant strategies and plans Essential Energy uses to meet these obligations.

There are control and management processes in place to ensure appropriate governance and strategic management of the assets which incorporates the overarching strategies that influence or guide the asset management outcome to achieve the stakeholder requirements.

A brief description of the key components underpinning the individual AMPs is detailed below.

5.4.1.1 Service Level Obligations

Essential Energy is focussed on satisfying all of the obligations of a State-Owned Corporation. The company's capital and operating program aims to ensure long-term value for regional development, effective environmental management and appropriate social responsibility.

Service Level Obligations for each asset group identify the relevant requirements of the various stakeholders and defines the required service levels, optimisation, criticality and risk management criteria, along with the asset management objectives.

5.4.1.2 Forecast Service Demand

Essential Energy's Network Planning Strategy ensures that network assets can continue to achieve service level obligations required for each asset category. The Forecast Service Demand sets out the demand for the assets' services and provides insight into the drivers of demand, the basis of the forecast, assumptions, sensitivities and the forecast's confidence level. This might include:

- Growth in the network, requiring additional equipment
- Organic growth in network demand, necessitating more capacity
- Licence compliance requirements
- Replacement of assets reaching the end of their productive life
- Replacement of equipment that fails in service.

5.4.1.3 Asset Information and Capabilities

Asset Information and Capabilities provides an overview of the assets that Essential Energy currently uses to meet the stakeholder requirements in the particular category and considers key issues relevant to understanding the overall current state of the asset, as a measure of capacity, to continue to provide an adequate level of service incorporating, for example, the role of the asset, a breakdown by type, voltage level and age profile.

5.4.1.4 Asset Performance and Risk

Essential Energy utilises an Asset Management Framework which incorporates business-wide asset management practices to support the monitoring, measurement and improvement of individual asset performance. The Framework aligns with the ISO9000 quality management principles which are underpinned by continuous improvement.

Asset Performance and Risk provides an assessment of the performance of the asset against the required service levels in the context of the service demand forecast over the timeframe of the Asset Management Plan. Maintenance of service level performance is assessed and any performance gaps defined in terms of the extent, timing, risk and cause.

5.4.1.5 Life Cycle Management Strategies

Life Cycle Management Strategies describes longer term asset life cycle related considerations incorporating maintenance, refurbishment, operation and asset disposal. The strategies are linked to the maintenance or achievement of the required service level and to the interrelationships of the strategies across the broader business context.

5.4.1.6 Asset Investment Plans

Essential Energy uses a combination of capital and operating expenditure to maximise the technical performance of the assets, whilst at the same time preserving the value of the assets in the most cost effective and sustainable way.

Capital Investment Plans (incorporating growth, reliability, refurbishment, safety and legal expenditure requirements) and Operating Investment Plans (incorporating operating and maintenance expenditure requirements) have been developed to illustrate the requirements in each area.

Asset Investment Plans document the specific investment the business will use in following the asset management strategies, along with relevant supporting information regarding cost, timeframe and resource requirement. The relationships between the individual AMPs and the overarching strategy are also considered, along with the interrelationships between these plans and the strategy of the broader business.

5.4.1.7 Monitoring and Improving Asset Management

The Asset Management Plans include investment cases, references to planning requirements and other documentation which justifies and supports the expenditure required to own, operate and maintain each asset group; and the performance and development of Essential Energy's asset management strategies, capabilities and technology.

5.4.2 Operating Strategy

The Operating Strategy applicable to Essential Energy's assets enables achievement of the service level obligations while minimising the overall life cycle costs, through active risk management and operational practices that maintain compliance with design parameters. To achieve this outcome Essential Energy employs an operating strategy that consists of the following strategic elements:

- Asset availability is proactively managed
- Operational risk is understood and managed
- Operation is aided by engineered protective measures
- Assets are operated within design parameters
- Operational resources are strategically deployed.

5.5 Risk Management

Essential Energy's Enterprise Risk Management Framework applies across the business and consists of a wide range of interrelated procedures and processes. The Framework makes an important contribution to the business as it strives to achieve its corporate strategy and objectives. It undergoes continuous improvement under the guidance of the Essential Energy Board and the Audit and Risk Committee.

Essential Energy manages risk by identifying risk, analysing it and then evaluating whether the risk should be modified by risk treatment in order to mitigate potential impacts. Communication, monitoring and review are also important elements of the process. This process of managing risk aligns with the International Standard ISO 31000 Risk Management – Principles and Guidelines.

The key initiatives within Essential Energy's Risk Management Framework are outlined below.

5.5.1 Corporate Risk Assessment

An annual Corporate Risk Assessment is undertaken consulting divisional management and the Executive. Material business risks are identified, analysed and rated. The risk assessment process considers Essential Energy's corporate objectives, inputs from strategic planning sessions, industry research, internal surveys as well as operational and executive management discussions. Outcomes from the risk assessment feed into the business planning process.

In the course of recent corporate risk assessments, Essential Energy has identified key corporate risks in the following areas:

- Bushfire (major)
- Flood/cyclones/storms
- Revenue
- Asset strategy/network plan
- Safety
- Information and system security
- Productivity and cost structure
- Industry reform
- IT system functionality and reporting
- Supply chain and procurement
- Environmental management
- TSA conclusion/network readiness
- Physical security.

5.5.2 Risk Management Plans

Risk Management Plans to address the material business risks are developed by divisional management and approved by an Executive sponsor. The status of the Risk Management Plans are reported to the Executive on a monthly basis and to the Audit and Risk Committee (ARC) quarterly via the Essential Energy Corporate Dashboard.

Some of the key corporate risks that are directly related to network operations include:

- Bushfire risk – covering the impacts that a major bushfire caused by Essential Energy's activities or assets would have on employees, communities and the environment. Key mitigating programs include:
  - Annual bushfire season preparation program, including aerial inspections
  - Vegetation management and reporting
  - Network maintenance and asset inspection programs
  - Bushfire assurance panel and work group.
- Safety risk – covering safety considerations for Essential Energy employees, contractors and the public. Key mitigating programs include:
  - Safety management tools (TotalSAFE)
  - Electrical Safety Office (ESO) and various safety committees
  - Electrical Public Safety plans
  - AS/NZS4801 certification and audits.
- Environmental risk – including accidental leakage, contamination or impact caused by Essential Energy's assets or activities. Key mitigating programs include:
  - Environmental management tools (TotalSAFE)
  - Regular environmental inspections and audit programs
  - ISO14001 certification and audits

- Investigation and reporting on incidents to Environmental Alliance meetings.

> Physical security risk – including acts of theft, tampering, public safety and other security risks relating to Essential Energy's assets. Key mitigating programs include:

- Operational security enhancement program
- Critical infrastructure protection initiatives
- Zone substation and depot fencing upgrades.

5.5.3 Internal Audit Program

The Internal Audit Program is aligned with the material business risks and Essential Energy's corporate objectives. The audit program aims to audit high-risk processes and systems. The annual internal audit plan is endorsed by the Executive and approved by the Audit and Risk Committee. The status of the audit program and progress against any resulting management actions is monitored independently and reported to the Audit and Risk Committee.

5.5.4 Audit and Risk Committees

The Audit and Risk Committee includes representatives from Essential Energy's Board and is responsible for oversight of the risk management framework and internal audit program within Essential Energy. The Audit and Risk Committee meets every two months A Risk Work Group consisting of divisional management representatives provides a communication channel for risk management activities between the business, the Executive and the Committee.

5.6 Public Liability

Essential Energy utilises the purchase of various insurance products to manage risk. Programs are reviewed regularly against premium cost, scope of cover and retention levels to ensure optimum total cost of risk in accordance with corporate objectives.

Essential Energy purchases liability insurance through participation in the NSW Electricity Distribution Industry Group Liability Insurance Scheme which is administered by a Committee that consists of representatives of insurance professionals from the three NSW distributors – Ausgrid, Endeavour Energy and Essential Energy. The Scheme covers the purchase of Fire and General Liability (including Public/Products Liability) Professional Indemnity and Directors' and Officers' Liability Policies. The services of an international insurance broker are utilised in placing cover.

Essential Energy also controls risk to corporate and network property, and fleet assets through comprehensive insurance programs and carries Workers Compensation and CTP Insurance in accordance with statutory requirements.

5.7 Customer Technical Service Standards

Under the *Electricity Supply Act 1995* (NSW) and the *National Energy Retail Law*, Essential Energy has an obligation to comply with all Guaranteed Service Levels. Compensation may be payable to customers for Essential Energy's failure to comply with some of these Guaranteed Service Levels.

Details of the standards and any applicable compensation are given in Essential Energy's Customer Connection Contracts. There are seven Guaranteed Service Levels which cover:

> Customer connection services

> Street lighting

> Reliability of service and supply

6 SAFETY AND EMERGENCY MANAGEMENT

This section describes the various components of the Safety Management Strategy employed for the purpose of ensuring the safe operation of the subtransmission and distributions system. Essential Energy's aim is to integrate Health, Safety and the Environment (HSE) into all operations.

6.1 Health, Safety and Environmental Policy

Essential Energy's Corporate Policy CECP1000 Health, Safety and Environmental (HSE) Policy details that the safety, security, health and well-being of our employees, customers, contractors, visitors, labour hire employees, the public and the environment are our highest priority.

Essential Energy has developed a HSE Management System in accordance with the requirements of AS/NZS 4801-2001 Occupational Health and Safety Management Systems and AS/NZS ISO 14001:2004 Environmental Management Systems. The system is described by CECM1000 Health, Safety and Environmental Manual. The manual comprises the following elements:

- System - details Essential Energy's approach in addressing the requirements of the Standards
- System Common - provides specific details on topics that form part of the System but are considered common to all divisions within Essential Energy
- Safety - provides safety related information at an operational level, by separating the information into specific subject areas
- Security - provides security related information at an operational level, by separating the information into specific subject areas
- Health - provides health related information at an operational level, by separating the information into specific subject areas
- Environment - provides environment related information at an operational level, by separating the information into specific subject areas
- HSE Handbook - summarises the individual components of the manual to provide an overview of the subject areas.

Essential Energy's integrated Health, Safety and Environmental Management System (HSE MS) is based on the Plan-Do-Check-Act (PDCA) principle, being a reiterative process described as follows:

- Plan - establish the objectives and processes necessary to deliver results in accordance with WHS&E policy
- Do - implement the processes
- Check - monitor and measure processes against HSE environmental policy, objectives, targets, legal and other requirements and report the results
- Act - take actions to continually improve performance of the HSE Management System.

The performance of the HSE MS is reviewed regularly and opportunities for improvement are identified and initiated.

Employee, Union and contractor consultation are integral parts of the Safety Management System, which can be accessed on Essential Energy's Policy Library.

6.2 Analysis of Hazardous Events

A critical component of Essential Energy's safety strategy is hazard identification, risk assessment and control.

Essential Energy's CECM1000 Health, Safety and Environmental Manual addresses WHS&E risk management, including hazard identification, risk assessment and control methodology and process control procedures.

6.2.1 Analysis Procedure

Essential Energy recognises that the electricity supply industry involves many hazardous situations, exposing employees, contractors, the public and the environment to varying levels of risk.

Essential Energy maintains a comprehensive HSE Hazards Register. The register includes Essential Energy's analysis of hazardous events which may reasonably be expected to occur in the course of its construction, maintenance and operation activities.

The SSHE Hazards Register:

- Lists hazards and hazardous events which have been reported or foreseen, and those which have been identified from incidents that have occurred
- Lists the risks and risk levels (likelihood and consequence) those hazards present
- Lists the available risk controls that will reduce the risk of harm
- Is a compilation of the hazards identified from all operations within Essential Energy (including the Electricity and Water divisions).

The analysis of hazardous events includes:

- Prompt incident reporting
- An appropriate degree of investigation
- Determination of cause(s), risk(s) and risk level(s)
- Determination of corrective and preventative actions incorporating risk controls.

Essential Energy has developed and implemented the TotalSAFE system which enables reporting and subsequent management of:

- Safety and environmental incidents
- Work process or system improvements/suggestions
- External contractors or supplier non-conformances.

6.2.2 Review of HSE Hazards Register

The Corporate Health, Safety and Environment Committee (CHSEC), as defined in CECM1000.04, Consultation, Communication and Performance Reporting, meets on a quarterly basis, or as required. The CHSEC has as a standing agenda item to review Essential Energy's hazard management practices. CECM1000 Health, Safety and Environment Manual further require that the CHSEC standing agenda item includes hazard identification and the HSE Hazards Register.

6.2.3 Development of Procedures

The risk controls in the HSE Hazards Register are progressively being developed into more detailed documents providing the necessary operational, maintenance and organisational safeguards.

Conversely, the need for some documents is clear and their development may precede the entering of relevant data in the HSE Hazards Register. Nevertheless, reference to the HSE Hazards Register is required to ensure consistency, to avoid duplication and to keep the HSE Hazards Register current.

6.2.4 Hazardous Events Occurring During Construction

All construction work requires some degree of hazard identification, risk assessment and control before work commences. Essential Energy's CECM1000 Health, Safety and Environment Manual applies to all employees, contractors and service providers. The purpose of the WHS and Risk Management section within the document is to help workers create and maintain a safe worksite whilst performing work by:

- Knowing the types of work requiring the worksite Hazard Identification, Risk Assessment and Control (HIRAC) process and form completion and when exemptions apply
- Being able to identify worksite hazards, assess the risks, determine risk controls, implement them and continue to look out for new hazards and/or altered risks
- Understanding responsibilities for the process
- Specifying minimum field and desk top audit requirements.

6.2.5 Maintenance Schedule

Essential Energy utilises the NAMP framework to initially summarise the asset management strategies and plans to be employed over the life of the asset. More detailed information is provided by the individual Asset Management Plans (AMPs) providing detail around operating and maintaining the assets within the class in the most cost effective manner, whilst providing a specific level of service based on stakeholder requirements and asset capability.

6.3 Emergency Management

Essential Energy utilises a multilevel response to emergency management to provide a robust and reliable method of restoring Essential Energy's ability to supply key products and services to an agreed level within an appropriate time after a disruption occurs. This incorporates strategic, tactical and operational elements to identify and categorise various levels of emergency and subsequently detail the organisational structures, roles and responsibilities applicable to an event with the potential to exceed the organisation's typical capacity to respond with 'business as usual' measures. This is to ensure that the required response is commensurate with the impact on the network in terms of reliability of supply, safety of staff and the public, and the environment.

The types of emergencies to which Essential Energy's procedures apply include, but are not limited to: natural disasters; civil disturbances; fires; explosions and other impacts, including those caused by impacts of external parties. Natural disasters and civil disturbances which may require a significant and coordinated multi-agency response are provided for under the NSW District Disaster Plan (DISPLAN) which deals with fires, explosions, floods, storms and bomb threats. DISPLAN provides for management of such emergencies at both local and district levels.

Essential Energy's, Electricity Networks Escalation and Recovery Plan, provides tactical response for major network events, either natural or man-made, which have a major impact on the electrical network. While a response may be required for a single event such as a major storm or flood, a number of incidents can occur as a result of such an event, therefore the procedure is generally applicable where large numbers of customers are without supply.

The purpose of the Electricity Networks Escalation and Recovery Plan is to:

> Provide a framework for escalation of Major Electrical Network Events

> Articulate the roles and responsibilities of the various response groups

> Articulate the roles and responsibilities for Major Incident Coordination

> Articulate the relationship between this procedure and the Regional Emergency Response Plans (RERPs)

> Illustrate the relationship between the plan and other incident management documents.

Regional Emergency Response Plans have been developed for each region which:

> Identify the incident escalation process

> Clarify roles and responsibilities

> Identify adverse conditions and their control measures

> Identify and include local regional information.

Essential Energy is continually and proactively improving resilience to disruptions that can potentially impact the organisation's ability to achieve its key objectives. The success of emergency organisational arrangements and procedures put in place are reviewed and tested as follows:

> For storms/other emergency incidents - by analysing the performance at subsequent debriefs, with procedures amended to reflect recommendations

> For community emergencies - by local trials of DISPLAN

> For building fire/explosion emergencies - by conducting evacuation trials.

Essential Energy's emergency contact number is 13 20 80.

6.4 Competency Requirements (for working on or near the network)

Essential Energy requires employees, contractors, contract employees, service providers and any other persons working on or near its electricity networks to have and maintain the competencies required to work safely. Essential Energy's Electrical Safety Rules (CEOP8030) and the Electricity Transmission and Distribution Asset Management Code of Practice outline the qualifications and training requirements for persons working on or near Essential Energy's assets.

Essential Energy uses competency based assessment in Vocational Education and Training programs to define the skills and knowledge (the competencies) needed to perform effectively in the workplace. Specific Training Packages, developed by industry through the National Industry Skills Councils or by enterprises to meet the identified training needs of specific industry sectors, provide a nationally endorsed set of standards and qualifications for recognising and assessing vocational skills and knowledge. For example, relevant training packages include:

> UEE11 Electrotechnology Training Package Release 1.3.

> UET12 Transmission, Distribution and Rail Sector Training Package Release 2.

The competency standards within the Training Package describe work outcomes. Each unit of competency describes a specific work activity, conditions under which it is conducted and the evidence that may be gathered in order to determine whether the activity is being performed in a competent manner.

Essential Energy maintains databases listing employees' personal details, training courses undertaken, regulatory requirements, competency assessments, qualifications and certification provided by authorised assessors.

Essential Energy, as a Registered Training Organisation (RTO), and in conjunction with other RTOs, delivers training and assessments to employees which are directly aligned to the roles they are employed to carry out. ASQA Registered Training Organisations providing Electricity Supply Industry training include:

- Essential Energy
- Engineering Institute of Technology (EIT)
- Hunter TAFE
- Riverina Institute of TAFE
- Western Institute of TAFE
- Illawarra Institute of TAFE
- North Coast Institute of TAFE.

6.5 Adherence to Safe Work Procedures

Essential Energy has established processes to ensure that employees are informed of all policy and procedure updates along with general safety information; and that compliance with procedures is monitored through internal audit processes.

Information is communicated to employees via the company's intranet (Essentialnet), various internal mediums, including newsletters, the Essential Express, E-Talk, Toolbox Talks and Safety Alerts. New or altered policy alerts are communicated via the policy section in the Essential Energy policy database. Communications tools include:

- Essential Energy's intranet, Essentialnet provides information from all areas of the organisation as well as links to systems applications and databases
- The Essential Express is a monthly newspaper featuring stories from across the business
- Broadcasts are issued as needed to convey important or emergency information to employees
- E-Talk is a 360^{o} feedback communication tool, conducted across the business monthly. It starts with the Executive and involves all levels of employees, providing a valuable feedback option for employees to submit questions on any subject to their management or the Executive. Topics covered include strategically focused information around Safety, Value and Performance at Corporate, Divisional and Regional levels. Toolbox talks, a weekly TotalSAFE update, is sent to all depots advising of recent incidents and the importance of identifying hazards, assessing risks, implementing controls and evaluating their effectiveness

> Safety Alerts communicate safety incidents within and external to Essential Energy. They contain information on incident details and proposed preventative and corrective actions. CECM1000.03 HSE Manual: Incident Management outlines the process for managing the development, dissemination and communication of Safety Alerts and SMS Alerts.

Essential Energy also utilises an Electrical Safety Office (ESO) as the principal point of contact for Essential Energy's employees requiring advice on the Electrical Safety Rules, operating work and associated policies and procedures. The ESO consists of a team of subject matter experts in the areas of switching, system access, authorisations, high voltage live line, overhead and underground work. The ESO team manages the development and implementation of electrical safety related procedures and initiatives, provides a consistent approach incorporating continual improvement to electrical safety, and promotes a productive and safe work place.

Compliance with procedures is monitored through internal audit processes. Team Leaders and Area Coordinators audit HIRACs and Access Permits with monthly reporting on compliance to Regional General Managers and Network Managers. Additionally, all managers, supervisors and the Safety Team members carry out planned, but unannounced, audits for compliance with all relevant procedures.

The Auditing and Inspection Procedure (CECM1000.06) within the HSE Manual describes the process of auditing Essential Energy's Work, Health and Safety (WHS) Management System, and the methodology for providing information on the results of audits to management, interested parties and employees.

The audit process is used to determine whether the system:

1. Conforms to planned arrangements for WHS management including the requirements of AS/NZS4801:2001
2. Has been properly implemented and maintained
3. Is effective in meeting the organisation's policy and its objectives and targets for continual WHS improvement.

7 NETWORK PERFORMANCE AND LICENCE COMPLIANCE

The objective of the Network Management Plan is to establish a framework to ensure that Essential Energy's transmission and distribution system provides an adequate, reliable and safe supply of electricity of appropriate quality.

Essential Energy reports annually on our network performance in accordance with the Electricity Network Performance Report outline issued by the NSW Department of Trade and Investment, Regional Infrastructure and Services (known as NSW Trade and Investment or DTIRIS). Licence Conditions Reports are also provided to DTIRIS on a quarterly basis in accordance with the Design Reliability and Performance (DRP) component of the NSW Licence Conditions.

Essential Energy provides public reports to the Government and regulators to satisfy requirements under Part 5 Compliance with plan, Clause 21 Network Operators to measure and report on network performance, of the regulation.

7.1 Supply Quality, Reliability and Security Performance Indicators

The Electricity Supply Standard (CEOP8026) provides details of the objectives Essential Energy has adopted in relation to the various system characteristics that influence quality, reliability and security of electricity supply, and includes:

- Reliability of Supply Standards
- Guaranteed Service Levels
- Sensitive Equipment
- Power Protection Options.

Performance targets include:

- Frequency of supply
- Range of supply voltage
- Voltage fluctuations
- Switching transients
- Voltage dips
- Voltage differences neutral to earth
- Step and touch voltages
- Voltage unbalance
- Direct current
- Harmonic content of voltage and current waveforms
- Interharmonics
- Mains signalling interference
- Mains signalling reliability
- Noise
- Notching
- Levels of electromagnetic fields.

Chapter 3 of the Network Management Plan; Public Electrical Safety Awareness Plan (CEOP8005), outlines Essential Energy's strategies to manage and raise public awareness of electrical safety with respect to the electricity supply network assets.

Performance indicators arising from this Plan include:

- The 'number of people trained/addressed at meetings' – this is currently the most important strategy in establishing public electrical safety awareness. Essential Energy's target is to bring electrical safety awareness to at-risk members of the public, concentrating on emergency services personnel, owners or operators of large items of agricultural plant, haulage contractors and heavy plant users in the construction industry.
- Essential Energy's end-of-year key performance indicator is the public's overall awareness of electrical safety as measured by:
  - Phone survey of our customers
  - The number of reported incidents involving the public.

7.2 Customer Installation Safety Performance Indicators

Chapter 2 of the Network Management Plan; Customer Installation Safety Plan (CEOP8004), ensures the provision of safe electrical installations for connection to Essential Energy's transmission and distribution system and the safe connection of such installations. In doing this Essential Energy can provide a safe working environment for its employees, service providers, contractors, customers and the general public.

Performance targets detailed in the Customer Installation Safety Report include:

- Number of Certificates of Compliance – Electrical Work (CCEW) received
- Number of Notifications of Service Work (NOSW) received
- Number of inspections performed by Essential Energy inspection employees
- Inspection findings
- Numbers of audits performed
- Audit findings
- Electric shock investigations on customers' installations
- Disciplinary action taken.

Where required, an Electrical Advice EAA 9/1999 form will be used for reports to the Office of Fair Trading with regards to:

- Electrical shocks
- Flash burns
- Falls from elevated positions associated with work on electrical apparatus.

Essential Energy's Annual Network Performance Report includes information relative to the Customer Installation Safety Plan.

7.3 Network Safety Performance Indicators

Essential Energy's Dashboard captures the company's strategic direction by defining key objectives and establishing targets and monitoring processes. The objectives and strategies are supported by Divisional Dashboards. Essential Energy's safety performance indicators are reported and communicated monthly to employees via E-Talk communications.

7.3.1 Incident Reporting

CECM1000.03 HSE Manual: Incident Management outlines how Essential Energy provides Government instrumentalities with timely and adequate information in the event of Electricity Network Incidents. The Manual details the NSW, QLD, Victoria and ACT regulatory requirements.

Note: Safety incident reporting not related to the electricity network is also outlined in CECM1000.03 HSE Manual: Incident Management. This procedure outlines safety incident reporting requirements of NSW WorkCover, QLD Workplace Health and Safety, Victorian WorkCover Authority (VWA) and ACT WorkCover and the reporting processes within Essential Energy.

7.3.1.1 New South Wales

Essential Energy complies with reporting requirements of the *Electricity Supply Act 1995* (NSW), the Regulations under the Act, the Minister, the Director-General of DTIRIS, DTIRIS and its Electricity Distributor's Licence.

DTIRIS requires reports on all Significant Electricity Network Incidents (SENI). These include:

- Reportable Safety Incidents
- Reportable Asset Incidents

CECM1000.03 HSE Manual: Incident Management outlines the reporting requirements.

Essential Energy's Annual Electricity Network Performance Report provided to DTIRIS and made available on the Essential Energy website reports Essential Energy's annual performance and incorporates:

- Network Management, including:
  - Network Complaints
  - Accredited Service Provider Scheme.
- Network Planning, including:
  - Reliability Standards
  - Demand Management.
- Asset Management, including:
  - Works and Asset Management Systems
  - Technical Service Standards
  - Quality of Supply
  - Distribution Reliability.
- Network Safety, including:
  - Electrical Network Accidents and Incidents involving the public
  - Electrical Network Accidents and Incidents involving Network Workers.
- Customer Installations
- Bush Fire Risk Management
- Public Electrical Safety Awareness Campaigns.

Additionally Essential Energy reports as required by the Director-General.

7.3.1.2 Queensland

Essential Energy complies with reporting requirements of the *Electricity Act 1994* (QLD), the Regulations under the Act, the Commissioner, the Minister, the Department of Justice and Attorney-General, the Electrical Safety Office and its Electricity Distributor Licence.

The QLD Department of Justice and Attorney-General require reports on serious electrical incidents and dangerous electrical events that involve the electricity network, as well as those that involve other electrical equipment or an electrical installation.

CECM1000.03 HSE Manual: Incident Management outlines the reporting requirements.

Additionally Essential Energy reports as required by the Commissioner.

8 CODES, STANDARDS, GUIDELINES AND PROCEDURES

Essential Energy has a structured framework for the preparation and development of all documents that relate to providing an adequate, reliable and safe supply of electricity of appropriate quality to customers. This incorporates policies, procedures, work instructions and safe work method statements. The taxonomy incorporates terminology based on the type and purpose of a document: Corporate Manual (CM), Corporate Policy (CP), Corporate Strategy (CS), Operational Form (OF), Operational Manual (OM), Operational Procedure (OP) and Operational Standard (OS).

Essential Energy also adheres to the following key codes and standards (as appropriate) in the design, installation, operation and maintenance of its transmission and distribution systems:

- National Electricity Network Safety Code (ENA Doc 001-2008)
- Electricity Transmission and Distribution Asset Management Code of Practice
- NSW Service and Installation Rules
- Contestable Works Code of Practice
- Electricity Service Standards Code of Practice
- NSW Maritime Crossings of NSW Navigable Waters: Electricity Industry Code
- NSW Code of Practice Electricity Service Standards
- NSW Code of Practice Installation Safety Management
- NSW Code of Practice Demand Management for Electricity Distributors 2004
- NSW Code of Practice Contestable Works
- NSW Code of Practice Electrical Workers Safety Equipment
- NSW Code of Practice Distribution Risk Management
- NSW Code of Practice Service and Installation Rules (updated Jan 2009)
- QLD Electrical Safety Office Guide to Safety Management Systems for Prescribed Entities under the Electrical Safety Act 2002
- ISSC 3 – Guide to Tree Planting and Maintaining Safety Clearances Near Powerlines
- ISSC 14 – Guide to Electrical Workers' Safety Equipment
- ISSC 28 – Guideline for Enclosed Spaces in NSW Electricity Networks
- ISSC 29 – Guideline for Pre-Climbing and Climbing Assessment of Poles

- ISSC 31 – Guideline for the Management of Private Overhead Lines
- ISSC 32 – Guide for Network Operators to Provide Information to the Construction Industry for the Use of Cable Covers
- ISSC 33 – Guideline for Network Configuration During High Bush Fire Risk Days
- AS 5804 (including: Guidelines for: Live Line Bare Hand Work, Live Line Stick Work and Live Line Glove and Barrier Work)
- National Guidelines for Protecting Critical Infrastructure from Terrorism.

This Plan and CEOP8030 Electrical Safety Rules comply with the Electricity Transmission and Distribution Asset Management Code of Practice.

Customer installations connected to the network are required to conform to CEOP8004 Network Management Plan, Chapter 2: Customer Installation Safety Plan, NSW Service and Installation Rules and Installation and Safety Management Code of Practice.

Essential Energy has taken into account the NSW Demand Management for Electricity Distributors Code of Practice in the development and implementation of this Network Management Plan Chapter 1: Network Safety and Reliability.

8.1 Quality Management

Essential Energy is committed to embracing the principles of Quality Management in all aspects of its management of the transmission and distribution networks. Essential Energy's Quality Management System is consistent with the principles of AS/NZS ISO 9001:2008 Quality Management Systems – Requirements.

Internal and independent third party audits assist in demonstrating Essential Energy's commitment to continuous review and improvement.

8.2 Design, Construction, Operation and Maintenance Standards

Essential Energy maintains an extensive and comprehensive set of Design and Construction Standards and procedures based on the Code of Practice Transmission and Distribution Asset Management.

Design and Construction Standards are available to employees, contractors and service providers as required.

8.3 NSW Maritime Crossings of NSW Navigable Waters: Electricity Industry Code

The requirements of this Industry Code have been identified and addressed in the following documents:

- CEOM7092 – Distribution Planning Manual
- CEOM7097 – Overhead Design Manual.

8.4 Engineering Records, Drawings and Maps

Essential Energy's Asset Management and Operating Support System (AMOSS) combines geographic information and asset management applications and interfaces with other business systems to provide accurate and timely engineering records, drawings and maps for field operations, works management, planning and regulatory reporting.

Employees can obtain information from AMOSS via personal computers or alternatively, from paper copies for employees without computer access. Maps are available to external customers on request from Essential Energy Call Centres on 13 23 91 or email aerial.patrol@essentialenergy.com.au.

8.5 System Reliability and Planning Standards

CEOP8026 Supply Standards: Electricity Supply Standard provides details of the Standards Essential Energy has adopted in relation to system characteristics that influence quality, reliability and security of electricity supply. Objectives detailed in CEOP8026 include:

- Frequency of supply
- Range of supply voltage
- Voltage fluctuations
- Switching transients
- Voltage dips
- Voltage differences neutral to earth
- Supply availability.

8.6 Technical Customer Service Standards

Under the *Electricity Supply Act 1995* (NSW) and the *National Energy Retail Law*, Essential Energy has an obligation to comply with all Guaranteed Service Levels. Compensation may be payable to customers for Essential Energy's failure to comply with some Guaranteed Service Levels.

Guaranteed Service Levels and any applicable compensation are detailed in Essential Energy's Customer Connection Contracts.

8.7 Maintenance Standards and Procedures

Essential Energy maintains extensive maintenance standards and procedures to provide for the ongoing operation of the electricity network ensuring it is safe, reliable and cost effective.

Essential Energy's maintenance standards and procedures are based on the Electricity Transmission and Distribution Asset Management Code of Practice. A maintenance procedure for each type of equipment is documented that covers the following aspects:

- General basis for maintenance approach
- Maintenance schedule
- Inspections, preventative maintenance and condition assessment tasks
- Frequency of maintenance.

8.8 Operation and Work Procedures

The operation of, and working on or near Essential Energy's electrical network, are carried out in accordance with CEOP8030 Electrical Safety Rules.

CEOP8030 Electrical Safety Rules provides a uniform set of safe work requirements with which persons must comply when involved with work on or near electrical apparatus.

CEOP8030 Electrical Safety Rules apply to all persons (employees, contractors and accredited service providers) working on or near high voltage and low voltage electrical apparatus within Essential Energy's distribution area.

For Essential Energy employees working on other electrical networks, these rules apply in the absence of adequate electrical safety rules.

CEOP8030 Electrical Safety Rules deals only with electrical safety and is not the definitive rules for all work - it must be read in conjunction with all other relevant Codes of Practice, Procedures, Guides and Standards. CEOP8030 Electrical Safety Rules and associated work procedures include:

- Hazard Identification, Risk Assessment and Control (HIRAC)
- Qualifications, training, assessment and authorization
- Safety and test equipment and other tools
- Personal protective equipment
- Hazardous and emergency communications
- Safe approach distances
- Minimum fixed clearances
- Working on high and low voltage overhead lines, apparatus and underground cables
- HV live line work
- Service polarity and neutral identification
- Access permits
- Earthing
- Working in confined spaces.

Asbestos management is specifically addressed in the following documentation:

- CECM1000.10 Hazardous Materials
- CEOP2387 – Worksite with Naturally Occurring Asbestos.

A list of operation and work procedures is included in Attachment C.

8.9 Safety Equipment Design, Use and Maintenance Standards and Procedures

Essential Energy purchases safety equipment which is designed in accordance with the relevant Australian Standards.

Safety equipment issued to Essential Energy employees is used and maintained in accordance with CEOP8030 Electrical Safety Rules. Essential Energy equipment and tools shall be periodically inspected, maintained and tested in accordance with CEOP8051 Tools and Equipment: Testing and Inspection.

8.10 Departure from Codes and Standards

8.10.1 Occupational Health and Safety Regulation 2001

Implementation and compliance with this Network Management Plan Chapter 1: Network Safety and Reliability relies upon Clause 207 (5) of the Occupational Health and Safety Regulation 2001. The clause states:

207 (5) *This clause does not apply to electrical work carried out under a safety plan required by the Electricity Supply Safety and Network Management Regulation 2002 or to electrical testing referred to in clause 208.*

8.10.2 NSW Service and Installation Rules

Essential Energy employees that are suitably qualified to carry out work on Overhead Service Lines as defined by the NSW Service and Installation Rules may carry out work in emergency and fault conditions on overhead consumers' mains under this Network Management Plan Chapter 1: Network Safety and Reliability. Consumers' mains are defined in the NSW Service and Installation Rules as:

1.2.5 Consumers' Mains *– Consumers' mains are the conductors between the point of supply and the main switchboard and form part of an electrical installation. Consumers' mains may be overhead, underground or within a structure.*

8.10.3 ENA Doc 001-2008 National Electricity Safety Code

Clause 6.4.1 will not apply to clearance of insulated overhead services in NSW. Essential Energy shall comply with the requirements of Clause 5.3.5.2 of the Code of Practice Electricity Transmission and Distribution Asset Management as per advice from DTIRIS.

9 AUDIT REQUIREMENTS

9.1 New South Wales

Should an audit of the Network Management Plan Chapters 1-4 be required by the Director-General under Clause 15 of the *Electricity Supply (Safety and Network Management) Regulation 2008* (NSW), Essential Energy will agree with the Director-General on a suitable independent auditor to undertake the audit function.

9.2 Queensland

Essential Energy submits an annual audit plan to the Commissioner in accordance with Section 66 of the *Electrical Safety Act 2002* (QLD) and Section 166 of the *Electrical Safety Regulation 2002* (QLD).

An audit will be carried out each year in accordance with the audit plan.

Essential Energy will carry out any additional audits as required by the Commissioner in accordance with Section 166 of the *Electrical Safety Regulation 2002* (QLD).

Following the annual audit and any subsequent audits, Essential Energy will submit to the Commissioner a certificate from an accredited auditor (in the approved form) verifying the safety management system has been assessed and validated to ensure that the system comprehensively identifies and addresses the hazards and risks associated with the design, construction, operation and maintenance of the entity's works.

In addition to the certificate from an accredited auditor, Essential Energy will submit to the Commissioner a copy of the safety management system and any information required to ensure that the design, construction, operation and maintenance of the entity's works is in accordance with the requirements of the *Electrical Safety Act 2002* (QLD).

Each time modifications are made to the Network Management Plan Chapter 1: Network Safety and Reliability, an additional modification audit must be carried out in accordance with Section 166 of the *Electrical Safety Regulation 2002* (QLD).

9.3 Annual Audit Plan

Procedure CECM1000.06 HSE Manual: Auditing and Inspection defines the annual audit process.

The audits form part of the Audit Program in accordance with the requirements of Essential Energy's Occupational Health, Safety and Environment Management System.

The effectiveness of the internal system audit function will be audited by external auditors in accordance with the requirements to maintain AS/NZS 4801:2001, AS/NZS ISO 14001:2004 certification and compliance to the WorkCover WHS Model for Self Insurance. The results will be made available to DTIRIS or Electrical Safety Office (ESO) as requested.

Essential Energy is committed to meeting the audit requirements of the Commissioner, Section 67 of the *Electrical Safety Act 2002* and Section 166 of the *QLD Electrical Safety Regulation 2002*. Safety Audit Performance is a Key Performance Indicator in the company's Corporate Dashboard.

10 ATTACHMENTS

10.1 Attachment A - Sub transmission Design Planning Criteria

Network Element	Load Type	Forecast Demand or Expected Demand	Security Standard	Customer Interruption Time
Subtransmission Line	Urban and Non-Urban	≥ 15 MVA	N-1[1]	< 1 minute
	Non-Urban	< 15 MVA	N[2]	Best practice repair time
Subtransmission Substation	Urban and Non-Urban	Any	N-1	< 1 minute
Zone Substation	Urban and Non-Urban	≥ 15 MVA	N-1[1]	< 1 minute
	Non-Urban	< 15 MVA	N[2]	Best practice repair time

Table 6: Subtransmission Design Planning Criteria

1. For a *Sub-transmission line - Overhead* and a Zone Substation:

   (a) under N-1 conditions, the *forecast demand* is not to exceed the *thermal capacity* for more than one per cent of the time, i.e. a total aggregate time of 88 hours per annum, up to a maximum of 20 per cent above the *thermal capacity* under N-1 conditions. For Essential Energy, in other than regional centres, the *forecast demand* must not exceed the *thermal capacity* under N-1 conditions.

   (b) under N conditions, a further criterion is that the *thermal capacity* is required to meet at least 115 per cent of forecast demand.

2. For a *Sub-transmission line – Underground*, any overhead section may be designed as if it was a *Sub-transmission line – Overhead*, providing the *forecast demand* does not exceed the *thermal capacity* of the underground section at any time under N-1 conditions.

   (a) Under N conditions, *thermal capacity* is to be provided for greater than 115 per cent of *forecast demand*.

   Note: The above extract is in accordance with Clause 14 Design Planning Criteria and Schedule 1 Design Planning Criteria, of Design reliability and performance – distribution network service provider's licence conditions – 1 December 2007.

10.2 Attachment B - Distribution Design Planning Criteria

Network Element	Load Type	Forecast Demand or Expected Demand	Security Standard	Customer Interruption Time
Distribution Feeder	Urban (regional centres)	Any	N-1[1]	< 4 hours[2]
	Urban (other than regional centres)	Any	N	Best practice repair time
	Non-Urban	Any	N	Best practice repair time
Distribution Substation	Urban and Non-urban	Any	N[3]	Best practice repair time

Table 7: Distribution Design Planning Criteria

1. By 30 June 2014, expected demand is to be no more than 80 per cent of feeder *thermal capacity* (under system normal operating conditions) with switchable interconnection to adjacent feeders enabling restoration for an unplanned *network element* failure. By 30 June 2019, *expected demand* is to be no more than 75 per cent% of feeder *thermal capacity*. In order to achieve compliance, feeder reinforcement projects may need to be undertaken over more than one *regulatory period*. In those cases where a number of feeders form an interrelated system (such as a meshed network), the limits apply to the average loading of the feeders within the one system.
2. The timeframe is expected only, and is based on the need to carry out the isolation and restoration switching referred to in note 4. This standard does not apply to interim/staged supplies, i.e. prior to completion of the entire development or *excluded interruptions* outside the control of the *licence holder*.
3. Urban Distribution substations shared, or available to be shared, by multiple *customer*s are generally expected to have some level of redundancy for an unplanned contingency, e.g. via low voltage manual interconnection to adjacent substations enabling at least partial restoration.

Note: The above extract is in accordance with Clause 14 Design Planning Criteria and Schedule 1 Design Planning Criteria, of Design reliability and performance – distribution network service provider's licence conditions – 1 December 2007Revisions

11 KEY TERMS AND DEFINITIONS

In this document the following terms have the meanings, as listed below:

AEMO: Australian Energy Market Operator, replaces NEMMCO.

AMOSS: Asset Management and Operating Support System. The suites of applications covered by the AMOSS acronym are: GE-SmallWorld Geographical Information System; WASP Asset Management System; DAIS handheld distribution asset inspection system; DAIS Lite vegetation pre-listing application; and PowerMap which is used to create construction drawings.

Commissioner: Commissioner for Electrical Safety, Queensland.

Contractor: Company, person or persons carrying out work for Essential Energy in the form of construction, maintenance, inspections or test on or near Essential Energy's electrical network.

Director-General: Director-General of the NSW Department of Trade and Investment, Regional Infrastructure and Services.

Dashboard: Essential Energy's Dashboard provides a clear understanding of the organisation's Key Performance Indicators. The Dashboard provides a means of evaluating business performance in an accurate and representative way.

DTIRIS: NSW Department of Trade and Investment, Regional Infrastructure and Services, replaces DII.

Electrical Apparatus: Means any electrical equipment (including overhead lines) associated with the supply of electricity at high or low voltage, the conductors of which are live or can be made live.

Emergency: A sudden, unexpected occurrence demanding immediate action.

ESO: Queensland Electrical Safety Office, within the Department of Justice and Attorney-General.

Hazard: Anything that has the potential to cause harm to life, property or the environment.

HIRAC: Hazard identification, risk assessment and control.

Network: Essential Energy's electrical transmission and distribution assets including streetlight and metering assets.

Plant: Includes machinery, equipment and appliances.

Risk: The chance of something happening that will have an impact on objectives. A risk is often specified in terms of an event or circumstance and the consequences that may flow from it. It can be measured in terms of a combination of the consequences of an event and their likelihood and may have a positive or negative impact (ISO 31000:2009).

Risk Management: The culture, process and structures, directed towards realising potential opportunities whilst managing adverse effects (ISO 31000:2009).

Service Provider: Refers to companies/sole traders who have gained accreditation through the NSW Department of Trade and Investment, Regional Infrastructure and Services allowing them to perform contestable works.

Supply: Refers to the supply of electricity.

TotalSAFE: Essential Energy's Health, Safety and Environment Information Management System. It is an integrated software management tool developed for the recording, analysis and reporting of Safety, Security, Health and Environment related data.

VETAB: Vocational Education and Training Accreditation Board

12 REFERENCES

12.1 Essential Energy Documents

CECM1000 – Safety, Security, Health and Environmental Manual

CECP1000 – Corporate Policy: Safety, Security, Health & Environment Policy

CECP1021 – Corporate Policy: Risk Management

CEOF9106 – Standard Form Customer Connection Contract

CEOM7510 – Managing Regional Emergencies: Central West Region

CEOM7511 – Managing Regional Emergencies: Far North Coast Region

CEOM7512 – Managing Regional Emergencies: Far West Region

CEOM7513 – Managing Regional Emergencies: North Western Region

CEOM7514 – Managing Regional Emergencies: Northern Region

CEOM7515 – Managing Regional Emergencies: Mid North Coast Region

CEOM7516 – Managing Regional Emergencies: Southern Region

CEOM7517 – Managing Regional Emergencies: South Eastern Region

CEOP2111 – Risk: Corporate Risk Management Procedure

CEOP2387 – Worksite with Naturally Occurring Asbestos

CEOP8003 – Subtransmission and Distribution Network Planning Criteria and Guidelines

CEOP8004 – Network Management Plan Chapter 2: Customer Installation Safety Plan

CEOP8005 – Network Management Plan Chapter 3: Public Electrical Safety Awareness Plan

CEOP8022 – Network Management Plan Chapter 4: Bush Fire Risk Management Plan

CEOP8026 – Supply Standards: Electricity Supply Standard

CEOP8030 – Electrical Safety Rules

CEOP8051 – Tools and Equipment: Testing and Inspection

Distribution Annual Planning Report

Essential Energy Annual Report

Essential Energy Dashboard

Essential Energy Network Performance Report

Essential Energy Safety Improvement Plan

12.2 Acts, Regulations and Other References

12.2.1 National

AS/NZS 4801:2001 – Occupational Health and Safety Management Systems - Specification with guidance for use

AS/NZS ISO 9001:2008 – Quality Management Systems – Requirements

AS/NZS ISO 31000:2009 – Risk management

AS/NZS ISO 14001:2004 – Environmental Management Systems - Requirements with guidance for use

ENA Doc 001-2008 National Electricity Network Safety Code

National Electricity Rules

National Energy Retail Law

National Energy Retail Rules

National Training Information Service (website).

12.2.2 New South Wales

Code of Practice Contestable Works (DTIRIS)

Code of Practice Demand Management for Electricity Distributors (DTIRIS)

Code of Practice Electricity Service Standards (DTIRIS)

Code of Practice Electricity Transmission and Distribution Asset Management (DTIRIS)

Electricity Supply Act 1995

Electricity Supply (General) Regulation 2001

Electricity Supply (Safety and Network Management) Regulation 2008

Energy and Utilities Administration Act 1987

Essential Services Act 1988

NSW Service and Installation Rules

NSW District Disaster Plan (DISPLAN)

Occupational Health and Safety Regulation 2001

Office of Fair Trading EAA 9/1999

State Emergency and Rescue Management Act 1989

12.2.3 Queensland

Electrical Safety Act 2002

Electrical Safety Regulation 2002

Electricity Act 1994

Guide to Safety Management Systems for Prescribed Entities under the Electrical Safety Act 2002

13 REVISIONS

Revision Number	Section	Details of Changes in this Revision
Original Issue		Replaces CEK8006 Safety and Operating Plan.
2	Various	Changes to reflect current work practices.
3	Attachment F	Audit Certificate included.
4	Various	Updated to include requirements of the NSW DEUS and the QLD ESO.
5	Various	Changes to reflect current work practices. Updated to include Australian Inland area. Update of Attachments A-C.
6	Various	Plan updated to new template – document number used to be CEK8029. Changes to reflect current work practices. Update of Essential Energy policy numbers to reflect new numbering system. Update of Attachments A-C.
7	Various	Plan updated to new format/template. Replaced term “Chief Executive” with “Commissioner” for the QLD ESO. The term “DWE” has replaced “DEUS” as the NSW governing body. Update of Essential Energy policy numbers to reflect new numbering system. Various updates to reflect current work practices. Update of Attachments A-C.
8	All	To comply with updated Electricity Supply (Safety and Network Management) Regulation 2008
9	Various	The term “DII” has replaced “DWE” as the NSW governing body. References to the WIN system have been replaced by TotalSafe – the new reporting system. Network Manager Commercial replaced by Network Manager Compliance and Network and Infrastructure Division replaced by Infrastructure Strategy Division. Various updates to reflect current work practices. Update of Attachments A-C.
10	Various	The term “AEMO” has replaced “NEMMCO”. Various updates to reflect current work practices. Various updates to reflect policy name/number changes. Combined Attachments A & B into A and updated. Update of Attachment C (now Attachment B). Environment and Safety consolidated under new Safety, Security, Health and Environment

Revision Number	Section	Details of Changes in this Revision
11	Various	Reference to Country Energy changed to Essential Energy. Various updates to reflect policy name/number changes. Update of Attachments A & C. The term “DTIRIS” has replaced “DII” as the NSW governing body.
12	All	Update to Template
13	Various	Update current 2012/13 year results