> Electricity Network Performance Report 2013/14

Submitted to:
NSW Department of Trade and Investment, Regional Infrastructure and Services 2014

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1. Profile

1.1 Overview

As a State Owned Corporation, Essential Energy is responsible for delivering and maintaining safe, reliable and affordable network electricity services to around 800,000 New South Wales residents, across an area spanning 95 per cent of the state and parts of southern Queensland and northern Victoria.

Additionally, Essential Water – an operating division of Essential Energy – delivers water services to around 20,000 customers in Broken Hill, Menindee, Sunset Strip and Silverton and sewerage service sot around 9,500 customers in Broken Hill.

With more than 4,000 employees based across more than 100 depots and regional offices, Essential Energy is a strong contributor to the regional areas it serves.

Our three key priority areas allow us to focus our efforts on continuously improving our safety performance for employees, contractors and the community, ensuring the reliability, security and sustainability of the network, while striving to contain average increases in our share of customers' electricity bills to CPI or below.

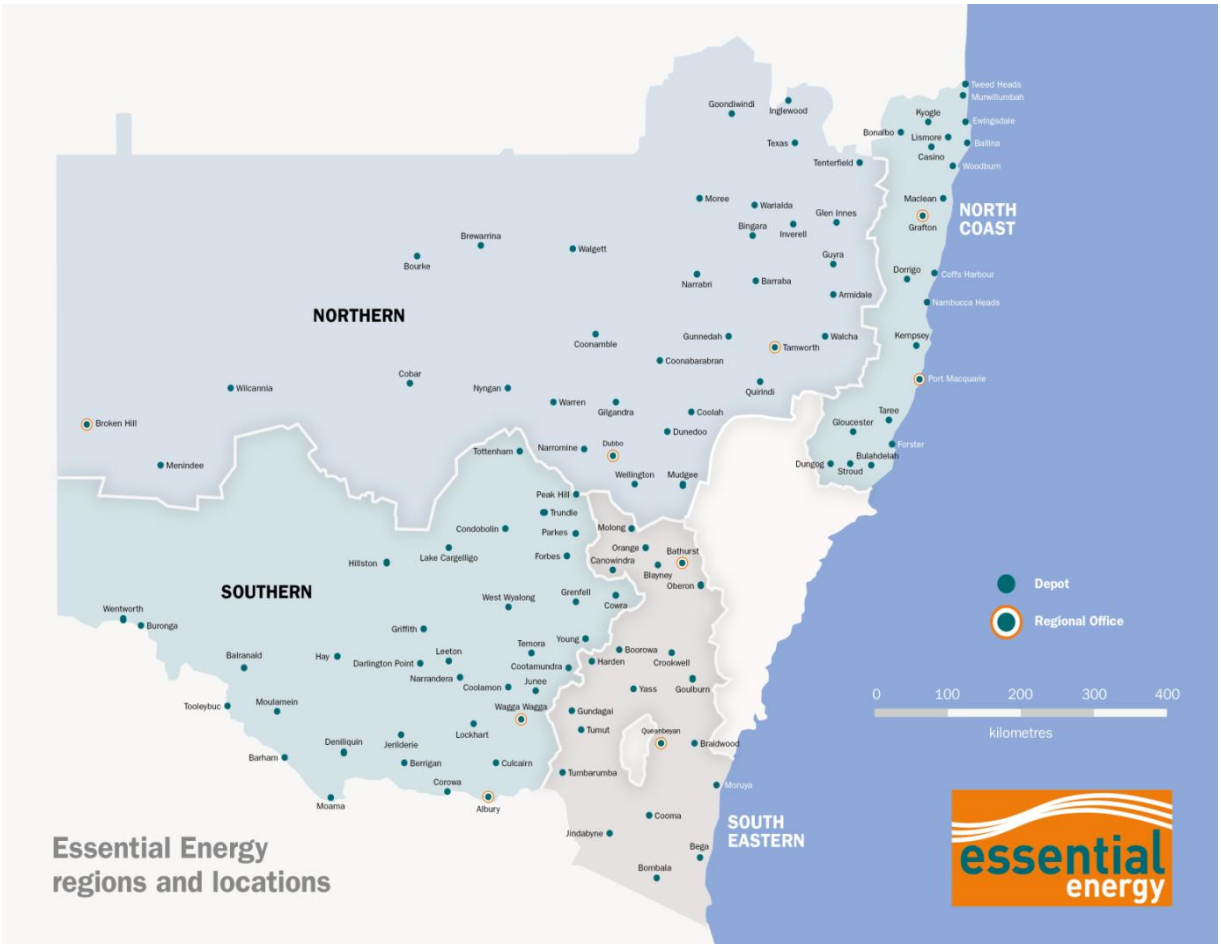


Figure 1 – Essential Energy locations

Table 1.1 Distributor Statistics

	Number at 30/6/13	Number at 30/6/14
Distribution Customer Numbers (Total)	812,373	822,413
Customer Numbers at Year End (Southern)	158,712	169,826
Customer Numbers at Year End (Northern)	147,710	170,851
Customer Numbers at Year End (South Eastern)	175,192	177,288
Customer Numbers at Year End (North Coast)	300,988	304,448
Customer Numbers at Year End (Far West)	29,771	n/a[1]
Maximum Demand (MW)	2,287	2,202
Feeder Number CBD	-	-
Feeder Number Urban	306	294
Feeder Number Short Rural	907	915
Feeder Numbers Long Rural	238	238
Energy Received by Dist Network to Year End GWh	12,894	12,799
Energy Distributed to Year End (Residential) GWh	4,475	4,323
Energy Distributed to Year End (Non-Residential including un-metered supplies) GWh	7,509	7,617
Energy Distributed to Year End (Southern) GWh	2,929	3,113
Energy Distributed to Year End (Northern) GWh	2,784	3,125
Energy Distributed to Year End (South Eastern) GWh	2,948	2,918
Energy Distributed to Year End (Far North Coast) GWh – now North Coast	2,827	2,784
Energy Distributed to Year End (Far West) GWh	496	n/a[1]
System Loss Factor (%)	7.05[2]	6.71
Transmission System (km)	-	-
Transmission Substation (Number)[3]	20	20
Sub Transmission System (km)	10,553	10,745[4]
Substation - Zone (Number)	328	330
Substation - Distribution (Number)	136,445	137,017[4]
High Voltage Overhead (km)	146,842	146,837
High Voltage Underground (km)	2,244	2,333[4]
Low Voltage Overhead (km)	25,742	22,202[5]
Low Voltage Underground (km)	4,728	5,214
Pole (Number)	1,387,206	1,387,204
Streetlights (Number)	152,129	154,811[4]
Employees (Full Time Equivalent Number)	4,394	4,051
Contractors (Full Time Equivalent Number)	243	128

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

[1] Essential Energy restructured its business consolidating its regions from five into four in April 2014
[2] System losses have been revised following data validation
[3] Essential Energy assumes any substation that converts to a voltage that is not used for distribution is a Transmission Substation.
[4] The variation from the previous year is mainly due to data cleansing during the reporting period.
[5] A significant amount of data cleansing occurred during the year to identify OH & UG LV services which were captured as LV mains. This has contributed to the reduction of LV overhead and increase in LV underground.

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. The capital program was reviewed to allow for a decline in network demand, improved network reliability performance and compliance to licence conditions and realised efficiencies. This review resulted in the opportunity to reduce the capital program in 2013/14 while still meeting required network outcomes for customers.

Table 1.2 Capital Works Program Trend

	Previous Years				Current Year
Year	**2009/10**	**2010/11**	**2011/12**	**2012/13**	**2013/14**
Capital works program ($M)	652.7	701.9	745.1	640.58	564.3

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	**2009/10**	**2010/11**	**2011/12**	**2012/13**	**2013/14**
Complaints Total	3,599	5,301	4,323	4,447	2,781
Complaints per 1,000 Distribution Customers	4.5	6.6	5.4	5.5	3.4
Complaints regarding Vegetation Management	234	328	376	432	270

The introduction of the National Energy Customer Framework in NSW on 1 July 2013 has seen an increased emphasis on the notification of planned interruptions, which has seen a reduction of complaints in this area, along with efforts to reduce the instances of planned outages running overtime.

A milder storm season has assisted in the reduction of complaints, as well as a number of significant maintenance and upgrade projects on the network has reduced complaints.

The end of the Transitional Service Agreement between Essential Energy and Origin in October 2013 allowed true separation of the retail and network activities and has resulted in less complaints.

Table 2.2 Network Complaint Investigations Completed Current Year

Summary

Table 2.2 Network Complaint Investigations Completed Current Year		2013/14
	Number	**Number Valid***
Voltage	567	265
Current	1	0
Other Quality	434	183
Reliability	140	39
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		2013/14	
Category	**Nature of Complaint**	**Number**	**Valid***
Voltage	Sustained over voltage	127	91
	Sustained under voltage	83	36
	Voltage fluctuations	212	75
	Voltage dips	78	36
	Voltage swell	1	1
	Switching transients	0	0
	N-E voltage difference	59	22
	Ground fault voltage	0	0
	Voltage unbalance	6	3
	Mains signalling voltages (Outside defined range)	1	1
	HV injection (HV/LV Intermix)	0	0
	Notching	0	0
Sub-total (Supply Voltage Complaints)		**567**	**265**
Current	Direct current	0	0
	Harmonic content	1	0
	Inter Harmonics	0	0
Sub-total (Supply Current Complaints)		**1**	**0**
Other Quality	Mains signalling reliability	0	0
	Noise & Interference	95	41
	Level of supply capacity	45	20
	Embedded Generation (Solar)	161	93
	Embedded Generation (Wind)	0	0
	Supply frequency	2	0
	Level of EMF	2	0
	Customer Equipment Failure	129	29
Sub-total (Other Quality of Supply Complaints)		**434**	**183**
Sub-total (All Quality of Supply Complaints)		**1,002**	**448**
Reliability	No. of supply failures	51	19
	Duration of supply failures	0	0
	Outages Miscellaneous	0	0
	No. of <1 min. interruptions	89	20
Sub-total (Reliability of Supply)		**140**	**39**

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		**995**	**487**
Other	IN Communities	0	0
	Under Investigation (not validated)	147	0
Totals		**1,142**	

Total Network Complaints have seen a further 13.5per cent decrease in the 2013/14 reporting period from the 2012/13 period. This is a significant 30per cent reduction over a two year period when compared to the 2011/12 report period. Valid complaints averaged across all categories have also seen a reduction from 51.5per cent to 48.9per cent for this reporting period. The categories of "Noise and Interference" and "Level of Supply Capacity" were the only two areas in which a small annual increase in reported complaints can be seen, all other categories have reduced. "Voltage fluctuations" continues to be the most common category of complaint which is understandable in that the term itself is broad and can describe a number of possible events. At the time of reporting 147 of the 1,142 complaints reported were still under investigation and had not been validated.

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	80	13	0	5

Table 2.3 shows a total of 13 Claims not paid based on Interruption Duration and 5 based on Interruption Frequency.

Claims based on duration were not paid for the following reasons:

- Nine occurred during severe weather events
- Four where the outage was less than 18 hours

The five claims for frequency were not paid due to customers premise having less than four eligible outages recorded.

Increase in the number of paid duration claims:

- There is a significant increase in the number of paid duration claims this financial year that can be attributed to a single incident occurring in January 2014 that resulted in Essential Energy paying 73 affected customers who experienced an outage exceeding 18 hours.

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 *Distribution Annual Planning Report (DAPR).* 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
- requirements 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.

It should be noted that following a review of the licence conditions conducted by the Minister, the licence conditions were replaced with updated and revised conditions with effect 1 July 2014. A significant change is the removal of the *design planning criteria* requirements from the new licence conditions.

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 was to substantially meet the Design Planning Criteria by 30 June 2014, for sub-transmission line, sub-transmission substations, and zone substations as *reasonably practicably* [6] achievable.

However five projects now have an anticipated completion date of 2014/15, and six other projects beyond this (2014/15), yet no later than 2018/19. Reasons for this include yet are not limited to: review of the 'project need' based on revised load forecasts, easement acquisition/approval delays, resourcing & equipment procurement constraints, etc.

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.

2013/14 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 – 6

Projects Added – 0

Total No. of Projects Completed – 31

No. of Projects Completed in 2013/14 – 5

No. of Projects Commenced (Expected Completion 2014/15) – 5

No. of Projects either yet to Commence or complete, post 2014/15 (& prior to 30 June 2019) - 6

[6] Design, Reliability and Performance Licence Conditions for Distribution Network Service providers, 1 December 2007, page 2 of 30

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

Element including Location, Customer Numbers, Element Length/Capacity	Description of Non-Compliance and Reason	Proposed Remedial Actions & Timetable
Projects Completed - 2013/14		
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
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
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
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 - 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
Projects Commenced – Expected Completion 2014/15		
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
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 - 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
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
Projects either yet to commence or complete, post 2014/15 (& prior to 30 June 2019)		
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. Final stage under review, expected completion 2015/16
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	Install a 66kV regulator on Nyngan - Cobar 66kV feeder, expected completion 2016/17
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, expected completion 2015/16
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, expected completion 2016/17

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 stage) completion 2016/17
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 2018/19

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 had committed to achieving full N-1 compliance by 2014 of both Tier 1 and Tier 2 Regional Centres. Currently there remain 80 projects scheduled for the 2014/15 financial year that will complete the program. The projects in 2014/15 are projects that were commenced prior to the removal of the N-1 Licence Condition, or have been assessed as critical projects for compliance with Essential Energy planning 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	299	29
Completed	1,325	226
In Progress	80	70
Total	**1,405**	**296**

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**
296	70	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 scheduled for completion in the 2014/15 FY(71 individual projects completed in the 13/14 FY).
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**
1,153	212	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. (199 individual projects completed in 13/14 FY).

Table 3.4 Distribution Substation Summary Report by Class of Network Elements Not Complying with the Design Planning Criteria on 1 July of the Current Year

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**
137,017	264	Incremental life style growth	Substations programmed to be upgraded when identified. (133 completed)

3.3 Demand Management

Essential Energy internal demand management procedures for 2013/14 complied with the requirements of the *National Electricity Rules*.

The process for 2013/14 provided for:

- The Distribution Annual Planning Report
- 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

Several factors including global financial conditions, electricity price rises', energy efficiency initiatives and increasing penetration of roof top photovoltaics have contributed to a general downturn in network demand levels and growth rates from about 2010/11. 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 were no demand management investigations for major network augmentations undertaken in 2012/13 and this was the case again in 2013/14.

There was one zone substation capacitor bank installation completed in 2013/14 however the ongoing power factor improvement program has been substantially curtailed due to low network demand growth. 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 2013/14 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 one day 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.
- 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 consumer and the network through the reduction of peak demand.
- Evaluation of conservation voltage reduction technologies allowing a reduction in both consumers energy and peak demand
- Evaluation of mid-sized statcoms 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	Yarrandale, Dubbo – installation of 3 MVAr capacitor bank	990	$820	$1,661
Consolidated projects				
1	Balranald SWER reactor installation	70	$33	$219
Totals		**1,060**	**$853**	**$1,880**

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
	Non network alternative options are constantly evaluated as part of Essential Energy's internal process and in compliance with the National Electricity Rules. Due to major augmentation project timings and deferrals resulting from downturn in network demand levels and growth rates no formal investigations of non-network alternatives were undertaken.	

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

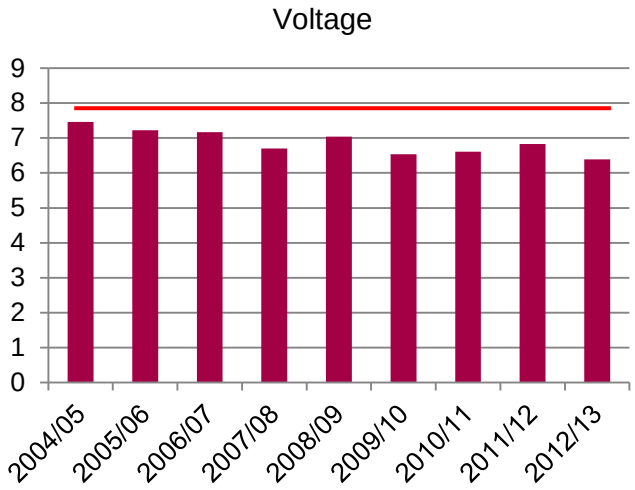
Essential Energy actively participates in the Long Term National Power Quality Survey (LTNPQS), a national power quality survey conducted by the University of Wollongong and a number of other distributors throughout Australia. This survey studies parameters such as steady state voltage, voltage total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

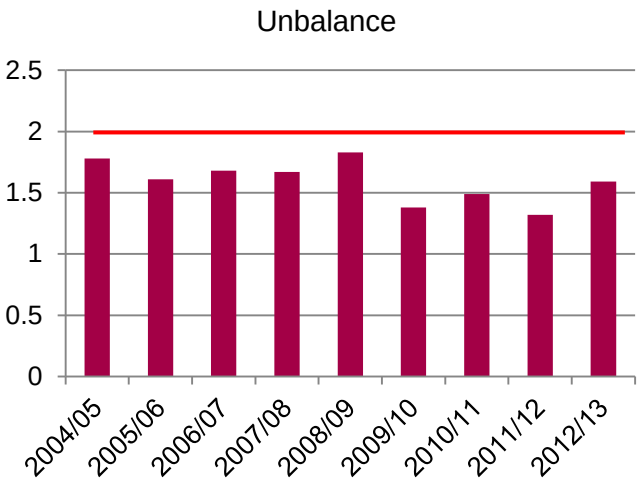
4.3.2 Performance Data

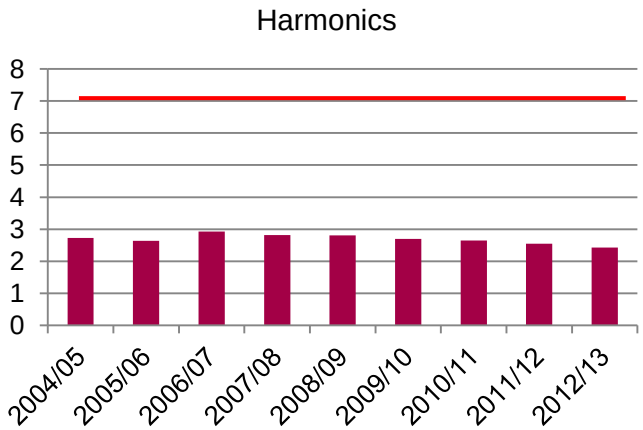
Trend of primary indices

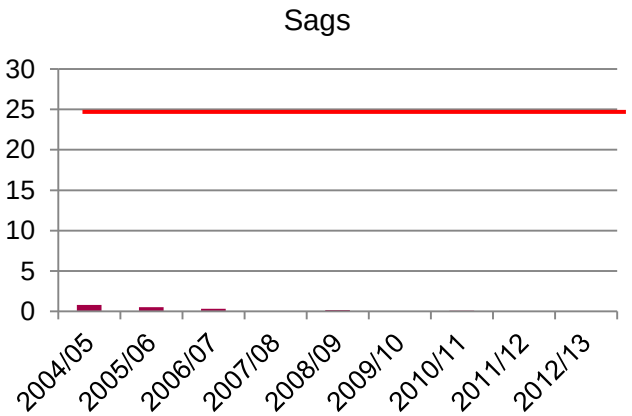
Low Voltage Sites

Disturbance	Voltage		Unbalance		Harmonics		Sags	
Limit	8%		2%		7.30%		25*	
	Index	% of limit	Index	% of limit	Index	% of limit	Index	% of limit
2004/05	7.46	93	1.78	89	2.73	37	0.8	3
2005/06	7.22	90	1.61	80	2.64	36	0.51	2
2006/07	7.17	90	1.68	84	2.93	40	0.33	1
2007/08	6.7	84	1.67	83	2.82	39	0.02	0
2008/09	7.04	88	1.83	92	2.81	38	0.16	1
2009/10	6.54	82	1.38	69	2.7	37	0.04	0
2010/11	6.61	83	1.49	74	2.65	36	0.1	0
2011/12	6.83	85	1.32	66	2.55	35	0	0
2012/13	6.39	80	1.59	79	2.43	33	0.01	0



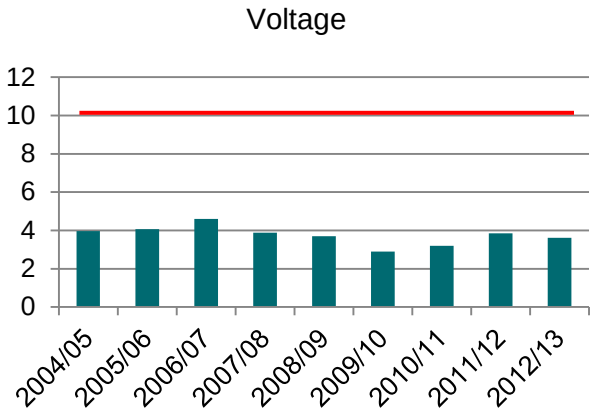


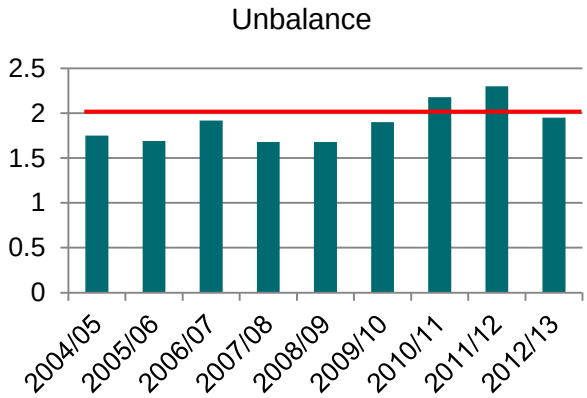


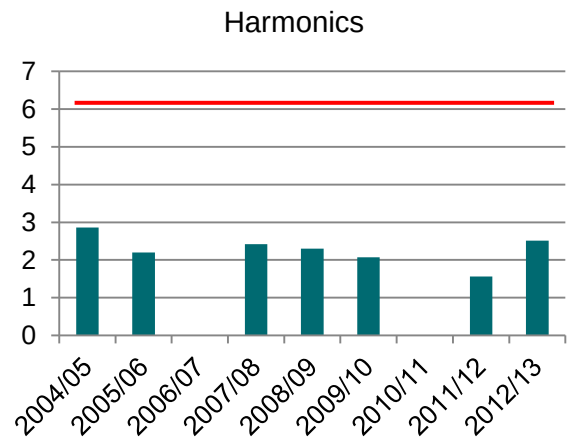


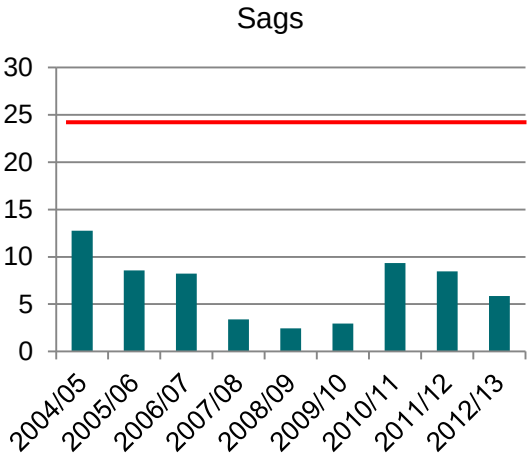
Medium Voltage Sites

Disturbance	Voltage		Unbalance		Harmonics		Sags	
Limit	10%		2%		6.60%		25*	
	Index	% of limit	Index	% of limit	Index	% of limit	Index	% of limit
2004/05	3.96	40	1.75	87	2.86	43	12.75	51
2005/06	4.06	41	1.69	84	2.2	33	8.55	34
2006/07	4.6	46	1.92	96		0	8.23	33
2007/08	3.88	39	1.68	84	2.42	37	3.38	14
2008/09	3.7	37	1.68	84	2.3	35	2.43	10
2009/10	2.89	29	1.9	95	2.07	31	2.94	12
2010/11	3.2	32	2.18	109		0	9.35	37
2011/12	3.85	38	2.3	115	1.56	24	8.46	34
2012/13	3.61	36	1.95	98	2.51	38	5.86	23









Summary

Low Voltage Sites

Voltage and harmonics show downward trends. Unbalance levels have increased this year.
The trend of median values for sags remains steady however the 95th percentile value is trending upward.

Medium Voltage Sites

Voltage is trending downward. The 95th percentile value of unbalance has decreased significantly this year. Harmonic levels have increased this year. Sag levels have decreased this year after a long term upward trend.

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 294 Urban Feeders, 915 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).

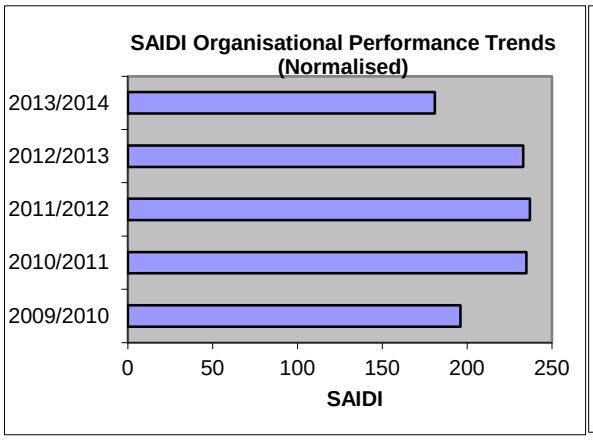
It has achieved an automated interface between systems, producing accurate reliability information to a distribution substation level for outage reporting. Previously outage data was only recorded to a distribution feeder segment level. ENMAC was updated to Power-on Fusion at the start of November 2012. 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.

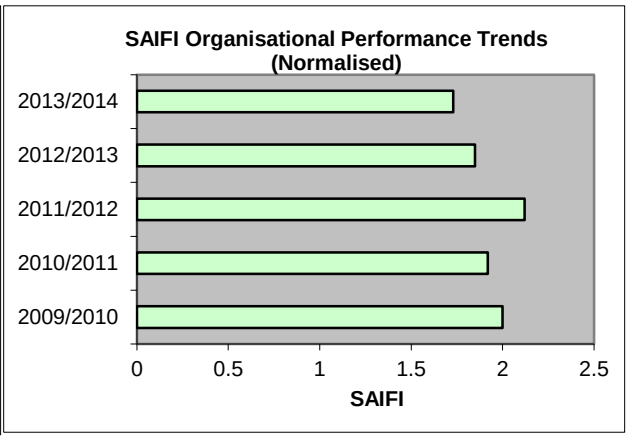
4.4.2 Organisational Performance (Normalised) Trend

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	**2009/10**	**2010/11**	**2011/12**	**2012/13**	**2013/14**
SAIDI	196	235	237	233	181
SAIFI	2.00	1.92	2.12	1.85	1.73





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. The SAIDI performance in 2013/14 is the best on record and has been positively influenced by the benign weather conditions especially over the December to February period.

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		848,965	N/A	194,704	521,023	133,238
SAIDI	Overall	428	N/A	208	422	770
	Planned	190	N/A	130	183	305
	Unplanned	224	N/A	75	227	431
	Normalised	181	N/A	63	180	357
SAIFI	Overall	2.63	N/A	1.38	2.72	4.13
	Planned	0.69	N/A	0.46	0.67	1.12
	Unplanned	1.82	N/A	0.82	1.93	2.84
	Normalised	1.73	N/A	0.78	1.83	2.69

* 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		2009/10	2010/11	2011/12	2012/13	2013/14
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		2009/10	2010/11	2011/12	2012/13	2013/14
SAIDI	Actual	69	68	80	73	63
	Target	128	125	125	125	125
SAIFI	Actual	1.04	0.76	1.16	0.86	0.78
	Target	1.84	1.8	1.8	1.8	1.8

Table 4.5 Rural Short Feeder Performance (Normalised) Trend

		Previous Years				Current Year
Year		2009/10	2010/11	2011/12	2012/13	2013/14
SAIDI	Actual	204	239	238	237	180
	Target	308	300	300	300	300
SAIFI	Actual	2.19	2.1	2.21	1.94	1.83
	Target	3.06	3.00	3.00	3.00	3.00

Table 4.6 Rural Long-Feeder Performance (Normalised) Trend

		Previous Years				Current Year
Year		2009/10	2010/11	2011/12	2012/13	2013/14
SAIDI	Actual	384	494	478	450	357
	Target	710	700	700	700	700
SAIFI	Actual	2.88	3.19	3.28	2.94	2.69
	Target	4.60	4.50	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.

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
1/10/2013	Strong winds across Northern part of the state	24,479	1,517	8.1	Major Event Day
16/03/2014	Extreme storms in the lower Mid North Coast area	53,272	4,494	34.7	Major Event Day

Major Event Day TMED

The value of TMED for 2013/14 was 5.89 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	294	915	238
Feeders that Exceeded the Standard During the Year (Total Number)	N/A	13	86	25
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	8	35	13
Feeders Not Having Identified Operational Actions Completed by Due Date (Total Number)	N/A	2	6	2
Feeders Not Having a Project Plan Completed by Due Date (Total Number)	N/A	4	10	4

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.

This policy applies to all workers of Essential Energy and any person or organisation that acts for or represents it.

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 systematic effective ways to minimise the risk as outlined in the PESAP.

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.

Agricultural activity and Tip trucks have been identified as areas that require continual education and this is being managed through the continued in field training offer to at risk groups, Media and advertising plus ready access to the community to safety links on Essential Energy website with free downloads of educational material.

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	**2009/10**	**2010/11**	**2011/12**	**2012/13**	**2013/14**
Non-Fatal	2	4	14	25	7
Fatal	2	1	0	1	2
Total	4	5	14	26	9

Fatal incident

- A property owner packing up a hydraulic spraying unit has made contact with OH HV conductors, which has resulted in a fatality
- Aircraft contacted OH HV river crossing causing the conductors to fail either side of the river, resulting in a fatality to passenger

Non-Fatal incidents

- Electric shock as a result of Tip truck contacting OH HV mains
- Electric shock to person on stock truck - contacted OH HV conductor by walking into it
- Electrical flash burn injury from Low voltage phase to phase flash over
- Electric shock to painting contractor - contacted OH LV service mains
- Electric shock when concrete truck contacted OH LV service main, causing the conductors to fail and make electrical contact with agitator
- Electric shock when a truck has contacted a pole that caused OH HV conductors to fall
- Electric shock when a storm caused tree limb to fall over OH LV mains causing them to fail and fall to the ground

Preventative actions for all incidents have been implemented 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 was one fatality and five incidents involving injuries to workers recorded during the reporting period. Comprehensive investigations were undertaken to determine, and in the case of the fatality are continuing to assess causal indicators such as systemic influences and human factors. Preventative actions were implemented for the workers through Essential Energy's incident management, investigation management processes which incorporate performance management with the effected workers. The relevant incident details were communicated across Essential Energy regarding the findings and recommendations of selected incidents. The probable causes are detailed as dot points beneath table 5.2.

Table 5.2 Worker, Contractor and ASP Injuries

	Previous Years				Current Year
Year	**2009/10**	**2010/11**	**2011/12**	**2012/13**	**2013/14**
Workers	-	6	7	9	5
Contractors	-	-	6	2	1
ASPs	-	-	1	1	0

Fatal - Workers Probable Causes:

> Worker came into contact with energised 11kV power line resulting in fatality. This is under legal privilege

Non-Fatal - Workers Probable Causes:

> Electric shock received when disconnecting a HV conductor at a substation pole
> Electrical flash burn from phase to phase arc flashover at a pad-mount transformer
> Flash burns received following arc flashover from UG LV conductor
> An arc flashover occurred during an OH HV fuse replacement
> Electric shock to contractor from induction between conductor and working earths

Contractors:

> Electric shock to contractor from induction between conductor and working earths

5.4 Major Incident Reports

Table 5.3 Summary of Major Incident Reports

Date	Incident Description	Locality
2 September 2013	Worker came into contact with energised 11kV powerline which resulted in a fatality.	Pacific Palms
2 September 2013	Person on stock truck contacted OH HV conductor by walking into it whilst trying to unload stock. Person admitted to hospital.	Condobolin
12 September 2013	132kV protection error during switching	Tamworth
1 October 2013	Leaking insulator led to zone-substation trip	Inverell
2 April 2014	A property owner packing up a hydraulic spraying unit has made contact with OH HV conductors, which has resulted in a fatality.	Cudal
8 April 2014	Essential Energy employee's received arc flash burns after shorting out UG LV conductors. Employees were admitted to hospital.	Bungendore
12 April 2014	Aircraft contacted OH HV river crossing causing the conductors to fail either side of the river, resulting in a fatality of a passenger.	Alice
2 June 2014	Broken cross-arm on pole caused breaker to trip at zone-Substation	Nana Glen

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	**2009/10**	**2010/11**	**2011/12**	**2012/13**	**2013/14**
Number of Notifications (CCEW)	26,614	54,152	31,085	32,025	29,843
Number of Inspections	10,920	25,706	12,634	11,940	14,857
Installation Inspection Rate (%)	41	47	40	37	50
Major Safety Defect Rate (%)	2.5	2.1	1.6	1.8	1.6
Safety Breach Notices Issued (%)	2.6	4.47	3.93	1.77	1.58
Number of Warnings Issued	280	1,148	496	211	235
Reports to Fair Trading (No.)	5	3	6	2	5
Number of Audits by Distributor	91	212	247	223	356

6.2 Customer Installation Shock Reports

Table 6.2 Customer Installation Shock Reports Trend

	Previous Years				Current Year
Year	**2009/10**	**2010/11**	**2011/12**	**2012/13**	**2013/14**
Shocks on Customer's Premises (Number Reported)	678	654	666	613	540

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	0.9%
Contact with Consumer's Mains – Human error		2	0.4%
Contact with Live Parts at Switchboard – Faulty Switchboard		2	0.4%
Contact with Live Parts at Switchboard – Human Error		4	0.7%
Faulty Mains Box		64	11.9%
Faulty UG Consumer Mains		1	0.2%
Faulty UG Consumer Mains Joint		3	0.6%
Induced Voltage		19	3.5%
Long LV Run (Customer responsibility)		8	1.5%
Poor Earthing		12	2.2%
Unsafe Installation Work by Licensed Contractor		12	2.2%
Failure of Part of Installation (not water related)		15	2.8%
Defective or Unsuitable Appliance		24	4.4%
Working on or Interference with Installation		2	0.4%
Working on or Interference with Appliance		1	0.2%
Water Damage or Ingress		9	1.7%
Static Electricity		12	2.2%
No Cause Found		17	3.1%
Other (Installation Related)		48	8.9%
Sub Total	**0**	**260**	**48%**
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		2	0.4%
Contact with OH Service Mains - Human error		3	0.6%
Faulty OH Mains Joint		44	8.1%
Faulty OH Service Joint		58	10.7%
Faulty OH Network Splice		5	0.9%
Faulty OH Open Service		2	0.4%
Faulty OH Twisted Service		12	2.2%
Faulty UG Distribution Mains Joint		5	0.9%
Faulty UG Service		4	0.7%
Faulty UG Service Joint		19	3.5%
Faulty UG Mains		1	0.2%
Long LV Run (Network responsibility)		15	2.8%
LV Leakage (salt/dust)		4	0.7%
HV Leakage		0	0.0%
Nuisance Tingles <10 volts		71	13.1%
Incorrect Polarity		0	0.0%
Other (Network Related)		10	1.9%
Sub total	**0**	**257**	**47.6%**

Other Cause Categories			
Lightning/Storm		14	2.6%
N/A		2	0.4%
Undefined (under investigation)		7	1.3%
Subtotal	**0**	**23**	**4.3%**
TOTAL	**0**	**540**	
Total per 1,000 customers	**0.6566**		

Essential Energy has experienced a further 12per cent reduction of reported public shocks in the 2013/14 reporting period which equates to a 20per cent reduction over a two year period. Installation related faults appear to be consistent in quantity yet there has been improvement seen in incidents that were related to the network. This could be attributed to favourable weather conditions with less network exposure to severe weather events in this reporting period. The impact of programs such as the service replacement program could also be attributing to a reduction by proactively replacing equipment that has potential to fail.

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.

2013/14 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 2013/14 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	
	2009/10		2010/11		2011/12		2012/13		2013/14	
	Int	Ext	Int	Ext	Int	Ext	Int	Ext	Int	Ext
Network Work (Level 1)										
Project Notifications	538	1,434	153	1,830	54	1,266	26	1,587	14	1,690
Initial Inspections of Completed Projects	595	907	391	1,026	4	1,654	6	1,303	0	1,098
Of Projects Inspected, Number Initially Nonconforming	46	159	87	228	0	294	4	319	0	353
Customer Connection Work (Level 2)										
Notifications (NOSW)	3,338	19,910	2,653	49,163	723	32,193	573	34,376	408	33,915
Inspections by Network Operator	2,526	12,433	1,891	31,554	359	16,783	358	13,945	182	21,903
Major Defects	2	62	2	379	0	477	0	123	2	275
Network Design Work (Level 3)										
Designs Certified	538	1,234	158	1,825	46	1,410	26	1,440	14	1,429

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	**2009/10**	**2010/11**	**2011/12**	**2012/13**	**2013/14**
Pre-summer aerial bushfire inspection %	100%	100%	100%	100%	100%
Fire ignitions by network assets (Number) [7]	168	111	191	354[8]	354
Complaints from the public regarding preparation for the bush fire season (Number)	22	37	22	18	19

Essential Energy's Network Management Plan Chapter 4 Bushfire Risk Management Plan was reviewed internally in July 2014 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 completed prior to the 2013/14 fire declaration period
- Cyclic ground-line inspection and assessment of overhead poles and structures

  The Essential Energy ground-line asset inspection programs successfully condition monitored approximately 347,038 poles and the associated conductors and pole top components during the 2013/14 year.
- Cyclic ground-based inspection of vegetation in rural areas
- Vegetation inspections and cutting have remained a significant focus throughout 2013/14 year. This activity is the largest component of the Essential Energy annual operating investment and has produced significant improvement in clearances to power lines in recent years. A major joint Networks NSW project has deployed Light Detection and Ranging (LiDaR) technology across a large section of the Essential Energy footprint. This technology will provide a very accurate snapshot of the current vegetation incursions across our higher bushfire risk areas.
- Cyclic earth integrity testing program, this inspection program is generally aligned with the Pole & Line inspection program

The results of the 2013/14 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 %
347,038	346,984	100.02	6,735	1.9

[7] 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.
[8] Increase instance of fire ignitions experienced for 2012/13 due to record heatwave conditions experienced during the year. Refer to the BOM special climate report at http://www.bom.gov.au/climate/current/special-statements.shtml

The average pole condemnation rate from cyclic ground line asset inspection of 1.9 per cent is consistent with expectations and an improvement on last year's rate of 2.39 per cent.

Annual Bushfire Patrol

Urgent risk defects highlighted through the annual pre-summer bushfire patrols for the 2014 Calendar Year are shown below.

Table 8.3 Annual Patrol Defects Identified

Annual Bushfire Patrol Defects Identified in Rural Areas			
Defect Category	**Assets**	**Vegetation**	**Total Urgent Risk Defects**
Number of Urgent maintenance tasks identified 01/01/2014 – 17/07/2014.	193	346	539
YTD tasks rectified at 17/07/2014.	193	346	539

All urgent risk defects identified by Annual Bushfire Patrols have been completed in readiness for the bushfire danger period. These were given a high priority in the works program and were typically completed within one month of being identified. Other defects were identified by the patrols; these were prioritised and have mostly been completed. This includes the completion of 4,363 vegetation tasks with two still in progress, and completion of 627 asset replacement tasks with 12 still in progress. In 2014 Essential Energy increased its level of bushfire patrols compared to previous years through the use of LiDar technology and high definition aerial photography.

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 is 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.

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 2014/15 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.
  - Low Voltage Spreader Installation - there is an ongoing targeted program installing spreaders to low voltage bare conductors in rural areas to mitigate the risk of line clashing.

> **Investigation of Emerging Technologies**

A number of research programs through 2013/14 are continuing into 2014/15. These include:

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

- Phoenix Fire Risk Modelling Project - this project is modelling the potential consequences of home losses across the state caused by a possible network fire ignition. It is being conducted in collaboration with other state agencies such as the NSW Rural Fire Services, Ausgrid, Endeavour, and the University of Melbourne. Stage 2 of this project commences in 2014/15.

- 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 detailed review of the reported fires suspected of starting from network assets in 2013/14 is underway 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.

- Essential Energy is reviewing some of its very long spans in high fire risk areas to ascertain if these spans pose an increased risk of fire start and what actions can be taken to mitigate any identified risk.

> Private Lines Policy

Essential Energy updated its private lines management plan in 2012/13 and is continuing its program of inspection of private poles and vegetation management near rural overhead lines.

> Training

Refreshers of the nationally accredited Rural Bushfire Service Awareness training were conducted throughout 2012/13 for Essential Energy field staff. Refreshers are due again in 2014/15.

9. Public Electrical Safety Awareness

The number of reportable Public Safety incidents increased from 203 in 2012/13 to 261 during the 2013/14 reporting period. This increase was attributed to four main areas being: Trucks; Excavators; Construction; and Trees.

The Public Safety awareness strategies aligned with Agribusiness has seen positive results with a general reduction within this sector, however the construction industry (excavators, trucks and general construction) has seen an increase, indicating a need to focus additional awareness in this area. The highest percentage increase was attributed to truck strikes on our network representing a 61per cent increase from the previous financial year, almost half of these where caused by "tipping" activities (24/50).The next highest percentage increase was attributed to "Excavators" showing a 53per cent increase on the previous financial period.

As a result of the increasing incidents, adherence to the requirements of the Network Management Plan Chapter 3 – Public Electrical Safety Awareness Plan has continued to provide strategies around reducing these types of incidents including joint strategies with Ausgrid and Endeavour Energy.

Reportable Public Safety Incidents Historical

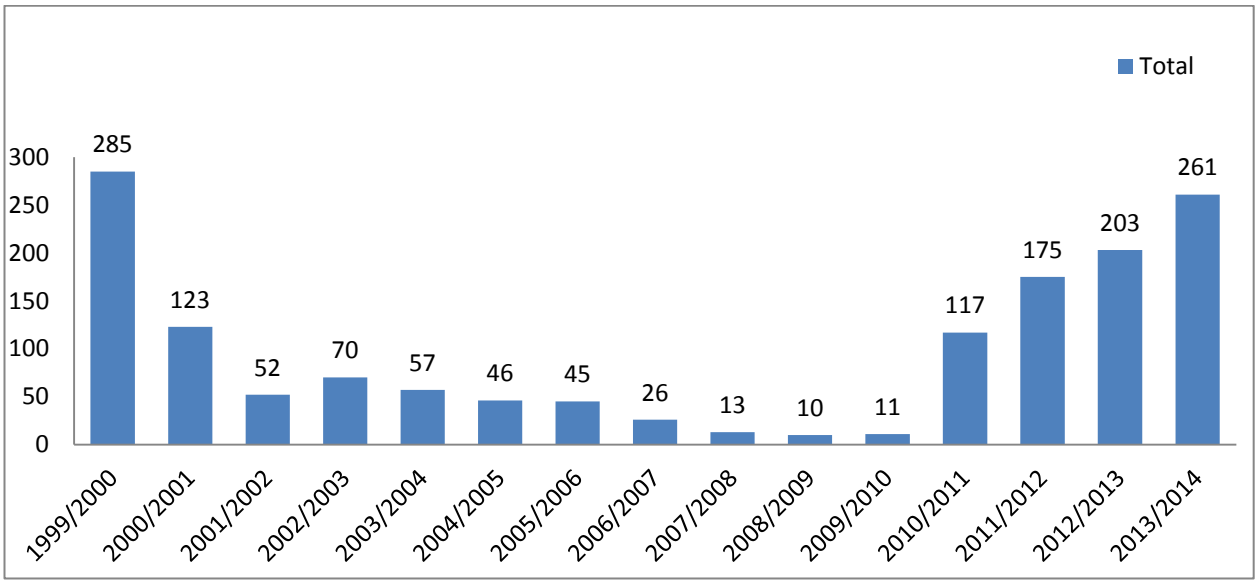
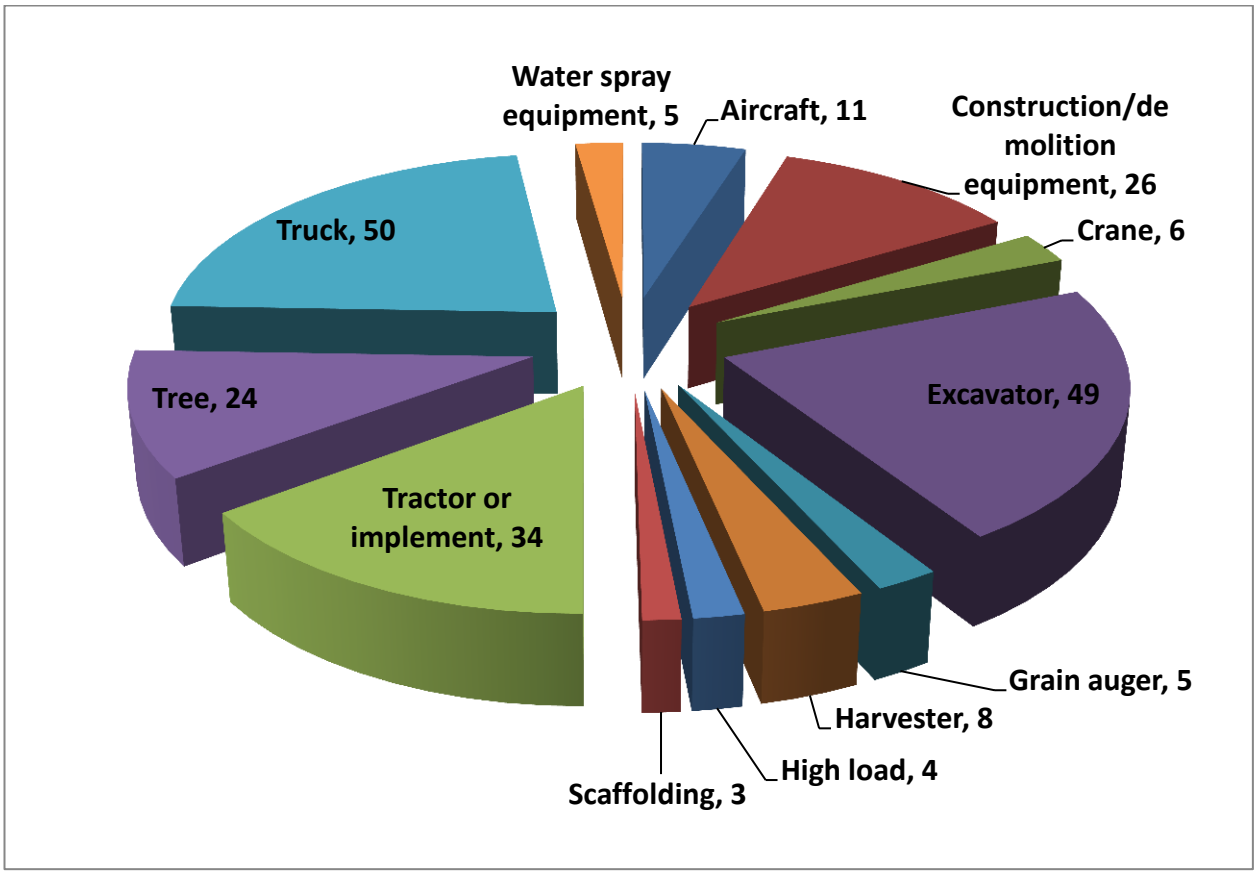


Diagram two below depicts the reportable public safety incidents by ‘object involved’ in line strikes during the 2013/14 reporting period. The increase of construction related strikes on our network (trucks, excavators and general construction equipment) will continue to be a focus in our 2014/2015 strategy. Excluded from the diagram below are 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 - 2013/14



Public Safety Initiatives:

It has been identified that high risk activities within the footprint of Essential Energy continue to involve heavy machinery, trucks and construction equipment. Essential Energy continues to educate these targeted areas through media, print and radio. Essential Energy's Public Safety Group has also recognised the importance of social media options and will look at developing this further to enhance the quality and relevance to these identified audiences.

Trucks represent a high percentage of identified strikes and this is being addressed with continued individual training and Electrical Hazard awareness training in the form of advice and access to the www.essentialenergy.com website which has been updated to enable external stakeholders to download relevant information to suit their needs. This has helped in companies rewriting SWMS and risk assessments and implementing controls. Recently a large Australian operated trucking enterprise utilised these fact sheets and training DVD's to internally train their own staff totalling 20,000 people in the Australasia regions.

The construction industry includes excavators, diggers, scaffolding, cranes and demolition equipment. Combined this involves a diverse range of industries that also have access to printed material from the Essential Energy website. These groups also benefit from broader media coverage including radio and television advertising which will continue to be delivered through-out the financial year in conjunction with Ausgrid and Endeavour Energy to develop enhances advertising to deliver the right safety message.

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 2013/14 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	0	0	1	0
Submarine Crossings	60	0	0	0	0

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 2013/14 reporting period

Crossings Reconstructed

One overhead crossing refurbishment project was completed in 2013/14.

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's crossing inspection and risk assessment program was completed during the year and has identified 149 crossings where the risk level is not as low as reasonably practicable.

These crossings have been issued to the network planning department for risk reduction activity and works are prioritised according to their relative risk.

2. Signage Replacement Program

A signage replacement program is under development for implementation in 2014/15. All signs to be in accordance with AS6947 Crossings of waterways by electricity infrastructure.

11. Chief Operating Officer Declaration

Essential Energy

ELECTRICITY NETWORK PERFORMANCE REPORT 2013/14

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 Humphreys

Signature

Date