ATTACHMENT 4.2
RESPONSE TO AER DRAFT DECISION ON THE STPIS

Contents

1. PURPOSE

The purpose of this paper is to present to the Australian Energy Regulator (AER) Essential Energy's response to the issues raised by the AER in the *Draft decision Essential Energy distribution determination (2015-16 to 2018-19) – Attachment 11: service target performance incentive scheme,* in particular, those issues related to the performance targets proposed by Essential Energy in its 2014-2019 Regulatory Proposal.

2. SUMMARY

It is the position of Essential Energy that the STPIS should not be applied to Essential Energy for the 2015-19 regulatory control period unless the AER accepts Essential Energy's revised capital and operational expenditure proposals. This position is based on the fact that the AER has not taken into account the interrelationships between proposed capital and operational allowance reductions and the STPIS when setting performance targets. In light of the AER's adjustment to our STPIS reliability targets and their proposed real reduction to our future capital and operating expenditure programs of 39% and 23%, respectively, against our initial proposal, we do not consider that we would be in a position to meet our current reliability targets.

A failure by the AER to account for these interrelationships would lead to an inequitable application of the scheme to the detriment of Essential Energy and its customers. Initial and conservative modelling undertaken by Jacobs[1] and Essential Energy indicate that if the AER were to enforce the depth of cuts to OPEX alone in its draft determination then Essential Energy would become non-compliant with Schedule 2 of the Licence Conditions[2] within the current regulatory period.

In order to prepare the following response to the issues raised by the AER, Essential Energy has made the assumption of the AER accepting the capital and operational expenditure proposed by Essential Energy in its revised proposal. Performance targets proposed by Essential Energy within this document are based on the stated assumption and deviation away from this assumption would result in the proposed targets no longer being valid.

Issues raised by the AER regarding Essential Energy's Service Target Performance Incentive Scheme Proposal (STPIS) and Essential Energy's response are highlighted in Table 2-1.

Table 2-1: AER Issues Summary

AER issue	Summary of AERs reasons and findings	Essential Energy's response
Reliability of supply performance targets	- Targets based on average performance of past 5 years has not accounted for past reliability improvement expenditure - The AER have adjusted targets based Apportioned adjustments used for Ausgrid	Essential Energy rejects the application of Ausgrid trend data to establish target adjustments. Essential Energy has instead applied the AER methodology using actual Essential Energy data (including actual 2013/14 figures). Essential Energy has also provided evidence to show that a rudimentary 5 year average as applied by the AER does not account for other factors expected to materially affect network reliability (as per Clause 3.2.1(a) of the STPIS) such as weather pattern variability. As such Essential Energy has applied a weather normalisation factor in conjunction with a statistical model to establish expected average performance levels to be used as the basis for setting STPIS performance targets.

[1] Jacobs Regulatory Revenue Decision – Reliability Impact Assessment 08 January 2015
[2] Reliability and Performance Licence Conditions 14-19 for Electricity Distributors – Commencement Date 1 July 2014

AER issue	Summary of AERs reasons and findings	Essential Energy's response
Customer service performance targets	- Lack of sufficiently robust historical data - Telephone answering target set at the average performance targets of the Victorian DNSPs	Essential Energy acknowledges the lack of robust historical data. Essential Energy rejects the use of Victorian DNSP performance to establish targets as setting a target based on other DNSP's performance is counter to the design of the incentive scheme where the target is intended to be based on actual performance, with the scheme providing an incentive to move to a different level of service where economic to do so.
Incentive rates	- Instead of applying the VCR prescribed in clause 3.2.2 of the STPIS, the most recent VCR [3] should be applied	Essential Energy acknowledges a more recent VCR has been established since Essential Energy submitted its substantive regulatory proposal and accepts the AER's proposed VCR in its draft decision

3. BACKGROUND

In its regulatory submission, Essential Energy put forward its STPIS proposal for the 2015-16 to 2018-19 regulatory control period. This STPIS proposal was supported by information about Essential Energy's objectives relating to Safety, Reliability and Affordability and our customer engagement.

The AER in its draft decision stated that it is not satisfied with Essential Energy's proposed STPIS due to the following issues:

> Reliability of supply targets do not adequately reflect historical reliability improvement expenditure.
> Lack of sufficiently robust historical data relating to telephone answering statistics.
> The most recent review of VCR should be incorporated into the STPIS because it better reflects current views of customers.

4. DISCUSSION

Essential Energy has reviewed the AER's issues in regards to Essential Energy's proposed STPIS. We accept the AER's draft decision in relation to:

> The most recent review of VCR should be incorporated into the STPIS because it better reflects current views of customers.

We reject the AER's draft Decision in relation to:

> The AER has not taken into account the interrelationships between proposed CAPEX and OPEX allowances and the STPIS when setting performance targets. The STPIS should not be applied for the 2015-19 regulatory control period unless the AER accepts Essential Energy's revised capital and operational expenditure proposals. Failure to account for these interrelationships would lead to an inequitable application of the scheme to the detriment of Essential Energy and its customers.
> For the reliability parameter, the methodology used by the AER to determine target adjustments was based on performance trends observed on the Ausgrid network. This approach displays a lack of rigour and Essential Energy has instead utilised actual performance figures for the Essential Energy network to calculate target adjustments.
> The use of a rudimentary five year average of historic performance to establish the undiscounted STPIS targets. Essential Energy has instead provided evidence to show that a rudimentary five year average as applied by the AER does not account for other factors expected to materially affect network reliability (as per Clause 3.2.1(a) of the STPIS) such as weather pattern variability. As such Essential has applied a weather normalisation factor in conjunction with a statistical model to establish expected average performance levels to be used as the basis for setting STPIS performance targets.

[3] AEMO, *Value of customer reliability review final report,* September 2014

- The calculation of incentive rates carried out by the AER is incorrect and is not aligned with the formula listed in Appendix B of the STPIS[4]. Essential Energy has calculated incentive rates based on Appendix B of the STPIS and included the results in section 4.7.
- The AER rejected Essential Energy's proposed target of 60 for the telephone answering parameter, as this value was based on only three months of data. It substituted a target of 68.53, based on the average of the Victorian DNSPs, stating that it should "*assess Essential Energy's proposed telephone answering performance target with consideration of an equivalent efficient business*". Essential Energy notes that setting a target based on other DNSPs performance is counter to the design of the incentive scheme where the target is intended to be based on actual performance, with the scheme providing an incentive to move to a different level of service where economic to do so. If the AER considers that Essential Energy's telephone answering service does not have sufficient data on which to set a target, the parameter should not be included in the STPIS. Additionally, Essential Energy notes that the telephone answering parameter is a Grade of Service rather than an efficiency measure. To be an efficiency measure would require further consideration of the cost of the service, the relationship between cost and level of service, and the exogenous factors that affect the efficiency of service delivery amongst other things

The following section focuses on discussing our revised proposal in regards to reliability of supply performance targets.

In this section, the following issues with respect to the reliability parameter are discussed:

- Essential Energy's objectives and supporting customer research.
- The interrelationship between the AER's proposed reduction to Essential Energy's expenditure allowances and the STPIS.
- Weather normalised average reliability performance.
- STPIS performance targets and adjustments.
- STPIS incentive rate calculation anomalies and corrections.

4.1 Essential Energy's Objectives and Supporting Customer Research

With regards to Essential Energy's revised proposal Essential Energy maintains its position based on the need to provide customers and the communities in which Essential Energy operates a safe, reliable and affordable electricity supply. Essential Energy has a number of customer insights as well as core customer research that has informed Essential Energy about customer expectations with regards to reliability, service level standards and response, these studies provide ample support for Essential Energy to maintain current reliability and response standards for customers.

In June 2012 Essential Energy conducted customer research[5] that found:

- Constancy of supply is paramount to customers, and for most, a reduction in price would not compensate for reduced reliability
- Customers would not accept reduced reliability in exchange for a price reduction

Essential Energy conducts customer satisfaction research on a quarterly basis. The October to December 2014 survey provided a result of 81.5 per cent, to a target of 80 per cent. This survey targets over 400 customers across the Essential Energy network area and asks them to consider the service they have experienced over the past three months including that received during planned and unplanned service interruptions. This result has held stable, indicating an ongoing level of customer satisfaction regarding the service levels they currently receive.

Furthermore, in December 2014 Essential Energy conducted choice modelling[6] research that found:

- While price is an important factor, it is not the only factor. The two components of this research directly related to reliability were questioned with regards to the number and duration of unplanned supply interruptions over a five year period and the time to respond to an unplanned supply interruption.

[4] AER, Electricity distribution network service providers—service target performance incentive scheme, 1 November 2009 (AER, Electricity distribution THE STPIS Nov 2009)
[5] IPSOS, *Customer Engagement Research Report,* August 2012.
[6] IPSOS , *Willingness to pay for network services*, January 2014.

- Despite the option of reduced quarterly network charges, customers were unwilling to completely sacrifice quality of service. When the option for service restoration to occur only in business hours and up to 6-8 hours average restoration time was presented, it was the most salient factor for unacceptability among customers.
- Customer insights found that the option of eight supply interruptions up to three hours duration over the next five years was far more acceptable than up to 15 supply interruptions each lasting up to eight hours over the next five years. When presented with the latter option, they were far less likely to select the option, despite the price.
- Customer satisfaction was also measured in this research. Results provided a score of 79 per cent, within 3 per cent of the separate quarterly customer satisfaction research indicating a collaborated recognition of customer satisfaction for the service levels they currently receive.

Essential Energy's Rural Advisory Group and Customer Council [7] also provided submissions and feedback stating that the long term interests of rural and regional electricity customers in NSW is the maintenance of current reliability standards. They expressed deep concern with regards to less reliability and the flow on impact this would have on customers with regards to ability to pump water for stock and crop requirements and the ability to pump water in the event of a bushfire. In addition, the Customer Council states that customers 'demand and deserve an acceptable level of reliability'. Relating this statement back to the research indicates that the notion of 'acceptable' for Essential Energy customers and stakeholders is maintaining current levels of reliability.

In addition, Essential Energy's CEO Vince Graham received letters from NSW Fire & Rescue and the NSW Rural Fire Service stating their concerns as emergency response organisations regarding increases response times and changes to service levels. They highlighted the potential for a reduction in response to provide a flow on effect to emergency services. These letters further support the position of Essential Energy to maintain current reliability standards through network maintenance and replacement and timely response and restoration following fault and emergency situations.

4.2 Risk of Non Compliance with Licence Conditions

Essential Energy notes that reliability improvements are attained via reliability focused capital investment on the proviso that nominal maintenance and replacement strategies retain the same level of historical efficacy. Since Essential Energy submitted its proposal the AER has handed down a draft decision that substantially cuts investment for CAPEX and OPEX expenditure putting at risk the ongoing efficacy of maintenance and replacement activities. It is reasonable to conclude that the depth of the proposed cuts will have significant implications for reliability in the immediate and long term.

This conclusion is borne out by modelling as performed by Jacobs[8] that focused on staff reduction, and Essential Energy[9] modelling of depot closures indicating that Essential would expect to become non-compliant with Schedule 2 Licence Condition requirements within the current RCP. Further the analysis performed by Jacobs alone indicated that asymmetrical STPIS penalties from 1.52%[10], rising to 3.61%[11] (capped at 2.25%) over the regulatory determination period, would result from the AER's draft decision if implemented. It must be noted that the reliability impacts and therefore STPIS penalty estimates are conservative and should not be taken as an alternative STPIS proposal. They serve only to provide confirmation that the implications of the AER's draft decision are material.

Given the outcomes of modelling suggesting Essential Energy would expect to become non-compliant with Schedule 2 of the Licence Conditions, it is also noted that the implications to reliability would be realised in the area of poor performing feeders (Schedule 3 of the Licence Conditions) with the number of non-compliant feeders also increasing.

4.3 AER Proposed Reduction in Allowance and its Interrelationship with the STPIS

As highlighted in the AER's Draft Decision on capital expenditure[12] an interrelationship exists between the total forecast CAPEX and the STPIS. The AER states that this interrelationship is important in that the CAPEX proposed by Essential Energy does not include reliability improvement expenditure. Essential Energy's regulatory proposal is designed to provide sufficient expenditure to maintain current levels of reliability performance only.

[7] Attachment 3.3: How customer engagement informed our revised regulatory proposal
[8] Jacobs Regulatory Revenue Decision – Reliability Impact Assessment 08 January 2015.
[9] Attachment 7.4: Response to the AER Draft Decision on System Direct Opex- Section 4.2.5.1.
[10] Jacobs Regulatory Revenue Decision – Reliability Impact Assessment 08 January 2015
[11] Jacobs Regulatory Revenue Decision – Reliability Impact Assessment 08 January 2015
[12] Draft decision Essential Energy distribution determination (2015-16 to 2018-19) – Attachment 6: capital expenditure, p30

It stands to reason that as an interrelationship between reliability improvement CAPEX and the STPIS exists then there must equally be an interrelationship between a reduction in CAPEX that ultimately results in degradation with regards to reliability performance.

Excerpts have been taken from the AER draft decision documentation[13] [14]for Essential Energy and comments included below to highlight the fact that the AER whilst proposing the premise of an interrelationship between CAPEX and the STPIS have omitted to fully take into account the STPIS/CAPEX interrelationship in its determination.

Similarly there is an interrelationship between OPEX and the STPIS. A reduction in OPEX ultimately results in a reduced capacity to respond to and to rectify system asset failures. The effect of this reduced capacity would be experienced almost immediately and be manifested in an increase in system SAIDI. Furthermore a reduction in system OPEX that results in an extended inspection and maintenance regime would manifested in an increase in system SAIFI. Practically a reduction in OPEX would affect both F&E and system OPEX with flow on effects to both SAIDI and SAIFI.

In its Draft Decision, the AER made reference to the AEMC rule change;

> *Relevantly, the recent rule change to the expenditure objectives in the NER means that Essential Energy does not need to maintain, and does not need the expenditure to maintain, the previous level of performance that was required prior to 1 July 2014.*[15]
>
> *Where regulatory obligations or requirements associated with the provision of services apply, as they do here in relation to reliability standards, it is sufficient that a DNSP comply with those standards; there is no requirement that they maintain the higher historical levels of performance such that they would exceed the levels required to meet those standards.*[16]

The above statements appear to be at odds with the following statement defining the AER's understanding of the objectives of the STPIS;

> *The scheme provides a financial incentive for DNSP's to maintain and improve their performance*

further

> *The STPIS balances the incentive for DNSP's to reduce costs at the expense of service performance.* ***Cost reductions are beneficial to both DNSP's and their customers when service performance is maintained or improved***[17]***.***

The initial reference to the recent rule changes implies that the AER need not provide expenditure allowance sufficient to maintain current levels of performance, and that merely complying with service standards is sufficient. STPIS however is geared to ensure that the DNSP does not reduce investment to the detriment of the customers' performance, as the STPIS targets are based on historical performance with a neutral STPIS financial outcome if reliability is maintained.

In this situation the position to cut investment to the detriment of the customers' performance (essentially allowing it to slip back to the "book end" service standard levels at a system level –worst served customers will deteriorate further) has been forwarded by the AER and not Essential Energy. The implications of the AER draft decision if they were to be enforced would be manifested in penalties suffered by Essential Energy under the STPIS as well as reduced reliability outcomes.

If the decision is made by the AER to reduce expenditure and allow performance to degrade to the limits of the service supply standards then it is Essential Energy's positional that the STPIS should not be implemented for the 2015-19 regulatory control period as this would result in an inequitable application of the scheme to the detriment of Essential Energy and its customers. Modelling of the draft decision for OPEX alone by Essential Energy and Jacobs show that the quantum impacts for SAIDI are such that for the entire RCP Essential Energy would suffer penalties under the STPIS regime with penalties reaching the full extent permitted by the scheme. Inequitably the level of OPEX and CAPEX expenditure permitted would mean Essential Energy could not reasonably be expected

[13] Draft decision Essential Energy distribution determination (2015-16 to 2018-19) – Attachment 6: capital expenditure
[14] Draft decision Essential Energy distribution determination (2015-16 to 2018-19) –Attachment 11: THE STPIS
[15] Draft decision Essential Energy distribution determination (2015-16 to 2018-19) – Attachment 6: capital expenditure, page 29
[16] Draft decision Essential Energy distribution determination (2015-16 to 2018-19) – Attachment 6: capital expenditure, page 29
[17] Draft decision Essential Energy distribution determination (2015-16 to 2018-19) –Attachment 11: THE STPIS, page 11

to hold reliability standards with the expenditure allowance given for operation of the network and at the same time would be penalised financially for failing to do so.

In relation to the changes made to the licence conditions in July 2014, the AER makes the following statement;

> *Consequently, where standards have been lowered for reliability or security and supply, the expenditure objectives now clarify that Essential Energy does not need to maintain, and does not need the expenditure to maintain, the previous level of performance*[18]

The extent of these changes was limited to the removal of Schedule 1 planning criteria (N-1) or security of supply standards, not to the reliability service standards. This point appears to be misinterpreted where the AER appear to be attempting to apply this rationale to Schedule 2 and 3 of Licence Condition requirements which have clearly not changed.

In response to the 2014 changes to the Licence Conditions Essential Energy made significant reductions to its proposed works program of approximately $45.2M, as acknowledged by the AER.[19].

4.4 Weather Normalised Average Reliability Performance:

Clause 3.2.1(a) of the STPIS20 states that performance targets for the reliability of supply parameters must be established with reference to average historical performance modified to account for completed or planned reliability improvements and (further in Clause 3.2.1 (a) 2) **any other factor expected to materially affect network reliability performance**.

It is Essential Energy′s position which is supported by evidence that the average performance of the previous five It regulatory years is not a true representation of the expected on-going level of performance and that it does not fully take into account other factors that will materially affect network reliability performance such as weather pattern variability. In particular the 2009-14 regulatory period has contained an abnormally large proportion of extremely benign weather which has resulted in exceptionally low reliability performance for the corresponding periods.

As such Essential Energy proposes an alternative approach to establishing baseline average performance levels. Instead of relying on a rudimentary five year average of performance Essential Energy has utilised its Reliability Forecasting Tool based on a statistical method known as ″Bootstrapping″ which is a form of Monte Carlo simulation to better establish and model expected average reliability performance taking into account variability in weather patterns that are not factored into a rudimentary five year average.

The variability in weather patterns, their effect on the Essential Energy network performance and the statistical method utilised by Essential Energy to better establish expected average performance levels is contained in the following sections 4.4.1, 4.4.2 and 4.4.3 .

It is important to note that the position forwarded by Essential Energy to establish baseline average performance relies on the assumption of the AER accepting the level of capital and operation al expenditure proposed by Essential Energy in its revised proposal. The weather normalised average performance indicated in section 4.4.4 does not take into account the impact of the reduction in allowances suggested by the AER in its draft decision.

4.4.1 Weather and the Essential Energy Network

Distribution network reliability performance is influenced significantly by the impact of weather, in particular with the Essential Energy network footprint spanning approximately 95 per cent of NSW our exposure to weather is far greater than other distributors in the NEM. Essential Energy has performed empirical analysis of the lighting impacts[21] on its network in comparison to peers based on Bureau of Metrology (BOM) data. The analysis shows Essential Energy's footprint is the worst network for lighting strike related outages in the NEM by a significant factor, as shown in Table 4-1and Figure 4-1.

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[18] Draft decision Essential Energy distribution determination (2015-16 to 2018-19) – Attachment 6: capital expenditure, page 15
[19] Draft decision Essential Energy distribution determination (2015-16 to 2018-19) – Attachment 6: capital expenditure, page 29
[20] AER, Electricity distribution network service providers—service target performance incentive scheme, 1 November 2009 (AER, Electricity distribution THE STPIS Nov 2009)
[21] Essential Energy, Lightning Analysis, January 2015

Table 4-1 Lightning Strikes per annum by Utility

Utility	Overhead HV (km)	Suceptability Radius (m)	Calculated Suceptable area (sq km)	Thunderdays (pa)	Mean Ground Flash Density (Ng)/sq km	Calculated Strikes per annum
ActewAGL	1,210	45	109	20	0.80	87
Aurora	14,957	45	1,346	7.5	0.20	271
Ausgrid	13,012	45	1,171	22.5	0.94	1,099
CitiPower	595	45	54	10	0.30	16
Endeavour	14,559	45	1,310	25	1.09	1,425
Energex	20,771	45	1,869	30	1.40	2,623
Ergon	132,144	45	11,893	20	0.80	9,460
Essential	**157,482**	**45**	**14,173**	**25**	**1.09**	**15,409**
JEN	1,924	45	173	10	0.30	52
Powercor	59,145	45	5,323	12.5	0.41	2,193
SAPN	51,946	45	4,675	12.5	0.41	1,926
SP Ausnet	31,537	45	2,838	15	0.53	1,509
United	4,227	45	380	10	0.30	115

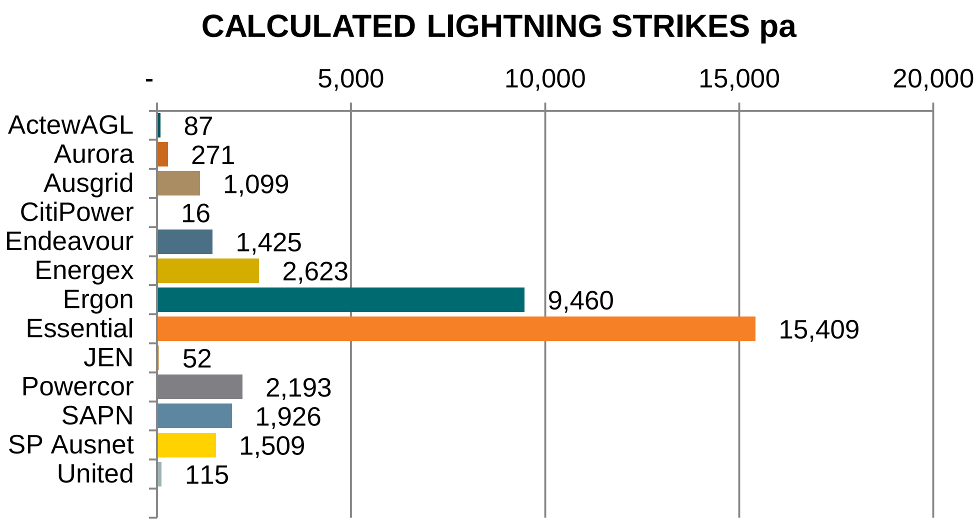


Figure 4-1: Empirical Lightning Strike Analysis

Essential Energy can expect to have approximately 15,000 lighting strikes per annum, its' nearest peer has approximately 9,000, with the next nearest experiencing approximately 2,600, as shown in Figure 4-1.

Given Essential Energy's networks exposure to lightning as demonstrated in Figure 4-1 it is evident that outages and asset performance are correlated to the lightning activity year to year. Figure 4-2 below is constructed from GPATS[22] data for all lightning strikes in NSW for the period 2006/07 to 2013/14, the years 2009/10 and 2013/14 have been highlighted to show the benign periods of storm activity with these years presenting as the lowest levels of activity in the last eight years.

[22] Global Position and Tracking System – Lightning detection systems: http://www.gpats.com.au/home

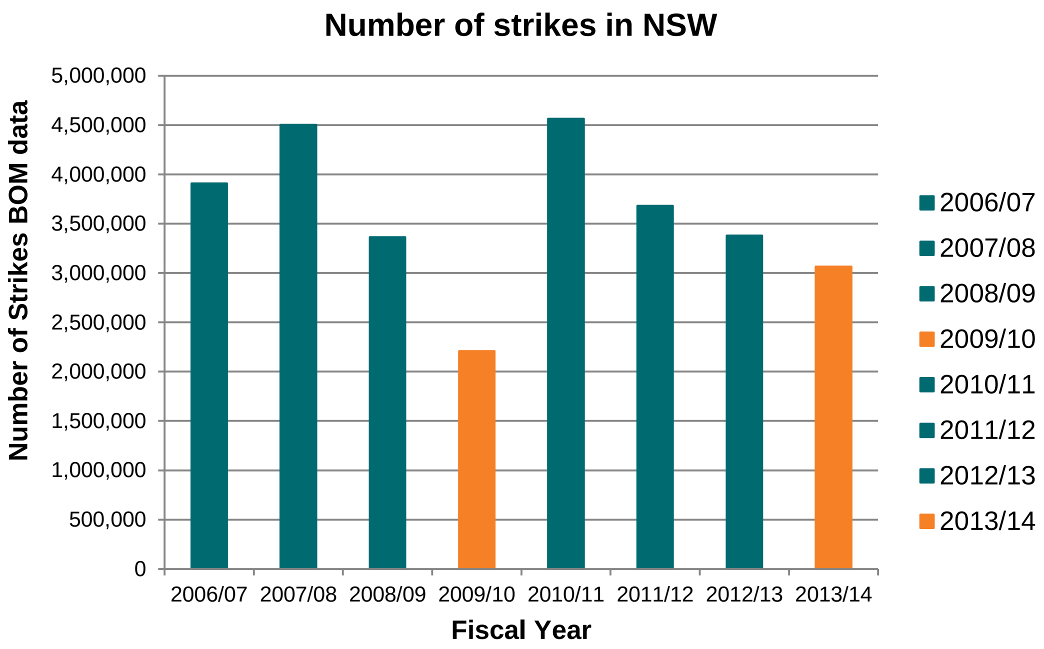


Figure 4-2: Number of Lightning Strikes in NSW - GPATS Data

This data analysis also shows the direct correlation to network performance and the number of lightning strikes in NSW (of which Essential Energy spans approximately 95 per cent) per annum. In years of lower lightning activity Essential Energy's reliability figures closely track the magnitude of storm related activity this is evidenced in Figure 4-2 and Figure 4-3 where the years 2009/10 and 2013/14 have noticeably reduced levels of lightning activity together with an improved network system performance.

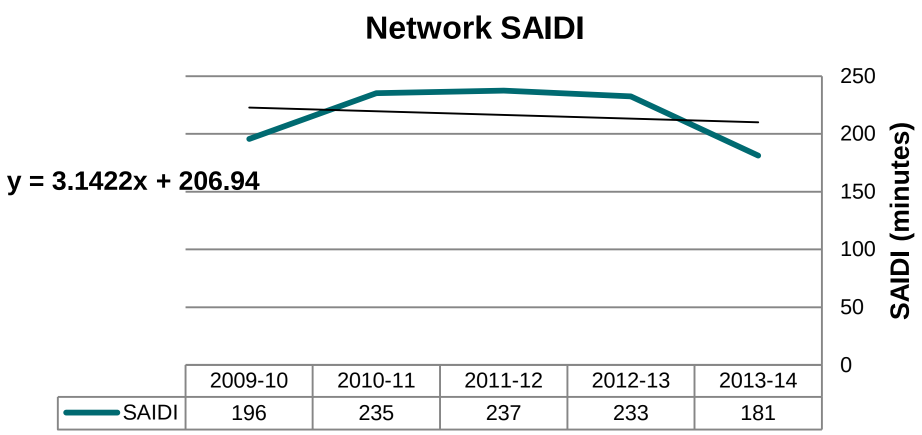


Figure 4-3: Essential Energy Network SAIDI 2009/10 to 2013/14

Further evidence of the correlation between network performance and weather activity is provided in Figure 4-4 with both 2009/10 and 2013/14 (where Essential Energy experienced improved performance) showing a reduction in the contribution of environmental factors to network SAIDI as recorded in Essential Energy's outage management systems.

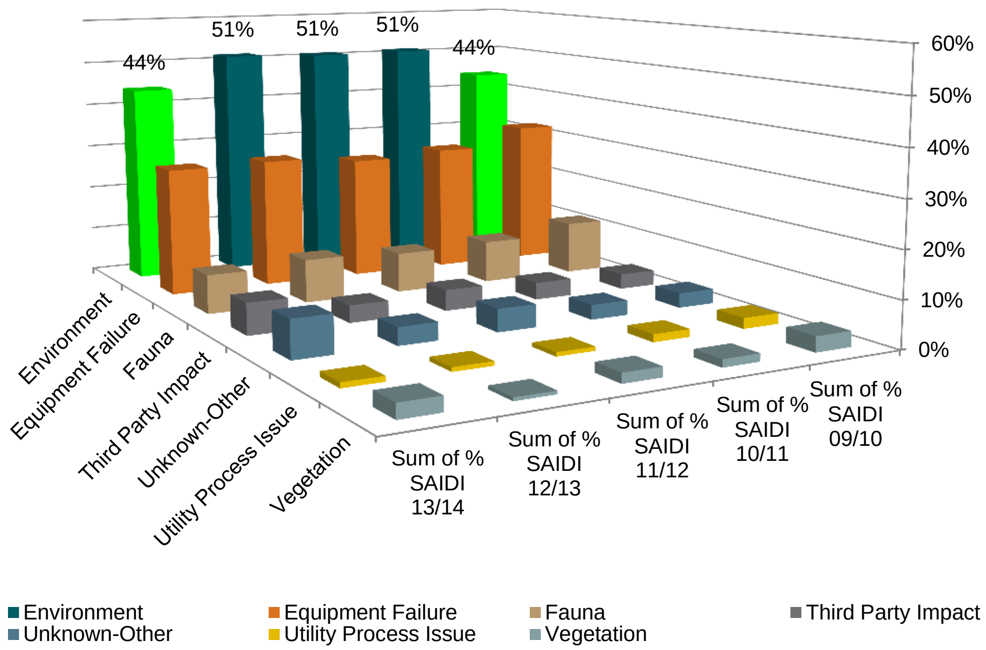


Figure 4-4: Essential Energy Causal Analysis 2009 to 2014 SAIDI Contribution

4.4.2 Weather Pattern Variability (Southern Oscillation Index)

The Southern Oscillation Index (SOI), gives an indication of the development and intensity of El Niño or La Niña events in the Pacific Ocean. The SOI is calculated using the pressure differences between Tahiti and Darwin.

Sustained positive values of the SOI above +8 may indicate a La Niña event, while sustained negative values below −8 may indicate an El Niño event. Values of between about +8 and −8 generally indicate neutral conditions. For the purposes of the chart below, the neutral periods have been further identified as Neutral La Niña or Neutral El Niño to indicate transition from one weather pattern to another.

> El Niño weather patterns are characterised by periods of dry weather and when this pattern persists for a long period of time it is often associated with drought. With the high temperatures associated with El Niño cycles the east coast will tend to experience hot dry winds from the west pushing away low level moisture required for lightning events, as a result lightning occurrences are expected to be less likely in this cycle.

> La Niña patterns are periods of higher rain and storm activity and hence increased exposure to damaging weather and lightning.

> Transition years (such as 2009/10 and 2013/14) and years with a larger proportion of neutral periods often experience benign and favourable conditions.

Below in Figure 4-5 is a plot of the number of days in each of the weather cycles by financial year, it can be seen that the previous regulatory period (2009-14) was dominated by La Niña and neutral weather. In particular the transitory year in 2009/10 and the predominantly neutral 2013/14 both experienced favourable weather conditions and improved reliability results, as highlighted in the previous section 4.3.1.

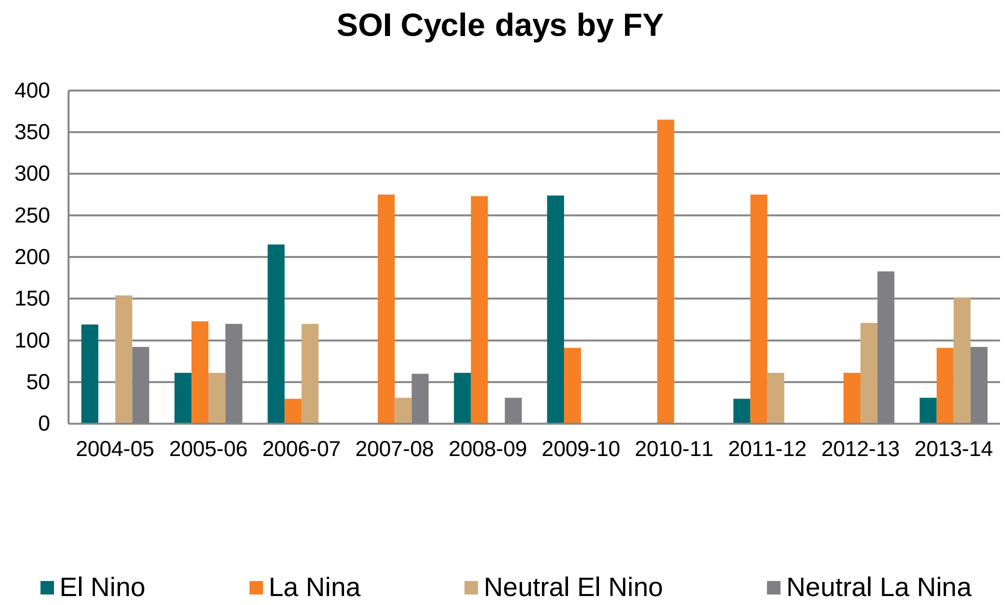


Figure 4-5: SOI Cycle days by Financial year

Table 4-2 below shows monthly values of the SOI obtained from the Bureau of Meteorology[23] (BOM) summed for the 2004-09 RCP and 2009-14 RCP. It can be observed from the BOM data below that the 2004-09 RCP presented as a relatively balanced period with the sum of the SOI for El Niño and La Nina of similar magnitude. The 2009-14 RCP however presented as one dominated by La Niña activity with the sum of SOI for La Niña greater than 3 times the magnitude of the sum of SOI for El Niño.

Table 4-2 Sum of SOI by RCP

	Sum of Southern Oscillation Index Monthly Values	
	2004-2009 RCP	**2009-2014 RCP**
El Niño	-200.7	-124.7
La Niña	260.8	422.7

Due to the skewed/biased representation of weather patterns contained in the period 2009 to 2014 as can be seen in Figure 4.1 and Table 4-2, Essential Energy has taken a longer term view (from 2004 to 2014) of weather patterns and the corresponding network performance when undertaking its modelling of average reliability performance. This longer term view has allowed Essential Energy to better represent the range of variability in weather patterns and hence capture an accurate level of expected average future performance that takes into account factors expected to materially affect network reliability performance.

4.4.3 Bootstrapping

The Reliability Forecasting tool utilised by Essential Energy applies a form of Monte Carlo modelling commonly referred to as a 'bootstrap' to forecast the anticipated reliability outcomes at a system level.

Bootstrapping is a resampling and replacement method of analysing data to forward forecast a statistical inference or proposition. In simple terms bootstrapping involves taking an existing data set and randomly taking a sample from that data set (and replacing that sample back into the mix to be potentially resampled again) to construct a 'new' randomised data set. Critical to the validity of bootstrapping is the number of random samples taken, the more samples taken the more accurate the statistical inference derived from the randomly sampled data, for the purposes of weather normalising average performance Essential Energy has utilised 1,000 years or 365,000 random sample operations.

[23] http://www.bom.gov.au/climate/current/soihtm1.shtml

In the reliability area for forecasting probable performance levels with associated levels of confidence (or the inverse of probability of exceedence) the application of Bootstrap techniques is recognised as a valid method for performance assessment[24].

Key advantages as to why bootstrapping is the most suitable statistical technique for reliability data sets are as follows;

> Reduced statistical assumptions. There is no need to have a Gaussian (normal) distribution in the raw dataset.

> Accuracy can be increased by simply increasing the number of random samples taken.

> Statistical anomalies in the raw dataset are not a barrier to Bootstrap analysis. (Classical analysis would require outliers to be identified and treated differently in order to produce a valid result).

> Complex raw data sets (non-Gaussian) can be analysed using Bootstrap techniques where classical methods are not able to be applied.

> The data range contains a number of ‘good’ and ‘bad’ years of reliability performance as well as multiple seasons by including all outliers.

> The selected data range for modelling covers the inception of the licence conditions through to current performance outcomes.

> The period of time selected for the seed data in the Bootstrap has had relatively consistent design, security of supply and maintenance standards thus is considered representative of the network and its historical improvement as it is today.

By utilising a bootstrap approach Essential Energy is able to apply a PoE (Probability of Exceedence) or confidence level to predicted reliability outcomes and thus provide a more accurate average reliability forecast performance level (THE STPIS target) which has been taken as the 50% PoE.

4.4.3.1 Modelling Assumptions

The modelling approach taken by Essential Energy utilises some assumptions that are detailed as follows;

> It is assumed that the historical performance is indicative of future performance. This is of course the case for all statistical methods. This assumption is considered valid as the network does not change radically over the years, and the historical data set contains by its nature extraneous and random events (such as weather) that affect the reliability outcome.

> Maintenance, outage response and inspection practices remain as effective as they are at present. For example if inspection regimes are reduced without maintaining current maintenance defect identification and rectification standards or response times then the modelling is no longer as valid as it was prior to the change in practice.

> Essential Energy applies the philosophy that standard maintenance and replacement activities ‘maintain’ the inherent network reliability. Consequently any improvement in reliability is achieved by targeted CAPEX spend.

> Changes in climate or weather events that are not representative of the historical data set are not modelled. Thus the selection of the period for use in the model has to include enough weather variation to be of use for future predictions. Consequently it is presumed that the past weather occurrences will be similar to the future weather occurrences. This is reason that a bootstrap method has been utilised.

> Changes in design standards are security of supply requirements and are not factored into the bootstrap model. The bootstrap by its nature reflects the standards of the past (via the historical dataset). Care has been taken to select a sampling period that has consistent standards for design, maintenance and security of supply.

[24] Billinton et al, Confidence Intervals Estimation for Reliability Data of Power Distribution Equipments Using Bootstrap; IEEE transaction Jan 2013

4.4.4 Bootstrap Results

The Reliability Forecasting Tool has been run utilising performance data for the period 2004-14 as this represents a period of sufficient variability in weather patterns as illustrated in Figure 4-5 thus ensuring a valid statistical proposition and model inputs.

The following scenarios have been modelled and results at a system SAIDI level displayed in Figure 4-7 and Figure 4-8;

> All Weather performance - includes all weather cycles for 2004-2014.

La Niña – includes only performance related to La Niña weather cycles for 2004-2014.Figure 4-6 charts the historical performance for the 2009-14 period against both modelled scenarios and the raw 5 year average performance at the system SAIDI level[25], which are;

> Raw five year average = 219.96 minutes

> All Weather average performance (modelled 50% PoE) = 225.54 minutes

La Niña average performance (modelled 50% PoE) = 236.20 minutes

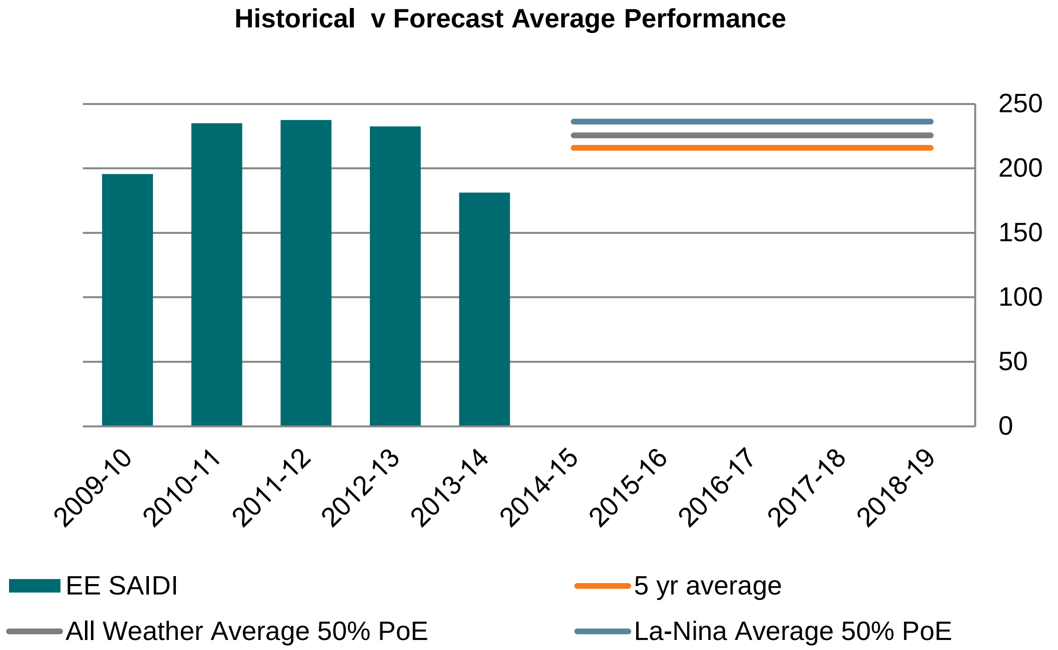


Figure 4-6: Historical Performance and Forecast Average Performance.

[25] Customer numbers sourced from Table 6.2.4 of NSW_ACT Electricity DNSPs reset RIN – 2013-14 figures.

BOOTSTRAP ANALYSIS

Update Charts

Random Data Seed Parameters					
Start Date	30/06/2004	**End Date**	1/07/2014	**Report Date**	16/12/2014 20:32

Results Parameters			
Number of Iterations (Yrs)	1000	**Region**	ALL
Southern Oscilation Index	ALL	**Day Blocks**	1

SUMMARY OF BOOTSTRAP ANALYSIS

Chart Update Required NO

OVERALL FIGURES		
Confidence Interval or (1/PoE)%	**SAIDI**	**SAIDI no MED's**
10	244.41	207.97
50	283.92	225.54
75	307.69	234.96
80	315.42	237.82
90	333.32	244.44
95	351.01	250.84
99	377.60	260.68

Figure 4-7: All Weather Bootstrap Results (2004-14)

In order to further demonstrate the impact of variable weather cycles a bootstrap sample was run for only La Niña periods between 2004 and 2014, the results contained below in which shows an increase in system SAIDI when compared with results for the same period modelled using all weather patterns.

BOOTSTRAP ANALYSIS

Update Charts

Random Data Seed Parameters					
Start Date	30/06/2004	**End Date**	1/07/2014	**Report Date**	16/12/2014 21:21

Results Parameters			
Number of Iterations (Yrs)	1000	**Region**	ALL
Southern Oscilation Index	La Nina	**Day Blocks**	1

SUMMARY OF BOOTSTRAP ANALYSIS

Chart Update Required NO

OVERALL FIGURES		
Confidence Interval or (1/PoE)%	**SAIDI**	**SAIDI no MED's**
10	247.17	219.04
50	277.40	236.20
75	295.89	245.55
80	300.45	248.60
90	312.06	255.71
95	320.91	260.75
99	335.72	273.03

Figure 4-8: La Niña Bootstrap Results (2004-14)

4.4.5 Normalised Performance

The results obtained from running a 1,000 year iteration of the Monte Carlo simulation for all weather patterns and the raw five year average performance have been utilised in the weather normalisation factor equation below.

$$Weather\ Normalisation\ Factor\ = \frac{Network\ SAIDI_{weather\ normalised}}{Network\ SAIDI_{5\ year\ aaverage}}$$

$$= \frac{225.54}{219.16}$$

= 1.02911

The resulting factor to apply to each of the feeder category SAIDI for weather normalisation is 1.02911, as displayed in Table 4-3.

The normalisation factor derived from the network SAIDI has also been applied to network SAIFI on the basis of the mathematical relationship between SAIDI and SAIFI as expressed below;

$$SAIFI\ = \frac{SAIDI}{CAIDI}$$

As CAIDI is typically driven by response time, it is assumed that there is no change in response times; as such the normalisation factor applied to SAIDI should also be applied to SAIFI, also expressed in Table 4-3.

Table 4-2: Weather Normalised Performance

	Performance target based on five year average	Weather Normalisation Factor	Weather Normalised Average Performance
Unplanned SAIDI			
Urban	70.58	1.02911	72.63
Short rural	219.69	1.02911	226.08
Long rural	432.71	1.02911	445.31
Unplanned SAIFI			
Urban	0.925	1.02911	1.092
Short rural	2.045	1.02911	2.105
Long rural	2.991	1.02911	3.078

Essential Energy proposes the figures as shown in Table 4-3 as appropriate undiscounted STPIS targets as derived from a statistical model based on historical performance over a representative period of time.

4.5 Performance Target Adjustments

4.5.1 AER Proposed Approach

Essential Energy does not accept the AER's draft decision on reliability of supply performance targets on the basis that the proposed reductions are based on trend data obtained from Ausgrid historical performance and not on trends observed from Essential Energy network performance.

There are many differences between the Ausgrid and Essential Energy networks including;

- Ausgrid has a far more meshed and interconnected network than Essential Energy

- Essential Energy is influenced to a greater extent by weather events than Ausgrid due to its increased footprint and subsequent increased exposure to these events. As demonstrated in Figure 4-1, the influence of weather on Ausgrid's network is insignificant compared to Essential Energy's network.

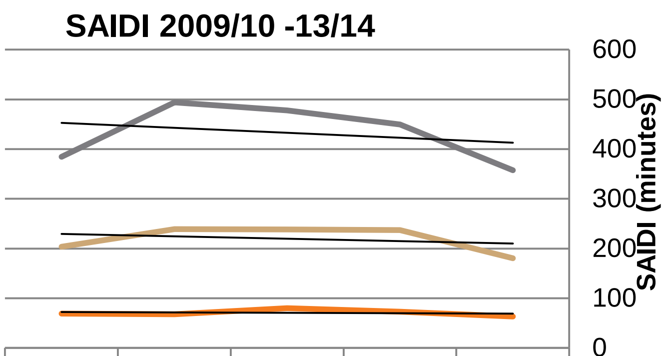
For these reasons Essential proposes that any trend analysis proposed by the AER be carried out using only actual Essential Energy performance data.

The AER have stated that there is no observed improvement in performance using Essential Energy data for the 2009 to 2014 period, however the data utilised by the AER when performing this assessment was based on a forecast end of year value for 2013/14. Section 4.5.2 below has addressed the issue of forecast performance data by substituting actual 2013/14 performance data and re-evaluating observed performance trends.

4.5.2 Updating with Current Data Using AER Method

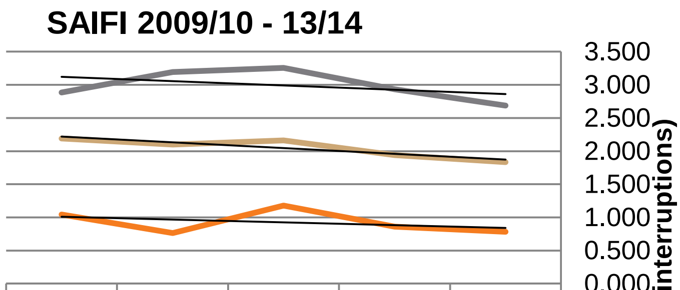
The following charts of Essential Energy feeder class (actual) SAIDI and SAIFI performance are shown below for the period 2009/10 to 2013/14, these charts utilise actual data for the period. The data and charts presented by the AER in its Draft Decision which included forecast values for the year 2013/14.

As shown in figures Figure 4-9 to Figure 4-12 improvement of reliability performance over the 2009-14 regulatory period has occurred for both SAIDI and SAIFI for all feeder classes.



	2009-10	2010-11	2011-12	2012-13	2013-14
Urban	69	68	80	73	63
Long Rural	384	494	478	450	357
Short Rural	204	239	238	237	180

Figure 4-9: Feeder Class SAIDI Trend

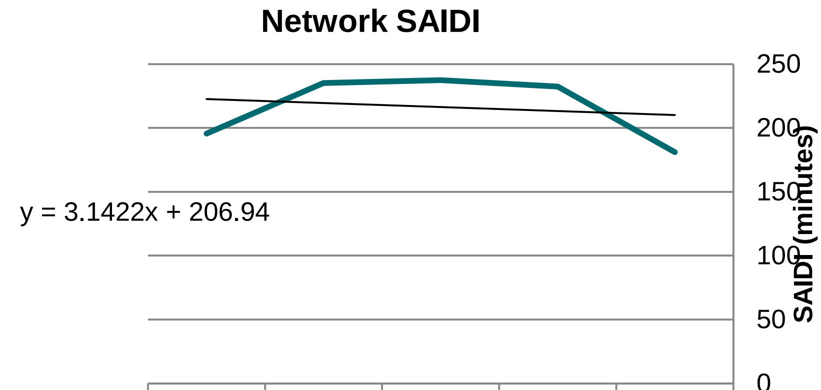


	2009 -10	2010 -11	2011 -12	2012 -13	2013 -14
Urban	1.043	0.762	1.177	0.862	0.781
Short Rural	2.193	2.100	2.163	1.941	1.833
Long Rural	2.883	3.193	3.257	2.935	2.686

Figure 4-10: Feeder Class SAIFI Trend

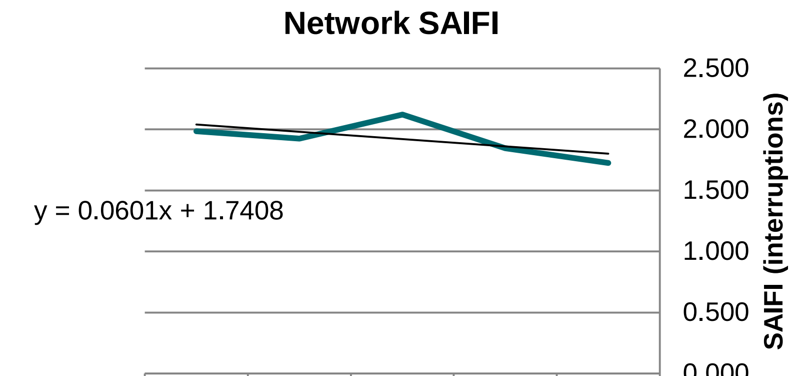
In order to replicate the method used by the AER in Attachment 11 of the AER's Draft Decision the following charts of network SAIDI and SAIFI for the period 2009/10 to 2013/14 have been displayed below with trend lines applied and related trend line equations listed.

Based on the approach outlined in the Draft Decision for Ausgrid[26] and using the trend line equations described above the expected value for the end of 2013/14 is calculated and compared to the five year average of performance, note: these values have been plotted in reverse order and as a result the value for 2013/14 is obtained by substituting x=1 into the equation.



	2009-10	2010-11	2011-12	2012-13	2013-14
SAIDI	196	235	237	233	181

Figure 4-11: Network SAIDI Trend



	2009-10	2010-11	2011-12	2012-13	2013-14
SAIFI	1.987	1.925	2.121	1.847	1.726

Figure 4-12: Network SAIFI Trend

Percentage difference between five year average and the value of the trend line for 2013/14 at the network level SAIDI and SAIFI are shown below:

$$Percentage\ Reduction\ SAIDI_{Essential} = [1 - (\frac{SAIDI_{trend\ line}}{SAIDI_{5\ year\ aaverage}}) \times \frac{100}{1}]$$

$$Percentage\ Reduction\ SAIFI_{Essential} = [1 - (\frac{SAIFI_{trend\ line}}{SAIFI_{5\ year\ aaverage}}) \times \frac{100}{1}]$$

- SAIDI difference = 2.906%
- SAIFI difference = 6.253%.

4.6 Performance Targets

Performance targets proposed within section 4.6 rely on the assumption of the AER accepting the capital and operational expenditure proposed by Essential Energy in its revised proposal. Deviation away from this assumption would result in the targets proposed by Essential Energy no longer being valid.

[26] Draft decision Ausgrid distribution determination (2015-16 to 2018-19) –Attachment 11: STPIS

The targets proposed by Essential Energy for the 2015 to 2019 period have been listed in Table 4-3 below based on the weather normalised average performance value adjusted using the method proposed by the AER in the draft Essential Energy STPIS decision.

Table 4-3: Essential Energy Proposed STPIS Targets

	Weather Normalised Average Performance (refer to section 4)	Adjusted Proposed AER Difference with actual 13/14 Data (%)	Adjusted Proposed AER Target Using Actual 13/14 Data and Weather Normalised Average
Unplanned SAIDI			
Urban	72.63	2.906	70.52
Short rural	226.08	2.906	219.51
Long rural	445.31	2.906	432.36
Unplanned SAIFI			
Urban	1.092	6.253	0.892
Short rural	2.105	6.253	1.973
Long rural	3.078	6.253	2.886

4.7 Incentive Rates

Appendix B of the STPIS[27] sets out the formula to be used when calculating incentive rates and the description of each of the variables used in this formula. Essential Energy believes that the AER has included some anomalies in its application of the incentive rate formula, in particular the following issues were identified;

- C_n- this value is based on the average of the regulatory control period, the AER have used five years of data however the regulatory control period in relation to the STPIS is actually four years.
- VCR - The VCR used in the incentive rate calculation should be adjusted by CPI to the start of the regulatory period, the AER appear to have used the flat $38,350/MWh.

Essential Energy has addresses the issues highlighted above and the appropriate variables and their values have been applied as follows;

- $VCR = \$38{,}350\ /MWh$
- $CPI = 1.88\%\ (\,Adjustment\ for\ Sept\ 2014\ to\ July\ 2015\ at\ assumed\ annual\ 2.5\%\ infaltion)$
- $\mathrm{R} = \$919{,}650{,}000 - \mathrm{average\ 2015\ to\ 2019}$
- $C_{Urban} = 3{,}367{,}444\ MWh - \ average\ 2015\ to\ 2019$
- $C_{Short\ Rural} = 6.125.818\ MWh - \ average\ 2015\ to\ 2019$
- $C_{Long\ Rural} = 1{,}964{,}885\ MWh - \ average\ 2015\ to\ 2019$
- SAIDI and SAIFI values are as per the adjusted proposed figures in Table 4-3.

[27] AER, Electricity distribution network service providers—service target performance incentive scheme, 1 November 2009 (AER, Electricity distribution THE STPIS Nov 2009)

Table 4-4: Essential Energy Proposed Incentive Rates

	Essential Energy Revised Incentive Rates (%)
Unplanned SAIDI	
Urban	0.01379
Short rural	0.02371
Long rural	0.00760
Unplanned SAIFI	
Urban	1.12395
Short rural	2.87159
Long rural	1.23835

4.8 Conclusion

It is important to note that the targets proposed in Table 4-3, and their validity rely on the assumption that Essential Energy is provided with sufficient allowance by the AER to maintain performance levels as set out in our substantive regulatory proposal and subsequent revised proposal.

In light of the AER's adjustment to our STPIS reliability targets and their proposed real reduction to future capital and operating expenditure programs of 39% and 23% respectively, against our initial proposal, Essential Energy does not consider that it would be in a position to meet current reliability targets. A STPIS incentive framework in the 2015-19 regulatory control period would not provide a symmetric application of the incentive scheme and Essential Energy considers that unless the AER accepts Essential Energy's revised capital and operating expenditure proposals, the STPIS should not apply.