> Electricity Network Performance Report 2012/13

Submitted to:
NSW Department of Trade and Investment, Regional Infrastructure and Services
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1. Profile

1.1 Overview

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

Essential Energy also provides water and sewerage services to more than 10,000 homes and businesses in Far West NSW.

With more than 4,000 employees based across over 100 local depots and regional offices, Essential Energy is one of the largest employers in regional NSW.

A Leader in Safety

- Building a workplace where no employee participates in unsafe acts, and challenges unsafe behaviours
- Continually improving safety performance, aiming to reduce the number and severity of workplace injuries year on year.
- Ensuring the safety of the public and Essential Energy employees through the adoption of best practice safety systems and workplace processes.
- Working with local communities and 'at risk' groups to promote public electrical safety awareness.
- Improving response to natural and other disasters such as bushfires and storms by providing specialist training across the business.
- Looking after employee health and wellbeing with corporate health programs developed and delivered by a team of qualified health professionals.

A Leading Provider of Essential Services

- Operating under a decentralised regional management structure, with five regional management teams responding quickly and effectively to local needs and priorities.
- Providing essential energy services to more than 800,000 homes and businesses across rural and regional NSW, and water services to 10,000 homes and businesses in Far West NSW.
- Maintaining approximately 200,000 kilometres of power lines, 1.4 million power poles and 136,000 distribution substations across a diverse geographical area.
- Investing in network upgrades to meet changing population and energy demands, renew ageing assets and ensure the continued delivery of safe, reliable and affordable essential services.
- Transforming the electricity network through a focus on cost effective alternatives to improve reliability, support the growth of renewable energy and make energy efficiency simpler for customers.

A Trusted Part of Local Communities

- A leading employer in regional NSW - providing meaningful and sustainable career opportunities for more than 4,000 employees in 1,500 communities across NSW.
- More than 1,200 new apprenticeships created since 2001.
- One of the largest direct employers of Indigenous apprentices in NSW, with more than 150 Indigenous apprenticeships and traineeships created since 2001.
- Supporting community based renewable energy generation solutions through a commitment to build a community based solar farm on the South Coast– the first of its kind in regional NSW.
- Working with local councils to deliver energy efficient street lighting – replacing around 88,000 inefficient streetlights across our distribution area, with new energy efficient technologies.

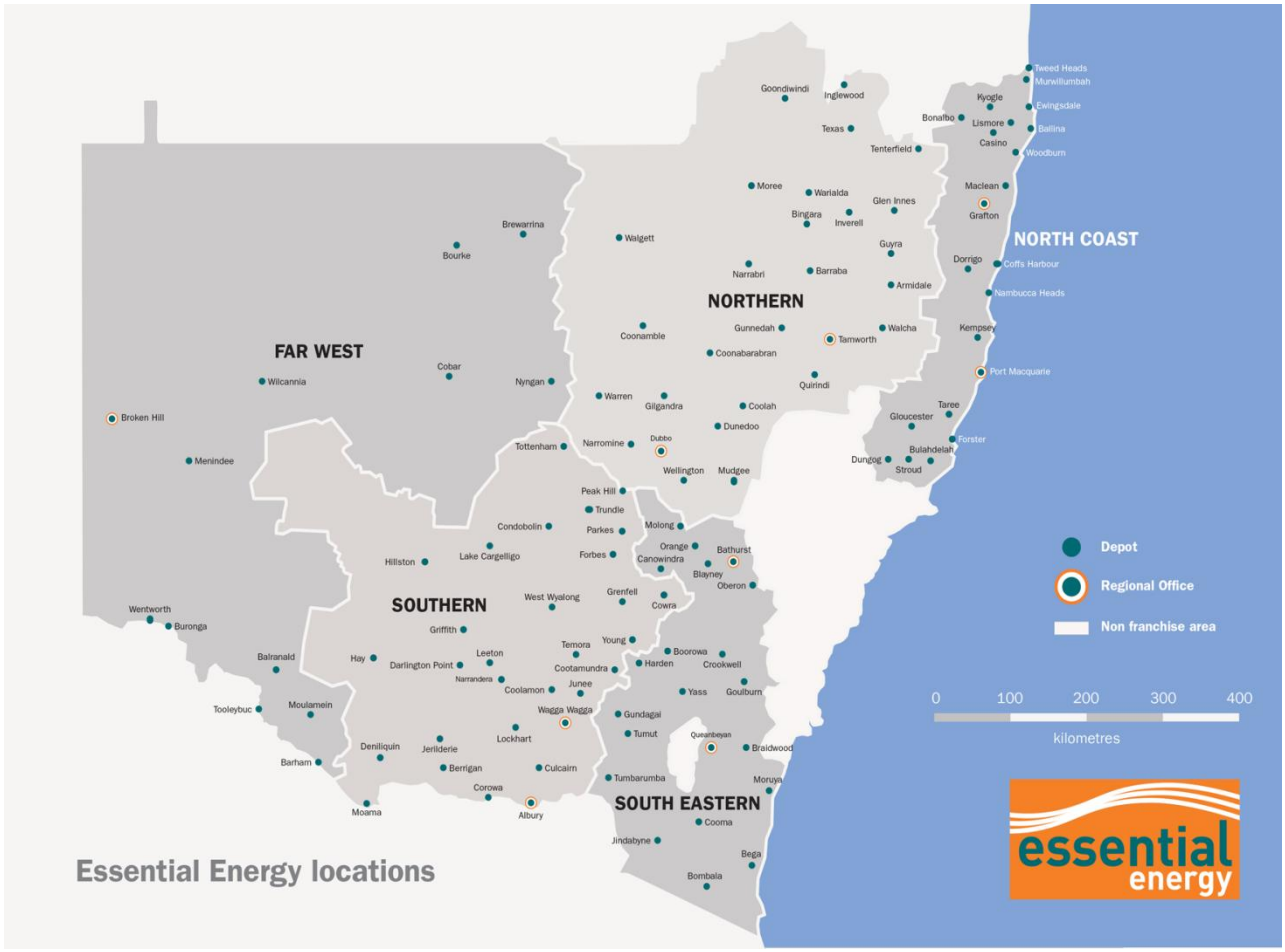


Figure 1 – Essential Energy locations

Table 1.1 Distributor Statistics

	Number at 30/6/12	Number at 30/6/13
Distribution Customer Numbers (Total)	803,414	812,373
Customer Numbers at Year End (Southern)	157,034	158,712
Customer Numbers at Year End (Northern)	145,801	147,710
Customer Numbers at Year End (South Eastern)	172,933	175,192
Customer Numbers at Year End (Far North Coast) – now North Coast	297,486	300,988
Customer Numbers at Year End (Far West)	30,160	29,771
Maximum Demand (MW)	2,184	2,287
Feeder Number CBD	-	-
Feeder Number Urban	298	306
Feeder Number Short Rural	901	907
Feeder Numbers Long Rural	240	238
Energy Received by Dist Network to Year End GWh	12,626	12,894
Energy Distributed to Year End (Residential) GWh	4,578	4,491
Energy Distributed to Year End (Non-Residential including un-metered supplies) GWh	7,158	7,537
Energy Distributed to Year End (Southern) GWh	3,085	2,940
Energy Distributed to Year End (Northern) GWh	2,651	2,794
Energy Distributed to Year End (South Eastern) GWh	2,614	2,958
Energy Distributed to Year End (Far North Coast) GWh – now North Coast	2,934	2,838
Energy Distributed to Year End (Far West) GWh	453	498
System Loss Factor (%)	7.1[1]	6.71
Transmission System (km)	-	-
Transmission Substation (Number)[2]	20	20
Sub Transmission System (km)	10,914	10,553[3]
Substation - Zone (Number)	326	328
Substation - Distribution (Number)	135,757	136,445
High Voltage Overhead (km)	146,372	146,842
High Voltage Underground (km)	2,121	2,244
Low Voltage Overhead (km)	25,807[4]	25,742
Low Voltage Underground (km)	4,679	4,728
Pole (Number)	1,387,234	1,387,206
Streetlights (Number)	149,375	152,129
Employees (Full Time Equivalent Number)	4,648	4,394
Contractors (Full Time Equivalent Number)	538	243

Notes: Distances for overhead and underground lines are circuit km.

[1] System Losses have been revised following data validation.

[2] Essential Energy assumes any substation that converts to a voltage that is not used for distribution is a Transmission Substation.

[3] Sub Transmission System (km) change, the reduction in sub transmission overhead is primarily due to identifying some 33kV lines as 33kV distribution instead of 33kV sub transmission as part of ongoing data maintenance.

[4] The movement in LV overhead is due to data cleansing during the reporting period.

1.2 Capital Works Program

Essential Energy is planning to deliver the capital work program necessary to meet objectives outlined in the regulatory determination submission and Network Management Plan. The plan is subject to on-going review to allow for changes due to work delivery scheduling and assessment of network performance and load growth. Several major projects were delayed due to major equipment manufacturer delivery delays and project re-phasing and this has impacted delivery of the major works program, remaining work will now be completed in 2013/14. Approximately 91% of the distribution works program was completed as planned.

Table 1.2 Capital Works Program Trend

	Previous Years				Current Year
Year	**2008/09**	**2009/10**	**2010/11**	**2011/12**	**2012/13**
Capital works program ($M)	561.7	652.7	701.9	745.1	640.6

2. Network Management

2.1 Overview

Essential Energy manages a complex and geographically diverse power supply network. Our distribution area is one of the largest in the world. To ensure our decisions are localised and reflect the needs and concerns of the local population, the network is managed through a regional management structure.

Essential Energy's Network Management Plan has been put in place to meet its statutory and public responsibilities and to provide a safe, reliable and sustainable electricity supply to our customers. The plan is divided into four chapters, these being:

- **Network Safety and Reliability** – aims to establish a framework which ensures Essential Energy's sub-transmission and distribution system provides an adequate, reliable and safe supply of electricity of appropriate quality. The plan is revised regularly and both management and operations employees are audited to ensure work practices are in accordance with the objectives of the plan (See sections 3 and 4).
- **Customer Installation Safety Plan** – ensures provision of safe electrical installations within Essential Energy's network area and their safe connection to Essential Energy's sub-transmission and distribution system to help provide a safe working environment for our employees, service providers, contractors, customers and the general public (See section 6).
- **Public Electrical Safety Awareness Plan** – provides a framework and strategies to warn the public of the hazards associated with electricity and, in particular, the hazards associated with overhead power lines, and to provide simple but effective ways to minimise their risk exposure (See section 9).
- **Bush Fire Risk Management Plan** – aims to ensure that Essential Energy's assets are managed in a way that will minimise the risk of bush fires, as well as protect our assets and maintain customer supply reliability at times of bush fire (See section 8).

Essential Energy's commitment to safety management procedures can also be seen in its continuous improvements in safety measures (See section 5).

2.2 Network Complaints

Table 2.1 Complaint Performance Data

	Previous Years				Current Year
Year	**2008/09**	**2009/10**	**2010/11**	**2011/12**	**2012/13**
Complaints Total	3,232	3,599	5,301	4,323	4,447
Complaints per 1,000 Distribution Customers	4.2	4.5	6.6	5.4	5.5
Complaints regarding Vegetation Management	169	234	328	376	432

Table 2.2 Network Complaint Investigations Completed Current Year

Summary

Table 2.2 Network Complaint Investigations Completed Current Year		2012/13
	Number	**Number Valid***
Voltage	731	403
Current	0	0
Other Quality	409	189
Reliability	182	89
Safety	0	0

* A complaint is valid where non-compliance with published service and network standards occurs.

Detailed

Table 2.2 – Network Complaint Investigations Completed		2012/13	
Category	**Nature of Complaint**	**Number**	**Valid***
Voltage	Sustained over voltage	145	110
	Sustained under voltage	108	63
	Voltage fluctuations	292	138
	Voltage dips	109	55
	Voltage swell	2	1
	Switching transients	0	0
	N-E voltage difference	66	34
	Ground fault voltage	3	1
	Voltage unbalance	6	1
	Mains signalling voltages (Outside defined range)	0	0
	HV injection (HV/LV Intermix)	0	0
	Notching	0	0
Sub-total (Supply Voltage Complaints)		**731**	**403**
Current	Direct current	0	0
	Harmonic content	0	0
	Inter Harmonics	0	0
Sub-total (Supply Current Complaints)		**0**	**0**
Other Quality	Mains signalling reliability	1	1
	Noise & Interference	78	29
	Level of supply capacity	40	24
	Embedded Generation (Solar)	196	118
	Embedded Generation (Wind)	2	0
	Supply frequency	2	0
	Level of EMF	0	0
	Customer Equipment Failure	90	17
Sub-total (Other Quality of Supply Complaints)		**409**	**189**
Sub-total (All Quality of Supply Complaints)		**1140**	**592**
Reliability	No. of supply failures	60	27
	Duration of supply failures	1	0
	Outages Miscellaneous	0	0
	No. of <1 min. interruptions	121	62

Sub-total (Reliability of Supply)		**182**	**89**
Safety	Overhead line safety	0	0
	Underground safety	0	0
	Electrical station safety	0	0
	Service line safety	0	0
Sub-total (Network Safety)		**0**	**0**
Total Completed		**1322**	**681**
Other	IN Communities	0	0
Totals		**1322**	**681**

Total Network Complaints experienced an 18.6% decrease in the 2012/13 reporting period compared to the 2011/12 period. The percentage of "Valid" complaints averaged across all categories for this period is 51.5% compared to 55.5% for the previous period. All categories other than "Voltage Dips" have shown improvement from the previous report period. Voltage fluctuation, Embedded Generation (Solar) and Sustained Over Voltage are the most common issues reported being 22.1% ,14.8% and 11% respectively of the total network complaints received.

2.3 Customer Service Standards Reporting

Table 2.3 Customer Service Standards Current Year Data

	Payments Given Based on Interruption Duration (Total Number)	Claims Not Paid Based on Interruption Duration (Total Number)	Payments Given Based on Interruption Frequency (Total Number)	Claims Not Paid Based on Interruption Frequency (Total Number)
Metropolitan	N/A	N/A	N/A	N/A
Non-Metropolitan	27	24	0	16

The duration claims were denied for the following reasons:

- 11 where the interruptions were caused by the effects of severe weather events
- Seven where the interruptions occurred in an areas where a Natural Disaster was declared
- Six where the interruption was less than 18 hours in duration

The frequency claims were denied for all 16 claims received due to the customers premise having less than four eligible outages recorded for the financial year.

3. Network Planning

3.1 Overview

Essential Energy is committed to providing a safe, secure and reliable supply of energy in a cost effective manner. Essential Energy achieves this by planning its network and making investment decisions in line with its *CEOM8018 Network Asset Management Plan (NAMP)*.

The *NAMP* outlines Essential Energy's obligations in relation to network planning, including the need to compile and publish an annual *Electricity System Development Review (ESDR).* The NAMP has been prepared in accordance with the compliance obligations of network management legislation, regulations and related codes of practice, and reflects recognised industry best practices and standards relating to the management of electricity infrastructure assets. It is designed to conform with the NSW Government policy and planning guidelines on total asset management, which addresses strategic planning relating to capital investments, renewal, and maintenance.

Essential Energy's network development is undertaken in accordance with the *Electricity Supply Act*, the *National Electricity Code*, the *NSW Code of Practice - Demand Management for Electricity Distributors* and our policy *CEOP8003 Sub-transmission and Distribution Network Planning Criteria and Guidelines.*

In general, Essential Energy plans the development of its network to ensure:

- network capacity is adequate to meet power transfer requirements
- electrical and thermal design ratings (normal and overload) of equipment are not exceeded
- supply reliability is in accordance with published standards, or as negotiated to meet the special requirements of individual major network customers
- quality of supply meets published standards and system voltage levels are maintained within acceptable standard limits
- safety standards are maintained or exceeded
- environmental constraints are satisfied, and
- the above requirements are met in a cost effective manner.

3.2 Design Planning Criteria Compliance Reporting

In August 2005 the Minister for Energy and Utilities introduced new *licence conditions* that included requirements for planning and design of sub-transmission and distribution networks.

Following a review of the *licence conditions* conducted by the Minister, the conditions were replaced with updated and revised conditions with effect from 1 December 2007.
The *design planning criteria* set out:

- input standards to be used by a licence holder in planning its network, and
- requirement's for load forecasting and contingency planning methodologies intended to achieve operational outcomes.

The baseline levels of planned redundancy required under the *design planning criteria* underpin Essential Energy's plans for the network to ensure, as far as is reasonably practicable, that:

- the reliability standards are met, and
- an adequate supply, with an appropriate level of redundancy, consistent with its regulatory obligations, is provided.

The *design planning criteria* applicable to Essential Energy are listed in Table 3.1.

Table 3.1 Design Planning Criteria

Network Element	Load Type	Forecast Demand or Expected Demand	Security Standard	Customer Interruption Time
Sub Transmission Line	Urban & Non-Urban	≥ 15 *MVA*	N-1[1]	< 1 minute
	Urban & Non-Urban	< 15 *MVA*	N[2]	*Best practice repair time*
Sub Transmission Substation	Urban & Non-Urban	Any	N-1	< 1 minute
Zone Substation	Urban & Non-Urban	≥ 15 *MVA*	N-1[1]	< 1 minute
	Urban & Non-Urban	< 15 *MVA*	N[2]	*Best practice repair time*
Distribution Feeder	Urban (regional centres)[4]	Any	N-1[3]	< 4 Hours
	Urban (other) & Non-Urban	Any	N	*Best practice repair time*
Distribution Substation	Urban & Non-Urban	Any	N	*Best practice repair time*

Notes:

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 1 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.

   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.

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

3. 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 reg*ulatory 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.

4. Regional centre means: Albury, Armidale, Ballina, Bathurst, Broken Hill, Coffs Harbour (including Sawtell), Dubbo, Forster-Tuncurry, Goulburn, Grafton, Griffith, Lismore, Orange, Port Macquarie, Queanbeyan, Tamworth, Taree, Tweed Heads, and Wagga Wagga.

3.2.1 Design Planning Criteria Compliance Reporting

Sub-transmission Planning

The planning criterion considers the adequacy of the sub-transmission network not only to meet the energy demand requirement, but also its capability to do so within component electrical and thermal ratings and voltage limits. Analysis is carried out to generally achieve an economically efficient outcome in which the sub-transmission network is secure and within rating following the forced outage of any single circuit line or substation element during peak periods.

Provision is also made for use of the short-time capability or cyclic rating of transformers during a planned outage of a parallel transformer.

Other sub-transmission planning criteria outline that:

- network equipment is designed to withstand maximum fault duty.
- any sub-transmission fault is seen by at least two protection systems that are fully independent.

Each potential augmentation project is treated on its own merits. The main economic impact of sub-transmission investment is on a reduction in the value of the energy not supplied (the 'unserved energy'), an extension of the time taken for capacity limits to be exceeded and the initial capital costs. These are quantified over the expected life of the project and costed at appropriate rates.

Planning of the sub-transmission network is usually carried out over a longer time horizon of between five to ten years. Essential Energy distinguishes between long-term and short-term network planning, with long-term network planning generally confined to 132kV and 66kV networks. Short-term network planning is usually limited to networks ranging from 11 to 33kV, with a horizon period of up to five years.

Progress against the Plan

The Essential Energy plan is to substantially meet the Design Planning Criteria by 30 June 2014, for sub-transmission line, sub-transmission substations, and zone substations, however a few projects have an anticipated completion timeline of 2014/15. It is advised that the information reported is based on Essential Energy's interpretation of the Design Planning Criteria, which is that the reported network elements are considered 'non-conforming' as opposed to 'non-complying' as in the Licence Conditions.

The table below summarises Essential Energy's progress to date against its plan.

2012/13 Progression Summary for sub-transmission line, sub-transmission substations, & zone substations

Total No. of projects in the Plan (as originally listed in 2008/09) – 48

Projects Deferred – 4

Projects Added – 0

Total No. of Projects Completed – 26

No. of Projects Completed in 2012/13 – 9

No. of Projects Commenced (Expected Completion 2013/14) – 15

No. of Projects yet to Commence (Anticipated completion 2014/15) – 3

Table 3.2 Sub-Transmission Lines and Substations and Zone Substations Not Complying with the Design Planning Criteria on 1 July of 2012/13

Element including Location, Customer Numbers, Element Length/Capacity	Description of Non-Compliance and Reason	Proposed Remedial Actions & Timetable
Projects Commenced - Expected Completion 2013/14		
Karangi - Coffs Harbour North 66kV feeder (11km) 10,000 customers North Coast Region	N-1 ≥ 15MVA sub-transmission feeder. 66kV feeder has peak demand of 30MVA. Outage of 66kV feeder results in overload of remaining in-service 66kV feeders and extreme low voltage levels	Construct a Coffs Harbour North - Coffs Harbour South 66kV feeder
Beryl - Dunedoo 66kV feeder (41km) 7,000 customers Northern Region	N-1 ≥ 15MVA sub-transmission feeder. Radial 66kV feeder with peak demand above 15MVA, outage of 66kV feeder leads to loss of supply to all customers	Construct a second Beryl - Dunedoo 66kV feeder
Yarrandale - Gilgandra 66kV feeder (65km) 5,000 customers Northern Region	N-1 ≥ 15MVA sub-transmission feeder. Radial 66kV feeder with peak demand above 15MVA, outage of 66kV feeder leads to loss of supply to all customers	Construct a second Yarrandale - Gilgandra 66kV feeder
Wellington - Dubbo 132kV feeders (2 x 47km) 70,000 customers Northern Region	N-1 ≥ 15MVA transmission feeder. 132kV feeder with peak demand above 150MVA, outage of a 132kV feeder leads to overload of remaining in-service 132kV feeder	Construct a Wellington - Narromine 132kV feeder
Wagga - Temora 132kV feeder (80km) 9,000 customers Southern Region	N-1 ≥ 15MVA sub-transmission feeder. 132kV feeder with limited 66kV backup, Peak demand of 50MVA. Outage of 132kV feeder leads to overload of 66kV feeder and results in loss load of 20+MVA	Rebuild existing Wagga-Junee-Temora 66kV feeder as 132/66kV dual circuit
TransGrid-Orange South-Orange West 66kV feeders (20km) 12,000 customers Southern Region	N-1 ≥ 15MVA sub-transmission feeder. Orange South and Orange West both have peak demands above 15MVA, 66kV feeders cannot be restored within 1 minute during contingency	Augment Orange South and Orange West zone substation, add 66kV feeder bays
TransGrid - Parkes 66kV feeder (12km) 7,000 customers Southern Region	N-1 ≥ 15MVA sub-transmission feeder. 66kV feeder has peak demand of 20MVA. Limited backup 66kV supply	Construct a second 66kV feeder to Parkes Town
Wagga - Uranquinty 66kV feeder (19km) 7,000 customers Southern Region	N-1 ≥ 15MVA sub-transmission feeder. Radial 66kV feeder with peak demand of 18MVA, outage of 66kV feeder leads to loss of supply to all customers	Construct Bourkelands - Uranquinty 66kV feeder and augment Uranquinty 66kV busbar

Element including Location, Customer Numbers, Element Length/Capacity	Description of Non-Compliance and Reason	Proposed Remedial Actions & Timetable
Taree - Kew 66kV feeder (45km) 7,000 customers North Coast Region	N-1 ≥ 15MVA sub-transmission feeder. 66kV feeder has peak demand of 15MVA. Outage of 66kV feeder results in overload of remaining in-service 66kV feeder	Establish a 132/66/11kV transmission substation at Herons Creek, refurbishment drivers have resulted in this project being required ahead of the reliability standards requirement
TransGrid - Quirindi 66kV feeder (56km) 7,000 customers Northern Region	N-1 ≥ 15MVA sub-transmission feeder. Radial 66kV feeder with peak demand of 15MVA, outage of 66kV feeder leads to loss of supply to all customers	Construct a second TransGrid - Quirindi 66kV feeder, deferred due to revised load forecast
Taree - Failford - Tuncurry - Forster - Bohnock 66kV feeders (100km) 18,000 customers North Coast Region	N-1 ≥ 15MVA sub-transmission feeder. 66kV feeders have peak demand of 40+MVA. Outage of 66kV feeder results in voltage levels below standard and overload of remaining in-service 66kV feeders	Establish a 132/66kV transmission substation at Hallidays Point and construct interconnecting 66kV feeders
Borthwick St - Wynne St 66kV feeder, Wynne St zone substation 8,000 customers Northern Region	N-1 ≥ 15MVA sub-transmission feeder and N-1 ≥ 15MVA zone substation. Wynne St substation with a peak demand of 25MVA is controlled by single 66kV circuit breaker at Borthwick St. Transformer or feeder fault leads to loss of supply to all customers with restoration greater than 1 minute	Augment Wynne St and Borthwick St substations and loop in/out Ashford 66kV feeder to Wynne St
Cooma - Bega 132kV feeder (92km) and Cooma - Bombala - Bega 66kV feeder (96km) 23,000 customers South East Region	N-1 ≥ 15MVA sub-transmission feeders. 132kV and 66kV network with peak demand of 50MVA. Outage of 132kV feeder leads to overload of 66kV feeder, results in loss load of 30+MVA	Construct a Cooma - Bega dual 132/66kV feeder on existing 66kV easement
Bathurst Russell St zone substation 8,000 customers South Eastern Region	N-1 ≥ 15MVA zone substation. Russell St zone substation has a firm transformer capacity of 20MVA with a peak demand of 26MVA	Augment Russell St zone substation to 30MVA capacity, transfer load to adjacent zone substation
Wagga Wagga City Network 66kV feeders (5km) 15,000 customers (Wagga City) Southern Region	N-1 ≥ 15MVA sub-transmission feeders. The Wagga Wagga city 66kV network is arranged in a 'ladder' formation, with some zone substations not having incoming 66kV feeder or 66kV transformer protection. Up to four zone substations can be affected by a single feeder or transformer fault. Restoration of supply within 1 minute is not possible.	Construct a number of short 66kV feeders between zone substations at Ashmont, Bomen and Cartwrights Hill

Element including Location, Customer Numbers, Element Length/Capacity	Description of Non-Compliance and Reason	Proposed Remedial Actions & Timetable
Projects yet to commence		
Nyngan - Cobar 66kV feeder (130km) 4,000 customers Far West Region	N sub-transmission feeder. Radial 66kV feeder with voltage levels below standard during system normal operation	Remedial action strategy under review, project anticipated completion 2014/15
Griffith 33kV feeders (37km) 12,000 customers Southern Region	N-1 ≥ 15MVA sub-transmission feeders. 33kV feeders have peak demand above 15MVA. Outage of 33kV feeder results in overload of remaining in-service 33kV feeders.	Initially construct 132kV feeder operated at 33kV. Establish a Griffith West 132/33kV transmission substation and 33kV feeder interconnections into the long term, anticipated initial feeder completion 2014/15
Cartwrights Hill zone substation 15,000 customers (Wagga City) Southern Region	N-1 ≥ 15MVA sub-transmission feeders. The Wagga Wagga city 66kV network is arranged in a 'ladder' formation, with some zone substations not having incoming 66kV feeder or 66kV transformer protection. Up to four zone substations can be affected by a single feeder or transformer fault. Restoration of supply within 1 minute is not possible	Augment Cartwrights Hill substation with fully switched in/out 66kV busbar, anticipated completion 2014/15

Primary Distribution Planning

The planning and capital investment framework associated with Essential Energy's distribution network is principally driven by technical considerations and requirements. This is primarily due to the inherent geographical challenges, our commitment to providing customers with published standards of reliability and quality of supply, and low profit structure of the network which is essentially radial.

Distribution network planning is generally of a short-term nature – up to five years. Essential Energy's traditional approach to distribution network planning has been to focus on feeder augmentation works to provide supply to new or growing loads, maintain adequate voltage regulation, enhance reliability of supply, upgrade thermal capacity (and minimise system losses). This form of distribution planning criteria will continue.

Progress against the Plan – Distribution Planning

Essential Energy will substantially achieve full N-1 compliance by 2014 for all Regional Centres. Currently there are 395 individual projects scheduled for the 2013/14 and 2014/15 financial years that will complete the program, 308 in 2013/14 and 87 in 2014/15. The projects in 2014/15 are mainly in the Broken Hill and Wagga Wagga areas and have been delayed due to resource levels and contract issues. There were initially 1,903 individual projects identified to achieve N-1 compliance in all centres, however this has now been reduced to 1,748 due to a re assessment of the Licence criteria.

Financial Year	Projects Completed	Feeders Completed
2009/10	316	N/A
2010/11	303	139
2011/12	252	26
2012/13	383	32
2013/14	0	0
Completed	1,254	197
In Progress	494	101
Total	**1,748**	**298**

Table 3.3 Distribution Feeder Summary Report by Class of Network Elements Not Complying with the Design Planning Criteria on 1 July of the Current Year

N-1 Regional Centres			
Total Number of Feeders	**Number of Feeders Without N-1 Capability (1 Minute)**	**Description and Reason for Non-Compliance**	**Proposed Remedial Actions and Timetable**
298	101	Inadequate feeder thermal ratings, lack of interconnectors, underrated interconnecting switchgear	Upgraded and additional feeders. Construction of interconnectors, upgrading additional interconnecting switchgear (gas switches, re-closers) N-1 programs have been and are scheduled to be completed by 2014. (123 completed)
URBAN			
Total Number of Feeders	**Number of Feeders Without N Capability**	**Description and Reason for Non-Compliance**	**Proposed Remedial Actions and Timetable**
As above	As above	As above	As above
NON-URBAN			
Total Number of Feeders	**Number of Feeders Without N Capability**	**Description and Reason for Non-Compliance**	**Proposed Remedial Actions and Timetable**
1,146	109	Insufficient capacity due to incremental growth	As N-1 capability exceeded remedial plans will be developed accordingly. All feeders without N capability have augmentation works programmed. (65 completed)

Table 3.4 Distribution Substation Summary Report by Class of Network Elements Not Complying with the Design Planning Criteria on

CBD			
Total Number of Substations	**Number of Substations Without N-1 Capability (1 Minute)**	**Description and Reason for Non-Compliance**	**Proposed Remedial Actions and Timetable**
N/A	N/A	N/A	N/A
URBAN and NON-URBAN			
Total Number of Substations	**Number of Substations Without N Capability**	**Description and Reason for Non-Compliance**	**Proposed Remedial Actions and Timetable**
136,445	264	Incremental life style growth	Substations programmed to be upgraded when identified. (133 completed)

3.3 Demand Management

Essential Energy's internal demand management procedures for 2012/13 complied with the NSW Code of Practice - Demand Management for Electricity Distributors and the National Electricity Rules.

The process for 2012/13 included:

- The Annual Electricity System Development Review
- Maintenance of a Register of Interested Parties
- Review of emerging constraints with a network augmentation in excess of $1 million.
- Screening of distribution projects with an augmentation component in excess of $250,000
- Publication of Consultation Papers via Australian Energy Market Operator (AEMO) and Essential Energy external web pages.
- Notification to Interested Parties of Demand Management opportunities.
- Use of non-network service providers to investigate and advise on demand management options.
- Consultation with prospective Demand Management Service Providers.
- Collaborative agreements with leading academic institutions
- Participation in related industry working groups
- Pooling of demand management knowledge and resources with other NSW distributors under Networks NSW guidance

A review of uncommitted major network augmentation proposals was conducted and in most cases the revised timing for the constraint has deferred the need for the augmentation. As a result there have been no demand management investigations for major network augmentations undertaken in 2012/13

There were a number of zone substation capacitor bank installations completed in 2012/13. Essential Energy has also continued to invest in upgraded load control functionality and in conductor upgrades which provide a demand benefit through series loss reductions.

Innovative Demand Management developments during 2012/13 included a continuation of work undertaken in previous years, such as;

- The continued focus on the application of power electronic equipment in field trials for energy storage, reactive power and embedded generation applications. Continued development in this technology may lead to mutually beneficial outcomes for both consumers and networks through increased penetration of renewables and mitigation of the adverse effects on network power quality currently experienced.
- The completion of the first stage of economic analysis of the value of network capacity, allowing for Essential Energy to develop business plans which will lead to long term deferral of demand growth and thereby a sustainable reduction in network expenditure.

- An evaluation of the effectiveness of demand based customer audits and through this project, the development of strategies to target areas where minor changes to consumers processes or equipment benefit both the individual consumers and the network through the reduction of peak demand.

As well as new developments including;

- Evaluation of conservation voltage reduction technologies allowing a reduction in both consumers energy and peak demand
- Evaluation of mid-sized static synchronous compensator for use in power factor correction, as a relatively simple alternative to traditional network augmentation but with major improvements to power quality over existing power factor correction technologies
- Development of optimisation techniques for existing and future field based power factor correction, ensuring Essential Energy is maximising the value of equipment currently being installed on the network.

Essential Energy continues to work toward the development of technologies and strategies which will enable demand management and reduced network augmentation investment now and into the future.

Table 3.5 Demand Management Projects Implemented During Current Year

	Description of Demand Management Project Implemented	Peak Demand Reduction (kVA)	PV of Costs of Demand Management Project (000's)	PV of Total of Capital Expenditure Deferment plus Op Ex Savings (000's)
Individual large projects				
1	Tumbarumba – installation of 3 MVAr capacitor bank	230	$762	$344
2	Jelbart, Albury – installation of 12 MVAr capacitor bank	3,330	$1,072	$2,729
3	Wellington – installation of 3 MVAr capacitor bank	670	$728	$494
4	Stewart Street, Bathurst – installation of 6 MVAr capacitor bank	920	$609	$680
5	Tharbogang, Griffith – installation of 7.5 MVAr capacitor bank	1,900	$607	$2,047
6	Maher Street, Bega – installation of 5 MVAr capacitor bank	590	$522	$890
Sub-totals		7,640	$4,300	$7,184
Consolidated projects				
1	Minor capacitor bank installations (Hammond Avenue, Wagga Wagga: Bomen, Wagga Wagga and Jindabyne) totalling 15 MVAr	3,810	$1,194	$2,942
Sub-totals		3,810	$1,194	$2,942
Totals		**11,450**	**$5,494**	**$10,126**

Table 3.6 Demand Management Investigations in Current Year Found Non-Viable

	Description of Potential Demand Management Project Investigated and Reason for Non-viability	PV of Costs of Investigations
	None undertaken following review of major augmentation project timings and deferrals resulting from downturn in network demand levels and growth rates	

4. Asset Management

4.1 Overview

Asset management is a critical component of Essential Energy's overall network management strategy and has an important role in determining the outcomes for both the business and our customers.

The *NAMP* provides a framework for strategic management of our physical system assets to best support network service delivery. It includes our asset management strategies, policies, processes, resources, and our planned capital investments, asset maintenance and demand management. The *NAMP* is closely related to annual budgets and forecasts for capital, operating and maintenance expenditure planning.

The *NAMP*'s primary objectives include:

- establishing priorities in line with organisational objectives and statutory obligations, namely safety, reliability and sustainability
- planning and controlling financing and expenditure in accordance with these priorities, and
- ensuring resources are used as effectively and efficiently as possible so that the government and the community receive the most value for money.

These objectives cover the three major elements of asset management outlined in the *NAMP*:

- capital investment strategic planning
- asset renewal and replacement strategic planning, and
- asset maintenance strategic planning

The *NAMP* is designed to comply with the State Government's policy on Total Asset Management (TAM). It includes a five year forecast and reviews capital investment, refurbishment and asset maintenance strategies to ensure a focus on long - term, system wide and whole of life management. These strategies ensure delivery of a secure, high quality, reliable and safe electricity network service that meets the needs and expectations of customers, community, shareholders, and other stakeholders at the lowest possible price, and complies with related statutory and regulatory requirements.

Essential Energy reviews this plan annually.

4.2 Technical Service Standards

The Electricity Supply Standards adopted by Essential Energy are set out in the document *CEOP8026 Electricity Supply Standard,* in accordance with the *Code of Practice – Electricity Service Standards.*
The main areas addressed include:

- voltage fluctuations managed in accordance with Australian Standards *AS/NZS 61000.3.3:2012, 61000.3.5:1998* and *61000.3.7:2012*
- switching transients (voltage waveform distortion) limited where possible to less than two times normal supply voltage
- frequency variation and Essential Energy's role in notifying AEMO of any sustained fluctuations
- voltage dips managed through best practice network improvement and augmentation
- steady state voltage differences between neutral and earth limited to less than 10 volts at the customer's point of supply
- lightning strikes limited in their impact on supply where possible by adherence to industry best practice system design and maintenance principles
- limitation of 'step and touch' voltage differentials managed in accordance with industry standards, namely *ENA Earthing Guide AS/NZS 7000*

- limiting of voltage imbalance to a 6 per cent difference on the LV network using 10 min average values between the highest and lowest phase to neutral or phase to phase steady state voltages (This may be exceeded on occasions in rural areas)
- harmonic content of voltage and current waveforms managed in accordance with Australian Standards *AS 61000.3.6:2012*
- Mains signalling reliability set at a target of 99.5 per cent failsafe to ensure correct switching and metering functions.

A copy of *CEOP8026 Electricity Supply Standard* can be downloaded from essentialenergy.com.au.

CEOP8026 also outlines Essential Energy's adoption of the Australian Standard *AS 60038 – 2000 Standard Voltages.*

4.3 Quality of Supply

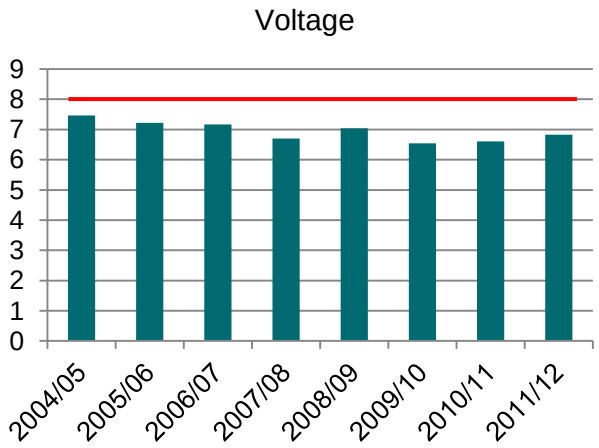
4.3.1 Overview

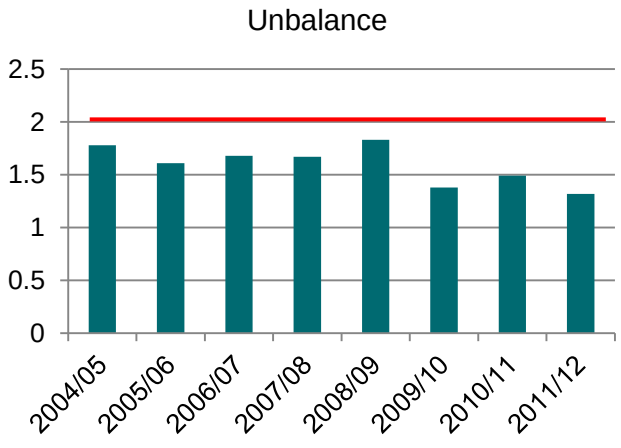
Essential Energy actively participates in the Long Term National Power Quality Survey (LTNPQS), a national power quality survey conducted by the University of Wollongong and a number of other distributors throughout Australia. This survey studies parameters such as steady state voltage, voltage total harmonic distortion (THD), voltage sags and voltage unbalance on three phase sites.

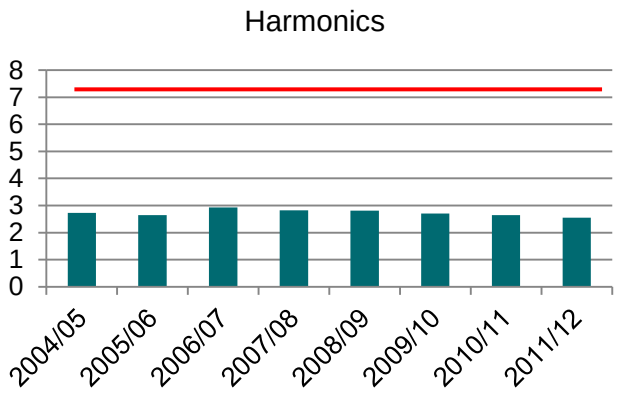
4.3.2 Performance Data

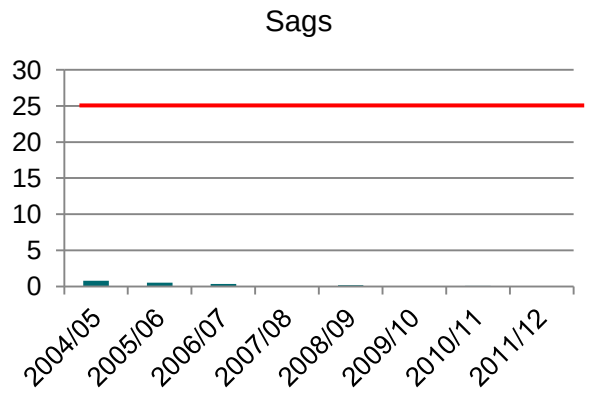
Trend of primary indices
Low Voltage Sites

Disturbance	Voltage		Unbalance		Harmonics		Sags	
Limit	8%		2%		7.3%		25*	
	Index	% of limit	Index	% of limit	Index	% of limit	Index	% of limit
2011/12	6.83	85	1.32	66	2.55	35	0.00	0
2010/11	6.61	83	1.49	74	2.65	36	0.10	0
2009/10	6.54	82	1.38	69	2.70	37	0.04	0
2008/09	7.04	88	1.83	92	2.81	38	0.16	1
2007/08	6.70	84	1.67	83	2.82	39	0.02	0
2006/07	7.17	90	1.68	84	2.93	40	0.33	1
2005/06	7.22	90	1.61	80	2.64	36	0.51	2
2004/05	7.46	93	1.78	89	2.73	37	0.80	3



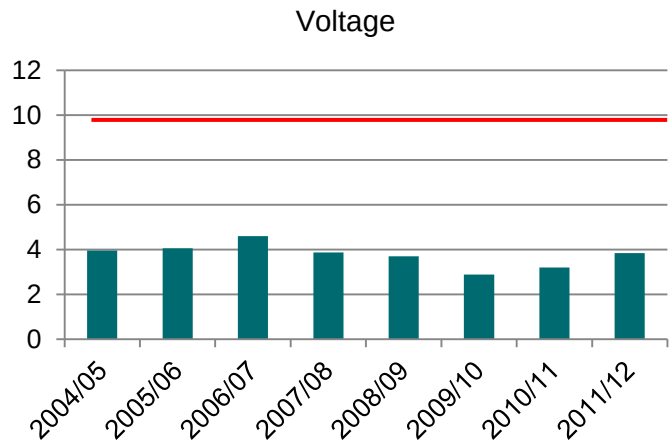


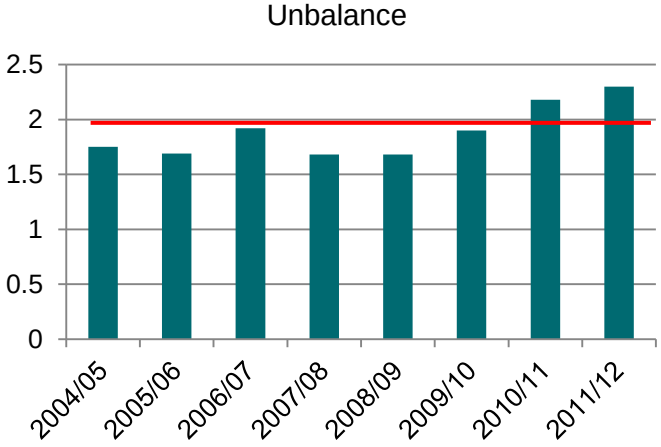


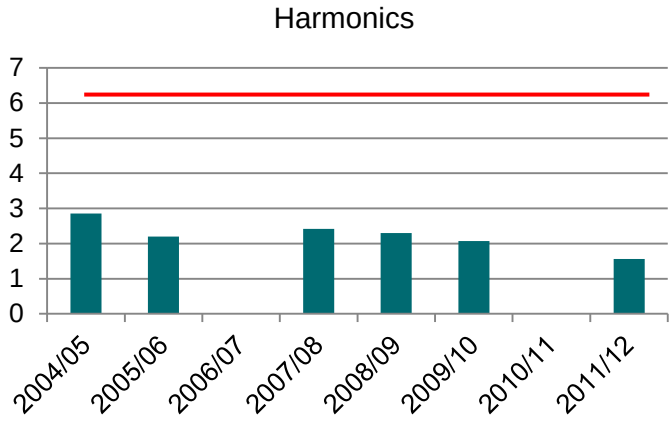


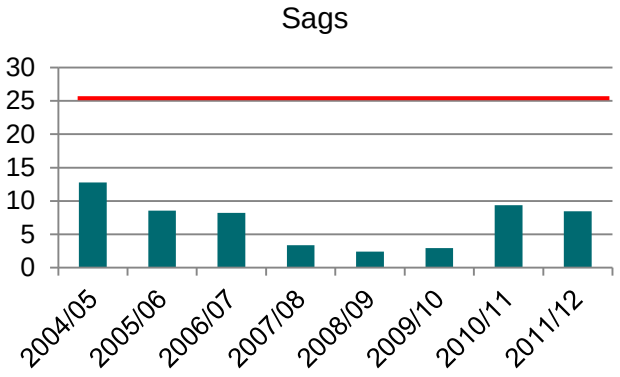
Medium Voltage Sites

Disturbance	Voltage		Unbalance		Harmonics		Sags	
Limit	10%		2%		6.6%		25*	
	Index	% of limit	Index	% of limit	Index	% of limit	Index	% of limit
2011/12	3.85	38	2.30	115	1.56	24	8.46	34
2010/11	3.20	32	2.18	109		0	9.35	37
2009/10	2.89	29	1.90	95	2.07	31	2.94	12
2008/09	3.70	37	1.68	84	2.30	35	2.43	10
2007/08	3.88	39	1.68	84	2.42	37	3.38	14
2006/07	4.60	46	1.92	96		0	8.23	33
2005/06	4.06	41	1.69	84	2.20	33	8.55	34
2004/05	3.96	40	1.75	87	2.86	43	12.75	51









Summary

LV disturbance levels indicate average voltage deviation to have slightly increased for this period. Harmonics and unbalance show a downward trend. The LV long term sag trend is unreliable with little variation from year to year.

For MV sites, the strongest trend seen is for unbalance which continues to show an upward trend over the past 4 years. A slight increase is indicated in the voltage spread level while harmonics continue to trend downwards. Sags show a slight decrease from the previous year's report data which could be attributed to a milder weather pattern over the report period

4.4 Distribution Reliability

4.4.1 Overview

Essential Energy conducts its reliability reporting in accordance with the *NSW Design, Reliability and Performance Licence Conditions for Distribution Network Service Providers* (Licence Conditions).

Essential Energy distribution network consists of 306 Urban Feeders, 907 Short Rural Feeders and 238 Long Rural Feeders. Over 60 per cent of our customers are on Short Rural Feeders and the average length of these feeders is approximately 56 kilometres.

Energy Network Management and Control ENMAC, introduced in July 2010, is an integrated suite of modules used by Essential Energy's Network Management group. ENMAC makes up the central modules of Essential Energy's power Distribution Management and Outage Management Systems (DMS/OMS).

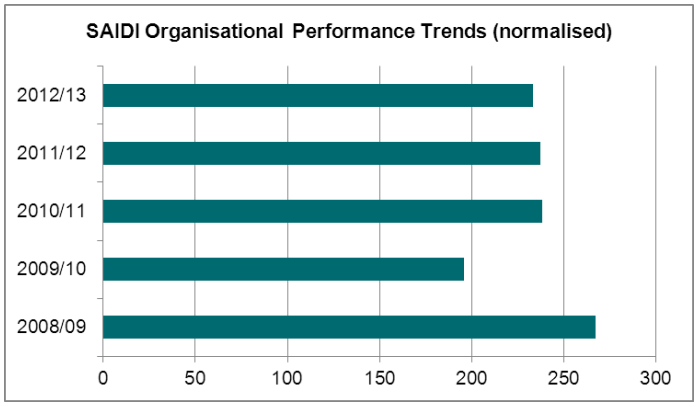
It has achieved an automated interface between systems, producing accurate reliability information to a distribution substation level for outage reporting. Previously, outage data was only recorded to a distribution feeder segment level. ENMAC was updated to Power-on Fusion at the start of November 2012. One of the changes it has brought is that all customer premises with an active NMI are now counted in an outage regardless of whether the account is active or not. Due to this, for this year only, average customer numbers were used in two groups – June 2012 – October 2012 and November 2012 – June2013.

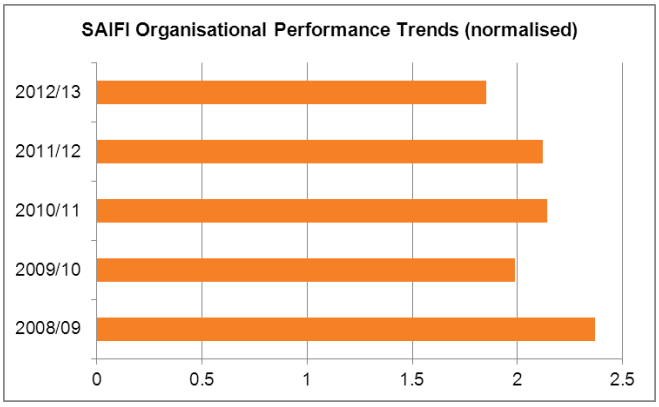
4.4.2 Organisational Performance (Normalised) Trend

Reliability data for SAIDI and SAIFI (Normalised) is reported in Table 4.1 and the graphs show the organisation trends over five years.

Table 4.1 Organisational Performance Trends (Normalised)

	Previous Years				Current Year
Year	**2008/09**	**2009/10**	**2010/11**	**2011/12**	**2012/13**
SAIDI	267	196	238	237	233
SAIFI	2.37	1.99	2.14	2.12	1.85





Comment on Performance

Essential Energy's network performance during the year is better than mandated in the licence conditions, and a testament to the network improvement strategies that Essential Energy is implementing.

4.4.3 Organisational Detailed Performance Current Year

Reliability data sets for SAIDI and SAIFI are reported for the whole organisation and feeder categories in Table 4.2.

Table 4.2 Organisational Detailed Performance Current Year

Sustained Interruption Data Sets		Whole Organisation and Feeder Category				
Category		ORG*	CBD	Urban	Short Rural	Long Rural
Customer Numbers		839,206	N/A	195,490	510,598	133,118
SAIDI	Overall	542	N/A	216	589	844
	Planned	165	N/A	106	166	250
	Unplanned	367	N/A	108	415	565
	Normalised	233	N/A	73	237	450
SAIFI	Overall	2.78	N/A	1.35	2.94	4.25
	Planned	0.69	N/A	0.41	0.70	1.02
	Unplanned	2.04	N/A	0.93	2.18	3.11
	Normalised	1.85	N/A	0.86	1.94	2.94

* Refers to the average performance of the organisation overall.

Note: Normalised data represents unplanned outages with 'excluded interruptions' subtracted e.g. those defined as being outside the control of the distributor.

4.4.4 Reliability Report against Standards

Table 4.3 CBD Feeder Performance (Normalised) Trend

		Previous Years				Current Year
Year		2008/09	2009/10	2010/11	2011/12	2012/13
SAIDI	Actual	N/A	N/A	N/A	N/A	N/A
	Target	N/A	N/A	N/A	N/A	N/A
SAIFI	Actual	N/A	N/A	N/A	N/A	N/A
	Target	N/A	N/A	N/A	N/A	N/A

Table 4.4 Urban Feeder Performance (Normalised) Trend

		Previous Years				Current Year
Year		2008/09	2009/10	2010/11	2011/12	2012/13
SAIDI	Actual	110	69	66	80	73
	Target	131	128	125	125	125
SAIFI	Actual	1.36	1.04	0.85	1.16	0.86
	Target	1.88	1.84	1.80	1.80	1.80

Table 4.5 Rural Short Feeder Performance (Normalised) Trend

		Previous Years				Current Year
Year		2008/09	2009/10	2010/11	2011/12	2012/13
SAIDI	Actual	285	204	245	238	237
	Target	316	308	300	300	300
SAIFI	Actual	2.58	2.19	2.31	2.21	1.94
	Target	3.12	3.06	3.00	3.00	3.00

Table 4.6 Rural Long-Feeder Performance (Normalised) Trend

		Previous Years				Current Year
Year		2008/09	2009/10	2010/11	2011/12	2012/13
SAIDI	Actual	483	384	493	478	450
	Target	720	710	700	700	700
SAIFI	Actual	3.47	2.88	3.37	3.28	2.94
	Target	4.70	4.60	4.50	4.50	4.50

Comment on Performance

It can be seen from Tables 4.3 to 4.6 that Essential Energy has consistently out-performed its target across all feeder categories. In January and February there were severe weather impacts on the network which resulted in 4 major event days being declared. Two of these days had the highest SAIDI impact on our network on record.

Excluded Events

Table 4.7 Excluded Interruptions for Current Year

Date of Event	Description of Event	Number of Customers Interrupted	Maximum Duration of Interruption (minutes)	Effect of Event on SAIDI Figure (minutes)	Basis for Exclusion
13/01/2013	Bushfires in Coonabarabran area	39,437	17,710	22.30	Major Event Day
27/01/2013	Storms - North Coast Region	31,215	18,182	23.20	Major Event Day
28/01/2013	Storms - North Coast Region	71,473	6,294	34.20	Major Event Day
22/02/2013	Storms - North Coast Region	75,381	8,626	54.60	Major Event Day

Major Event Day TMED

The value of TMED for 2012/13 was 5.83 minutes.

4.4.5 Performance against Individual Feeder Standards

The performance objectives for organisational average performances for each feeder category are not sufficient to identify when customers on a particular feeder experience unsatisfactory reliability performance. For this reason, SAIDI and SAIFI criteria (after 'excluded interruptions' are disregarded) act as a trigger for investigation and exception reporting purposes. The figures contained in the ministerially imposed licence conditions are shown in Table 4.8.

Table 4.8 Individual Feeder Standards for Exception Reporting Specified in the Licence Conditions Applicable to Essential Energy

	Feeder Categories			
Category	**CBD**	**Urban**	**Short Rural**	**Long Rural**
SAIDI	N/A	400	1,000	1,400
SAIFI	N/A	6	8	10

Performance outside this range results in the following actions:

- immediate investigation of the causes for each feeder exceeding the individual feeder standards
- by the end of the quarter following the quarter in which the feeder first exceeded the individual feeder standard, complete an investigation report identifying the causes and action required to improve the performance
- complete any operational actions identified in the investigation report by the end of the third quarter following the quarter in which the feeder first exceeded the standard, and
- where the investigation report identifies actions, other than operational actions, required to improve the performance of each feeder to the individual feeder standards, develop a project plan, including implementation timetable, and commence its implementation by the end of the second quarter following the quarter in which the feeder first exceeded the individual feeder standards.

Summarised performance against the above licence conditions is shown in Table 4.9.

Table 4.9 Individual Feeder Performance against the Standard Summary

	Feeder Type			
	CBD	Urban	Short Rural	Long Rural
Feeders (Total Number each Type)	N/A	306	907	238
Feeders that Exceeded the Standard During the Year (Total Number)	N/A	18	108	45
Feeders Not Immediately Investigated (Total Number)	N/A	0	0	0
Feeders Not Subject to a Completed Investigation Report by Due Date (Total Number)	N/A	15	63	30
Feeders Not Having Identified Operational Actions Completed by Due Date (Total Number)	N/A	2	22	12
Feeders Not Having a Project Plan Completed by Due Date (Total Number)	N/A	5	33	15

Comment on Performance

Following periods of high network activity, an increased number of feeders require investigation. In all cases, the investigation commenced on time and interim remedial actions taken where appropriate, even though the report may not have been completed in the required timeframe. Essential Energy has implemented processes to expedite investigations.

4.5 Transmission Reliability

Essential Energy has no requirement to provide this data.

5. Network Safety

5.1 Overview

Essential Energy is Australia's largest regional utility business. The health, safety, and well-being of our employees, customers, contractors, visitors, labour hire employees, the public and the environment are our highest priority.

Our aim is to integrate Health, Safety, and Environmental (HSE) responsibilities into all that we do.

To demonstrate our commitment to HSE, we will:

- Strive to be an incident free organisation
- Provide a safe, secure, healthy and environmentally conscious working environment through the effective implementation of the Health, Safety and Environment (HSE) Management System (CECM1000).
- Apply a risk management approach to the full scope of our activities, products and services to reduce hazards
- Comply with relevant legislation, regulations, standards, codes, licences and commitments
- Ensure all workers are trained and have the knowledge and skills they need to undertake their work in a safe, secure, healthy and environmentally responsible manner
- Require supervisors, employees, contractors, labour hire employees and visitors to abide by all HSE policies, procedures and other requirements
- Engage in effective consultation and open communication about HSE issues with our workers and workers representatives.
- Conduct incident investigations fairly, with a focus on implementing preventative actions
- Ensure appropriate resources are applied to fulfil the aims of this policy
- Establish measurable objectives and targets based on our significant HSE hazards to continually review and improve our safety, security, health and environmental performance
- Minimise the impact of pollution generated by our activities on the environment by reducing emissions, discharges and wastes by promoting energy conservation and recycling of wastes
- Promote a 'Safety First' culture where everyone watches out for their workmates, families and local communities.

Essential Energy also publishes a Public Electrical Safety Awareness Plan to educate the general public, industry workers and emergency service personnel on the hazards associated with electricity in relation to its transmission and distribution system. Essential Energy has the following processes in place to achieve these objectives:

- Development and dissemination of electrical safety awareness collateral incorporating;
  - Electrical infrastructure safety fact sheets
  - Practical instructional safety DVD
  - Storm safety advice
  - Electrical safety stickers for plant and equipment
- Delivery of Electrical Hazard Awareness presentations to at risk groups
- Targeted media campaigns based on seasonal activities within the agricultural sector
- Reporting of incidents as specified by the Department Trade and Investment, Regional Infrastructure and Services under the Significant Electricity Networks Incident (SENI) requirements

5.2 Public Injuries

Essential Energy's Public Electrical Safety Awareness Plan provides strategies to raise public awareness of the numerous hazards that may result from contact with electricity network assets, and provide simple yet effective ways to minimise the risk.

Our strategy of targeting 'at risk' groups - providing education material to organisations for their members to assist them to prevent and solve electrical safety issues - is the key to reducing the number of public safety incidents.

Ongoing agricultural activity and bumper harvest seasons following drought and the employment of itinerant workers such as backpackers appears to be the major contributing factor to an escalation of public safety incidents during the 20012/13 financial year.

Much has been done to raise awareness throughout the community regarding these hazards including targeted print media and radio campaigns, electronic distribution of safety information and Electrical Hazard Awareness presentations to industry and farmers in the lead up to harvest season and attendance at agricultural field days.

The 'at risk' groups include Emergency Services, earthmovers, construction workers, cotton growers, pilots, transport groups, and relevant Local and State Government workers. Essential Energy consults widely and tailors practical, effective training sessions free of charge.

Table 5.1 Public Injuries

	Previous Years				Current Year
Year	**2008/09**	**2009/10**	**2010/11**	**2011/12**	**2012/13**
Non-Fatal	1	2	4	14	25
Fatal	0	2	1	0	1
Total	1	4	5	14	26

Fatal incident

- Property worker was found deceased near a low hanging high voltage conductor

Non-Fatal incidents

- Electric shock from steel framed shed. Metering cable insulation failure energised earthing system
- Electric shock from service riser bracket. Active connected to bracket by contractor
- Electric shock from aerial service when painting house. Insulation degradation of service cable
- Electric shock from fallen aerial service when picked up
- Electric shocks from pillar box – vegetation growth through damaged cover in contact with energised cable
- Electric shock from fallen LV resting on gate
- Electric shock from street light column – insulation failure within column
- Electric shock from exposed LV cables following motor vehicle accident
- Electric shock when trenching machine contacted LV cable
- Electric shock when hedge trimmer cut aerial service
- Motorcyclist contacted low hanging de-energised powerline and fell from machine suffering lacerations
- Electric shock through step potential following storm damage
- Electric shock from transformer pole – insulation degradation energised earthing system
- Electric shock when irrigation pipe lifted into HV powerline
- Electric shock from street light column – nearby lightning strike damaged street column wiring
- Electric shock from street light column – light not connected to neutral system
- Electric shock from fallen LV – vehicle pulled down conductors, driver picked them up to remove from carriageway
- Electric shock through steering wheel of tractor when radio aerial contacted HV powerlines
- Sign being erected on pole. Flash burns to hand when drilled through steel conduit into energised LV cables
- Electric shock received when fallen LV conductor picked up
- Electric shock from service riser bracket. Active connected to bracket by contractor
- Electric shock from street light column – light not connected to neutral system
- Electric shock received whilst attempting to lower a tipper in contact with HV powerlines
- Electric shock received when vehicle mounted crane (HIAB) became entangled in HV powerlines
- Electric shocks received from installation following pole replacement by ASP

Preventative actions for all incidents are continuation of outworking activities in accordance with Essential Energy's Network Management Plan Chapter 3: Public Electricity Safety Awareness Plan. Where applicable, public electrical hazard awareness collateral was provided and offers made to conduct Electrical Hazard Awareness presentations.

5.3 Worker Injuries

There were no fatalities recorded during the reporting period. A total of 9 workers (1 incident involved medical treatment to 2 workers), 2 contractor workers and 1 ASP worker were injured. Comprehensive investigations were undertaken to determine causal indicators such as systemic influences and human factors. Preventative actions were implemented for the worker and contractor worker incidents through Essential Energy's incident management,

investigation and contractor management processes which incorporate performance management with the effected workers. The relevant incident details were communicated across Essential Energy and applicable contractors regarding the findings and recommendations of selected incidents. The probable causes are detailed beneath table 5.2.

Table 5.2 Worker, Contractor and ASP Injuries

	Previous Years				Current Year
Year	**2008/09**	**2009/10**	**2010/11**	**2011/12**	**2012/13**
Workers	1	-	6	7	9
Contractors	-	-	-	6	2
ASPs	-	-	-	1	1

Workers Probable Causes:

- Mild concussion when broken pole step contacted workers safety helmet
- Friction burns to gloved hands when vehicle passing through worksite made contact with lowered conductors
- Elevated Work Platform failed in service ejecting two workers who fell approximately 8 metres to the ground.
- Electric shock received from induction (suspected static line charging) in a HV conductor due to equipotential conditions not being maintained
- Electric shock received through induction on de-energised line created through lightning strike
- Electric shock received from energised street light conductor
- Burns to hand caused by electrical flashover when altering phase rotation on an energised circuit breaker
- Shoulder dislocated when worker was dragged from a quad bike which contacted lowered powerlines

Contractors:

- Temporary loss of vision in one eye due to electrical flash over when a drill contacted energised 11kV cable
- Spinal injury received when vegetation worker's high line snapped causing the worker to fall approximately 6 metres to the ground from the tree

ASPs:

- Flash burns to wrist when working on LV cables within a pillar box. Cables were assumed to have been de-energised

5.4 Major Incident Reports

Table 5.3 Summary of Major Incident Reports

Date	Incident Description	Locality
21 September 2012	Spinal injury received when vegetation worker's high line snapped causing the worker to fall approximately 6 metres to the ground from the tree	Main Arm
12 October 2012	EWP failed in service ejecting two workers who fell approximately 8 metres to the ground.	Casino
05 March 2013	Property owner was found deceased near a low hanging high voltage conductor	Mendooran

6. Customer Installations

Monitoring of installations is carried out in accordance with regulations and industry codes of practice. In addition to the *Electricity Supply (Safety and Network Management) Regulation 2008*, installations must be consistent with the *Electrical Safety (Electrical Installations) Regulation 1998*, the *Code of Practice for Installation Safety Management*, and the *Code of Practice for Contestable Works Accreditation*.

Essential Energy's *CEOP8004 Network Management Plan Chapter 2*: *Customer Installation Safety Plan* outlines the approach taken to managing all aspects of customer installation work. The plan defines our approach with respect to the roles of both contractors and Essential Energy.

Installation and inspection data is managed within Essential Energy's Web Form Manager which enables management of Certificate of Compliance for Electrical Work (CCEW) and Notification of Service Work (NOSW) information. The auditing of individual contractors to ensure adherence to *CEOP8004* is monitored via a spread-sheet.

6.1 Reports against Customer Installation Safety Plans

Table 6.1 Installation Inspections Trend

	Previous Years				Current Year
Year	**2008/09**	**2009/10**	**2010/11**	**2011/12**	**2012/13**
Number of Notifications (CCEW)	18,771	26,614	54,152	31,085	32,025
Number of Inspections	7,297	10,920	25,706	12,634	11,940
Installation Inspection Rate (%)	38.9	41	47	40	37
Major Safety Defect Rate (%)	2.8	2.5	2.1	1.6	1.8
Safety Breach Notices Issued (%)	2.9	2.6	4.47	3.93	1.77
Number of Warnings Issued	214	280	1,148	496	211
Reports to Fair Trading (No.)	4	5	3	6	2
Number of Audits by Distributor	28	91	212	247	223

6.2 Customer Installation Shock Reports

Table 6.2 Customer Installation Shock Reports Trend

	Previous Years				Current Year
Year	**2008/09**	**2009/10**	**2010/11**	**2011/12**	**2012/13**
Shocks on Customer's Premises (Number Reported)	719	678	654	666	613

Table 6.3 Customer Installation Safety- Categories of Shocks Analysed

Category	Number		% of Total
	Fatal	Non-Fatal	
Cause Category Installation Related			
Contact with Consumer's Mains – Faulty Mains		5	0.8%
Contact with Consumer's Mains – Human error		1	0.2%
Contact with Live Parts at Switchboard – Faulty Switchboard		5	0.8%
Contact with Live Parts at Switchboard – Human Error		4	0.7%
Faulty Mains Box		63	10.3%
Faulty UG Consumer Mains		1	0.2%
Faulty UG Consumer Mains Joint		5	0.8%
Induced Voltage		18	2.9%
Long LV Run (Customer responsibility)		11	1.8%
Poor Earthing		6	1.0%
Unsafe Installation Work by Licensed Contractor		7	1.1%
Failure of Part of Installation (not water related)		13	2.1%
Defective or Unsuitable Appliance		16	2.6%
Working on or Interference with Installation		1	0.2%
Working on or Interference with Appliance		1	0.2%
Water Damage or Ingress		11	1.8%
Static Electricity		10	1.6%
No Cause Found		15	2.4%
Other (Installation Related)		65	10.6%
Sub Total	**0**	**258**	**42%**
Cause Category Network Related			
Contact with Network Mains - Faulty mains		1	0.2%
Contact with Network Mains - Human error		1	0.2%
Contact with OH Service Mains - Faulty mains		4	0.7%
Contact with OH Service Mains - Human error		2	0.3%
Faulty OH Mains Joint		52	8.5%
Faulty OH Service Joint		97	15.8%
Faulty OH Network Splice		3	0.5%
Faulty OH Open Service		6	1.0%
Faulty OH Twisted Service		18	2.9%
Faulty UG Distribution Mains Joint		3	0.5%
Faulty UG Service		3	0.5%
Faulty UG Service Joint		11	1.8%
Faulty UG Mains		0	0.0%
Long LV Run (Network responsibility)		6	1.0%
LV Leakage (salt/dust)		14	2.3%
HV Leakage		1	0.2%
Nuisance Tingles <10 volts		81	13.2%
Incorrect Polarity		0	0.0%
Other (Network Related)		19	3.1%

Sub total	**0**	**322**	**52.5%**
Other Cause Categories			
Lightning/Storm		23	3.8%
N/A		1	0.2%
Undefined (under investigation)		9	1.5%
Subtotal	**0**	**33**	**5.4%**
TOTAL	**0**	**613**	
Total per 1,000 customers	**0.7549**		

Essential Energy in the reporting period 2012/13 experienced an 8% decrease in reported Public Shocks compared to the previous reporting period. Analysis of the data indicates from a network perspective *"Faulty OH Service Joints"* and *"Nuisance Tingles < 10 volts"* dominate the causes being 15.8 % and 13.2 % respectively of the total reported. From an installation perspective "*Other (installation related)*" and "*Faulty Mains Box*" dominate the cause being 10.6% and 10.3% of the total respectively. Results indicate that 42% of reported shocks can be attributed to installations and 52.5% can be attributed to the network.

Essential Energy's Safety Group continues to campaign on the dangers associated with electricity.

7. Contestable Works Scheme

Essential Energy monitors Level 2 works in our Web Form Manager (WFM) system, Level 1 and Level 3 information is collected regionally by the Quality Control Co-ordinators in the Contestable Works Database and internal inspection information is collected in CRM Red back.

2012/13 has seen the following trends:

- **Level 1** – Internal project notifications are down and inspection rates falling in line with this decline. External project notifications remain steady.
- **Level 2** – The 2012/13 trend has again highlighted the drop off in growth and involvement by all stakeholders particularly with the closure of the solar bonus scheme.
- **Level 3** – Design submissions from Level 3 ASP's remains steady.

Table 7.1 Contestable Works Trend

	Previous Years								Current Year	
	2008/09		2009/10		2010/11		2011/12		2012/13	
	Int	Ext	Int	Ext	Int	Ext	Int	Ext	Int	Ext
Network Work (Level 1)										
Project Notifications	778	1,269	538	1,434	153	1,830	54	1,266	26	1,587
Initial Inspections of Completed Projects	786	947	595	907	391	1,026	4	1,654	6	1,303
Of Projects Inspected, Number Initially Nonconforming	220	200	46	159	87	228	0	294	4	319
Customer Connection Work (Level 2)										
Notifications (NOSW)	5,518	17,135	3,338	19,910	2,653	49,163	723	32,193	573	34,376
Inspections by Network Operator	3,485	12,919	2,526	12,433	1,891	31,554	359	16,783	358	13,945
Major Defects	3	107	2	62	2	379	0	477	0	123
Network Design Work (Level 3)										
Designs Certified	778	947	538	1,234	158	1,825	46	1,410	26	1,440

Note:

"Int" refers to contestable work done by the distributor's ASP entity and "Ext" refers to work done by independent ASPs.

8. Bush Fire Risk Management

Table 8.1 Bushfire Risk Management

	Previous Years				Current Year
Year	**2008/09**	**2009/10**	**2010/11**	**2011/12**	**2012/13**
Pre-summer aerial bushfire inspection %	100%	100%	100%	100%	100%
Fire ignitions by network assets (Number) [5]	94	168	111	191[6]	354[7]
Complaints from the public regarding preparation for the bush fire season (Number)	7	22	37	22	18

Essential Energy's Network Management Plan Chapter 4 Bushfire Risk Management Plan was reviewed internally in December 2012 and republished with revisions. This is part of the standard annual review cycle adopted for this plan.

Inspections

Essential Energy inspections pertaining to bushfire risk mitigation include:

- Annual pre-summer aerial inspection of overhead lines to identify assets or vegetation with potential bushfire risk prior to the fire danger declaration period.
  Annual inspection of the rural overhead network by aircraft and ground support vehicles was satisfactorily completed before the 2012/13 fire declaration period (October 2012 to March 2013).
- Cyclic ground-line inspection and assessment of overhead poles and structures

  The Essential Energy ground-line asset inspection programs successfully condition monitored approximately 345,000 poles and the associated network.
- Cyclic ground-based inspection of vegetation in rural areas

  Vegetation inspections and cutting have remained a significant focus throughout 2012/13 year. This activity is the largest component of the Essential Energy annual operating investment and has produced significant improvement in clearances to power lines as noted in this year's aerial inspections. Trials in the use of new technologies such as Light Detection and Ranging (LiDaR) are continuing for the purposes of better managing the risk trees pose to power lines and overall safety.
- Cyclic earth integrity testing program

  This inspection program is generally aligned with the Pole & Line inspection program

The results of the 2012/13 asset inspection program are shown below.

Table 8.2 Asset Inspection Program

Poles Inspected	Target Pole Population	Inspection Completion Rate %	Poles for replacement or reinforcement	Condemn Rate %
345,441	346,876	99.6	8,261	2.39

The average pole condemnation rate of 2.39 per cent is consistent with expectations and the previous year (2.38%).

[5] Fire ignitions from network assets are those fires where the network was the ignition source regardless of causes. This includes network ignitions caused by 3rd parties e.g machinery contacting lines and excludes fire damage to assets by non-network ignition sources e.g bushfires, grassfires, uncontrolled burn-offs.
[6] Improved monitoring and reporting procedures have contributed to this increased result.
[7] The increase for 2012/13 was primarily due to the extreme heatwave conditions in January 2013. Refer to the BOM special climate report at http://www.bom.gov.au/climate/current/special-statements.shtml

Annual Bushfire Patrol

Urgent risk defects highlighted through the annual pre-summer bushfire patrols for the 2013 Calendar Year[8] are shown below.

Table 8.3 Annual Patrol Defects Identified

Annual Bushfire Patrol Defects Identified in Rural Areas 2012			
Defect Category	**Assets**	**Vegetation**	**Total Urgent Risk Defects**
Number of defects identified 01/01/2013 – 09/07/2013.	263	642	905
Defects rectified at 09/07/2013.	259	623	882

It is expected that all urgent risk defects identified by Annual Bushfire Patrols will be completed prior to the RFS fire danger declaration period. These are given high priority in the work programs and typically actioned within a short period of time. All other less urgent defects identified will be prioritised based on risk and locality and scheduled for rectification.

Audit of Activities

Essential Energy carries out a number of audits on key activities associated with bushfire mitigation. These include activities relating to;

- Ground-line Pole & Line inspections
- Vegetation inspections
- Annual bushfire patrols in rural areas.

The purpose of the audits is to ensure the activities are carried out in accordance with Essential Energy's policies and procedures.

Community Awareness

Essential Energy has developed materials relating to bushfire risk and safety which are available to the public via its website through other marketing channels each year. The Vegetation Management Plan and Network Management Plan Chapter 4: Bushfire Risk Management Plan are available to the public for comment.

Bushfire related electrical safety topics include:
- bushfire and storm safety tips
- dangers of trees near power lines
- electrical safety for emergency services personnel
- advice on safety when burning off near electrical network assets
- safe operation of farm equipment such as grain augers, harvesters and irrigation systems, and advice on electrical safety for heavy plant operators.

Essential Energy remains an active member of the local Bush Fire Management Committees with employee representatives on some 45 committees across the state.

[8] Essential Energy reports Aerial Annual Inspections on a calendar year basis to ensure data coincides with the relevant flight schedule.

Bushfire Mitigation Initiatives

Essential Energy has implemented, or is currently implementing, bushfire mitigation initiatives including;

> **Organisational Structure**

- The dedicated Senior Management Assurance Panel and a Bushfire Working Group continually monitor the effectiveness of the bushfire mitigation activities and this will continue throughout the 2013/14 period. These groups review the fire starts associated with network assets, initiate and review mitigating programs of work, and oversee the company's preparedness for the specified fire danger periods.

> **Resourcing (Field Based)**

- Essential Energy is continuing to devote significant resources to fire mitigation activities. The most significant resource allocation in the operating budget is the vegetation management program. Asset inspection programs are also a significant component of the allocations. Both these programs have a direct impact on bushfire mitigation capability.

> **Investigation of Emerging Technologies**

- A number of research programs are either being considered or continuing through 2013/14. These include;

- Continuing assessment of LiDaR technology to better understand vegetation growth and clearances near powerlines

- Failure Mode Effects and Criticality Analysis FEMCA project: This project utilises a rigorous analytical process to assess asset failures and predict service life and optimal maintenance practices.

- Alternative high voltage fuse replacement research looking to further reduce the potential risk posed by some expulsion dropout fuses currently installed on the network.

> **Monitoring:**

- Continuation of the existing inspection programs including specific bushfire mitigation aerial patrols prior to the coming fire season.

- A review of the 2012/13 fires suspected of starting from network assets has been completed ensuring a clear understanding of the risks and to identify potential new programs of work which will enhance risk mitigation.

- Essential Energy has reviewed and adopted changes to the asset inspection program to include closer monitoring of all rural low voltage open wire spans for the development of additional programs relating to fitting of spreaders to prevent conductor clashing.

    - Other changes include identification of high voltage spans with or without vibration dampers for possible development of future retrofitting programs.

> **Private Lines Policy**

A revision of the Private Lines Plan was undertaken resulting in the republishing of the plan in June 2013. This included re-assessment of the approach to inspection and maintenance of private lines which enhances the fire risk management.

> **Training**

- Refreshers of the nationally accredited Rural Bushfire Service Awareness training was conducted throughout 2012/13 for Essential Energy field staff.

- Essential Energy is continuing to apply nationally accredited training modules for the training and assessment of asset inspectors in 2013/14.

> **Other Initiatives**

- Further development of the Essential Energy Bushfire Preparedness Index occurred in 2012/13 for adoption throughout 2013/14

- Continued association with NSW RFS through organisation briefings to senior managers and participation by Essential Energy in the multi-agency pre-season briefings.

- Essential Energy is continuing implementation of initiatives associated with the Victorian Bushfire Royal Commission recommendations. Particular focus is continuing in regard to recommendation 32 – auto-reclose policy and recommendation 33 fitting of spreaders & vibration dampers. These are monitored by the Bushfire Risk Working Group & the Bushfire Risk Assurance Panel.

- Broader Industry Collaborations on bushfire risk management issues. Increased interaction with Ausgrid and Endeavour relative to fire risk management and policy particularly with the formation of the entity Networks NSW.

- Continuing the 2012/13 initiative to establish and implement a uniform industry based Fire Risk Rating Methodology for electricity distribution assets. It is expected that the first evolution of this risk model for NSW will be available during 2013/14. It is based on work undertaken by Dr Kevin Tolhurst Department of Forest and Ecosystem Science and the Bushfire Cooperative Research Centre CRC in conjunction with Melbourne University.

- Development of tools to accurately track and understand asset breakdowns or failures. A new database was created called ENI (Electricity Network Incident) to capture failure data for better understanding of causal factors.

- Overhead service cable bulk replacement program – this program has been extended into the 2013/14 works programs. This mitigates the risk of cables failing in situ which can lead to fire starts.

It should be noted that initiatives conducted for other purposes such as reliability improvement or network refurbishment, can directly or indirectly result in complimentary benefits for bushfire mitigation.

9. Public Electrical Safety Awareness

The number of reportable Public Safety incidents increased from 175 in 2011/12 to 203 during the 2012/13 reporting period. Ongoing agricultural activity and bumper harvest seasons following drought and the employment of itinerant workers such as backpackers appears to be the major contributing factor to an increase of public safety incidents during the 2012/13 financial year (see diagram one).

While we have seen an overall increase in reportable incidents year on year, our focused cotton and grain harvest safety campaigns provided positive results with a reduction in line strikes specifically related to harvest activities for cotton (53% reduction) and grain (22% reduction) along with a marked decrease (72% reduction) in the number of aircraft strikes, predominantly aerial crop application craft used prior to cotton harvest.

An increase in excavator incidents is thought to be partly attributed to the months when flooding was occurring in the southern regions of NSW. A number of strikes involved excavators increasing levee bank wall heights, thus reducing ground clearances of the overhead network when passing beneath them.

It is also apparent that the increased use of GPS steering technology in tractors may have contributed to the increase of tractors and implements contacting power poles due to concentration on the task at hand being diminished by the operator.

As a result of the increasing incidents, adherence to the requirements of the Network Management Plan Chapter 3 – Public Electrical Safety Awareness Plan has focussed heavily on the planned activities within section 12.1 and 12.2 looking at key strategies to improve electrical hazard awareness in the agricultural and construction sectors.

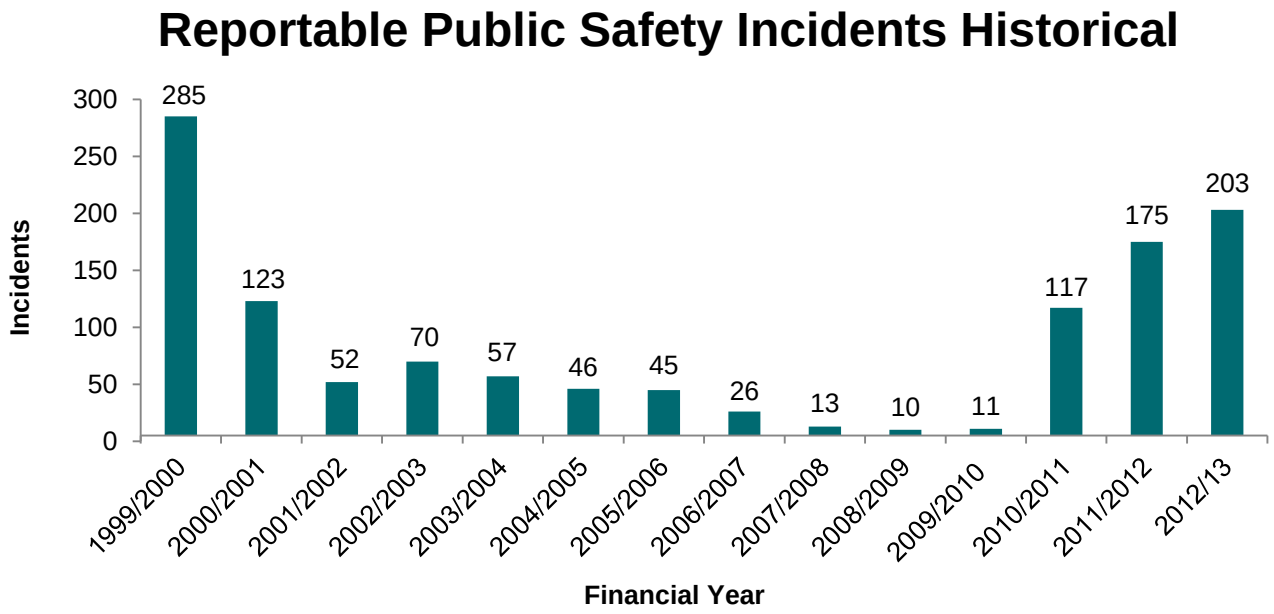
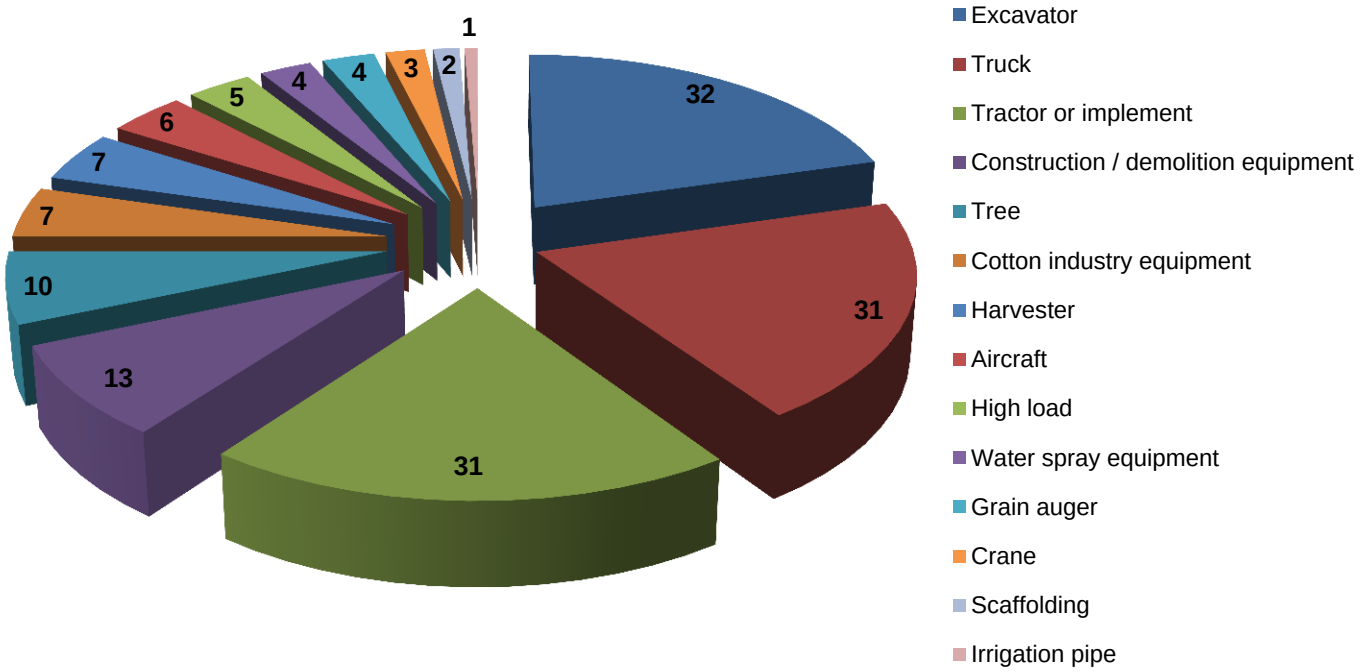


Diagram two below depicts the reportable public safety incidents by 'object involved' in line strikes during the 2012/13 reporting period. It is clear the at-risk groups to continue focus on are excavators, tractors and implements contacting poles, and trucks (mainly tippers). The 'other' category incorporates incidents such as persons receiving electric shocks or injury from fallen or faulty electrical distribution infrastructure and apparatus, infrastructure damage caused by stubble burn off and emergency service workers encroaching safe approach distances to fallen power lines.

Reportable Public safety Incidents by Object Involved in Contact - 2012/13



Public Safety Initiatives:

A targeted approach was taken following the 2011/12 reporting period to reduce the incidents associated with aircraft strikes and cotton / grain harvest activities. An agricultural aircraft business involved in the majority of strikes during the previous year was very proactive in assisting us with development of an aerial safety video. This approach saw a 72% reduction in powerline strikes compared with the previous reporting period.

A 53% reduction in cotton harvest and 22% reduction in grain harvest incidents can be attributed to targeted harvest safety campaigns. A brochure containing relevant fact sheets and link to industry related videos and an on line ordering system for safety stickers was sent to industry organisations, growers and contractors in the lead up to the commencement of harvest activities. Targeted print, radio and social media (Facebook and Twitter) were also used to spread the awareness campaign.

Essential Energy was invited to present Electrical Hazard Awareness information to more than 400 individuals within the NSW Police Force, NSW Volunteer Rescue Association, NSW Rural Fire Service, State Emergency Service, numerous regional shire councils, the sugar cane industry, the construction industry and schools.

Work continues with development of a fact sheet for watercraft navigating waters where powerlines may cross and a review of the structures near powerlines and easement fact sheets to align with the recently released ISSC 20 publication: Guideline for the Management of Activities within Electricity Easements and Close to Electricity Infrastructure.

10. Power Line Crossings of Navigable Waterways

Existing crossing numbers

Essential Energy currently has a total of 1,356 crossings that were identified for risk assessments in consultation with NSW Transport, Roads and Maritime Services. These sites are part of an ongoing inspection and risk assessment program. The table below provides the current number of sites and works carried out in the 2012-13 reporting period.

Table 10.1 Power Line Crossings of Navigable Waterways Summary

	Existing (Number)	New (Number)	Incidents (Number)	Crossings Reconstructed (Number)	Crossings Identified as Requiring Conversion to Submarine Crossings (Number)
Overhead Crossings	1,296	-	-	6	-
Submarine Crossings	60	1	-	-	-

Note: The existing numbers of overhead and submarine crossings shown in Table 10.1 are the result of consultations with the NSW Transport, Roads and Maritime Services.

Crossings Incidents

Essential Energy had no reportable incidents for the 2012/13 reporting period.

Crossings Reconstructed

Details of the six reconstructed sites are;

- 4 x Refurbishment of existing overhead crossings
- 1 x Removal of overhead crossing – reconstructed as an attachment to nearby bridge
- 1 x Removal of overhead crossing – removal of low voltage conductors only, high voltage conductors remain at this crossing

Activities to comply with the NSW Transport, Roads and Maritime Services (previously NSW Maritime) Crossings of Navigable Waters: Electricity Industry Code (the Code)

1. Essential Energy Navigable Waterways Risk Assessment Program

Essential Energy has completed a comprehensive external inspection and risk assessment of all sites that have been identified by the NSW Transport, Roads and Maritime Services as crossing a navigable waterway.

Although there have been a number of delays due to access, flooding, and service provider compliance issues, the results of this program are currently being analysed to determine the necessary activities that will be required as treatment to reduce crossing site risks to as low as reasonably practicable. All scheduled activities are being prioritised based on the associated site risk.

These activities include;

- installation of signage in accordance with AS6947-2009 Crossing of waterways by electricity infrastructure
- conductor re-tensioning, raising of attachment height, and stay installation
- taller pole installation

- conversion of the existing overhead crossing to a submarine crossing
- relocation of the crossing
- removal of the crossing

Required modifications to Essential Energy's corporate asset management system have also been completed to enable the storage and ongoing management of all designated navigable crossings within Essential Energy's distribution network.

2. Network Refurbishment Works

Where network refurbishment works include a crossing of a navigable waterway these works are carried out to meet the requirements of the Code using the preliminary risk assessment information as mentioned above.

11. Chief Operating Officer Declaration

Essential Energy

ELECTRICITY NETWORK PERFORMANCE REPORT 2012/13

Declaration by Chief Operating Officer

In submitting this Electricity Network Performance Report (the Report), I declare that the Report:

1. Complies with reporting requirements prescribed under the *Electricity Supply (Safety and Network Management) Regulation 2008*, and the "Distribution Network Service Provider Annual Report Outline" (the Outline), as provided by DTIRIS.
2. Has been checked in accordance with recognised quality procedures; and in my opinion, there are reasonable grounds to believe the data, and notes in respect of data contained in this Report, give a true and fair view of the organisation's performance in respect of the matters contained in the Outline.

Chief Operating Officer Gary Humphries

Signature

Date 29-11-13