ATTACHMENT 7.4

Operating Expenditure

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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 its Draft Determination regarding Essential Energy's Operating Expenditure (opex) submitted as part of the 2015 – 2019 regulatory proposal.

2 Summary

Essential Energy asserts that the AER's draft determination on operational expenditure fails to recognise the scale of our network and the diverse environment it operates in. The draft determination also makes erroneous benchmarking assumptions and therefore, arrives at a counter-intuitive recommendation. In doing so, the AER has implied an operating environment where Essential Energy cannot comply with critical public and employee safety, reliability, regulatory or other service delivery performance measures expected of all DNSPs in the National Electricity Market (NEM).

For these reasons alone, the AER's draft determination of $1,440 million ($2013/14)[1] in operational expenditure is inadequate to safely, efficiently and effectively operate the Essential Energy network. An abrupt 38.4% reduction backdated to 1 July 2014 is not consistent with meeting the National Electricity Objective, being

> *to promote efficient investment in, and efficient operation and use of, electricity services for the long term interests of consumers of electricity with respect to – price, quality, safety, reliability, and security of supply of electricity; and the reliability, safety and security of the national electricity system.*

Essential Energy has submitted a revised operating expenditure of $2,331 million[2]. Essential Energy's network is vastly different to that of all urban and most rural DNSPs and they cannot be directly compared. Our operational expenditure is driven by the scale and nature of the assets we require to service our customers, not the number of customers we service (refer to section 4.2.1). Whether there are 50 customers connected to one pole or 50 poles connecting one customer, each asset needs to be inspected, safely maintained, and replaced at the end of its life.

In contrast, the AER appears to have arrived at its recommendation almost entirely by using customer numbers as a common denominator and guiding principle. The AER appears to have ignored the geographic area our network covers, the terrain it traverses, the vegetation that grows within it and the diversity of weather that passes over it. These environmental factors have far greater influence on our operational expenditure than customer numbers.

In its draft determination, the AER identified a number of Victorian distribution businesses as achieving a level of operational efficiency that is close to its desired 'efficient frontier':

> *We have compared Essential Energy's efficiency to a weighted average of all networks with efficiency scores above 0.75 (CitiPower, Powercor, United Energy, SA Power Networks and AusNet) rather than the most efficient service provider (CitiPower) in our preferred model[3].*

Despite the AER recognising that *'**per customer metrics tend to favour higher density service providers**[4][emphasis added],'* in many instances, it uses a 'per customer' or 'maximum basis to make comparisons and draw its conclusions.

This methodology does not apply to Essential Energy's unique network environment. When benchmarked and normalised by assets, we compare favorably to other networks, suggesting unequivocally that Essential Energy's proposed operational expenditure is reasonable.

For example, if per kilometre comparisons were applied, Essential Energy would have been identified as one of the more efficient providers:

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[1] AER (Nov 2014), *Draft Decision Essential Energy distribution determination 2015-16 to 2018-19 Overview*, p.52. (Includes debt raising costs and DMIA)

[2] Essential Energy (Jan 2015), *Revised Regulatory Proposal*, Section 7. (Includes debt raising costs and DMIA)

[3] AER (Nov 2014), *Draft Decision Essential Energy distribution determination 2015-16 to 2018-19 Overview*, p.55.

[4] AER (Nov 2014), *Draft Decision Essential Energy distribution determination 2015-16 to 2018-19 Attachment 7: Operating expenditure*, p.79

- Essential Energy's operational expenditure is only 34 per cent more than Endeavour Energy (refer section 4.2.2.1), but covers 436 per cent more line length
- Essential Energy's operational expenditure is less than SA Power Networks current proposal[5], but covers a 220 per cent more line length with equivalent customer numbers (refer section 4.2.2.2)

The AER's proposed NSW 10 per cent allowance[6] in itself does not account for the vastly different network characteristics intrinsic in the Essential Energy footprint. Other key drivers of operational expenditure that require particular consideration by the AER in arriving at a final determination for Essential Energy include:

- **Vegetation management** – this is Essential Energy's largest single operating expense. Essential Energy is obliged by law to make sure that trees and other tall growing vegetation are kept clear of powerlines – either by trimming or removal – to maintain fire safety clearances and power supply reliability.

  These vegetation management costs are driven by the size of the geographic area the network covers, the volume of trees requiring trimming and the extent to which trees need to be trimmed. Due to a longer average span length than most distributors, Essential Energy requires a wider corridor and therefor has on average more trees to maintain per span.

  When Essential Energy's operational expenditure on vegetation management is benchmarked using overhead line length, and based on the AER's nominated Distributors on the efficient frontier, the spend is comparable to Powercor and SA Power Networks, and is approximately half of AusNet.
- **Routine asset inspection and planned maintenance** – when normalised by total line length, Essential Energy's average annual operational expenditure for routine asset inspection and annual planned maintenance is lower than the majority of its comparable peers, including Powercor and Ausnet, both of which the AER consider to be on the efficient frontier.
- **Emergency network fault maintenance** – Essential Energy must respond to unplanned outages caused by events such as storms, equipment failures, acts of vandalism, and vehicle collisions. Exposed line length/total assets and the resultant emergency interruptions are the primary cost drivers for emergency maintenance. Essential Energy's operational expenditure per emergency response interruption, excluding major event days and other known exceptions, is slightly higher on average than its comparable peers but is substantially lower than SA Power Networks, which the AER considers to be on the efficient frontier.

Essential Energy also clearly recognised the need to continue to improve productivity in a sensible and structured manner. As such the revised proposal forecasts annualised labour productivity improvements of 22.6% by the end of the regulatory period.

Table 2-1 summarises Essential Energy's critical concerns regarding operational expenditure allowances, the benchmarking methodology and the AER's lack of consideration for the scale and nature of the network we operate:

[5] SA Power Networks (2014), *SA Power Networks Regulatory Proposal 2015-2020*, p28

[6] AER (Nov 2014), *Draft Decision Essential Energy distribution determination 2015-16 to 2018-19 Attachment 7: Operating expenditure*, p.19

Table 2-1: Critical issues with the Draft Determination

Issue	Reasoning	Section
Counter-intuitive results	Based on the Draft Decision, Essential will: > be allowed $1,488 (average annual opex per total line length km), whereas Endeavour will be allowed $4,834, > receive less opex than SA Power Networks proposal for more than twice the network length > be required to operate on 29% less opex than the combined Victorian “frontier” rural distributors (Ausnet + Powercor) but with a network that is 62% longer.	4.2.2
Environmental factors not adequately allowed for	> The lack of understanding regarding intrinsic environmental factors > Vast physical network, largest in NEM > Network exposure to extreme environmental conditions	4.2.4
Benchmarking methodology inappropriate	> Assets drive opex, not customers (or maximum demand) > Failure to adequately consider the limitations of the benchmarking methodology > Inordinate weighting applied to customer numbers and ratcheted demand when assessing required operational expenditure. > Small heterogeneous sample used by the AER to define Essential Energy’s benchmarking peers	4.2 4.3.2 4.3.3
Draft Determination opex quantum is unreasonable	> Existing low opex per asset > Ability to maintain prudent industry best practice > Ability to maintain public and employee safety[7]	4.3

This revised proposal submitted by Essential Energy provides a pathway for realistic, progressive and sustainable improvement in operating efficiency while maintaining a safe and reliable network.

3 Background

Under the National Electricity Rules Essential Energy, as a Distribution Network Service Provider (DNSP), is required to submit a regulatory proposal to the AER every five years to set appropriate network tariffs. As part of the regulatory proposal Essential Energy submitted a proposed opex[8] to the AER in respect of regulatory period 1 July 2014 to 30 June 2019.

The AER’s Draft Determination[9] has provided an alternate estimate 38.4%[10] lower than Essential Energy’s proposed opex. Given the findings from the AER on Essential Energy’s opex, this paper seeks to discuss in more detail the approach that the AER has utilised in the Draft Determination, the inconsistencies in this approach and the outcomes of more appropriate comparison techniques. Specifically,

- the counterintuitive results in the benchmarking approach utilised in the AER Draft Determination
- the efficiency of Essential Energy’s Base Year (2012/13) opex when appropriate benchmarking comparisons are undertaken (refer to section 4.3)

[7] R2A. (Jan 2015). *Essential Energy Asset / System Failure Safety Risk Assessment*.

[8] Essential Energy (May 2014), *Regulatory Proposal*, Section 6 Operating Expenditure

[9] AER (Nov 2014), *Draft Decision Essential Energy distribution determination 2015-16 to 2018-19 Overview (The Draft Determination)*

[10] AER (Nov 2014), *Draft Decision Essential Energy distribution determination 2015-16 to 2018-19 Overview*, p.51

4 Discussion

4.1 The AER's Draft Determination

The Draft Determination includes an alternate amount of $1440m ($2013/14)[10] of operating expenditure to Essential Energy's substantive proposal of $2,334m ($2013/14)[11], based on:

- The efficiency of Essential Energy's Base Year (2012/13)[12]; opex benchmarks poorly against peers by customer numbers and Peak Demand using a number of benchmarking models including Multilateral Total Factor Productivity (MTFP), Multilateral Partial Factor Productivity (MPFP) and several opex cost function models [13] (refer to section 4.2)
- Essential Energy overheads[14] (refer to section 4.3.3.6 and Attachment 6.4 Corporate and Divisional Overhead)
- Essential Energy labour and workforce practices[13] (refer to Attachment 7.5 Labour Cost Analysis and Attachment 7.6 Productivity)
- Essential Energy vegetation management inefficiency and reactive approach[15] (refer to section 4.3.3.4 and Attachment 7.10 Vegetation Management)
- Essential Energy's rate of change[15] (refer to Attachment 7.11 Asset Growth and Attachment 6.14 NNSW Cost Escalation)
- Essential Energy's step changes[15] specifically due to Essential Energy's network reform program[15] (refer to Chapter 7 of the revised Essential Energy Proposal)

4.1.1 Essential Energy's Position

Essential Energy submits a revised operating expenditure (opex) program of $2,331 million ($2013-14) for the 2014-19 regulatory control period (RCP) to support our business activities and maintain the reliability, safety and security of our distribution system. This is marginally lower than the forecast operating expenditure in our substantive regulatory proposal.

Having had regard to the AER's decision, Table 4-1 provides our revised forecast operating expenditure for each year of the 2014-19 regulatory control period, compared to the substantive regulatory proposal and AER Draft Decision.

Table 4-1: Forecast standard control opex over the 2014-19 RCP ($ million, 2013-14)*

$m; Real 13-14	2014-15	2015-16	2016-17	2017-18	2018-19	TOTAL
Substantive Regulatory Proposal	464	465	461	467	477	2,334
AER Draft Determination	281	284	287	291	295	1,440
Revised Regulatory Proposal	498	491	455	459	428	2,331

* Includes debt raising costs and DMIA

Figure 4-1 demonstrates the step changes that have been incorporated into the Essential Energy revised submission. Each of these adjustments relate to updates for the latest information and data rather than concerns raised by the AER's decision. These include:

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[11] Essential Energy (May 2014), *Regulatory Proposal*, Section 6 Operating Expenditure

[12] AER (Nov 2014), *Draft Decision Essential Energy distribution determination 2015-16 to 2018-19 Overview*, p.52

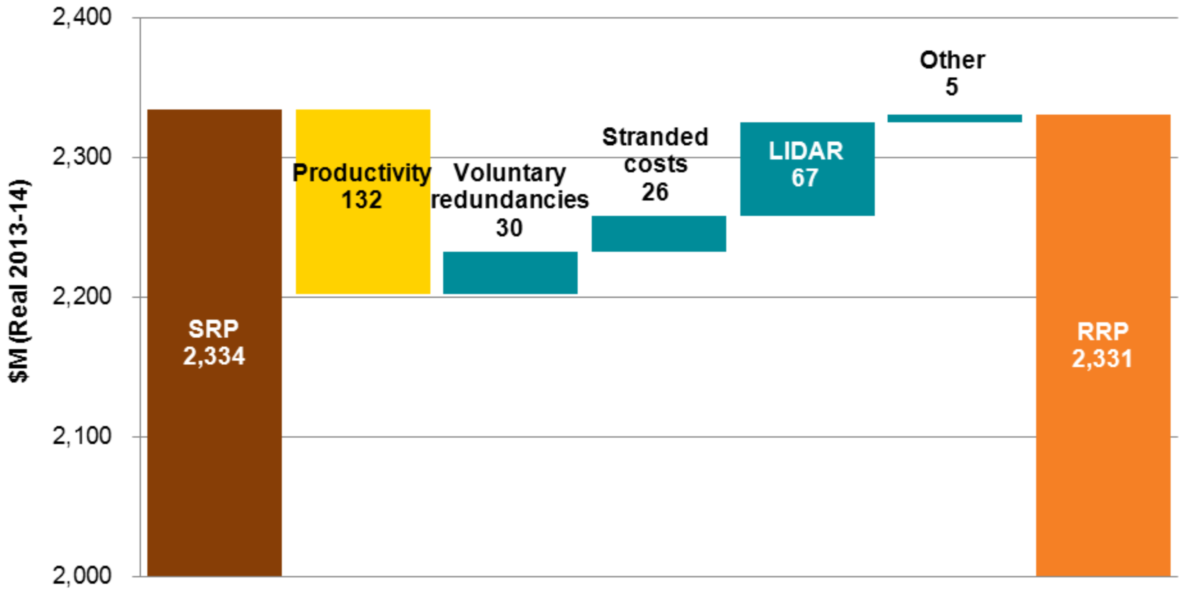
[13] AER (Nov 2014), *Draft Decision Essential Energy distribution determination 2015-16 to 2018-19 Overview*, p.53

[14] AER (Nov 2014), *Draft Decision Essential Energy distribution determination 2015-16 to 2018-19 Attachment 7: Operating expenditure*, p.82

[15] AER (Nov 2014), *Draft Decision Essential Energy distribution determination 2015-16 to 2018-19 Overview*, pp.54-55

- The AER considered that our vegetation management costs should not be accepted. Upon further review, we found that our costs should be higher than proposed as a result of updated information gathered through LIDAR (refer to Attachment 6.8 Network Aerial Patrol and Analysis (AP&A) – Step Change Analysis) since the submission of our substantial proposal.
- We have examined whether our latest information reveals any change in our staffing levels as a result of efficiency programs we are undertaking. As a result of this analysis we are proposing an additional 5.3 per cent reduction in operating expenditure related to the latest information on staff attrition rates.
- We have updated labour cost escalators by adopting the AER's approach from its Draft Decision and using the most current data from CEG and averaging this with the AER's escalators from the Draft Decision provided by Deloitte.

Figure 4-1: Opex adjustments from SRP to RRP[16]



The revised proposal for opex of $2,331M determined from a base year with adjustments benchmarks favourably when normalised by any logical asset based metric. The Draft Determination replaces Essential Energy's proposed opex with an allowance of $1440M being a reduction of 38.4%. The Draft Determination's proposed opex is unreasonable and does not reflect the costs required for an efficient and prudent operator to undertake opex activity on the Essential Energy Network.

4.2 The use of benchmarking in the Draft Determination

The AER's Draft Decision provided an adjusted opex of $271 million p.a., $144 million lower than Essential Energy's submission. The main driver behind this substantial cut is the newly adopted econometric benchmarking tools used by the AER to score the efficiency of each of the Australian DNSP's which consequently scored Essential Energy much lower than the DNSPs of Victoria and South Australia.

The AER noted that its assessment method to review Essential Energy's proposal was consistent with its Assessment Guidelines[17]. The AER's stated approach was as follows:

[16] Essential Energy (Jan 2015), *Revised Regulatory Proposal*, Section 7 Operating Expenditure

[17] AER (Nov 2013), *Better Regulation Explanatory Statement Expenditure Forecast Assessment Guideline*

Our approach is to compare the service provider's total forecast opex with an alternative estimate that we develop ourselves. By doing this we form a view on whether we are satisfied that the service provider's proposed total forecast opex reasonably reflects the criteria. If we conclude the proposal does not reasonably reflect the opex criteria, we use our estimate as a substitute forecast.

Our estimate is unlikely to exactly match the service provider's forecast because the service provider may not adopt the same forecasting method. However, if the service provider's inputs and assumptions are reasonable, its method should produce a forecast consistent with our estimate.

If a service provider's total forecast opex is materially different to our estimate and there is no ***satisfactory explanation for this difference****, we may form the view that the service provider's forecast does not reasonably reflect the opex criteria. Conversely, if our estimate demonstrates that the service provider's forecast reasonably reflects the expenditure criteria, we will accept the forecast. Whether or not we accept a service provider's forecast, we will provide the reasons for our decision.*

Upon review of the AER alternate estimate, and the specific benchmarking analysis that supported this outcome, Essential Energy will provide the Australian Energy Regulator with a “satisfactory explanation for the difference”. Essential Energy has three main concerns with regard to the benchmarking approach adopted when reviewing its proposed base year opex.

- The small heterogeneous sample used by the AER to define Essential Energy’s benchmarking peers.
- The inordinate weighting applied to customer numbers & ratcheted maximum demand when assessing required operational expenditure.
- The counterintuitive results

The modelling methodology used by the AER to establish their alternative forecast is inappropriate for a large rural based distributor. Under the constraints imposed by the AER’s alternate proposal it will not be possible to provide those mandatory activities required to maintain a safe and reliable network.

Essential Energy has also identified errors in logic which may cause uncertainties in the AER’s analysis of Essential Energy’s emergency maintenance opex. Benchmarking unplanned outage (emergency maintenance) expenditure by customers affected is counter-intuitive as the number of affected customers is not linear to the effort or expenditure required to rectify failures. Whilst the duration of an outage does not directly cause cost, it is a good indication as to the effort required to locate, access and rectify the outage. Failures within remote parts of the network may only affect small numbers of customers but require long travel times and major rectification works. In benchmark studies performed by Frontier Economics for Ofgem, a similar conclusion was drawn. When simple measures of density (such as customers per unit of service and customers per network area) were utilised, evidence was found demonstrating that increasing density decreased costs, obviously the inverse of this statement is also true.[18]

Huegin Consulting are a respected firm that has undertaken a significant volume of research into utility benchmarking. Huegin were engaged by Networks NSW and ActewAGL to review the benchmarking process implemented by the AER in their Draft Decision[19] . The Huegin report states:

Validity is defined as the extent to which the benchmark actually measures the attribute under study - in this case, efficiency. The benchmark measures relied upon by the AER compare businesses on the basis of customer numbers, line length and ratcheted peak demand. Any residual between an individual business and the business(es) that are

[18] Frontier Economics (Apr 2013),*Total cost benchmarking at RIIO-ED1 – Phase 2 report – Volume 1: (Prepared for Ofgem),* pg 51

[19] Huegin Consulting (Jan 2015), *Huegin’s response to Draft Decision on behalf of NNSW and ActewAGL. Technical response to the application of benchmarking by the AER.*, p 22

deemed to have the most efficient relationship between these variables and expenditure is composed of:

1. *The influence of variables that are not included in the model yet influence costs;*
2. *Measurement error; and*
3. *Efficiency differences.*

Without correcting for the first two, the residual is not a valid measure of efficiency. This is not an issue so long as the measures are robust and the statistical practices sound.

Our primary concern with the validity of the opex SFA and MPFP efficiency measures is not related to the residual, rather the assumption that operating expenditure can be explained through customer numbers, ratcheted peak demand and line length. In our experience and supported by previous Huegin studies, the incremental opex cost of increasing customers in an electricity network is actually quite low, yet the SFA model has a coefficient of 0.667. The incremental opex costs of increasing ratcheted peak demand is negligible, yet the SFA model gives this variable a coefficient of 0.21. Line length is the only variable that presents some sort of proxy for the asset itself, but even then:

4. *It's influence is low in the model, with a coefficient of only 0.10; and*
5. *The actual line length is only a moderately strong proxy for influence of the asset on opex, as the design, type and location of the assets all drive opex.*

Overall, we consider that the validity of the model is poor. Whilst there are coincidental relationships between increases in customers and line length, more important considerations of the asset design and location are not considered.

They have also stated;

Failure to consider the likelihood of multiple frontiers and the use of an historical reference point for the frontier exaggerates the distance between businesses and their natural efficient position

Frontier Economics has an impressive record with regard to benchmarking and are considered leaders domestically and internationally with regard to regulated networks benchmarking. Frontier Economics were engaged by Networks NSW to review the benchmarking process implemented by the AER in their Draft Decision.[20]

Frontier Economics made a number of findings with regards to the veracity of the benchmarking in particular deficiencies, errors and inconsistences with;

> Utilisation of non-representative international data

The consequences of the significant differences in operating environment across the sample is that the business models applied by the businesses are likely to be very different – an Ontarian business operating in a harsh wintry environment will have a completely different business model to achieve a given security of supply than a rural Australian network. In turn, this will mean that the relationship between costs and cost drivers is quite different across the two jurisdictions, and is not amenable to being caught by a relatively small number of high level explanatory factors combined with country dummy variables.

In addition to the differences in network characteristics that exist, it is clear that there is no consistency in the cost data across the sample, as is acknowledged by EI itself:[21]

[20] Frontier Economics (Jan 2015), *Review of the AER's econometric benchmarking models and their application in the draft determinations for Networks NSW*,

We cannot be certain that we have exactly the same opex coverage across the three countries so we have included country dummy variables for New Zealand and Ontario to pick up differences in opex coverage (as well as systematic differences in operating environment factors such as the impact of harsher winter conditions in Ontario). [Emphasis added]

In our view, it would be difficult for EI to assert that it cannot be certain it has comparable opex coverage across the three countries and then proceed to develop a model that is used mechanistically to justify very deep expenditure cuts.[22]

> Reliance on international data for benchmark model legitimacy

On this basis, we might expect the Ontarian and New Zealand networks to drive materially EI's results for the full sample, notwithstanding their clear lack of comparability with the Australian networks. Yet absent those data there is no evidence to suggest that the EI model describes well the Australian data. Indeed, we find explicit statistical evidence to suggest that it is inappropriate to pool the data from these three countries as EI has done, owing to significant differences in underlying differences between the relationship between costs and cost drivers.[23]

> Modelling flaws and incorrect assumptions

The AER's approach fails to measure up to the recommendations by Coelli et al (2003)[24]*, to practitioners and regulators, about the importance of sensitivity testing using different models and techniques before results from benchmarking analyses are applied to derive efficiency adjustments to regulated firms' allowed costs*[25]

> Application of back cast data in benchmark modelling without due consideration of inherent errors in back casting data

However, it is simply not realistic to expect that the back-casted data will be reported on a consistent basis across the DNSPs for a number of reasons[26]

And

The serious difficulties inherent in the data preparation - and the amount of work that is required to create a consistent dataset - are simply not acknowledged in the AER's benchmarking analyses. [27]

> Large degree of heterogeneity in Australian data sample

Within the Australian sample itself there is an unprecedented degree of heterogeneity of circumstance. For example, the two largest Australian DNSPs are Essential Energy and Ergon Energy. Essential Energy serves an area (775,520 km²) significantly greater than the land area of France (547,700 km²) and almost three times as large as the entire land

[21] Economic Insights (Nov 2014), *Economic Benchmarking Assessment of Operating Expenditure for NSW and ACT Electricity DNSPs*, p.31.

[22] Frontier Economics (Jan 2015), *Review of the AER's econometric benchmarking models and their application in the draft determinations for Networks NSW*, pg ix

[23] Frontier Economics (Jan 2015), *Review of the AER's econometric benchmarking models and their application in the draft determinations for Networks NSW*, pg ix

[24] Coelli, T., Estache, A., Perelman, S., Trujillo, L. (2003), *A Primer on Efficiency Measurement for Utilities and Transport Regulators*, World Bank Development Studies, Washington DC: World Bank.

[25] Frontier Economics (Jan 2015), *Review of the AER's econometric benchmarking models and their application in the draft determinations for Networks NSW*, pg vii – viii

[26] Frontier Economics (Jan 2015), *Review of the AER's econometric benchmarking models and their application in the draft determinations for Networks NSW*, pg xiii

[27] Frontier Economics (Jan 2015), *Review of the AER's econometric benchmarking models and their application in the draft determinations for Networks NSW*, pg xiv

area of New Zealand (263,300 km²), while Ergon Energy serves an area (1,698,100 km²) significantly greater than the land area of France, the UK (241,900 km²) and Spain (498,800 km²) combined and nearly twice the land area of Ontario (917,741 km²).4 By contrast, CitiPower serves an area (157 km²) that is orders of magnitude smaller. These differences alone ought to give the AER pause to consider whether it is sensible to treat such different networks as if their characteristics may be captured by a small set of common explanatory factors.[28]

Advisian (formerly Evan and Peck) part of the Worley Parsons Group were engaged by Networks NSW via Ausgrid to examine the benchmarking performed by the AER. The Advisian report raises concerns around the application of the benchmark activities (conducted by the AER and its consultants) to opex determinations.

> Application of benchmarking to opex determination

The AER's benchmarking approach was not designed to assess the opex efficiency but to measure the relative productivity of the DNSP's… In particular Advisian has identified issues with the AER's benchmarking approach relating to:

(a) Comparability of the DNSPs used for benchmarking purposes;

(b) The failure to appropriately consider the effect of spatial density (customers/km2) in addition to linear density (customers/km) on efficient Opex;

(c) The application of alternative approaches to determine efficient Opex; and,

(d) The need for DNSPs to operate and maintain, in a safe and reliable manner, the assets they actually have, rather than the assets they might have had.

As a result, Advisian considers that, as a starting point, the use of the DNSPs revealed base year represents the most appropriate and robust means of accounting for the difference in spatial density and all other network specific factors.[29]

> Lack of credible 'intuitive' outputs from the model

The model itself does not account for exogenous factors (such as the nature of the assets and the development history of the network) that have influenced the development of the existing asset base. These instead must be accounted for by specific ex-post adjustments to the model. In particular, Advisian has identified issues relating to:

(a) The benchmarking results failing to provide intuitively credible results for Opex based on the line length measures of network scale;

(b) Issues of comparability relating to installed transformer capacity and the scope of network services provided;

(c) The material impact of SWER lines on circuit length of the notional frontier business.

On the basis of our assessment, Advisian is of the opinion that the benchmarking approach used to determine the frontier businesses does not (and the preferred model specification cannot) appropriately account for the differences in the volume of assets that the businesses must operate and maintain.

Whilst the modelling approach taken by Economic Insights may be appropriate for assessing a measure of relative productivity of the businesses (which simply demonstrates that DNSPs which can meet the historical maximum demand with fewer assets, generally do so at lower cost per customer), it is not a reasonable basis for setting

[28] Frontier Economics (Dec 2014), *Review of the AER's econometric benchmarking models and their application in the draft determinations for Networks NSW*, pg xii

[29] Advisian (Jan 2015),*Review of AER Benchmarking Networks NSW – Preliminary Report*, p 2

efficient Opex because it does not account for the exogenous factors that have led to the need for historical investments in, and configuration of, the existing asset base.[30]

- Drivers of opex expenditure and efficiency

  To this end, we note that the Opex efficiency relates to the cost with which the existing assets can be operated and maintained at the required safety and reliability levels, whilst Opex productivity relates to the cost with which the existing assets have served existing customers at the historical safety and reliability levels (whether these were appropriate or not). Under a productivity measure, the businesses with the fewest assets per customer will almost always appear to be more productive. The AER's underlying assumption that productivity is equivalent to efficiency does not take into account the fact that the efficiency of Opex is driven by:

  - *The physical volume, type and capacity of assets installed (and cost per asset);*
  - *The reliability performance of the network (and historical trend in reported performance); and,*
  - *The geographic distribution of assets and customers across the service area.*[31]

Networks NSW engaged David Newberry via Ashurst to review the AER's approach to benchmarking given Mr Newberry's international standing and significant experience in economic analysis and reform. Mr Newberry raises concerns as follows;

- Lack of consideration for operating environment

  "After reviewing the AER's and its consultant's (Economic Insights) analysis and modelling, it is my opinion that insufficient consideration has been given to the DNSPs' different operating environments within the benchmarking. This is particularly critical as the AER has buttressed its claims for robustness by the use of international data (New Zealand and Ontario, Canada) that does not appear to have been robustly reviewed for operating environment differences either with Australia or across the countries [32]

- Post modelling adjustments to frontier

  The AER used a number of post-modelling normalisations to adjust the frontier target for the NSW service providers. This is not in line with the practices adopted overseas and risks not comparing the DNSPs on a like-for-like basis. One notable areas is capitalisation, where the AER accepted the DNSPs own capitalization policies and which may vary significantly from one DNSP to the next.[33]

- Depth of proposed cuts

  Putting aside the critique of the AER's benchmarking and the reliability of the AER's estimates of the DNSP's efficiencies, the AER's proposal to cut their forecast opex by almost 40% in the cases of Ausgrid and Essential Energy and even 22% in the case of Endeavour Energy is quite clearly an unprecedentedly large cut to their proposed expenditure requirements. Applying these sizes of adjustment as an immediate and full change in the P_0:

  - *risks prejudicing the financeability of their investment and operations;*
  - *is not in keeping with international precedent; and*

[30] Advisian (Jan 2015),*Review of AER Benchmarking Networks NSW*, p 2

[31] Advisian (Jan 2015),*Review of AER Benchmarking Networks NSW*, p17

[32] Draft Response D, Newberry Cambridge Economic Policy Associates January 2015 Pg 10

[33] Draft Response D, Newberry Cambridge Economic Policy Associates January 2015 Pg 11

- *risks being inconsistent with the National Electricity Objective of ensuring the long term interests of consumers with respect to the reliability, safety and security of the national electricity system if sudden opex cost reductions are required.*[34]

Essential Energy agrees with the concerns raised above by a number of eminently qualified professionals with regards to the effectiveness and validity of the benchmarking undertaken by the AER. These concerns, when taken collectively, materially affect the outputs of the benchmark modelling and resultant determination. To that end Essential Energy has performed a sensibility check of the outputs from the AER benchmarking using metrics as proposed as valid measures by a number of the aforementioned reports.

The benchmarking sensibility check performed by Essential within this report is primarily normalised by assets (Total Line Length, Total Poles, or Total Assets). Maintenance is largely driven by the quantity, complexity and location of assets.

4.2.1 Opex is driven by asset numbers and condition

The AER's Draft Decision has made adjustments to the opex based on Essential Energy's opex benchmarking unfavourably. The AER has used the following measures to benchmark DNSP opex:

> Productivity
> Partial Performance Indicators normalised by customer density

While the above two metrics are informative, they are not the most relevant metrics to use with regard to opex efficiency. Issues about the productivity benchmarking are detailed in the revised regulatory proposal[35]. We note that the benchmarking adopts line length as one of the output factors, which would appear to take account of network scale; however, the low weighting given to this (10%) appears wholly inadequate when applied to opex. Table 4-2 shows the coefficients used in the productivity benchmarking (SFA Cobb–Douglas cost frontier estimates using medium dataset) compared to the expected relationship to opex drivers as assessed by Huegin, and also the relativity assigned to each from analysis of Essential Energy's actual direct accounting lines.

These same drivers apply equally to emergency response expenditure and vegetation management. It is the amount of assets susceptible to failure and the quantity of individual spans of network that have to be cleared of vegetation that drives the quantum of work, not the number of customers. The outcomes from the analysis of Essential Energy's expenditure account lines for a five-year period showed the drivers of operating expenditure by cost code are predominately driven by line length and asset numbers. This demonstrates the lack of appropriateness of the coefficients chosen for the benchmarking model, consequentially Essential Energy opex has a poor correlation to the number of customers and demand, but a strong correlation to line length and asset volumes that is not adequately reflected in the benchmarking approach.

[34] Draft Response D, Newberry Cambridge Economic Policy Associates January 2015 Pg 16

[35] Essential Energy. (Jan 2015). Revised Regulatory Proposal

Table 4-2: Direct cost drivers (AER outputs vs Huegin Analysis vs Essential Energy Accounts)[36]

Source	Item	AER Modelling Outputs (Relationship/Weighting)		
		Customers	RM Demand	Line Length
AER	**SFA coefficient**	0.667	0.214	0.106
Huegin Analysis (Relationship to modelling output)	**Inspection**	none	none	Moderate
	Planned Maintenance	Moderate/none	none	High
	Emergency Maintenance	Low/none	none	Moderate
	Vegetation	none	none	High
Essential Energy Analysis (from actual account lines)	**Inspection**	none	none	High
	Planned Maintenance	none	none	High
	Emergency Maintenance	Low	Low	High
	Vegetation	none	none	High

In contrast, the alternative benchmarking undertaken by the AER – Partial Performance Indicators (PPIs) normalised by customer density – does appear to take into account network scale as the density is based on customers per line length. The relationship between customer density and the measures examined by the AER (Total cost per customer and Opex cost per customer) is, however, not linear. The AER has said that Essential Energy (with a customer density of approx. 4.4 per km) can be compared to Powercor (with a customer density of approx. 10 per km) but has not taken into account the non-linear relationship between opex per customer, and customer density.

A simple example illustrates the issue. Consider two networks, each with 200 customers, one supplied by 2.5 km of line and the other by 5km of line. With double the number of assets, the second network requires twice the opex to inspect, maintain and operate. Table 4-3 shows the example expanded to different network lengths, each supplying the same number of customers. Figure 4-2 shows that in the region of the indicated customer densities for Essential Energy and Powercor, the relationship is quite non-linear, indicating a 56% variance in cost per customer for the same level of efficient expenditure per km. At higher customer densities the relationship between customer density and opex per customer is relatively linear. This is not inconsistent with that of Frontier Economics 'increasing density decreases costs' finding.[37]

[36] Economic Insights, 2014, p.33 and Huegin, 2015, p.40

[37] Frontier Economics (Apr 2013),*Total cost benchmarking at RIIO-ED1 – Phase 2 report – Volume 1: (Prepared for Ofgem),* p 51

Table 4-3: Calculation of relationship between cost per customer and customer density

Customers	km	Opex/km	Opex	Customers/Km	Opex/Customer
200	2.7	$2500	$6,763	73.9	$33.81
	4.96		$12,400	40.3	$62.00
	9.6		$24,000	20.8	$120.00
	13.1		$32,750	15.3	$163.75
	20		$50,000	10.0	$250.00
	20.9		$52,250	9.6	$261.25
	45		$112,500	4.4	$562.50

Figure 4-2: Cost per Customer vs Customer Density (with Opex/km static)

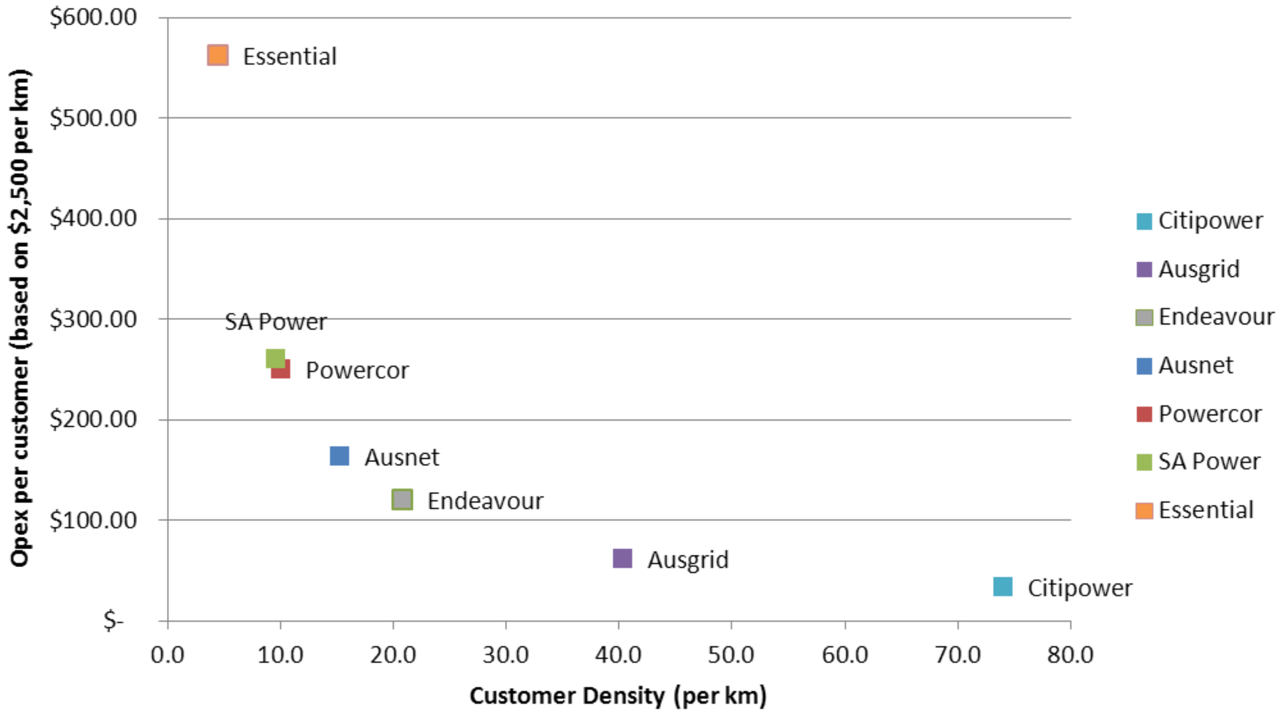


Figure 4-3: Figure A-2, AER Draft Decision[38]

This example is simple and does not adequately consider the ratio of fixed to variable costs and regional differences, amongst other matters. However, the example does demonstrate that the use of PPI's normalised by customer density can be misleading given the high sensitivity to customer density at low values, and hence is not the most relevant approach.

In Essential Energy's view, the inspection, maintenance and defect tasks that constitute Essential Energy's opex are dependent on the number of assets on the network. The expenditure is not customer driven and as such the opex task volumes do not correlate well with measures that focus on the cost to serve a customer. This view is supported by the following:

- Whether there are fifty customers connected to one pole or fifty poles required to connect one customer, every pole will need to be routinely inspected and maintained. Opex for inspection and maintenance is driven almost entirely by asset volumes and their condition.
- Situations within the Essential Energy footprint where more than ten kilometres of electrical infrastructure is required to supply one customer (refer Figure 4-4). This could involve up to eighty poles, eighty crossarms, twenty kilometres of conductor or more, and hundreds of insulators and ancillary equipment. Each one of these assets must be maintained with exactly the same diligence and process as the urban pole supplying a unit block of fifty customers. Opex for maintenance has a small fixed cost (for IT systems etc.) and a high variable cost driven by asset volumes.
- In remote areas of the network, lengthy travel times are required to reach the programmed assets. It is not unusual for maintenance staff to have to travel over 100 kilometres from the nearest depot to begin their scheduled daily maintenance activities.

[38] AER (Nov 2014), *Draft Decision Essential Energy distribution determination 2015-16 to 2018-19 Attachment 7: Operating expenditure*, p.7-31

Figure 4-4: Feeder Segment Customer Density[39]

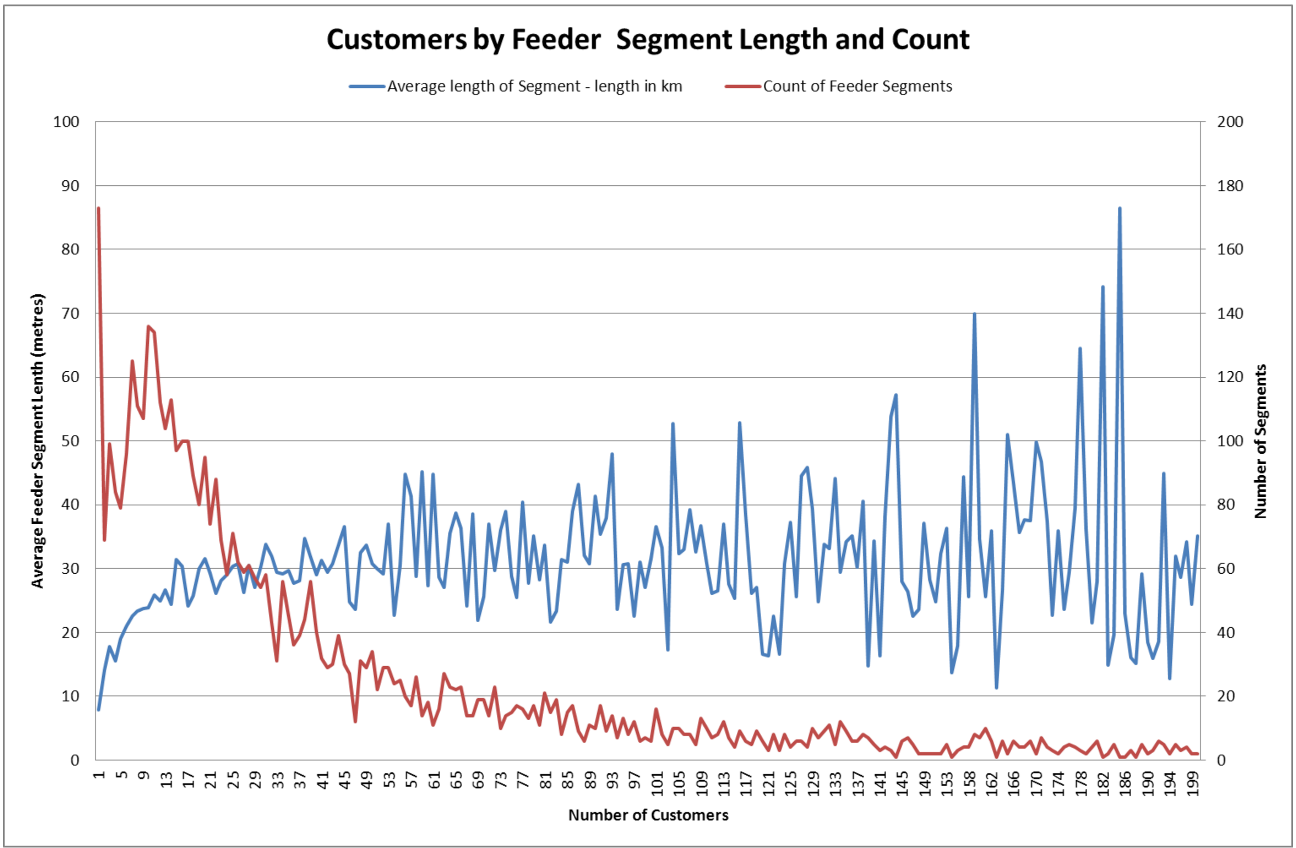


Figure 3-4 graphs the average feeder segment length by the number of customers (blue line) and the number of segments by the customers (red). For example feeder segments with only one customer have an average length of 7.9km and there are 173 of these segments on the network. It is apparent from Figure 4-4 that Essential Energy has significant feeder lengths to maintain with minimal customers served by these segments, thus illustrating the customer density issues found within the Essential Energy network. Figure 4-4 has been produced for feeder segments with 200 or less customers; this represents 37% of the total network line length that Essential Energy is obliged to maintain for 22% of the total customers served by Essential Energy with segments of up to 80km on average.

In order to determine an appropriate normalising metric, the following information was considered.

The vast majority of all direct operating expenditure (for all electricity distributors) is expended on only a small number of main asset groups. These categories include poles, conductor, cables, pole-top structures, switchgear, services and substations. These assets are the basis of all inspection and maintenance activities virtually independent of the number of customers and load that they service. As opex is about maintaining installed assets it has a direct correlation to the volume of assets on the network. In high level benchmarking the following can readily be used to normalise costs in order to provide a view on relative expenditures:

> Line route length (km)
> Number of poles
> Total number of assets[40]

[39] The figure shows those feeder segments with less than 200 customers, to highlight the number of long feeder segments with very few customers.

Normalising by line length or number of poles does not properly account for the opex associated with zone substations (noting that this is difficult to correctly evaluate from the Regulatory Information Notices, although Essential Energy has a far greater number due to their 11kV network); however, the required inspection and maintenance activities for these groups are all fundamental and largely consistent between all DNSPs.

Rather than selecting a single normalising metric, Essential Energy has applied each of these factors – line route length, number of poles and total number of assets in section 4.3 to assess the RIN data to form a view on relative efficiency of the DNSPs.

The maintenance expenditure required for inspection, non-routine maintenance and fault and emergency is related to the volume of assets owned, requiring repairs and exposed to failure, and the condition of assets. The cost of inspecting assets is related to the number of assets in service on the network, the frequency of inspections and what work is completed at the inspection. The frequency of corrective tasks and component failures is also related to the volume of assets, the asset's age and condition, and the relative risk associated with that asset.

These factors are important in determining the expenditure required, and the AER's model does not appropriately address these.

4.2.2 Counterintuitive modelling results

Essential Energy's concerns with regard to the benchmarking approach adopted when reviewing its proposed base year opex are validated by the following counterintuitive results

> Essential Energy will receive less opex (excluding vegetation) than Endeavour Energy[41] for more than four times the network length
> Essential Energy will receive only 34% more opex (including vegetation) than Endeavour Energy for more than four times the network length (see section 4.2.2.1)
> Essential Energy will receive less opex than SA Power Networks proposal[42] for more than twice the network length (see section 4.2.2.2)
> If the AER alternate base year[43] for Essential Energy was applied, Essential Energy would be required to operate on 29% less opex than the combined Victorian "frontier" rural distributors (Ausnet + Powercor)[44] but with a network that is 62% longer.

4.2.2.1 Endeavour Energy comparison

According to the AER's Draft Determination, Essential Energy will receive less OPEX (excluding vegetation management) than Endeavour Energy. Essential Energy supplies only 8% less customers, but a substantially longer network (436%) containing 355% more assets than Endeavour Energy, as shown in 4.2.2.1. Taking into consideration vegetation management expenditure, Essential Energy will receive only 34% more OPEX than Endeavour Energy.

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[40] Essential Energy has used the number of poles, transformers, service line kilometers, line kilometres & switchgear when referring to Total Assets

[41] AER (Nov 2014), *Draft Decision Endeavour Energy distribution determination 2015-16 to 2018-19 Overview*, Table 8-6, p52

[42] SA Power Networks Regulatory Proposal 2015-2020, SA Power Networks, 2014, p28

[43] AER (Nov 2014), *Draft Decision Essential Energy distribution determination 2015-16 to 2018-19 Attachment 7: Operating expenditure*, Table A-23, p7-136

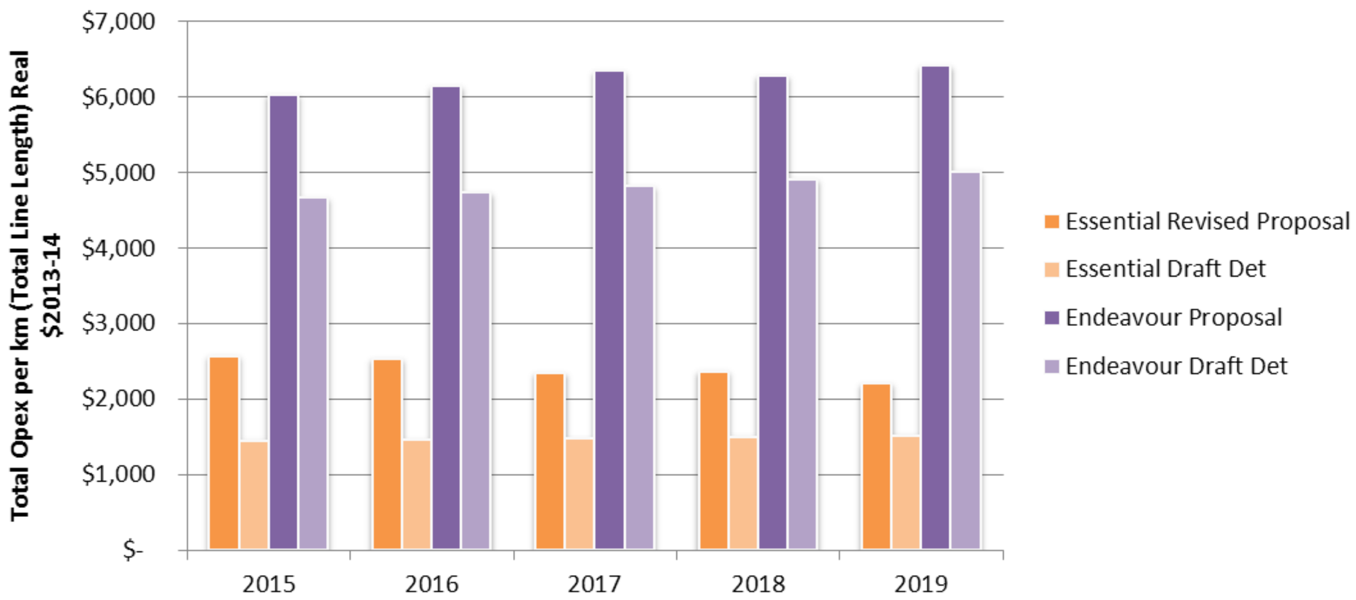
[44] Compared to the combined total 2012-13 opex for Ausnet and Powercor as reported in their respective Category Analysis RIN's

Table 4-4: Comparison between Essential Energy and Endeavour Energy – asset, customers and opex

	Essential Energy	Endeavour Energy	Essential Energy Difference
Customers	844,244	919,385	-8%
Line Length	193,423 km	44,305 km	+436%
Poles	1,377,483	305,822	+450%
Total Transformers	137,210	30,176	+455%
Total Assets[45]	2,343,086	660,889	+355%
Opex –Draft Determination	$1,439.5 million[46]	$1,068 million[47]	+34%
Opex –Draft Determination (less veg)	$702.4 million	$747.4 million	-6%

Essential Energy's proposed total opex normalised by total line length is significantly lower than the Endeavour Energy proposal and the AER's subsequent draft determinations, as shown in Figure 4-5. According to the Draft Determinations, Essential Energy will be allowed $1,488 average annual opex per km (total line length), whereas Endeavour Energy will be allowed $4,834 average annual opex per km. This difference in opex spend between Endeavour Energy and Essential Energy is at odds with the Frontier Economics finding of 'increasing density decreased costs'.[48]

Figure 4-5: Proposed Opex per km vs Draft Determination - Comparison with Endeavour Energy



Essential Energy's proposed total opex normalised by total number of poles is considerably lower than the Endeavour Energy proposal and the AER's subsequent draft determinations, as shown in Figure 4-6. According to the Draft Determinations, Essential Energy will be allowed approximately $204 average annual opex per pole,

[45] Total assets represents the number of poles, transformers, service lines (kilometres), line kilometres & switchgear

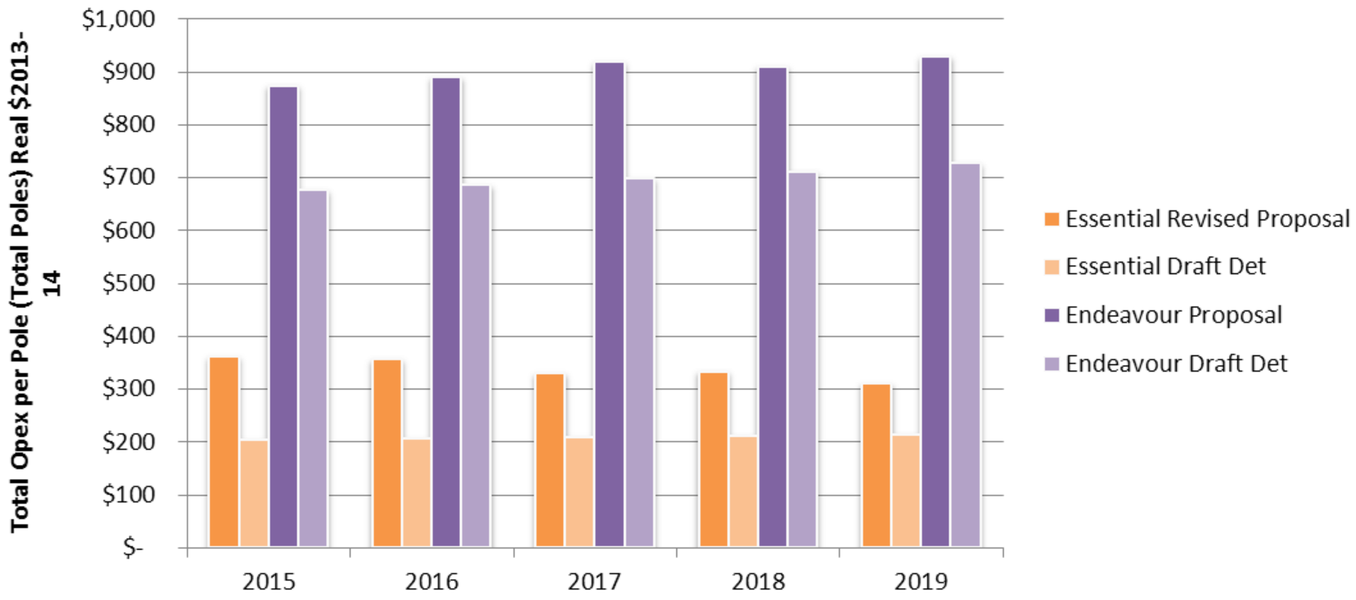
[46] AER (Nov 2014), *Draft Decision Essential Energy distribution determination 2015-16 to 2018-19 Overview*, Table 8-6, p52 (DMIA has been added)

[47] AER (Nov 2014), *Draft Decision Endeavour Energy distribution determination 2015-16 to 2018-19 Overview*, Table 8-6, p52 (DMIA has been added)

[48] Frontier Economics (Apr 2013), *Total cost benchmarking at RIIO-ED1 – Phase 2 report – Volume 1:* (Prepared for Ofgem) pg 51

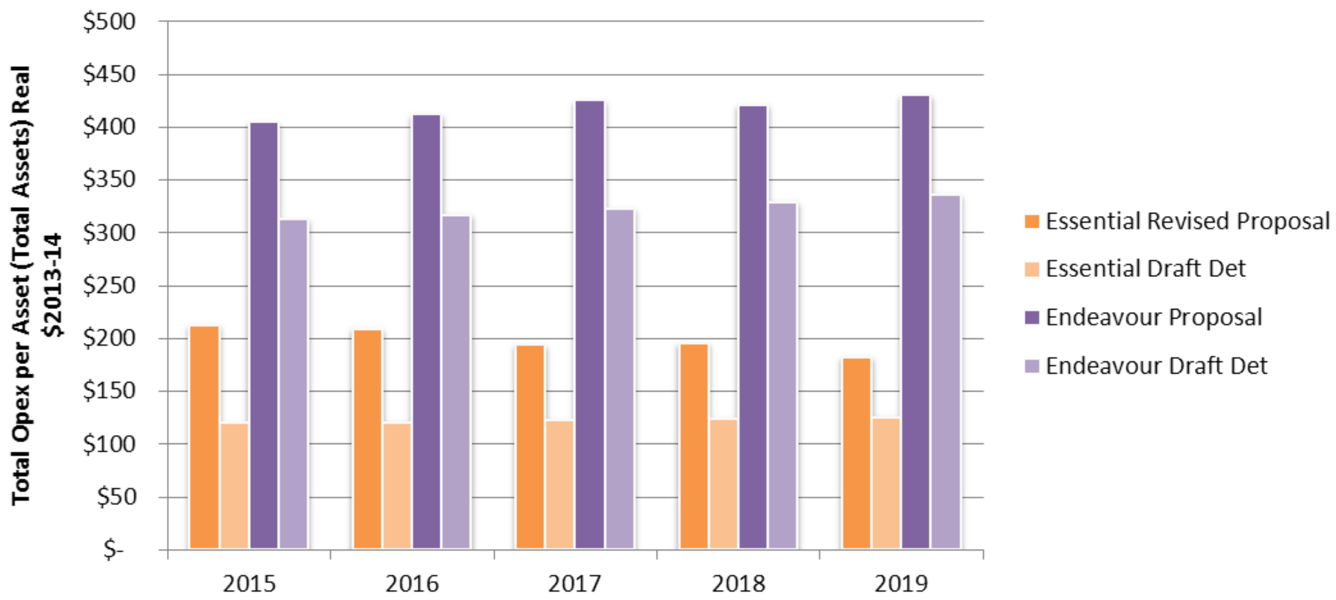
whereas Endeavour Energy will be allowed an average of $677 per pole. Essential Energy's network has more than four times the number of poles over a significantly larger network area than Endeavour Energy.

Figure 4-6: Proposed Opex per Pole vs Draft Determination - Comparison with Endeavour Energy



Essential Energy's proposed total opex normalised by total number of assets is lower than the Endeavour Energy proposal and the AER's subsequent draft determinations, as shown in Figure 4-7. Essential Energy's proposed average annual opex spend per asset count is approximately $123, whereas Endeavour Energy has been allowed an average of $324 per asset.

Figure 4-7: Proposed Opex per Asset vs Draft Determination - Comparison with Endeavour Energy



It is incongruous that both decisions by the AER can be correct. Essential Energy is inspecting, maintaining, responding to faults and cutting vegetation on a network broadly 4 times larger than that of Endeavour Energy and is expected to do so for only an additional 34% opex.

4.2.2.2 South Australian Power Networks comparison

Essential Energy will receive less opex than SA Power Networks has proposed for their 2015-20 regulatory period. Essential Energy supplies electricity to similar customer numbers, but operates a substantially longer network (220% longer) containing 252% more assets than SA Power Networks, as shown in Table 4-5.

Table 4-5: Comparison between Essential Energy and SA Power - asset and customer numbers and opex

	Essential Energy	SA Power Networks	Essential Energy Difference
Customers	844,244	847,766	- 0.6%
Line Length	193,423 km	87,895 km	+ 220%
Poles	1,377,483	739,709	+ 186%
Total Transformers	137,210	75,042	+ 183%
Total Assets[49]	2,343,086	929,408	+252%
Opex (2014/15-2018/19) Real $2013/14	$1,439.5 million	$1,443.9 million[50,51]	- 0.3%

In comparing SA Power's opex in their regulatory proposal with Essential Energy's proposed opex and the AER's draft determination, Essential Energy has a declining forecast opex whereas SA Power's opex is increasing annually. The significant percentage increase in opex[50] for SA Power suggests that their historical spend is questionable from the perspective of long term prudency and efficiency and has obviously been unsustainable. This suggests SA Power's expenditure used by the AER for benchmarking may be unwarranted based on their current proposal. This creates uncertainty about whether benchmarking against historical expenditure for SA Power Networks is appropriate and brings into doubt the AER's benchmark model results. This issue aside, with similar customer numbers, Essential Energy has a lower proposed annual opex normalised by total line length than SA Power (proposal), as shown in Figure 4-8, and the AER considers SA Power Networks as one of the DNSP efficiency frontiers[52].

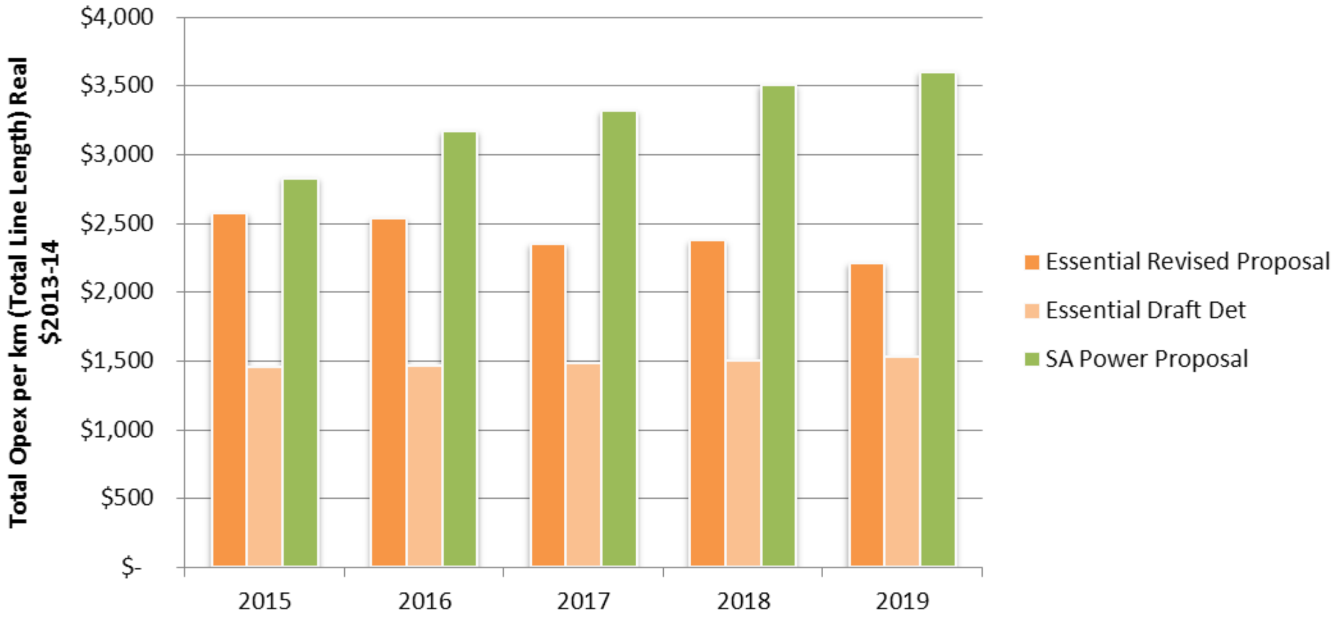
[49] Total assets represents the number of poles, transformers, service lines (kilometres), line kilometres & switchgear.

[50] SA Power Networks (Oct 2014), *SA Power Networks Regulatory Proposal 2015-2020*, p28

[51] SA Power Networks (Oct 2014), *Attachment 20.73 SA Power Networks: Capital and operating historical expenditure*, p8

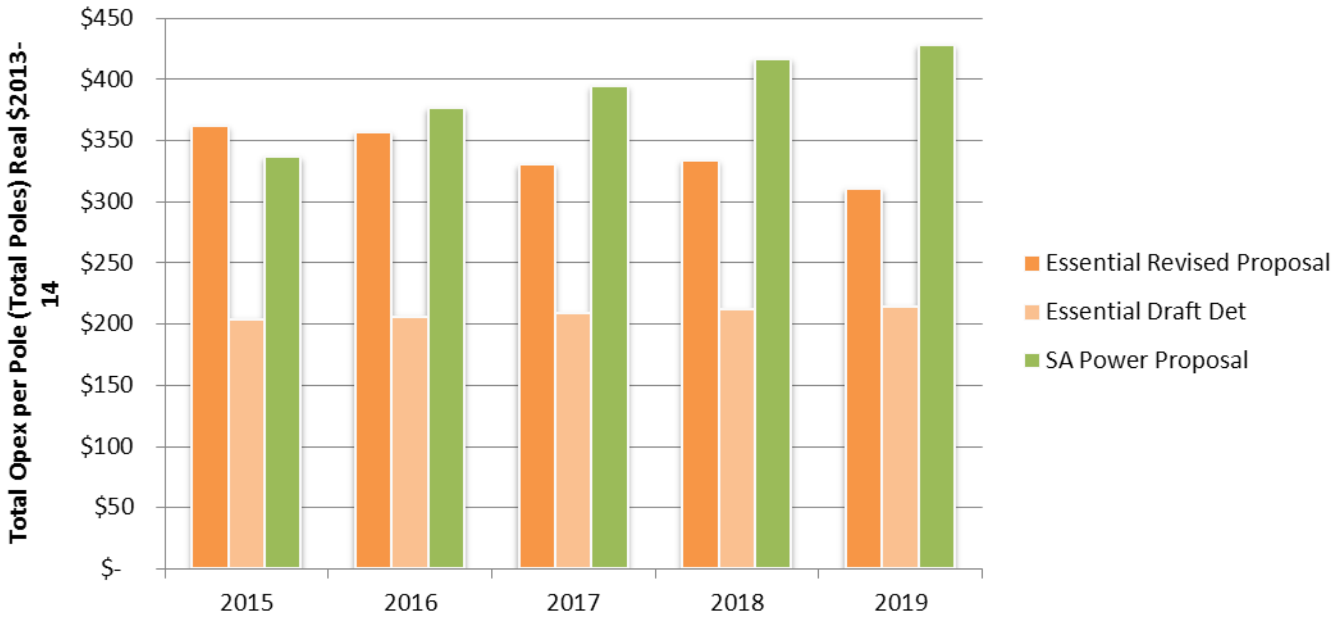
[52] AER (Nov 2014), *Draft Decision Essential Energy distribution determination 2015-16 to 2018-19 Attachment 7: Operating expenditure*, p.19

Figure 4-8: Proposed Opex per km vs Draft Determination - Comparison with SA Power Networks



Essential Energy has a lower proposed annual opex normalised by total number of poles than SA Power Networks (proposal), as shown in Figure 4-9 and the AER considers SA Power Networks as one of the DNSP efficiency frontiers[53].

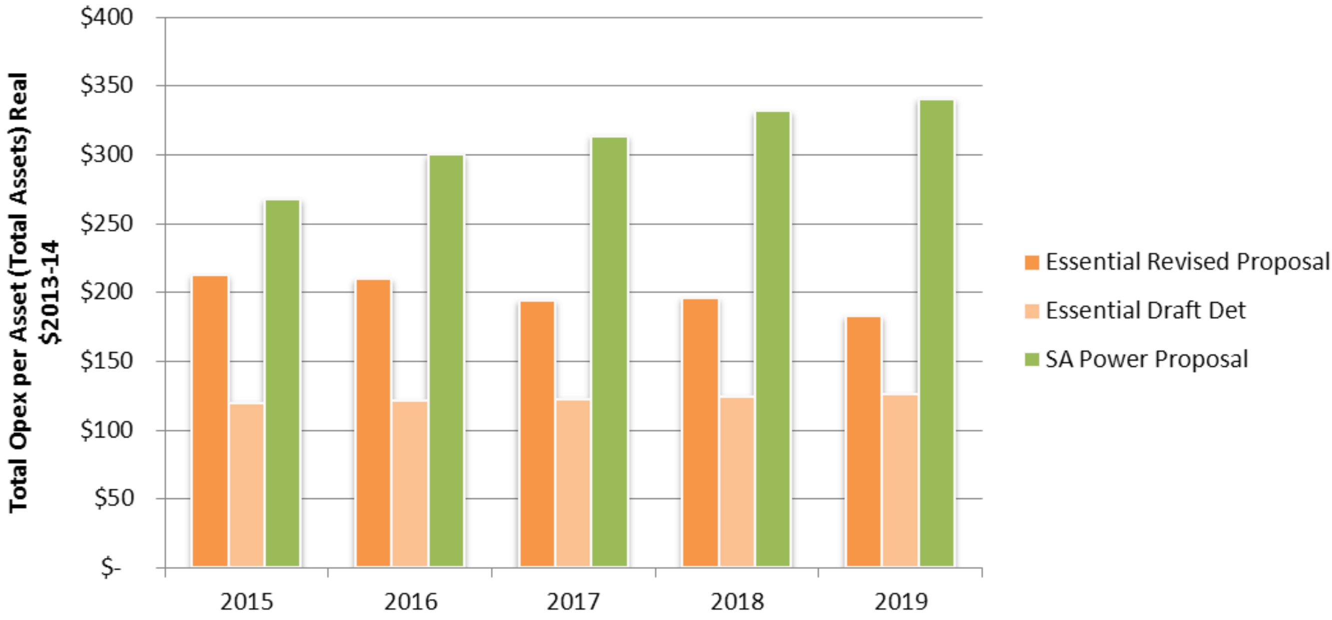
Figure 4-9: Proposed Opex per Pole vs Draft Determination - Comparison with SA Power Networks



[53] AER (Nov 2014), *Draft Decision Essential Energy distribution determination 2015-16 to 2018-19 Attachment 7: Operating expenditure*, p.19

Essential Energy also has a lower forecast opex normalised by total assets than SA Power Networks proposal (as shown in Figure 4-10) and the AER considers SA Power Networks as one of the DNSP efficiency frontiers[54].

Figure 4-10: Proposed Opex per Asset vs Draft Determination - Comparison with SA Power Networks



With more than twice the network length and 2.5 times the total assets it is completely illogical to consider that Essential Energy should be required to maintain their network on considerably less than the AER nominated efficiency frontier distributor.

4.2.3 Comparable benchmarking peers

The Draft Determination has made adjustments to Essential Energy's opex based on unfavourable benchmarking. The AER has used distributors with significantly different characteristics to benchmark opex including:

- All NEM distributors
- CBD, urban and rural distributors
- Small scale distributors, including a number from other countries with disparate operating environments and density

While the above characteristics are informative, they are not the most relevant peers to use.

Although Ergon Energy is arguably the only Australian distributor with similar characteristics, Essential Energy has reviewed their opex data against the two Victorian distributors that have been identified by the AER as close to the efficient frontier. As both AusNet and Powercor have a component of rural network they are seen as the closest comparable networks of those identified by the AER as efficient performers.

These Victorian distributor networks are closest to that of Essential although they are noted as being;

- at least twice and three times as dense on a customer per km basis
- much denser on a network per square km basis
- having a much more homogenous network having a history from a single prior DNSP in the State Electricity Commission of Victoria (SECV)

They are more comparable summed as a notional single utility because they have a geographical spread and span across Victoria from the east to the west of the state similar to what Essential Energy has in NSW. In isolation they

[54] AER (Nov 2014), *Draft Decision Essential Energy distribution determination 2015-16 to 2018-19 Attachment 7: Operating expenditure*, p.19

are not a good benchmark against Essential Energy as one is more coastal and ranges while the other is plains dominant.

The selected distributors have been nominated by the AER as the efficient frontier. These two distributors, outside of Ergon Energy have the most similar network to Essential Energy in the NEM and both were included in the AER's top quartile to determine the "efficient frontier". Essential Energy's customer density is still significantly lower than AusNet and Powercor as shown in Table 4-6. The comparability of the peers has been addressed in presenting the comparison of opex, refer to 4.3.1.

Table 4-6: Comparison of Network Characteristics[55]

Item	Essential Energy[56]	Ausnet[57]	Powercor[58]	All Victorian DNSPs[59]
Area (km^2)[60]	737,000	80,000	145,651	227,010
Customers	844,244	681,299	753,913	2,714,595
Customers density (customers/ km^2)	1.1	8.5	5.2	12.0
Customer density (customers / line km)	4.4	15.3	10.0	17.0
Overhead Network Length (km)	185,285	38,448	68,843	137,929
Underground Network Length (km)	8,138	6,169	6,245	21,305
Network Length (km)	193,423	44,616	75,088	159,236
Poles	1,377,483	372,147	547,567	1,295,200

The AER has also chosen to compare Essential Energy to SA Power Networks[61] in several categories although their operating environment is more comparable to Ausgrid or Endeavour Energy. Approximately seventy per cent of their customers are considered metropolitan with only a small proportion as rural[62]. They are displayed in the benchmarking comparisons; refer to section 4.3 for details.

4.2.4 Other environmental factors

The use of benchmarking as a deterministic tool requires consideration of the operating environment of the network areas. Although individual environmental factors in a network area may not be significant, collectively they can be, including:

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[55] Data based on Category Analysis RIN data for each company

[56] Essential Energy (2014), *Attachment 4 2014 Reset RIN Workbook Consolidated*, Template 2.8 Maintenance, Table 2.8.1 – Descriptor Metrics for Routine and Non-Routine Maintenance

[57] SP Ausnet (2014), *SP Ausnet (D) 2008-13 - Category Analysis RIN - templates CONSOLIDATED - 12 June 2014 - PUBLIC_1.xlsx*

[58] Powercor (2014), *Powercor 2008-13 - Category Ananlysis RIN - responses CONSOLIDATED- 2 June 2014 - PUBLIC.xlsx*

[59] Energy Safe Victoria (Jun 2014), *Safety Performance Report on Victorian Electricity Networks 2013*, Table 1 p. 20

[60] Sourced from individual DNSP websites, except 'All Victorian DNSP's', which was sourced from *Safety Performance Report on Victorian Electricity Networks*, Energy Safe Victoria, June 2014.

[61] AER (Nov 2014), *Draft Decision Essential Energy distribution determination 2015-16 to 2018-19 Attachment 7: Operating expenditure*, section 7.4, p.19

[62] SA Power Networks. (Oct 2014). *SA Power Networks Regulatory Proposal 2015-2020.*p3

- Physical network size - Essential Energy is the largest regionally based network service provider in Australia
- Climatic conditions - Essential Energy, due to its vast network area, has a wide range of environmental and geographical factors that vary in intensity compared to the peer group companies of Victoria and South Australia
- Essential Energy operates a highly non homogenous network established from over 20 legacy organisations each having different standards and practices. This is in direct contrast to the AER top quartile Victorian utilities that have a highly homogenous network derived from one legacy organisation.

4.2.4.1 Physical networks

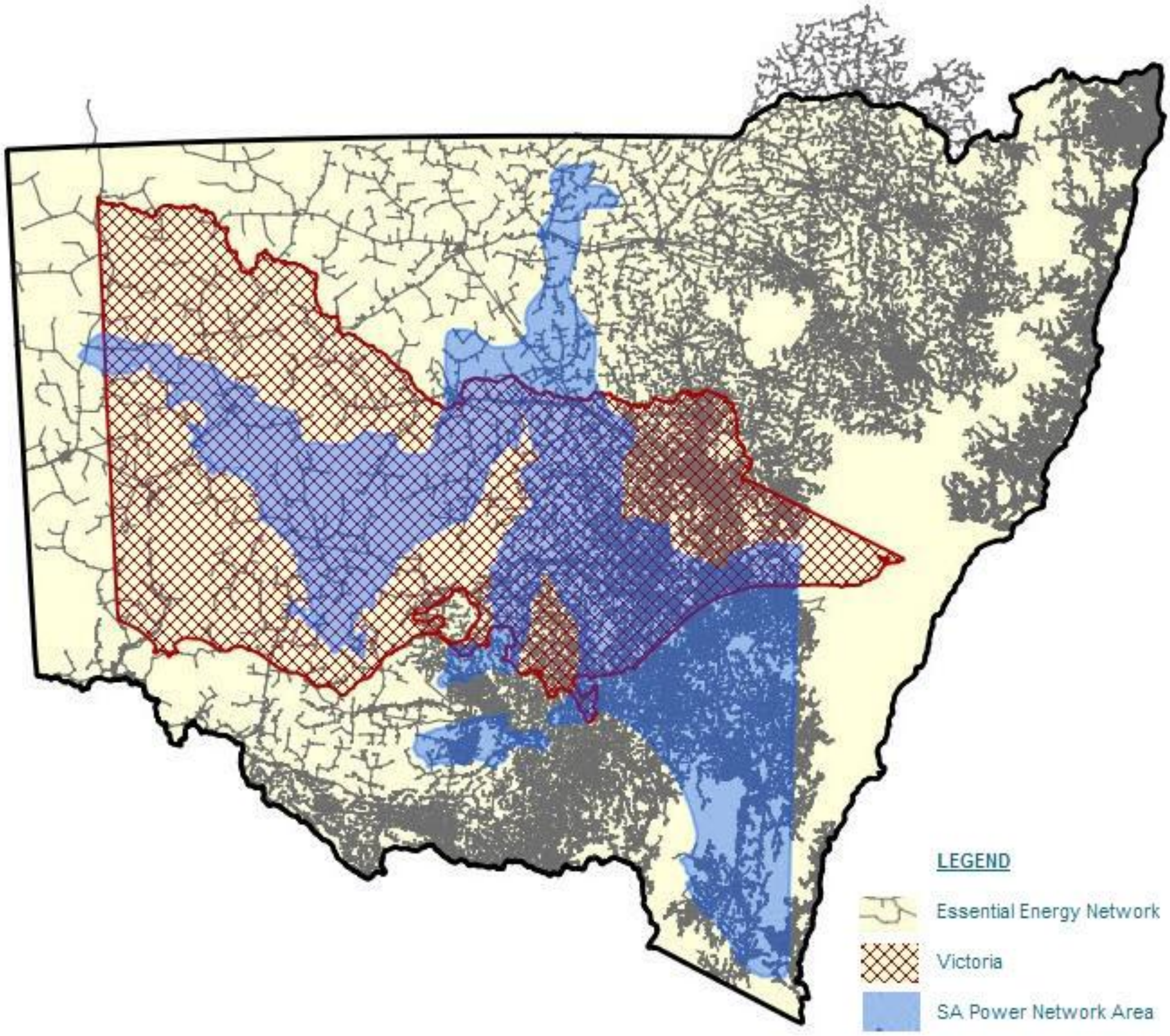
Essential Energy's network size requires the adoption of certain work practices in order to meet its opex objectives; these practices burden Essential Energy with significant expense.

Essential Energy is the largest regionally based network service provider in Australia.

Essential Energy's network area covers approximately 737,000 km² or 95% of New South Wales, with over 800,000 network customers. Essential Energy's network consists of 193,423 kilometres of sub-transmission, high voltage distribution, low voltage distribution power lines, and 1,377,483 poles. Over 95% of the distribution substation population are pole-mounted due to the predominantly rural nature of the supply area, and the economics of predominantly rural networks. However, this type of distribution substation is inherently more susceptible to failure than ground mounted distribution substations.

Essential Energy's network length is greater than all of the Victorian DNSPs combined and contains more poles while being spread across a vastly greater area, as shown in Figure 3.1. Not only is customer density per line km much lower than any Victorian or South Australian DNSP the network density is also far lower in km of line per square km basis.

Figure 4-11: Network Area Comparison – Essential Energy, Victoria, SA Power Networks



The large network area requires certain practices to ensure local access to the network for maintenance and defect repair. The different practices are shown in Table 4-7.

Table 4-7: Considerations and practices required for large network areas

	Considerations / Certain Practices
Depots	Appropriate distance / proximity between depots to maintain service levels
Staff	Staff required to be skilled across multiple disciplines
Materials	More stores required due to large area of network More spare transformers, stored in more locations, due to greater no of voltages
Fleet	Greater distances means greater fleet costs
Travel time	Unit rates are impacted by travel times.

The time to restore supply following an unplanned outage is heavily dependent on the distance from the nearest depot to the fault, and the necessary staff being available at the closest depot (low staff levels at a depot can cause longer outages during storms). In general, reducing the number of depots is not cost efficient as staff would be required to travel greater distances. This has the effect of;

- increasing labour costs due to travel time and more staff required due to lost productive time while travelling
- increasing plant costs due to increased travel time and more plant required due to increased travel time
- deteriorating reliability outcomes

The vast area of Essential Energy's network also requires significant quantities of equipment to be stored at more locations than would be required for a small dense network. There is also an increased requirement for spare transformers and other plant to be held in more locations due to significant transport times, as well as the variety of voltages and phasing that Essential Energy has inherited from previous county councils.

Unit rates for both routine and non-routine maintenance are impacted by network size. Travel time becomes a significant factor when the travel to and from the work site is greater than the time to complete the work. This is particularly significant for emergency response and other unplanned or urgent maintenance.

The average and max distance from each depot to individual substations that the depot is responsible for varies across the network, as seen in Table 4-8 (depots grouped by region for simplicity). The table shows the significant distances between depots and substations, and is a good indicator of travel time for all types of maintenance.

Table 4-8: Time to substation based on straight line distance – current state

Region	Average straight line distance to substation (km)	Max. straight line distance to substation (km)	Average travel time to substation(mins @50km/h)	Max. travel time to substation(mins @50km/h)
Far West	74	246	89	295
North Coast	18	66	22	79
Northern	28	123	33	148
South Eastern	22	71	26	85
Southern	26	148	31	177
Overall	**26**	**246**	**31**	**295**

Essential Energy has limited options when opex reductions in the quantum determined by the AER need to be implemented, effectively these options are depot closures and resource reductions.

4.2.4.1.1 Depot Closures

Essential Energy has modelled the impacts of depot closures. The selected depots modelled are depots that have relatively low number of staff (10 FTE's on average). Closures were modelled such that the nearest depot to the closed depot took on the service area of the closed depot. Based on 46 depots closing and 66 remaining open the impacts to travel times are as shown in Table 4-9.

Table 4-9: Time to substation based on straight line distance – closed depots

Region	Average crow flight distance to substation (km)	Max. crow flight distance to substation (km)	Average travel time to substation(mins @50km/h)	Max. travel time to substation(mins @50km/h)
Far West	87	250	104	300
North Coast	26	88	31	106
Northern	42	165	50	198
South Eastern	29	110	35	132
Southern	32	148	38	177
Overall	**35**	**250**	**42**	**300**

Examining Table 4-8 and Table 4-9 shows an increase in travel times for all regions and an overall increase of travel time of 11 minutes. This has immediate opex implications as staff would have to travel on average an extra 22 minutes for each task (to and from times).

To model the reliability implication Essential Energy added an extra 11 minutes to the historical outages that required staff attendance. A Monte Carlo statistical technique termed 'bootstrapping[63]' was applied to this data set to construct 1000 years of reliability data with a resultant increase in SAIDI in the order of 26 - 27 minutes. The results of this analysis are shown in Table 4-10

Table 4-10 Depot Closure Reliability Modelling[64]

Confidence Interval	SAIDI Current State (no MED's[65])	SAIDI Depot Closure (No MED's)	Minutes Difference
10	208.58	229.91	25.67
50	225.91	251.58	26.54
75	235.86	262.40	26.88
80	238.63	265.51	28.36
90	245.21	273.57	27.19
95	251.24	278.43	28.34
99	261.32	289.66	25.67
Average Minutes			27.16

Essential Energy maintains that the impacts on reliability due to depot closures in order to reduce opex spend are not in the interests of customers. Such a significant change in reliability outcomes (27 minutes SAIDI, which will be a negative 1.13% STPIS outcome) has correspondingly large impacts on the economic interests of businesses and consumers. Furthermore the impacts of depot closures given the nature of the depots that have been modelled will affect regional areas significantly and major centre response times will be markedly increased. For example one

[63] 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.

[64] Bootstrap of outage data from 2004 – 2014, 1000 year simulation, all weather patterns

[65] MED Major Event Day as per IEEE 1366

large coastal depot currently has an average travel time of 18 minutes, however with the modelled closures this depot's average travel time increases to 42 minutes. For one large inland depot average travel times increase from 21 minutes to 74 minutes under the same modelling. Essential Energy has been conservative in the number of modelled depots closed in an effort to contain the impacts of the opex reductions, it is also important to note that this modelling assumes that there is no reduction in human resources required to attend to faults (i.e. all closed depot field staff relocate to the nearest open depot)

4.2.4.1.2 Staff Reductions

Networks NSW engaged Jacobs to model the impacts on reliability as a result of the draft determination for opex and capex.[66] With regard to opex Jacobs modelled the impacts due to staff reductions (resource reductions only) against modelled asset failures with an extended inspection cycle. The report found that for opex reductions based on reduced resources only[67];

- Essential Energy's average annual SAIDI performance can be expected to worsen by 2018/19 to 27.5% over the next 5 years, relative to the base year (2014/15).
- Our high level analysis of the impacts of the proposed reductions in opex demonstrates that expenditure decisions cannot be made in isolation without consideration of the possible network performance consequences and provides an indication of the type of impacts that might be expected.

Jacobs, in their report, make a number of comments around the conservative nature of this estimation.

Essential Energy holds grave concerns that the outcomes of resource reductions based on modelled reliability outcomes will have a direct and immediate impact on customers and NSW productivity. Such an outcome also has an implicit public safety implication as Essential Energy will not be able to attend to faults in a timely manner in order to make safe. Further it is Essential Energy's contention that such an outcome would result in regulatory body intervention and a corresponding step change in investment in order to recover, which would be inefficient and highly expensive, and would ultimately lead to higher customer prices.

The resulting increases in system SAIDI as modelled for resource reductions and modelled depot closures has a commensurate impact on the number of poor performing feeders. Based on the SAIDI system modelling Essential Energy can expect to see a marked increase in the number of poor performing feeders. As Essential Energy is obliged to address poor performing feeders in order to meet Schedule 3 of the NSW licence conditions there will be an increase in poor performing feeder spend. As Essential Energy invests in mitigation strategies for poor performing feeders that returns them to satisfactory performance levels only, it is reasonable to expect that prior poor performing feeders will resurface. One of the aspects of reliability expenditure is that it has diminishing returns on rural feeders. In other words expenditure in one period to rectify performance will not achieve the same performance outcome if spent again in another period. It is thus reasonable to conclude that the current average spend profile for poor performing feeders will increase as a larger investment will be required to restore performance for individual feeders.

4.2.4.2 Climatic conditions

Essential Energy, due to its vast network area, has a wide range of environmental factors that vary in intensity compared to its peers in Victoria and South Australia. This includes temperature, humidity and lightning strikes. The temperature and humidity on the Essential Energy network causes increased decay compared to Victoria and South Australia. Essential Energy's network also experiences higher numbers of thunder days and lightning strikes, resulting in increased number of fault and emergency repairs compared to its peers in Victoria and South Australia.

[66] Regulatory Revenue Decision Reliability Impact Assessment, Jacobs, Dec 2014

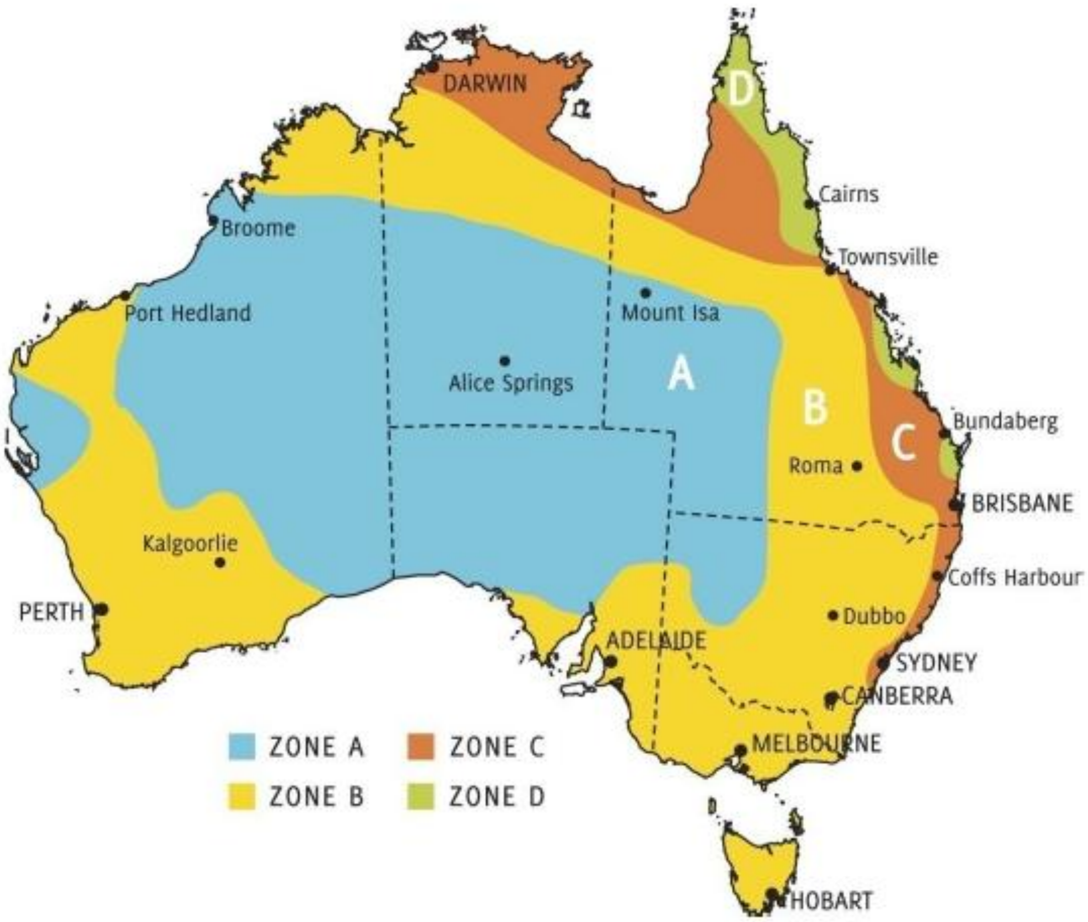
[67] Jacobs (Dec 2014), *Regulatory Revenue Decision Reliability Impact Assessment*, pg 5

Temperature and Humidity

The temperature and humidity on the Essential Energy network causes increased decay compared to Victoria and South Australia.

Across NSW, there are varying hazard rates for in-ground timber fungal decay as shown in Figure 4-12. The area along the coastline, starting from Sydney and heading north past the NSW/QLD border, has been classified as Zone C by the CSIRO, which implies a decay factor of 2.5[68]. Comparing this with the decay factor of 1.5 for Zone B (which covers all of Victoria) shows Essential Energy's 260,000 timber poles on the North Coast (equivalent to 50% of Ausnet & Powercor's combined timber pole population) is subject to approximately 66% greater decay hazard than that of Victoria.

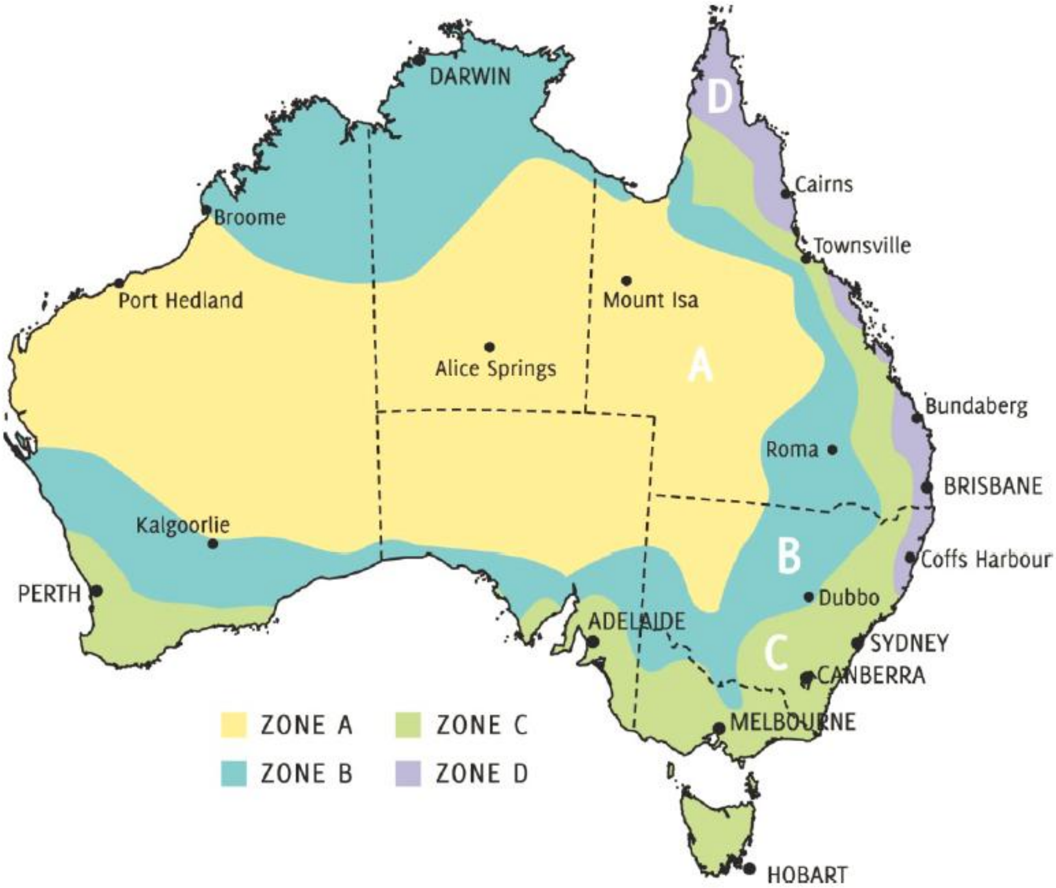
Figure 4-12: Hazard map for timber in-ground under attack of decay fungi (Zone D is the most hazardous)[68]



[68] Forest & Wood Products Australia (CSIRO) 2007, *Manual 3 – Decay in ground contact*, p13, http://www.fwpa.com.au/images/marketaccess/ManualNo3-IG%20Decay.pdf, accessed 15/12/14

Similar to in-ground decay, above-ground decay (as shown in Figure 4-13) is also a significant problem, particularly on the North Coast of NSW. Essential Energy has approximately 60% of its timber pole population located in Zone C with a further approximately 20% located in Zone D (most hazardous). This represents a 15% greater decay risk for Essential Energy's poles within this region (approximately 200,000) compared to Victoria. The difference in decay risk would be even greater if compared against South Australia, but due to the network configuration (Stobie poles) timber decay is not an issue in South Australia.

Figure 4-13: Hazard map for timber above-ground under attack of decay fungi[69]



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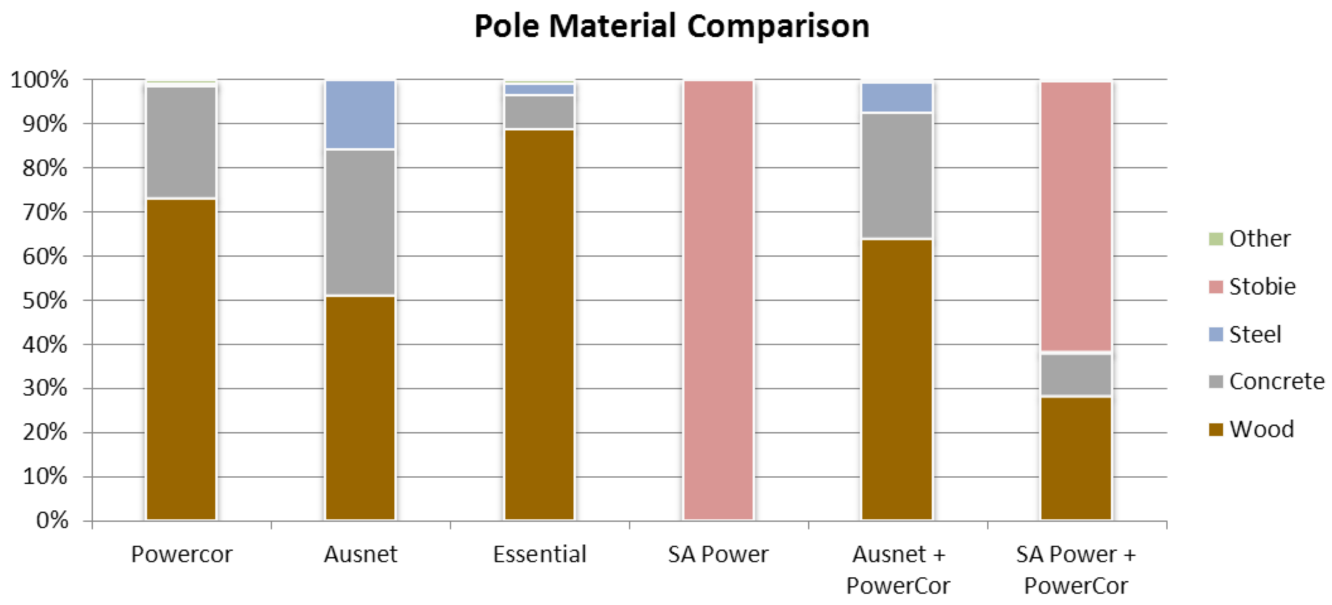
[69] Forest & Wood Products Australia (CSIRO) 2007, *Manual 4 – Decay above ground*, p15, http://www.fwpa.com.au/images/marketaccess/ManualNo4-AG%20decay.pdf, accessed 15/12/14

In addition, Essential Energy has a much higher percentage of timber poles than AusNet, Powercor or SA Power Networks as shown in Figure 4-14. This means that not only does Essential Energy have a higher timber decay hazard but Essential Energy also has a greater exposure to timber decay than AusNet, Powercor or SA Power Networks.

Figure 4-14: Pole Material Comparison[70]



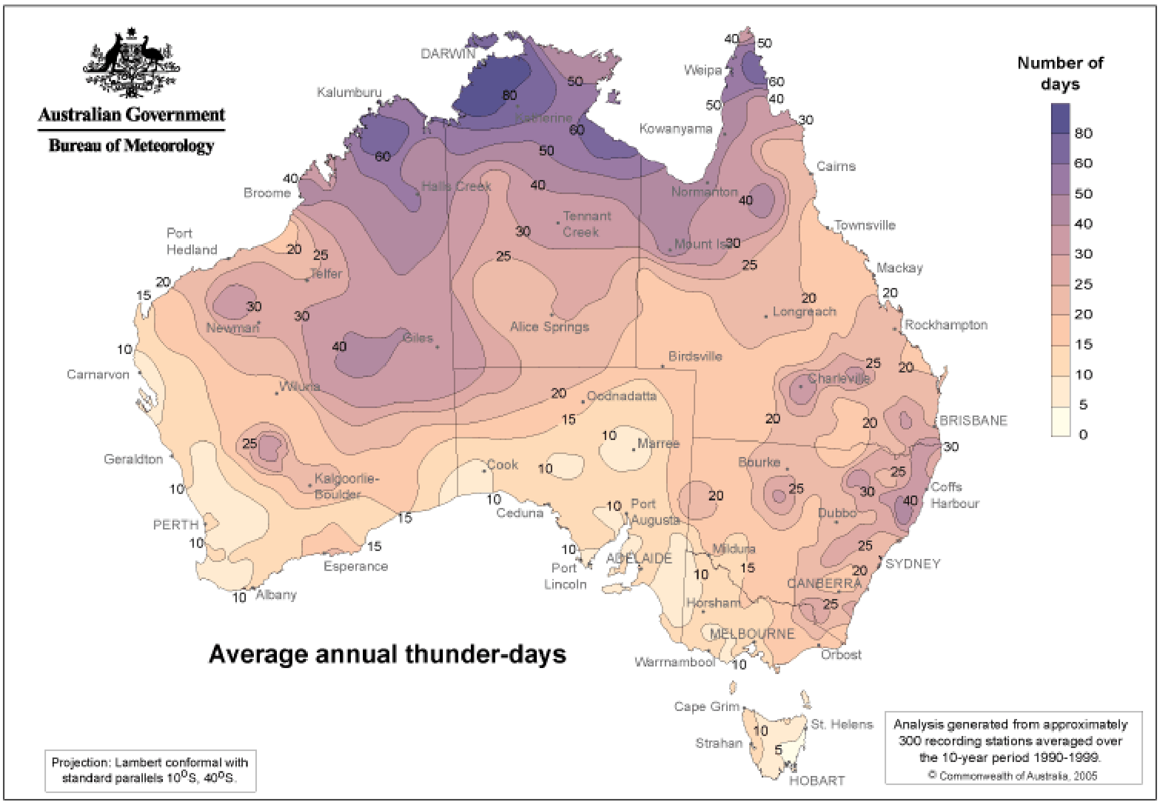
70 Data based on publicly available Category Analysis RIN data (Table 5.2) for each company,

Lightning and Thunder

The Essential Energy network experiences a significant number of thunder days per year and number of lightning strikes. This causes increased fault and emergency expenditure through increased wind loading, debris and operation of protection systems to isolate network faults.

The Essential Energy network experiences a higher number of thunder days per year than Victoria and South Australia, as seen in Figure 4-15.

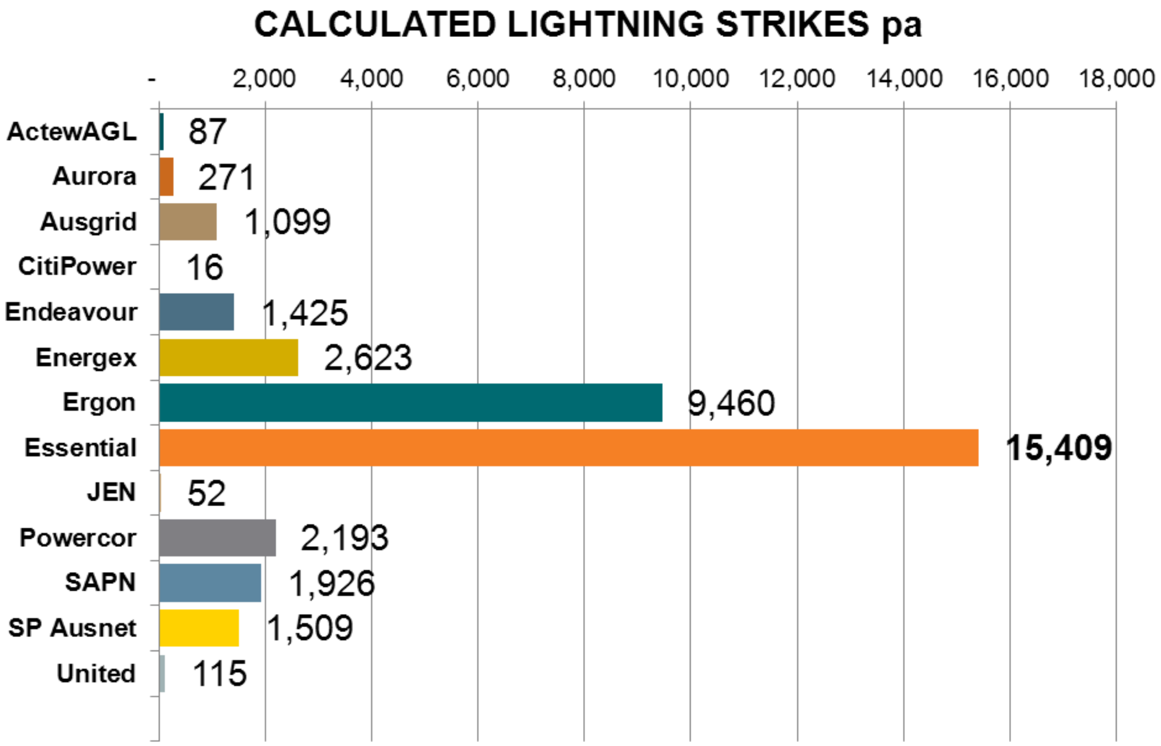
Figure 4-15: BoM Average Annual Thunder Days[71]



[71] BoM, http://www.bom.gov.au/jsp/ncc/climate_averages/thunder-lightning/index.jsp, accessed 11/12/14

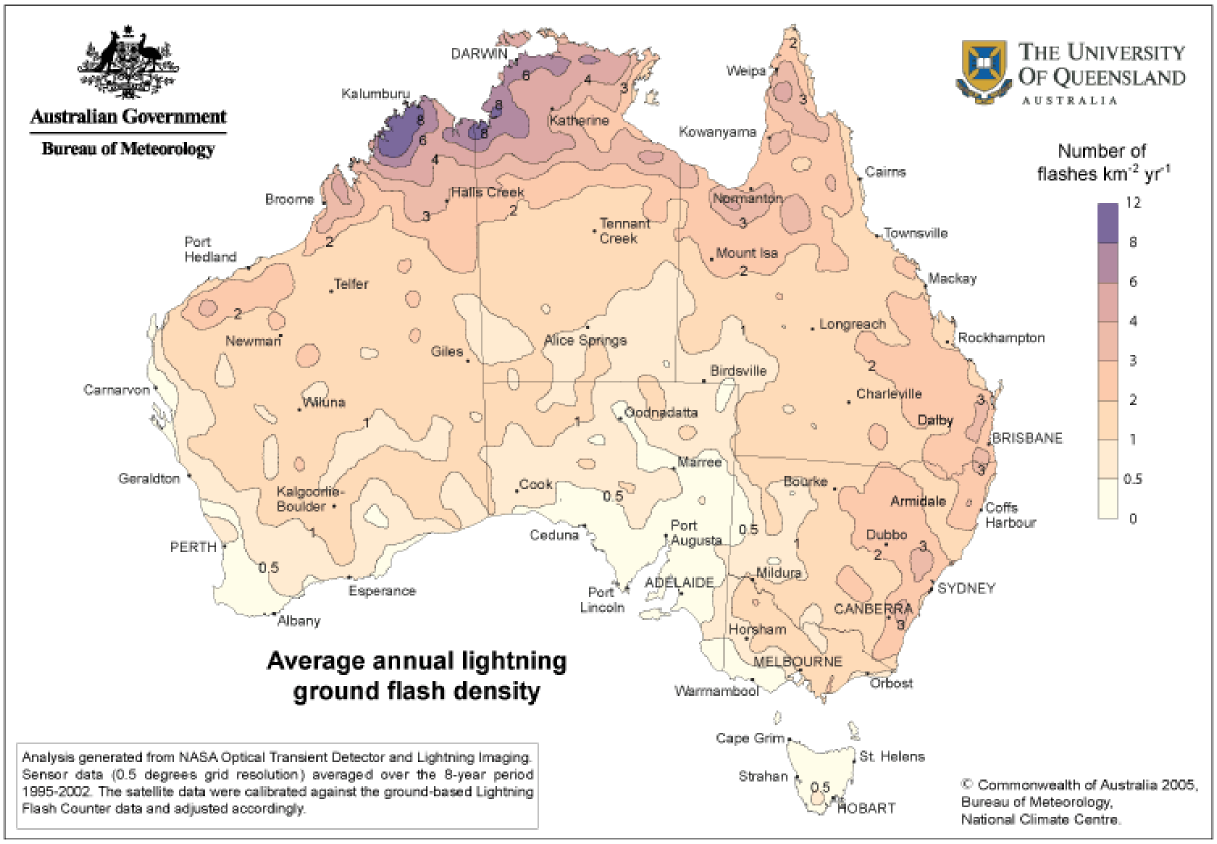
Essential Energy's estimated direct network lighting strikes per year is substantially higher than its comparable peers, as seen in Figure 4-16[72]. This estimate is based on an empirical calculation using a susceptibility radius of 45m, and conservative estimates for average thunder days. Figure 4-17 validates the conservative values selected, showing much of NSW with an average annual ground flash density per sq km of >2 (using an average thunder days value of 20 for Essential provides an average annual ground flash density of 1.09). This highlights the significant exposure of the Essential Energy network compared to its peers.

Figure 4-16: Calculated Average Annual Network Lightning Strikes



[72] *Essential Energy Lightning Analysis*, January 2015

Figure 4-17: BoM Average Annual Lightning Flash Density[73]



4.2.5 AER proposed NSW allowance

Based on the AER's own assumptions regarding higher sub-transmission intensiveness and more onerous health and safety regulations within NSW the AER have allowed a 10% allowance in the modelled efficiency. This allowance has been clearly provided for in the AER determination where they have stated;

> *Following detailed examination of the quantitative and qualitative evidence, we consider it is appropriate to adjust Essential Energy's base year opex.*[74]

And further;

> *We have provided a further 10 percent allowance for those operating environment differences not completely captured by our preferred benchmarking model.*[75]

Although Essential Energy agrees with the AER regarding the various factors they have cited, the AER have not elaborated on what other factors may be included within this allowance. As this allowance has been applied to all NSW distributors Essential Energy does not believe it takes into account any of the large rural network characteristics that are discussed within this response. For this reason Essential Energy has based all of their comparative modelling without the proposed 10% AER allowance.

[73] BoM, http://www.bom.gov.au/jsp/ncc/climate_averages/thunder-lightning/index.jsp?maptype=otdg accessed 11/12/14

[74] AER (Nov 2014), *Draft Decision Essential Energy distribution determination 2015-16 to 2018-19 Attachment 7: Operating expenditure*, section 7.4, p.19

[75] AER (Nov 2014), *Draft Decision Essential Energy distribution determination 2015-16 to 2018-19 Attachment 7: Operating expenditure*, section 7.4, p.19

4.2.6 External resource weighting

The AER raised concerns with the level of Essential Energy's overheads and low levels of outsourcing. The overhead rate appears higher than industry peers because of the specific cost components included in the overheads, in accordance with the CAM, refer to

- Attachment 6.4 Corporate and Divisional Overheads
- Attachment 7.5 NSW DNSP Labour analysis
- Attachment 7.6 Productivity

There are limitations to comparing direct expenditure without fully understanding the individual approaches used by various distributors when assigning field based support costs. Where a greater proportion of contractors and their supporting structures and management are employed by companies this will often involve a greater allocation of these overheads onto their direct costs.

Essential Energy's support costs have been reviewed and those field support costs that could be included in direct cost comparisons by a more holistic approach to contracted maintenance services have been reallocated. This allowance has been estimated to enable a more realistic comparison of Essential Energy's performance with those that are reported from the more externally resourced benchmark companies in Victoria and South Australia.

When analysing total operating expenditure this adjustment is not required as all overheads are included.

Individual analysis of all direct cost expenditure categories has been undertaken with and without an increase of 16% to inflate Essential Energy's direct cost unit rates to the heavily outsourced scenario. The adjustment factor of 16% is fully explained within Attachment 6.4 Corporate and Divisional Overheads. Individual company accounting policies, labour practices and operational structure have not been analysed in determining this factor. Hence, it must only be considered a simple illustration of one possible scenario. With this in mind, all instances within this attachment that use the 16% adjustment factor are also modelled without this factor.

4.3 Efficiency of the base year opex

The opex proposed in the Draft Determination is inadequate for the Essential Energy network given its scale, operating environment and diversity of assets.

The Draft Determination has made adjustments to the opex based on benchmarking by customer numbers and Peak Demand using a number of benchmarking models including Multilateral Total Factor Productivity (MTFP), Multilateral Partial Factor Productivity (MPFP) and several opex cost function models.

Benchmarking normalised by assets and compared to peers shows:

- Essential Energy's total opex benchmarks favourably when normalised by line length, number of poles and total assets.
- Essential Energy's opex on routine inspection programs, non-routine planned maintenance, emergency response is efficient, and benchmarks favourably when normalised by line length, pole and total asset

4.3.1 Comparable networks

Essential Energy's network has a higher proportion of overhead assets (96%) than both Ausnet (90%) and Powercor (89%). This overhead network is exposed to greater environmental conditions and with a relatively high average number of lightning days (30 per annum); the impact of lightning and wind from storms on the network assets is significant.

Over 95% of the distribution substation population are pole-mounted due to the predominantly rural nature of the supply area, and the economics of predominantly rural networks. However, this type of distribution substation is inherently more susceptible to failure than ground mounted distribution substations.

The network topology of Essential Energy is also significantly different to Ausnet and Powercor. The Victorian utilities operate in the main a 66kV to 22kV network with legacy constructions built by SEC Vic. Essential Energy on the other hand operates a network that has 132kV, 110kV, 66kV, 33kV, 22kV, 19.1kV, 12.7kV, 11kV and 6.6kV with legacy constructions from over 20 separate County Councils. As a result the built network in Essential Energy which is largely non-homogeneous and has regional differences due to prior standards and practices that influence the condition and service life of the assets and their management.

Figure 4-18, Figure 4-19, and Figure 4-20 demonstrate the obvious quantum differences between Essential Energy and the AER suggested benchmarking peers with regard to overall assets.

Figure 4-18: Comparison of Total Line Length

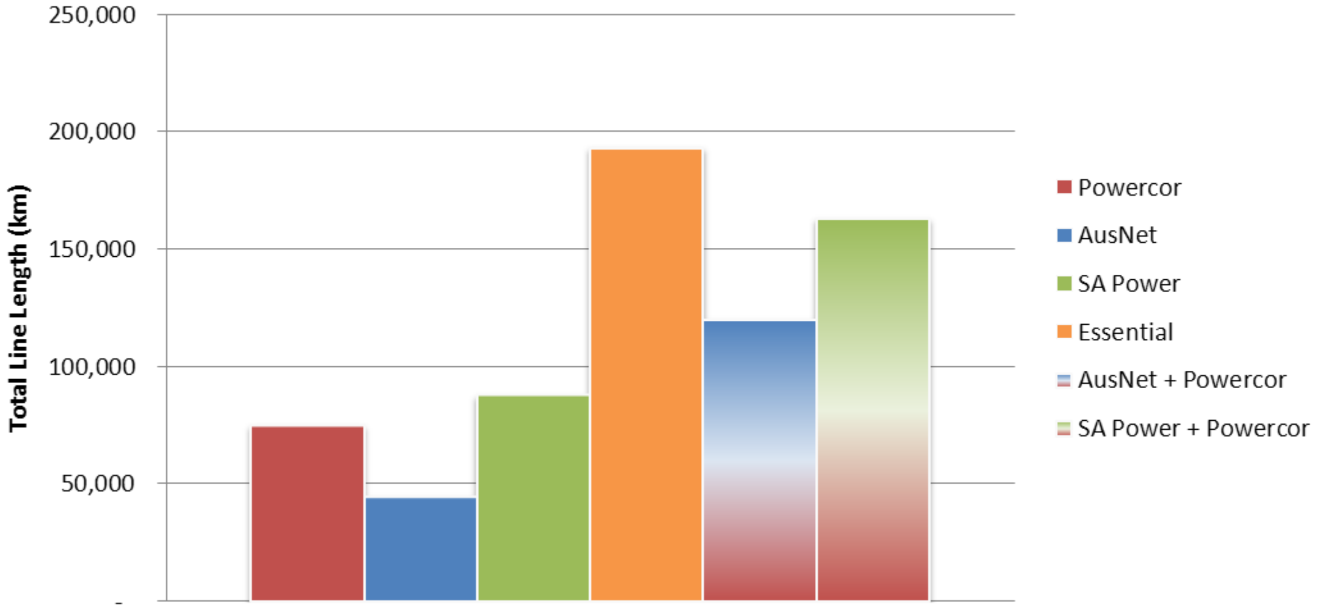


Figure 4-19: Comparison of Total Poles

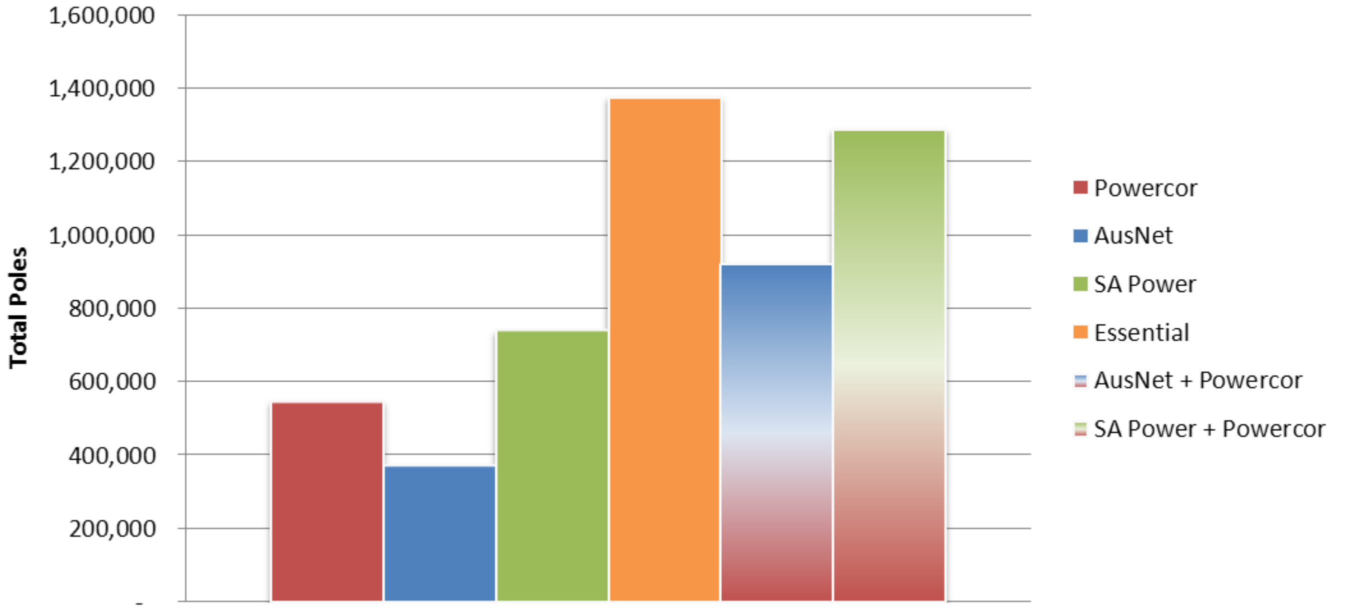
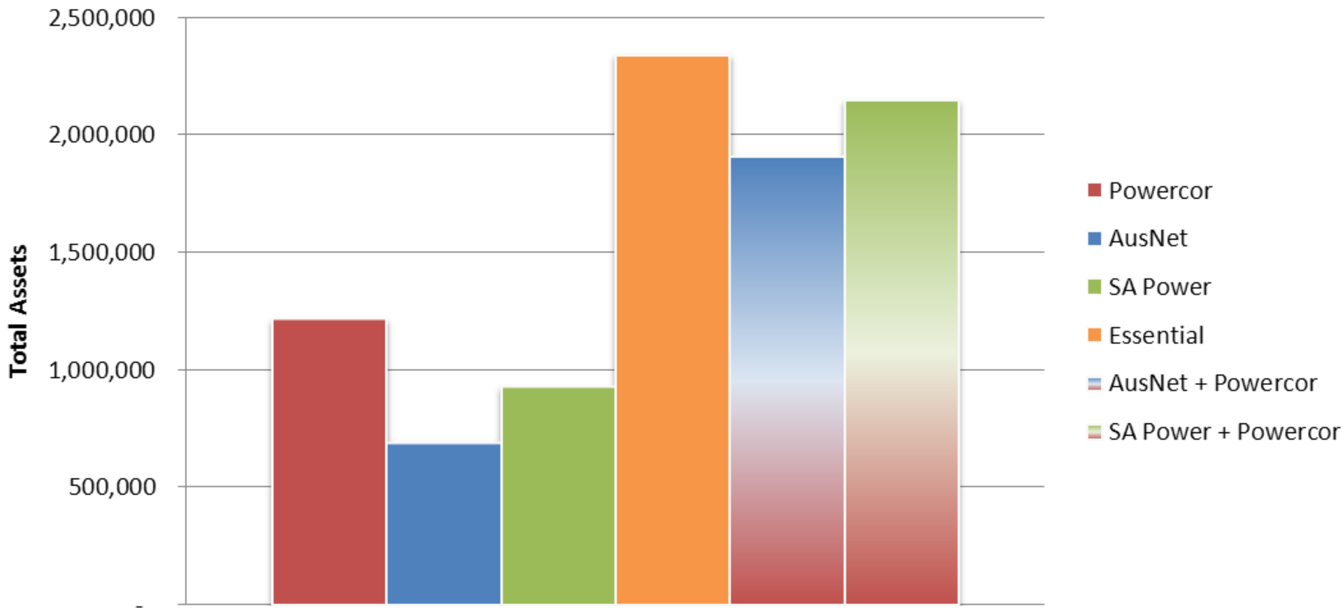
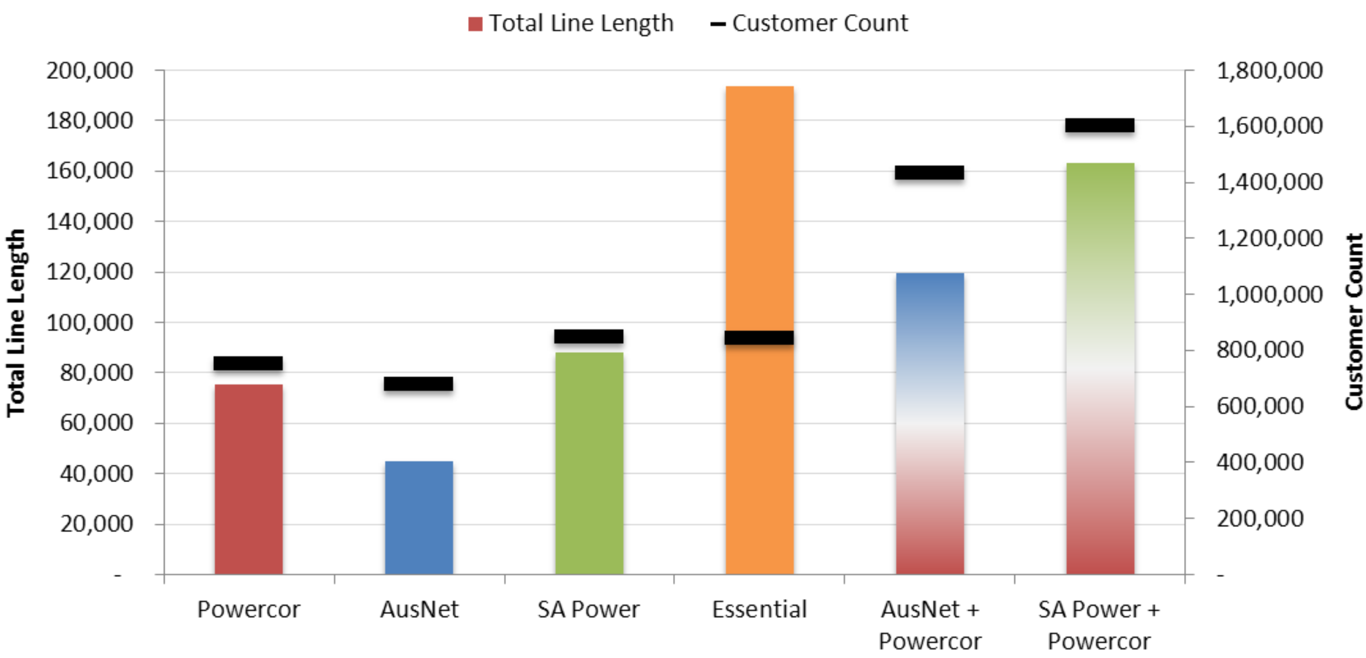


Figure 4-20: Comparison of Total Assets



In comparing the line length and customer numbers, Essential Energy services a similar number of customers as its comparable peers but over a substantially longer network, as seen in Figure 3.17. Direct maintenance work effort is completed on individual assets. Assets drive opex, not customers. Essential Energy has used this common sense fact to demonstrate the efficiency of its opex through the remainder of this attachment by normalising opex by line length.

Figure 4-21: Asset Comparison - Total Line Length vs Customers

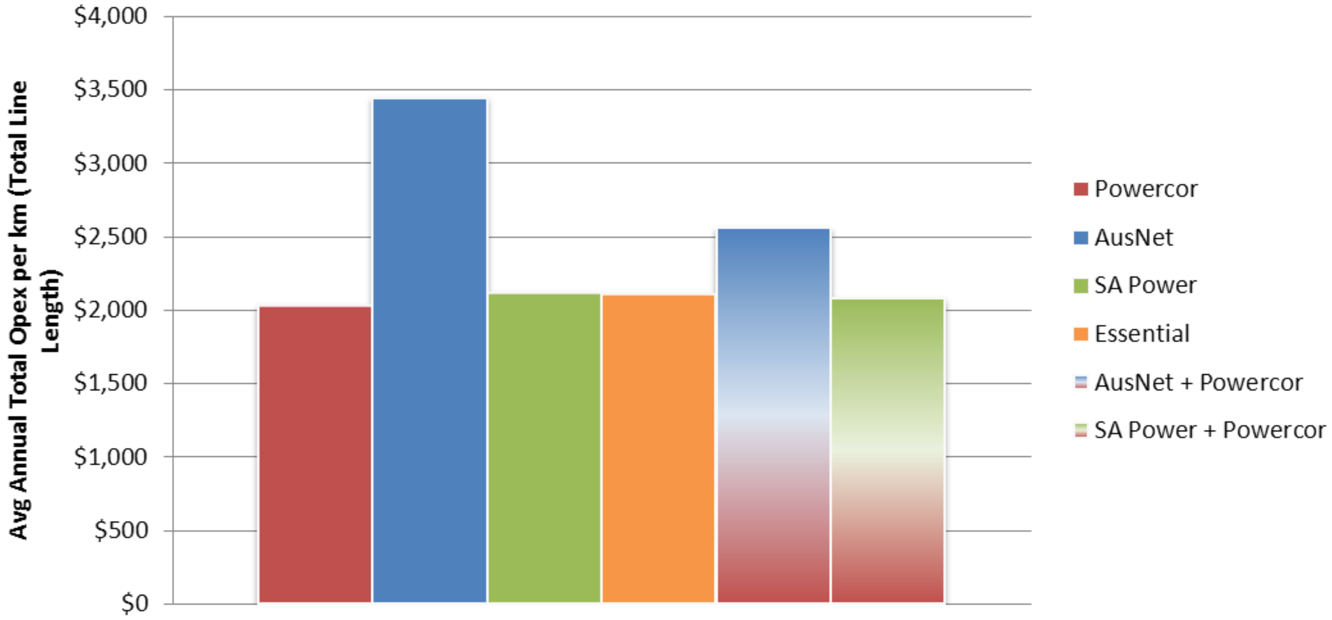


4.3.2 Total historical opex comparisons

The data in the following sections has been sourced from Category Analysis RIN data, with average annual opex expenditure by category over the period from 2008/09 to 2012/13. Essential Energy's total opex is efficient, and benchmarks favourably when normalised by line length, number of poles and total assets.

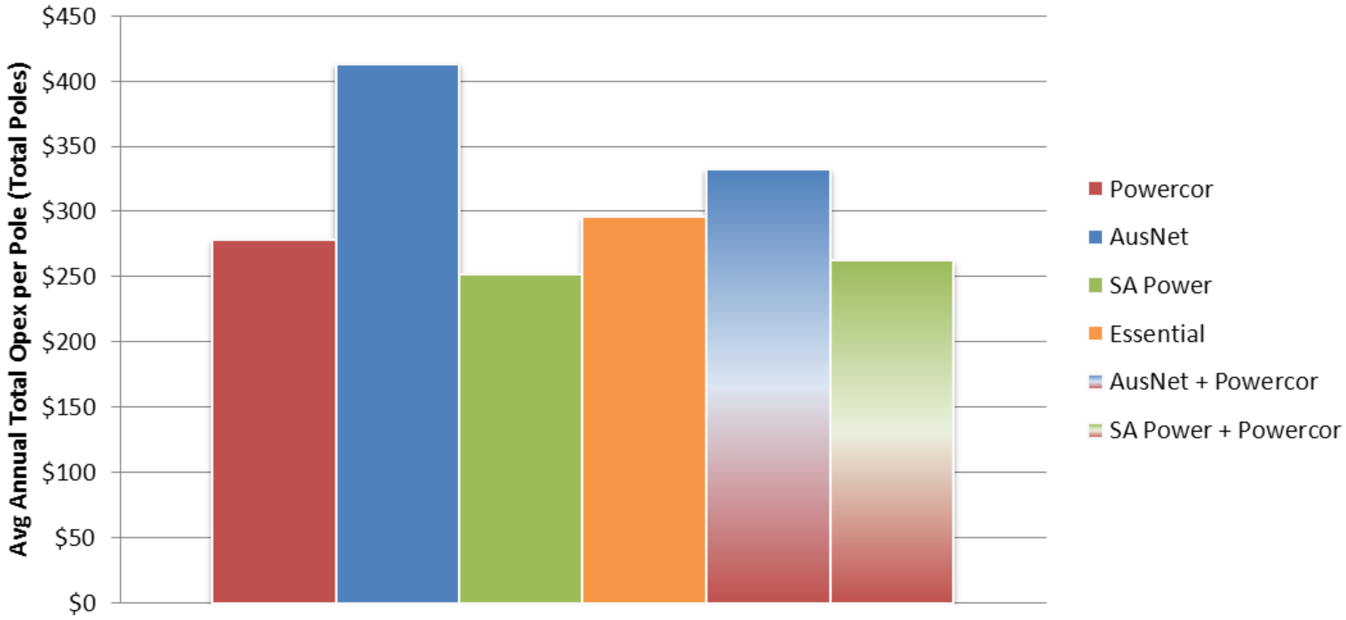
Essential Energy has an equivalent or lower average annual total opex normalised by total line length than its comparable peers, as shown in Figure 4-22. Essential Energy's average annual total opex normalised by total line length is substantially lower than Ausnet and similar to Powercor, which the AER considers representative of the 'efficient frontier'.

Figure 4-22: Average Annual Total Opex per km (2008/09 – 2012/13 Nominal)



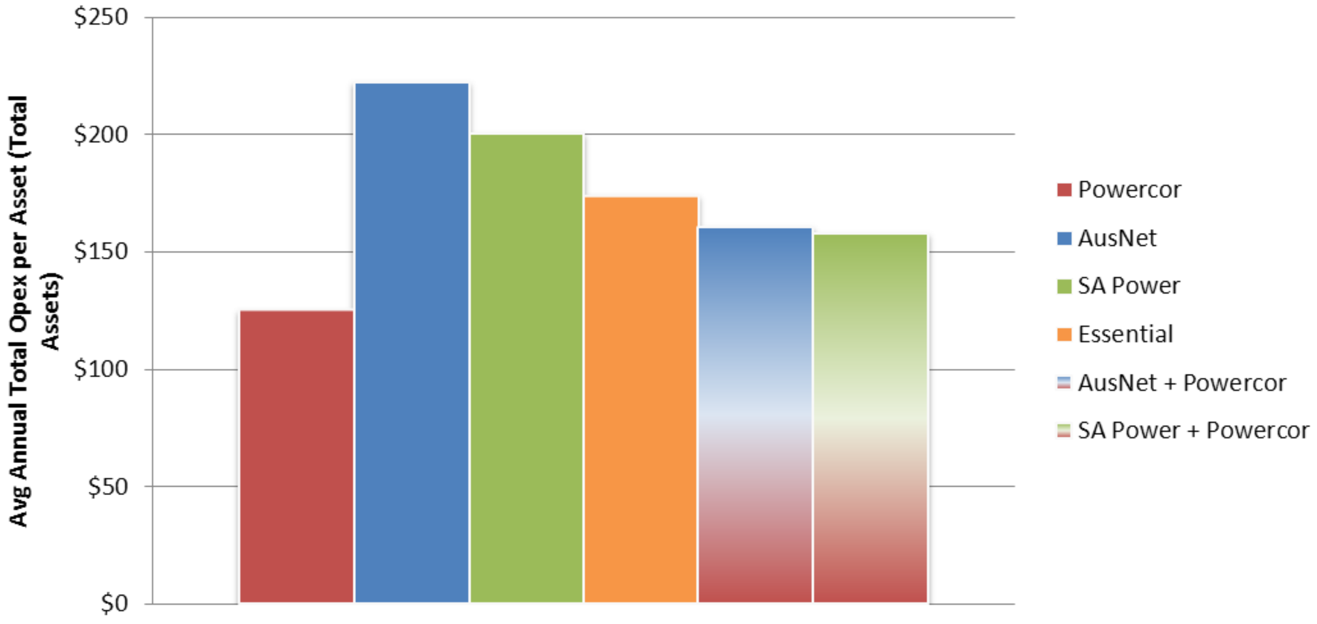
Essential Energy's average annual total opex normalised by total number of poles is lower than Ausnet, which the AER considers close to the 'efficient frontier', as shown in Figure 4-23. Essential Energy's average annual total opex normalised by total number of poles is similar to its other comparable peers.

Figure 4-23: Average Annual Total Opex per Pole (2008/09 – 2012/13 Nominal)



Essential Energy has a lower average annual total opex normalised by total number of assets than AusNet and SA Power, both are considered by the AER to be close to the 'efficient frontier', as shown in Figure 4-24.

Figure 4-24: Average Annual Total Opex per Asset (2008/09 – 2012/13 Nominal)



4.3.3 Individual direct opex category comparisons

Analysis of Essential Energy's historical opex by individual direct opex categories reinforces the favourable benchmarking when normalised by the true cost drivers of line length, number of poles and total assets. The following sections provide a detailed breakdown of the main direct cost maintenance activity categories and explain the 16% direct cost loading that has been used to ensure equity with all distributors.

Essential Energy has described and charted both the raw expenditure for each category, and also provided analysis charting if 16% direct cost loading was applied to each category of Essential Energy's historical expenditure. This loading has been applied to allow for more realistic comparison with DNSP's that contract out maintenance, and hence have most labour related overheads incorporated in the direct cost[76]. The data in the following section has been sourced from Category Analysis RIN data, with average annual opex expenditure by category over the period from 2008/09 to 2012/13. Reviewing this data illustrates that;

- Essential Energy average annual opex for routine maintenance is efficient, and benchmarks favourably when normalised by the total average line length
- Essential Energy's average annual non-routine maintenance is efficient, and benchmarks favourably when normalised by total line length.
- Essential Energy's vegetation management is efficient and compares favourably when benchmarked by total route length.
- Essential Energy's average annual emergency response opex is efficient, and benchmarks favourably when normalised by supply interruption and line length

4.3.3.1 16% direct cost increase for overhead adjustment

Essential Energy understands that there are a broad range of approaches used across the DNSPs in categorising costs. While the AER has cited the use of all expensed and capitalised overheads *"because opex overheads are*

[76] Refer to Attachment 7.3 Corporate and Divisional Overheads

affected by a service providers' capitalisation policies[77] this issue does not mitigate the impact of variable classification of costs between overheads and direct operating expenditure.

Essential Energy through its cost allocation methodology tends to treat a greater portion of its costs as overheads when compared to many other DNSPs. This difference in treatment of costs means that equivalent costs are treated as direct costs and therefore form part of unit rates. These variations are more apparent in the case of businesses where a greater proportion of work is performed by contracted parties.

Heugin notes *"Many of the overhead costs reported by the NSW and ACT businesses are absorbed into the contract costs for direct maintenance activities for the frontier businesses, as the frontier businesses generally outsource more work"*[78]

The decision to outsource work does not of itself imply an increased level of efficiency, however to consider overhead costs without accounting for these issues can be problematic. The inconsistency in cost classification affects the ability to conduct meaningful comparisons between DNSPs.

Essential Energy has modelled a scenario to illustrate the impact of different blended service delivery models on overhead rates (refer Figure 4-25). The scenario assumes a business model that mainly outsources its Network operations. The rationale being that if outsourced, Essential Energy would not incur the level of overhead it currently recognises through its current cost allocation methodology (CAM). The outsourced functions would be invoiced to Essential Energy by the contractor and the invoice amount would be loaded with both an element of the contractors corporate and network overhead. This split would not be visible on the invoice and the whole invoice would be processed as a direct cost.

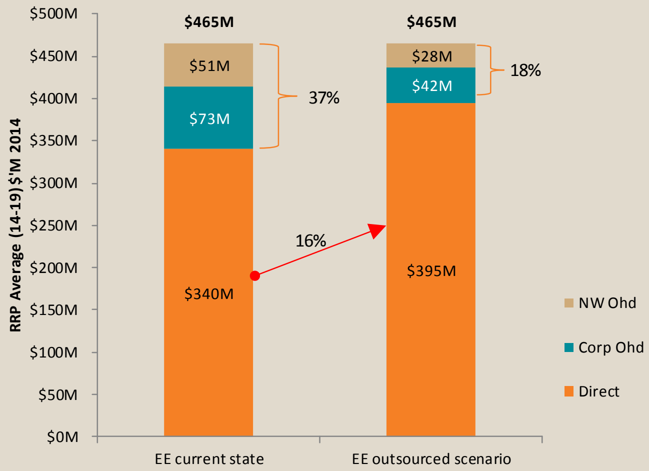
This transfer of overhead to an effective direct cost increases the direct cost pool whilst reducing the overhead pool and thus has a compounding effect on the overhead rate as the direct costs in the denominator increase and the overhead costs in the numerator decrease and hence the overhead rate reduces.

It should be noted that Essential Energy's overhead rate in the original submission was on average 42%. This has since reduced by 5% to 37% in the revised proposal. This is due to higher than forecast efficiency savings through higher staff attrition rates.

[77] AER (Nov 2014), *Draft Decision Essential Energy distribution determination 2015-16 to 2018-19 Attachment 7: Operating expenditure*, p7-80

[78] Huegin Consulting (Jan 2015), *Technical response to the application of benchmarking by the AER*, p43

Figure 4-25: Impact of Outsourcing on Direct and Overhead Cost Categorisation



The outsourced scenarios illustrates:

- **Corporate and network overheads related to field operations are reclassified as direct expenditure**
- **Hence, there is a corresponding dollar decrease in Network and Corporate overheads (net zero overall cost impact)**
- **The overhead rate would reduce from 37% to 18% in the outsourced scenario**

This illustrates that different business models (e.g. Outsourced vs. Insourced) can have very different overhead vs. direct cost splits which inevitably makes comparison across various businesses problematic when comparing overhead rates.

- *The Revised Regulatory Proposal includes a* ***5% average overhead rate reduction*** *from the original submission. This is due to efficiencies identified since the original submission.*

Scenario assumptions for overheads

- *The only network overheads remaining in EE would be those related to Engineering support functions*
- *The overhead costs related to the depots are assumed to be outsourced and hence incurred by the contractor/s.*
- *Corporate overheads are assumed to be normalised for the 35% normalisation factor relating to overheads associated with network size, mainly related to Property, ICT, HR and Safety. These are also assumed to be incurred by the contractor/s.*

Individual company accounting policies, labour practices and operational structure have not been analysed in determining the 16% direct cost increase factor. Hence, it must only be considered a simple illustration of one possible scenario. With this in mind, all instances within this attachment that use the 16% adjustment factor are also modelled without this factor.

4.3.3.2 Routine inspection direct opex

The approach and frequency of routine inspections has been determined in accordance with accepted risk management principles, industry guidelines and established industry best practice. These activities have now been reviewed against the activities of the AER's selected efficiency frontier companies to ensure they are consistent and generally seen as industry best practice. Essential Energy has utilised Failure, Mode, Effects and Criticality Analysis (FMECA) into their maintenance strategy to ensure the activities undertaken are prudent and efficient.

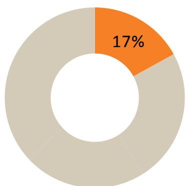
Table 4-11 lists all Essential Energy's material routine inspection programs and highlights where an equivalent activity is also undertaken by its nominated benchmarking peers. If the work programs are considered appropriate then the required operating expense should be dependent on only the efficient unit rate normalised by asset and the total number of assets requiring inspection. If the inspection process is comparable and considered prudent than the required man hours is almost totally dependent on the number of assets to be inspected and the travel distance between them. Essential Energy has provided both these benchmarked measures in order to demonstrate their position on comparable funding.

Table 4-11: Routine inspection programs

Inspection Program	Description	Performed by all Distributors
Ground line Pole Inspection	Routine ground line inspection and treatment of all poles	Yes
Overhead Line Inspection	Routine visual inspection of all overhead assets	Yes
Substation Inspections	Programmed inspection and testing of all substations and transformers	Yes
Switchgear Inspections	Programmed condition monitoring dependant on assessed risk and complexity of each switchgear unit	Yes
Thermo graphic Inspections	Programmed use of thermography cameras on zone substations and high risk high voltage lines	Yes
EWP Sub-trans. Inspection	Programmed detailed pole top inspection carried out on high risk transmission lines	Yes

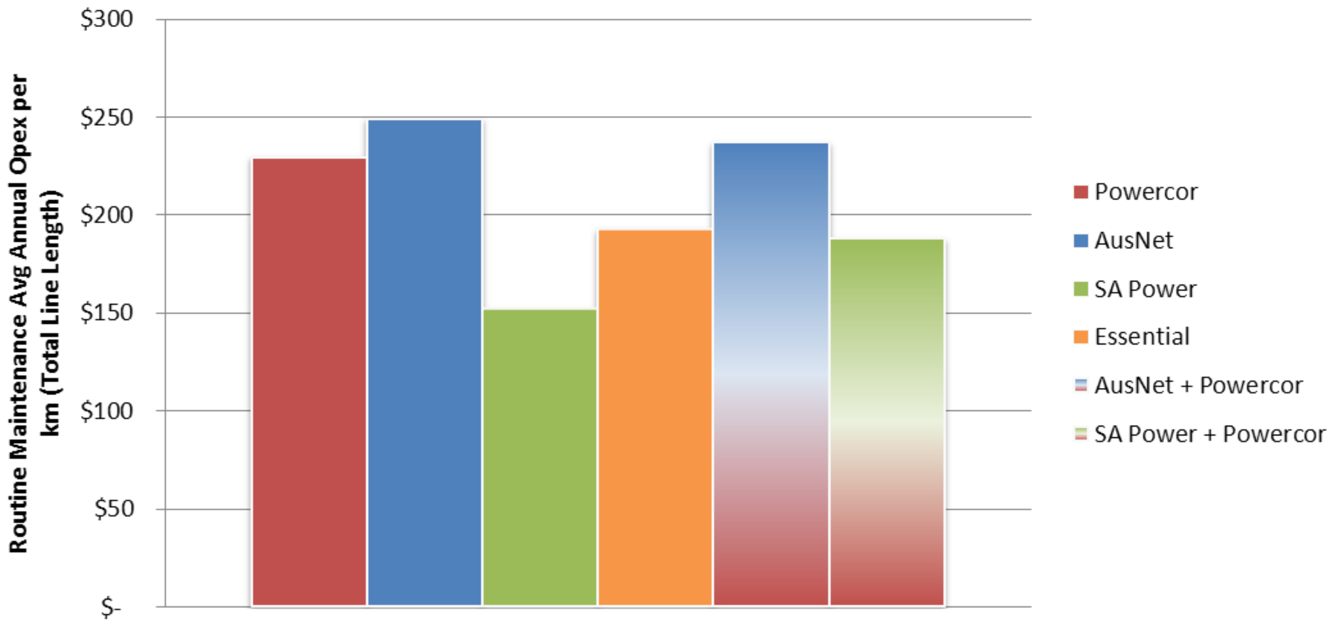
Figure 4-26 presents a summary of the key activities, expenditure and primary drivers for routine inspections. It also shows the key factors driving cost for each activity. What this shows is that line length/total assets is the primary cost driver for routine inspections.

Figure 4-26: Routine Inspection – Primary Cost Drivers

Cost Category	Contribution to Direct Opex	Activities	5 Year RIN Total 2008/09 - 2012/13	Primary Drivers	Scaleability factors (Factors driving quantum of costs)		
					Customers	Line length / Total Assets	Maximum Demand
Routine Inspection		Pole Insp Treat & Audit	$ 69,721,737.15	Number of network assets, asset condition, rate of deteriation, cycle time and associated risk level	None	High	None
		Annual Fire Mit Insp Rural	$ 20,586,187.15		None	High	None
		Reg / Recloser Inspection	$ 2,436,251.80		None	High	None
		Underground Asset Inspections	$ 5,558,955.02		Low	High	Low
		Dist Substation Inspection	$ 3,594,903.25		Moderate	High	Low
		Radial Subtrans LL inspections	$ 2,018,684.81		None	High	None
		Zone Substation Routine Inspection & Testing	$ 59,225,754.94		None	High	Low
		Critical Assets Inspection	$ 9,729,402.37		None	High	moderate

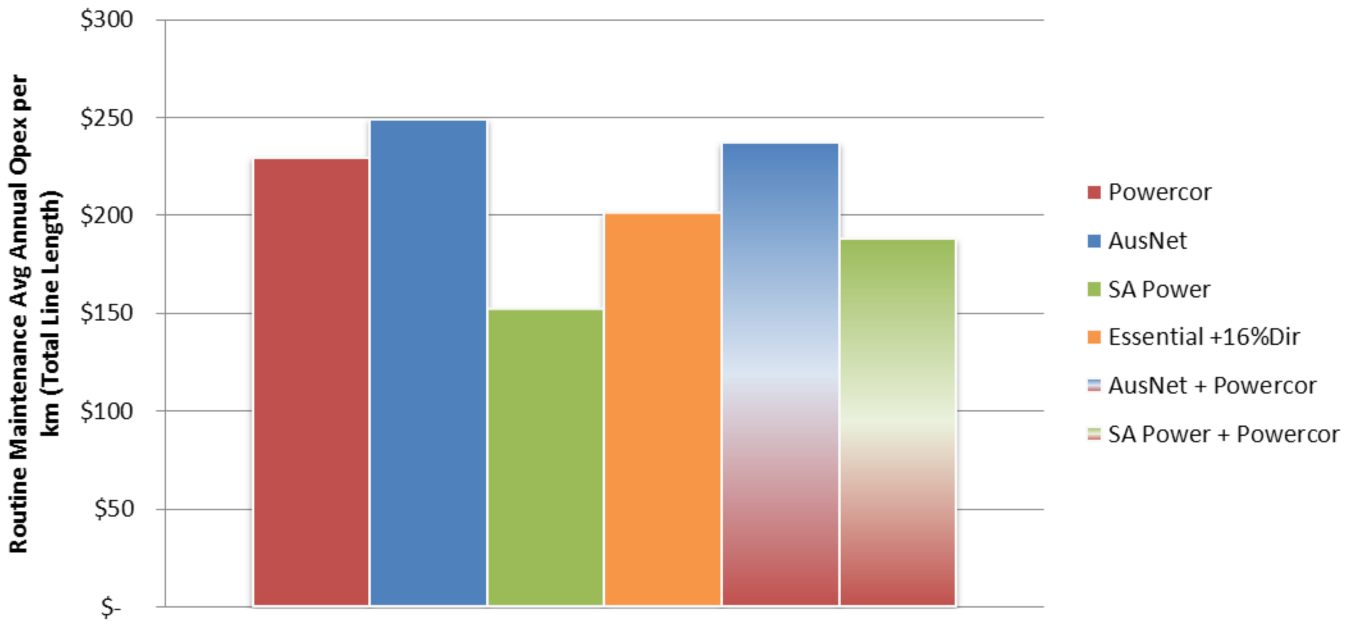
Essential Energy's average annual opex for routine maintenance normalised by total line length is lower than its comparable peers, with the exception of SA Power and SA Power + Powercor, as seen in Figure 4-27. Essential Energy's average annual opex for routine maintenance normalised by total line length is lower than Powercor and Ausnet, both of which the AER consider to be efficient frontiers.

Figure 4-27: Routine Inspection Average Annual Direct Opex per km (2008/09 – 2012/13 Nominal)



Even with the previously described 16% loading (reallocation of overheads), Essential Energy's annual average routine maintenance normalised by line length is still generally lower than its comparable peers. With the exception of SA Power Networks, Essential Energy's annual average routine maintenance plus 16% is lower than both Powercor and AusNet, and only slightly higher than SA Power Networks.

Figure 4-28: Routine Inspection Average Annual Direct Opex per km (Essential +16% Direct, 2008/09 – 2012/13 Nominal)



4.3.3.3 Non routine planned maintenance direct opex

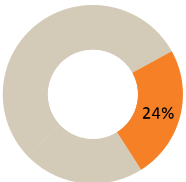
The AER has noted within their Determination;

> *Maintenance expenditure relates to the direct operating costs incurred in maintaining poles, cables, substations, and SCADA, but excludes vegetation management costs and costs incurred in responding to emergencies.*
>
> *We chose maintenance per circuit kilometre because assets are more likely to drive maintenance costs than customer numbers. We used circuit length because it is a more easily understandable and intuitive measure of assets than transformer capacity or circuit capacity.*[79]

Essential Energy agrees with the AER's statement and has reviewed their maintenance expenditure based on this logical metric. The results of the benchmarking has shown the Essential Energy average annual non-routine maintenance to be efficient, and benchmarks favourably against the AER nominated peers when normalised by line length or any other asset based metric.

Figure 4-29 presents a summary of the key activities, expenditure and primary drivers for non-routine maintenance. It also shows the key factors driving cost for each activity. What this shows is that line length/total assets is the primary cost driver for all non-routine maintenance.

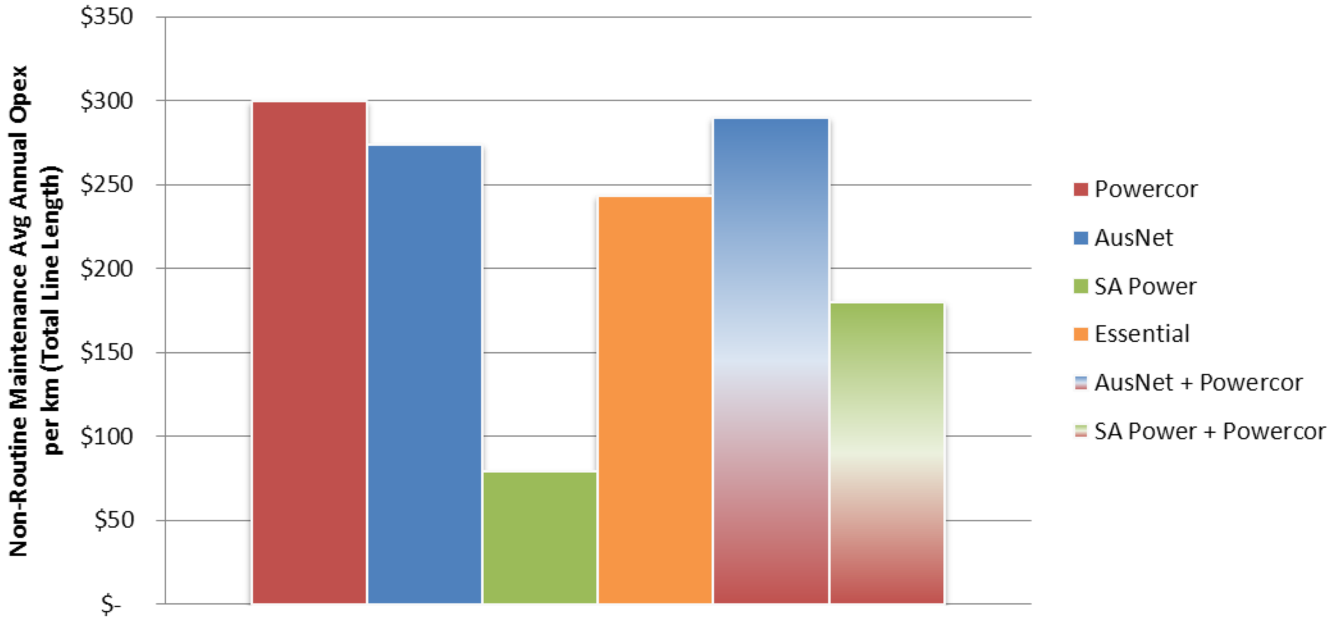
Figure 4-29: Non-Routine Maintenance – Primary Cost Drivers

Cost Category	Contribution to Direct Opex	Activities	5 Year RIN Total 2008/09 - 2012/13	Primary Drivers	Scaleability factors (Factors driving quantum of costs)		
					Customers	Line length / Total Assets	Maximum Demand
Non Routine Maintenance and Repair		Overhead Mains M&R	$ 173,671,002.78	Number of network assets, asset condition, rate of deteriation,MTBF and associated risk level	None	High	None
		Underground Mains M&R	$ 4,526,891.50		None	High	None
		Other Defect rectification	$ 7,736,797.98		None	High	None
		Urgent Risk Defect rectification	$ 42,185,340.82		None	High	Low
		Zone Sub Transformer M&R	$ 7,402,313.69		Low	High	Low
		Zone Substation Defects M&R	$ 10,926,911.67		Low	High	Low

[79] AER (Nov 2014), *Draft Decision Essential Energy distribution determination 2015-16 to 2018-19 Attachment 7: Operating expenditure*, p7-82

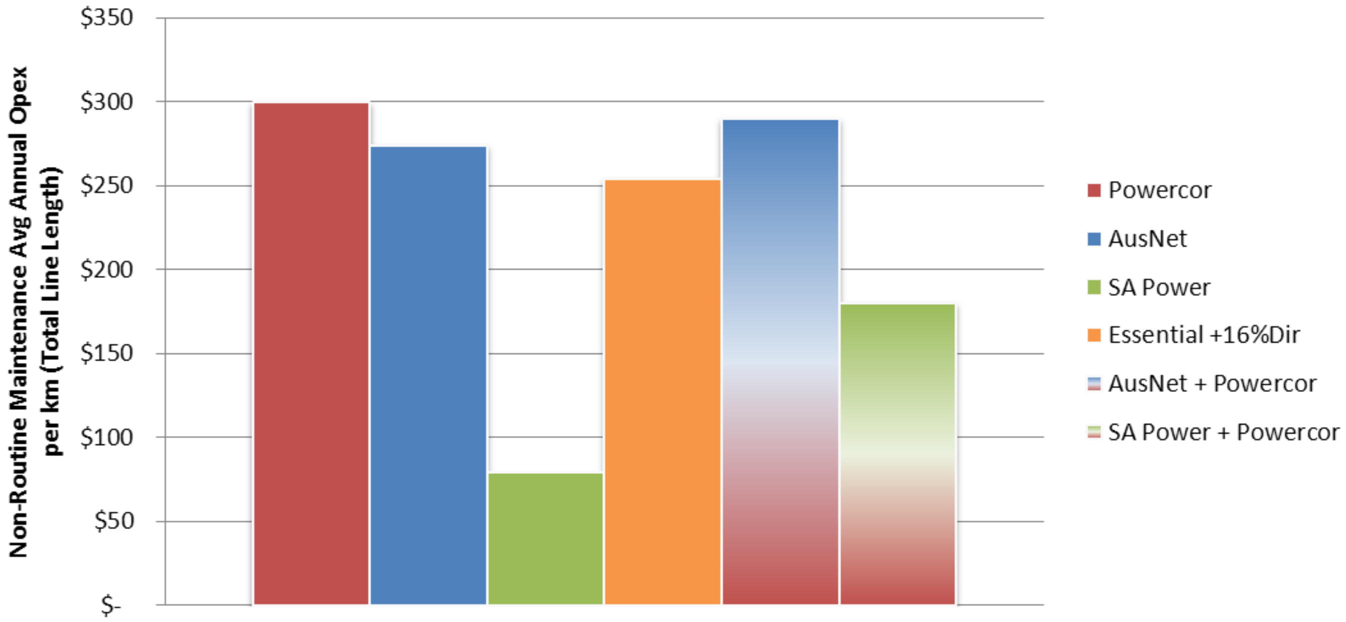
Essential Energy's average annual non-routine maintenance expenditure normalised by total line length is lower than its comparable peers, with the exception of SA Power Networks and SA Power + Powercor, as seen in Figure 4-30. When normalised by total line length Essential Energy is lower than Powercor and AusNet, both of which are considered by the AER to be efficient frontiers. SA Power's non routine expenditure appears abnormally low and cannot be explained.

Figure 4-30: Non Routine Maintenance Average Annual Direct Opex per km (2008/09 – 2012/13 Nominal)



Even with the previously described 16% loading (reallocation of overheads), Essential Energy's annual average non routine maintenance normalised by line length is still generally lower than its comparable peers. With the exception of SA Power, Essential Energy's annual average non routine maintenance plus 16% is lower than both Powercor and AusNet.

Figure 4-31: Non-Routine Maintenance Average Annual Direct Opex per km (Essential +16% Direct, 2008/09 – 2012/13 Nominal)



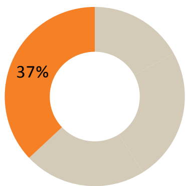
4.3.3.4 Vegetation management direct opex

This work category is mainly carried out by external contractors and is essential in minimising safety hazards and interruptions to supply. Compliance with Essential Energy's own policies and several mandatory codes (ISSC3) and regulations is a critical control measure associated with management of bushfire and community safety risk. Vegetation is a continuous program and must be undertaken in a way that is sensitive to environmental and community issues. For further detail on Essential Energy's comprehensive vegetation management programs refer to Attachment 7.7 Vegetation Management.

Figure 4-32 presents a summary of the key activities, expenditure and primary drivers for vegetation management. It also shows the key factors driving cost for each activity. This demonstrates that line length is the primary cost driver for vegetation management. This conclusion is supported by the AER where they have stated within the draft determination;

> *We chose vegetation management per kilometre of overhead route line length because the length of overhead lines is more likely to drive vegetation management costs than customer numbers.*[80]

Figure 4-32: Vegetation Management - Primary Cost Drivers

Cost Category	Contribution to Direct Opex	Activities	5 Year RIN Total 2008/09 - 2012/13	Primary Drivers	Scaleability factors (Factors driving quantum of costs)		
					Customers	Line length / Total Assets	Maximum Demand
Vegetation Management		Vegetation Mgt & Scoping Urban	$ 110,060,775.57	Number of vegetated network spans, growth rate, voltage, associated risk level	Low	High	None
		Vegetation Control Rural	$ 187,398,393.37		None	High	None
		Veg Control Poor Performers	$ 23,583,661.53		None	High	None
		Veg Control - Non Routine	$ 41,502,927.52		None	High	None
		Aerial Patrol Vege Cutting	$ 21,903,275.70		None	High	None

Although the AER have been critical of the Essential Energy vegetation management expenditure when compared to a new set of benchmarking peers (Ergon Energy and Tas Networks), it is evident in Figure 4-33 that when benchmarked on overhead route length, and based on the AER nominated frontier Distributors the spend is very comparable to Powercor and SA Power Networks and is approximately half of AusNet.

[80] AER (Nov 2014), *Draft Decision Essential Energy distribution determination 2015-16 to 2018-19 Attachment 7: Operating expenditure*, p7-84

Figure 4-33: Vegetation Management Average Annual Direct Opex per Route km (2008/09 – 2012/13 Nominal)

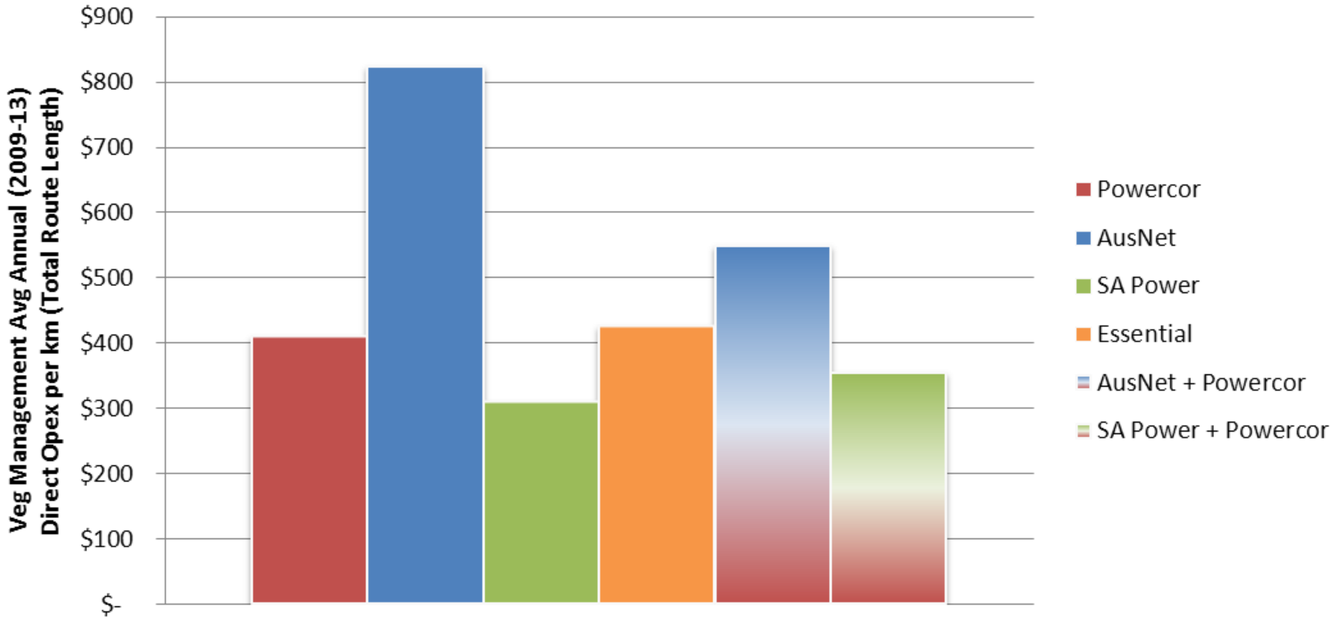
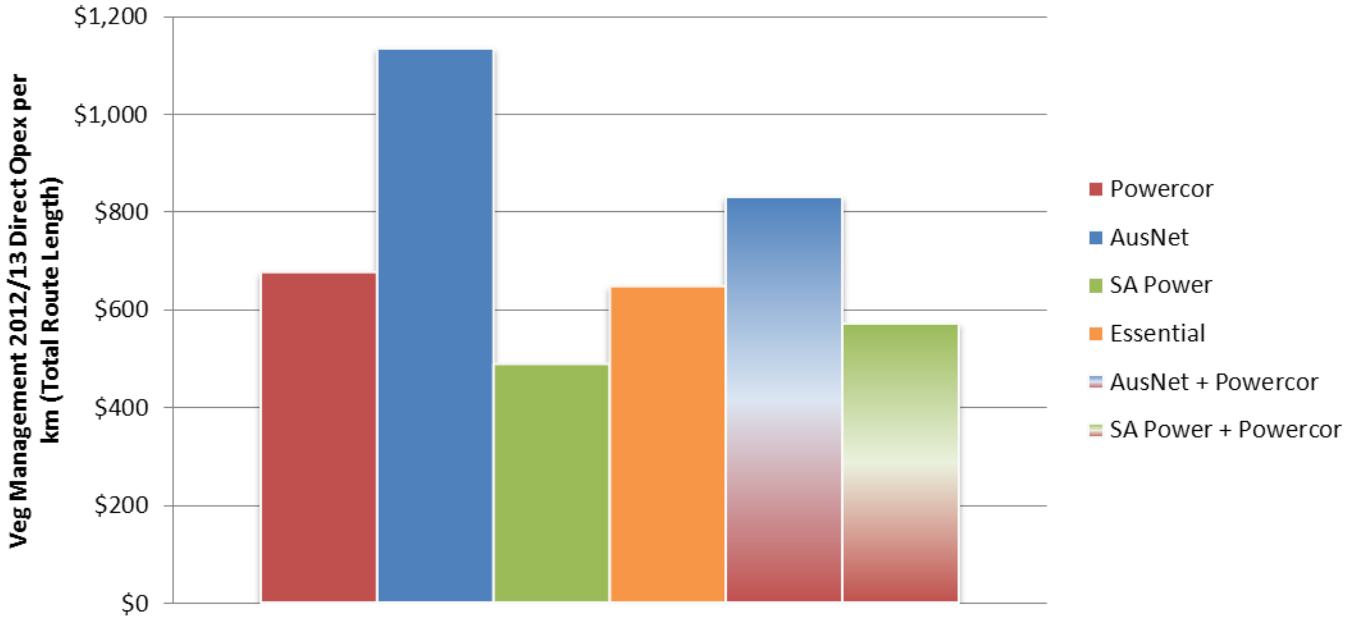


Figure 4-34: Vegetation Management Base Year Direct Opex per Route km (Nominal)



In Figure 4-35 it can be seen that Essential Energy's direct vegetation expenditure in the base year of 2012/13 is consistently placed amongst the nominated peers with regard to the 5 year average modelling. Although there has been an increasing trend over the five year period, it has been respectively mirrored by most of the Australian distributors.

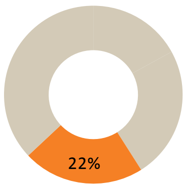
4.3.3.5 Emergency maintenance direct opex

Essential Energy has a responsibility to maintain a safe electricity supply. A key component of this is performing emergency maintenance in response to unplanned outages caused by events such as storms, equipment failures, acts of vandalism, and vehicle collisions.

Figure 4-35 presents a summary of the key activities, expenditure and primary drivers for emergency maintenance. It also shows the key factors driving cost for each activity. What this shows is that exposed line length/total assets and the resultant emergency interruptions are the primary cost drivers for emergency maintenance. Once again the AER appear to have agreed with this conclusion by stating within the draft determination;

> *We chose emergency response per interruption because the number of supply interruptions is more likely to drive emergency response costs than customer numbers.*[81]

Figure 4-35: Emergency Maintenance – Primary Cost Drivers

Cost Category	Contribution to Direct Opex	Activities	5 Year RIN Total 2008/09 - 2012/13	Primary Drivers	Scaleability factors (Factors driving quantum of costs)		
					Customers	Line length / Total Assets	Maximum Demand
Emergency response		Fault and Emergency Rural	$ 159,480,533.70	Number of network assets, asset condition, rate of deteriation, MTBF and associated risk level	Low	High	Low
		Other F&E	$ 1,375,437.92		Moderate	High	None
		Load Control F&E	$ 1,672,163.79		High	Moderate	None
		Fault and Emergency Urban	$ 64,349,921.87		Low	High	Low

Essential Energy has identified logic issues within the Draft Determination which may cause uncertainties in the AER's analysis of Essential Energy's emergency maintenance opex. This includes examining customer interruptions instead of supply interruptions and including costs which should be excluded from the emergency maintenance opex. Essential Energy considers that the duration of an interruption should not be disregarded. Whilst the duration of an outage does not directly cause cost, it is a good indication as to the effort required to access and rectify the outage. Failures within remote parts of the network may only affect small numbers of customers but require long travel times and major rectification works. Additionally, Essential Energy considers its' average annual emergency response opex is efficient, as it benchmarks favourably when normalised by either supply interruptions or total line length.

Essential Energy agrees with the AER's comment[82] that the number of supply interruptions is more likely to drive emergency response costs than customer numbers. On Figure A-17[83] of the Draft Determination, the title states *"Average emergency response expenditure per interruption for 2009 to 2013 against customer density",* however it appears the graph shows the average emergency response expenditure per customer interruption for the 2009 to 2013 period. This is looking at the number of customer interruptions rather than the number of supply interruptions. For example, a single interruption affecting 100 customers would appear as 100 customer interruptions but only 1 actual interruption that requires a response by the company. Considering that Essential Energy has far fewer customers in relation to both line length and interruptions, the figure may reflect higher average emergency response expenditure per interruption for Essential Energy compared to its more customer dense peers.

[81] AER (Nov 2014), *Draft Decision Essential Energy distribution determination 2015-16 to 2018-19 Attachment 7: Operating expenditure*, p.7-83

[82] AER (Nov 2014), *Draft Decision Essential Energy distribution determination 2015-16 to 2018-19 Attachment 7: Operating expenditure*, p.7-83

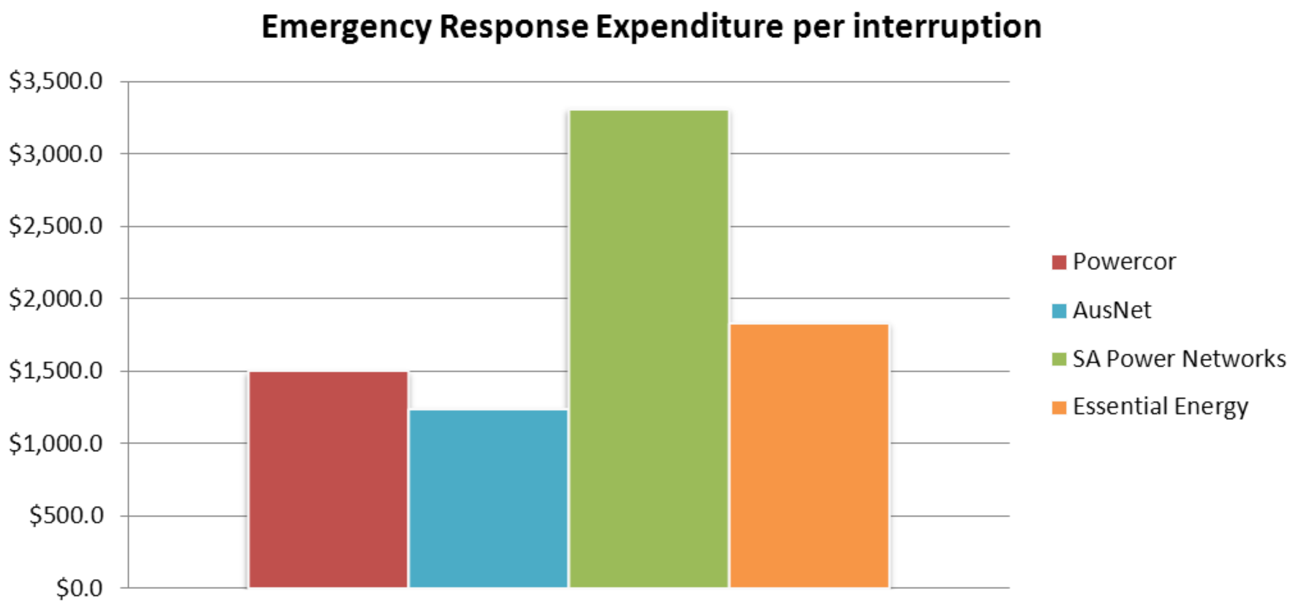
[83] AER (Nov 2014), *Draft Decision Essential Energy distribution determination 2015-16 to 2018-19 Attachment 7: Operating expenditure*, section A.4.2, Figure A-17 Average emergency response expenditure per interruption for 2009 to 2013 against customer density, p.84

Additionally in Figure A-17, the AER appears to have included customers interrupted by transmission interruptions and those occurring on MED's. This contradicts the first statement in this section by the AER that Emergency Response expenditure does not include expenditure incurred on MED's[82].

Figure 4-36: Figure A-17 from the AER's Draft Determination[83]

Essential Energy's emergency response opex per interruption, excluding major event days and allowable exclusions (e.g. transmission outages), is slightly higher on average than its comparable peers, with the exception of SA Power Networks, as shown in Figure 4-37. The figure shows Essential Energy's emergency response opex per interruption is substantially lower than SA Power Networks, which the AER considers to be on the 'efficient frontier'.

Figure 4-37: Emergency Response Direct Opex per Interruption[84]



Essential Energy's cost to respond to unplanned outages is a function of a number of variables including asset quantity/length, distance from the nearest depot to the fault, as well as the quantity of incidents and exposure to adverse environmental conditions. Essential Energy has a much longer network covering a much larger area than both AusNet and Powercor, and more than double that of SA Power Networks.

Compared to peers within the NEM, Essential Energy has:

> a long network length, with much larger areas with lower network density
> a greater exposure to lightning (refer to 4.2.4.2)
> a greater exposure to timber decay (refer to 4.2.4.2)
> a greater ratio of overhead to underground line length

This significantly larger network area and network length results in:

> longer travel times to and from unplanned outages, as well as longer time to locate faults
> increasing plant costs as the distance from the depot to the fault increases
> greater likelihood that the outage will require stand down time for workers attending to the outage
> the need to regularly hire aircraft to locate faults within a reasonable timeframe

Combined, these factors burden Essential Energy with significant expense.

Essential Energy's average annual emergency maintenance opex is efficient, and benchmarks favourably when normalised by line length. Only when the annual emergency maintenance is normalised by customers does Essential Energy appear to be less efficient. This is because emergency response to network faults is driven by failed assets, not customers. For example, if a cross arm fails (and causes an unplanned outage), Essential Energy would respond by performing an emergency replacement of the cross arm to restore supply. This response would require the same level of effort and expense regardless whether one or 100 customers experienced supply disruption.

Essential Energy's average annual emergency response opex normalised by total line length is lower than its comparable peers, as shown in Figure 4-38. This demonstrates Essential Energy spends less per line length than

[84] Based on 2008-/09 – 2012/13 financial years. Data sourced from publicly available Category Analysis RIN data.

its comparable peers (Powercor, AusNet and SA Power Networks) which are considered by the AER as being on the efficient frontier.

Figure 4-38: Emergency Response Average Annual Direct Opex per km (2008/09 – 2012/13 Nominal)

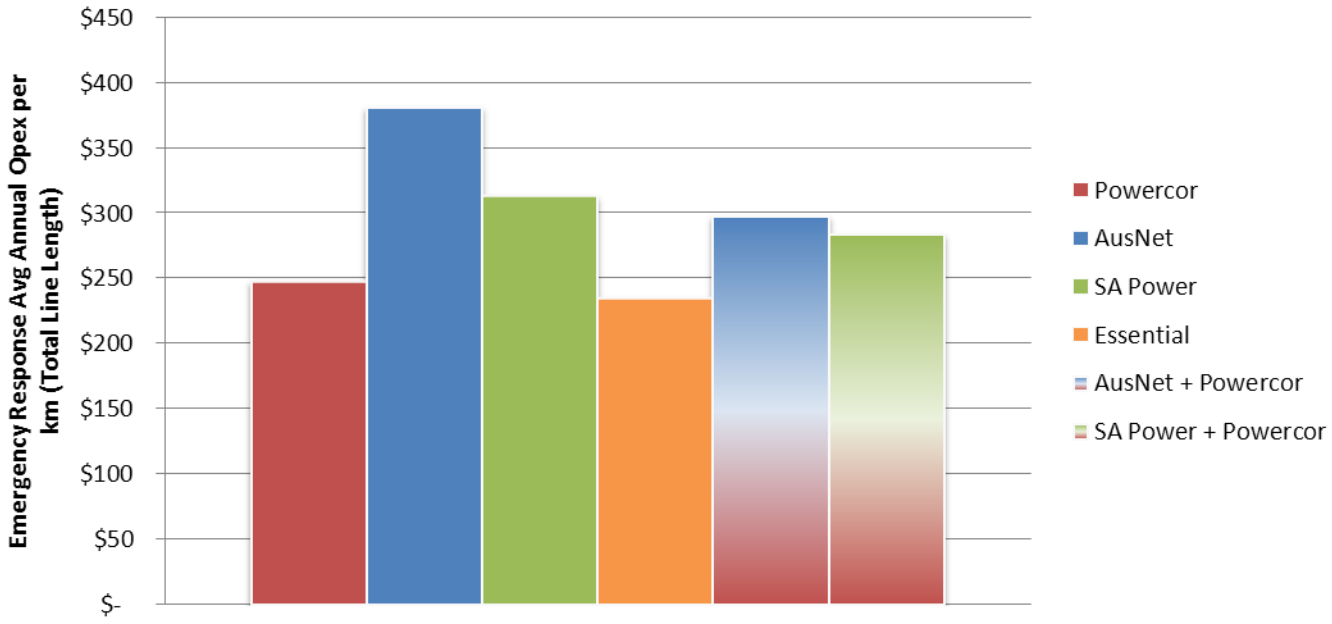
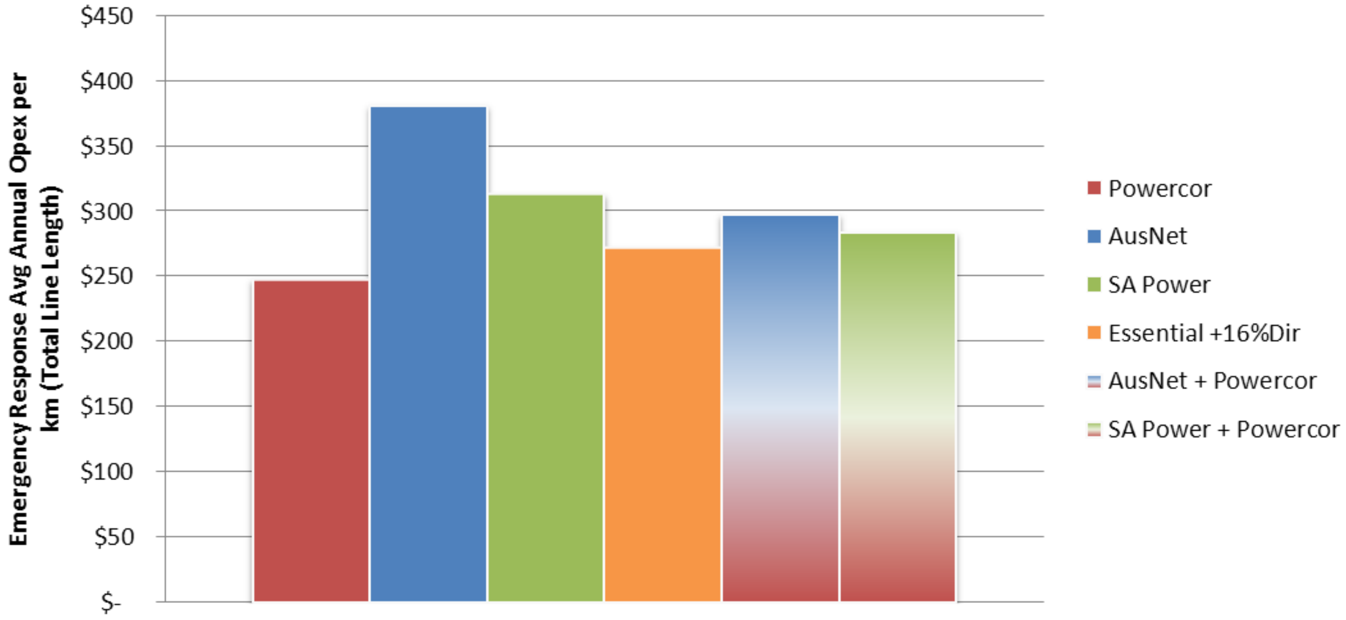


Figure 4-39 shows that with the 16% additional direct cost increase, Essential Energy's average annual emergency response normalised by total line length is still lower than most of Essential's comparable peers.

Figure 4-39: Emergency Response Average Annual Opex per km (Essential +16% Direct, 2008/09 – 2012/13 Nominal)



4.3.3.6 Opex overheads

Essential through its cost allocation methodology tends to treat a larger portion of its costs as overheads when compared to many other DNSPs. This difference in treatment of costs means that equivalent costs are treated as direct costs and therefore form part of unit rates. These variations are more apparent in the case of businesses where a greater proportion of work is performed by contracted parties.

That said, if the reported Essential Energy corporate and network overheads are reviewed based on network length then it can be seen in Figure 4-40 Essential Energy compares very well in relation to the nominated peer group. As highlighted in the direct opex categories Figure 4-41 serves to demonstrate the effect on Essential Energy overheads if the 16% indicative reallocation is incorporated. The full details regarding Essential Energy's corporate and divisional overhead methodology along with a detailed response to the issues raised within the Determination can be found in Attachment 6.4 (Corporate and Divisional Overheads).

Figure 4-40: Average Annual Opex Overheads per km (2008/09 – 2012/13, Nominal)

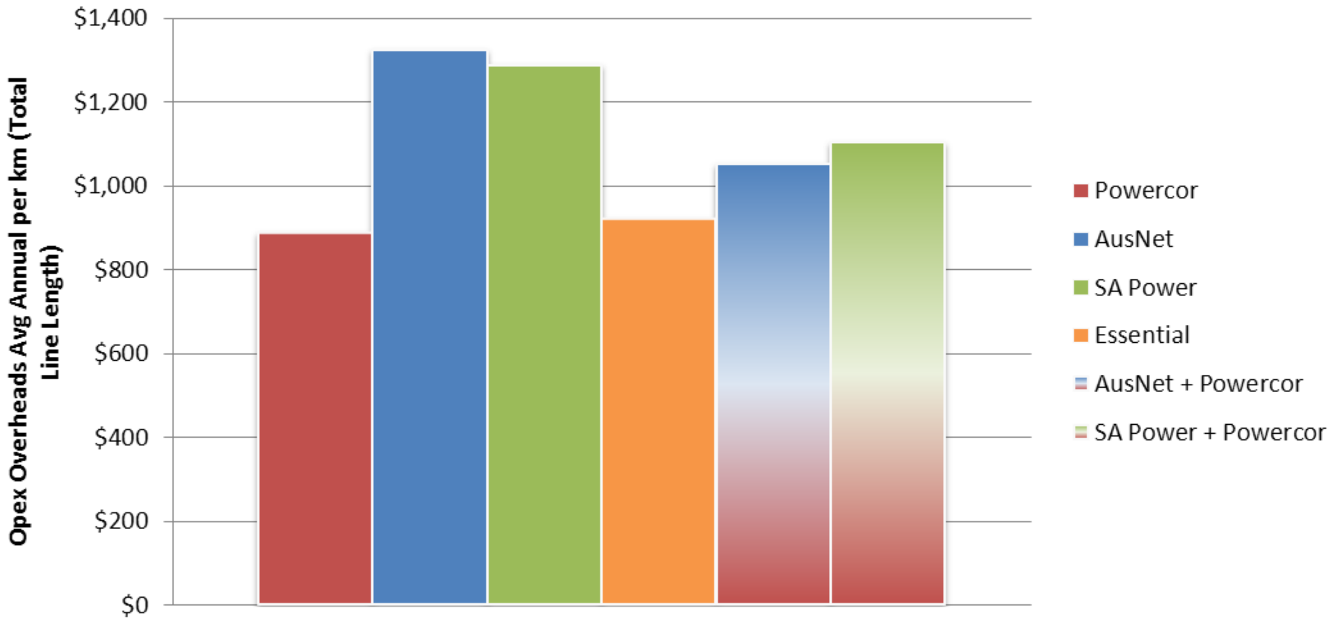
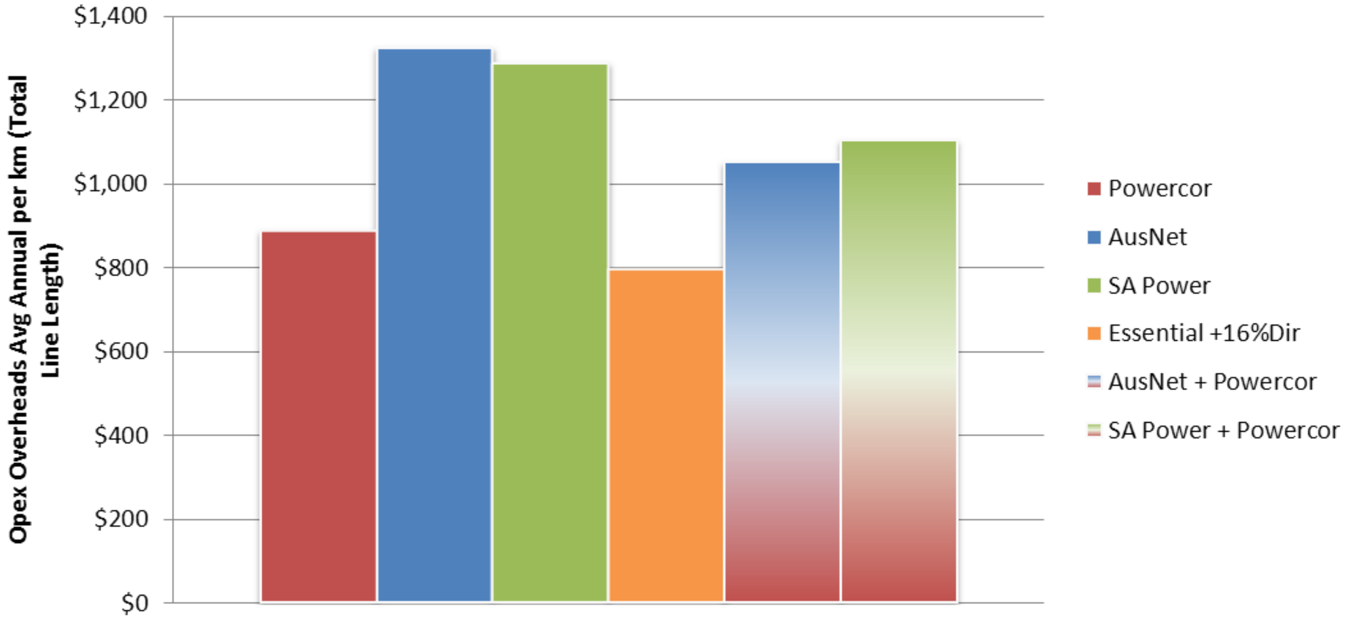


Figure 4-41: Average Annual Opex Overheads per km (Essential overheads reduced due to Direct cost 16% increase, 2008/09 – 2012/13 Nominal)



Supporting Documents

Advisian. (Jan 2015). *Review of AER Benchmarking Networks NSW.*

AER. (Nov 2013). *Better Regulation Explanatory Statement Expenditure Forecast Assessment Guideline.*

AER. (Nov 2014). *Draft decision Endeavour Energy distribution determination 2015-16 to 2018-19 Overview.*

AER. (Nov 2014). *Draft decision Essential Energy distribution determination 2015-16 to 2018-19 Attachment 7: Operating expenditure.*

AER. (Nov 2014). *Draft decision Essential Energy distribution determination 2015-16 to 2018-19 Overview.*

Ausnet. (Jun 2014). *SP Ausnet (D) 2008-13 - Category Analysis RIN - templates CONSOLIDATED - 12 June 2014 - PUBLIC_1.xlsx.*

Bereau of Metereology. (2012, Feb 29). *Average annual thunder-day and lightning flash density*. Retrieved Dec 11, 2014, from Climate Data Online: http://www.bom.gov.au/jsp/ncc/climate_averages/thunder-lightning/index.jsp?maptype=otdg

Bureau of Metereology. (2012, Feb 29). *Average annual thunder-day and lightning flash density*. Retrieved Dec 11, 2014, from Climate Data Online: http://www.bom.gov.au/jsp/ncc/climate_averages/thunder-lightning/index.jsp

Coelli, T., Estache, A., Perelman, S., & Trujillo, L. (2003). *A Primer on Efficiency Measurement for Utilities and Transport Regulators, World Bank Development Studies.* Washington DC: World Bank.

Economic Insights. (Nov 2014). *Economic Benchmarking Assessment of Operating Expenditure for NSW and ACT Electricity DNSPs.*

Energy Safe Victoria. (Jun 2014). *Safety Performance Report on Victorian Electricity Networks 2013.*

Essential Energy. (2014). *Attachment 4 2014 Reset RIN Workbook Consolidated.*

Essential Energy. (Jan 2015). *Asset Expenditure Comparison.xlsx.*

Essential Energy. (Jan 2015). *Lightning Analysis.*

Essential Energy. (Jan 2015). *Revised Regulatory Proposal.*

Essential Energy. (Jan 2015). *Revised Regulatory Proposal: Attachment 6.14 NNSW Cost Escalation.*

Essential Energy. (Jan 2015). *Revised Regulatory Proposal: Attachment 6.4 Corporate and Divisional Overheads.*

Essential Energy. (Jan 2015). *Revised Regulatory Proposal: Attachment 7.10 Vegetation Management.*

Essential Energy. (Jan 2015). *Revised Regulatory Proposal: Attachment 7.11 Asset Growth.*

Essential Energy. (Jan 2015). *Revised Regulatory Proposal: Attachment 7.5 Labour Cost Analysis.*

Essential Energy. (Jan 2015). *Revised Regulatory Proposal: Attachment 7.6 Productivity.*

Forest & Wood Products Australia. (2007). *Manual 3 – Decay in ground contact.* Retrieved Dec 15, 2014, from http://www.fwpa.com.au/images/marketaccess/ManualNo3-IG%20Decay.pdf

Forest & Wood Products Australia. (2007). *Manual 4 – Decay above ground.* Retrieved Dec 15, 2014, from http://www.fwpa.com.au/images/marketaccess/ManualNo4-AG%20decay.pdf

Frontier Economics. (Apr 2013). *Total cost benchmarking at RIIO-ED1 – Phase 2 report – Volume 1.*

Frontier Economics. (Jan 2015). *Review of the AER's econometric benchmarking models and their application in the draft determinations for Networks NSW.*

Huegin Consulting. (Jan 2015). *Huegin's response to Draft Decision on behalf of NNSW and ActewAGL. Technical response to the application of benchmarking by the AER.*

Jacobs. (Dec 2014). *Regulatory Revenue Decision Reliability Impact Assessment.*

Newberry, D. (Jan 2015). *Draft Response Cambridge Economic Policy Associates .*

Powercor. (Jun 2014). *Powercor 2008-13 - Category Ananlysis RIN - responses CONSOLIDATED- 2 June 2014 - PUBLIC.xlsx.*

R2A. (Jan 2015). *Essential Energy Asset / System Failure Safety Risk Assessment.*

SA Power Networks. (2013). *Category Analysis RIN.*

SA Power Networks. (Oct 2014). *SA Power Networks Regulatory Proposal 2015-2020.*

SA Power Networks. (Oct 2014). *SA Power Networks Regulatory Proposal 2015-2020: Attachment 20.73 SA Power Networks: Capital and operating historical expenditure.*