Australian Energy Regulator

Independent review of Operating Environment Factors used to adjust efficient operating expenditure for economic benchmarking

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Glossary

To ensure analytical clarity and for ease of communication, we have developed a set of inter-related stipulative definitions of key technical terms used throughout this report. Accordingly, the technical definitions below go beyond a typical glossary. Technical terms in bold signify cross references.

AER	Australian Energy Regulator.
Annualisation	A process to standardise the value of intermittent or limited duration OEFs over the **benchmark period.** Multi-year OEFs are converted to annual values.
Assessed DNSPs (OEFs)	DNSPs for whom **OEF adjustments** in addition to **econometric benchmarking** have been assessed, as part of a regulatory decision making process. To date this includes NSW, ACT and Queensland DNSPs.
Base OPEX	The **base OPEX** is the estimate of total OPEX prior to application of economic benchmarking to estimate ideal or OEF optimised OPEX. For example, in regulatory decisions base OPEX is estimated by a roll-forward procedure of the previous historical OPEX.
Benchmark period	The period over which the **econometric analysis** is applied to derive **productivity scores**. In the AER's 2016 annual benchmarking report, this period was 2006 to 2015. In the AER's 2015 Queensland determinations, this period was 2006 to 2013. A complication is that Victorian DNSPs report data on a calendar year and all other DNSPs on a financial year.
CAPEX	Capital expenditure. Expenditure that is capitalised and not **OPEX**. Differences in capitalisation boundaries may require OEF adjustments due to the OPEX implications of operating and maintaining additional CAPEX.
Capital governance	The framework and processes by which **DNSPs** internally regulate **CAPEX**. Differences in capital governance effectiveness may influence differences in **productivity scores** by increasing the asset base to be operated and maintained for a given productivity output.
Comparison point	The **productivity score** of the DNSP (or average of a group of DNSPs) selected by the AER to be the comparison point for the purpose of setting an **efficiency target**. Not to be confused with **reference point** for calculating **OEF adjustments**.
Distribution assets	DNSP assets operating at a threshold of 33kV and below. This threshold is applied to measure differences between DNSPs in the density of **sub-transmission** assets above this threshold.
DNSP	Distribution network service provider. The entity to which **economic benchmarking** is applied to standard control services.

Duplicative	A **OEF candidate** that duplicates an operating environment variable fully or partially accounted for by the **productivity score**, or via another mechanism such as annual pricing variation decisions, where an **OEF adjustment** would duplicate the existing expenditure allowance**.** One of three **OEF criteria** for an **OEF adjustment**.
Economic benchmarking (AER)	OEF adjustments form part of **economic benchmarking** and operate alongside **econometric benchmarking** undertaken by **Economic Insights**.
Econometric benchmarking results (EI)	The results of **econometric benchmarking** modelling of OPEX by **Economic Insights'** Cobb Douglas Stochastic Frontier Analysis (SFA) production model.
Efficiency target	The efficiency target for a DNSP, obtained by comparison (over the **benchmark period**), between a DNSP's own **productivity score** and the **comparison point**. Together with **base OPEX**, the efficiency target is used to derive **ideal Optimised OPEX**.
Economic Insights (EI) model	The set of **econometric benchmarking** models used by **Economic Insights** to derive **productivity scores**. In particular, the AER preferred production model employs a parametric approach, Stochastic Frontier Analysis (SFA), using a log-linear Cobb-Douglas form, commonly known as a Cobb Douglas stochastic frontier model.
Exogeneity (OEF)	Whether a **OEF candidate** is considered to be outside the control of the relevant DNSP. One of three **OEF criteria** for an **OEF adjustment**.
Historical OPEX	This report provisionally uses historical OPEX for 2015 used in the AER's 2016 benchmark report as **base OPEX** to derive **ideal optimised OPEX** for the purpose of expressing OEF estimates in percentage terms.
Ideal optimised OPEX	Ideal optimised OPEX is derived from applying the **efficiency target** to **historical OPEX**.
Incremental OPEX (OEF)	The additional **efficient OPEX** attributable to an **OEF**, above **ideal optimised OPEX**.
Materiality threshold	A threshold (expressed as a percentage of **ideal optimised OPEX**), below which the AER has decided it would not make an **OEF adjustment**. One of three **OEF criteria** for an **OEF adjustment**.
Non-assessed firms/DNSPs	DNSPs for which **OEF assessments** have not previously been made by the AER.
Non-reference group	The group of DNSPs that are not members of the **reference group** in the **reference year.** These can in turn be split into **assessed DNSPs** for which OEF decisions have been made and **non-assessed DNSPs**.

OEF	An operating environment factor that is **non-systemic** (see **systemic operating environment** factor) that is necessary to explain variations in efficient OPEX between equally efficient DNSPs (all other things being equal). For current purposes assessment of the efficient OPEX is made employing **econometric benchmarking**.
OEF assessment	A previous determination of the AER of **OEF adjustments** for **assessed DNSPs.** This can refer either to a class of OEFs (e.g. bushfires) or to the **OEF adjustment** for a class of OEFs for a specific DNSP.
OEF adjustment	An change from **ideal optimised OPEX** for the DNSP to account for an OEF, expressed as a dollar value or percentage of ideal optimised OPEX, equal to the difference in the OEF estimate compared with the **reference point** for that OEF.
OEF assessed DNSP	A DNSP for which the AER has previously determined **OEF adjustments** (Ergon, Energex, Essential, Endeavour, Ausgrid, ActewAGL).
OEF adjustment	A supplement to **econometric benchmarking,** and the second step in the AER's **economic benchmarking** of **DNSPs,** to address differences in operating environment factors not fully accounted for in **econometric benchmarking**.
OEF candidate	A candidate for consideration as an **OEF**.
OEF criteria	The OEF criteria form a three part test used by the AER for assessing the eligibility of **candidate OEFs**, being the OEF is **non-duplicative**, **exogenous** and **material**.
OEF estimate	An estimate of the efficient **incremental OPEX** for a **candidate OEF** meeting the **OEF criteria**, measured from the **zero point**. Not to be confused with the **OEF adjustment**.
OEF optimised OPEX	The sum of **ideal optimised OPEX** and aggregate **OEF adjustments.**
OH&S	Occupational health and safety laws and regulations, a **Work Health Safety** law that applies only to Victoria.
OPEX	Operating and maintenance expenditure relating to services delivered by **DNSPs** that have been classified by the AER as relating to standard control services, and not capitalised (i.e. not **CAPEX**).
Optimisation (OPEX)	Depending on the **comparison point** chosen, the difference between actual and estimated efficient OPEX, excluding OEFs – historical **OPEX** minus **ideal optimised OPEX.**
Productivity score	The output of the **EI model** for each DNSP, used as an input into the **efficiency target** to derive **an ideal optimised OPEX**.
Reference group	The group of top five DNSPs ranked by **productivity scores** used to set the **reference point**. For the **reference year**, this included CitiPower, Powercor, AusNet, SAPN and United Energy

Reference point	The OEF estimate reference value selected by the AER for calculating **OEF adjustments** from **OEF estimates,** currently obtained by a weighted average of the **OEF estimates** of the **reference group**. Not to be confused with the **comparison point** or the **zero point**.
Reference year	The year for which **productivity scores** are utilised to identify the **reference group**, and the **historical OPEX** year (2015). For the purposes of illustration in this report, we use the same reference year and hence the same **reference group** as the AER's ACT/NSW/Qld decisions (although the composition of the **reference group** can change between different reference years.
RIN	Regulatory Information Notice. Economic benchmarking RIN data submitted by DNSPs to the AER is used for **econometric benchmarking**. Category analysis RIN data was not used for econometric benchmarking but is used in some aspects of OEF analysis.
Service output measures	Differences in output measures in **econometric benchmarking** that allow assessments of **OEF candidates** – e.g. customer density and line length. Relevant to applying the non-**duplication** criterion.
SFA model	Stochastic Frontier Analysis model. See Economic Insights model.
Standard control (OPEX)	The component of total **DNSP OPEX** of concern for **economic benchmarking** of DNSP services classified by the **AER** as being Standard Control for price regulation purposes.
Sub-transmission	All assets operating at or above 33kV. See **distribution assets**.
Sub-transmission density	A measure of the proportion of sub-transmission classified assets, above the threshold for **distribution assets**, relative to total assets including distribution assets.
Systemic operating environment	All **DNSPs** operate under less than ideal conditions. Systemic variables apply to all DNSPs and are not candidate OEFs as they have been fully accounted for in the **econometric benchmarking**.
WHS model laws	Work Health Safety model laws that apply outside Victoria and WA.
Zero point	For each individual OEF assessment/DNSP, the minimum expression of the **candidate OEF** across all DNSPs, which may be the absence of the OEF for one or more DNSPs. For some OEFs, this may represent the minimum expression of the environmental variable among the DNSPs assessed that, while non-zero, is used to define the zero point. Not to be confused with **comparison point** or **reference point**.

Executive summary

Introduction

The Australian Energy Regulator (**AER**) has retained the present authors to provide independent technical advice about material differences in operating environments between Australian electricity distribution network service providers (henceforth "**DNSP**") in the National Energy Market (**NEM**). This can form a technical input into the AER's annual benchmarking analysis and future regulatory determinations.

The final report is required to:

- identify the most material factors driving apparent differences in estimated productivity and operating efficiency between the distribution networks in the NEM, and
- quantify the likely effect of each factor on operating costs in the prevailing conditions.

The present report is an initial draft of the final report. The primary objectives of the draft report are to:

- explain Sapere-Merz's preliminary findings on operating environment factors (**OEFs**);
- test the preliminary OEF findings with stakeholders; and
- seek input and further information from stakeholders.

The focus of this report is the effect on **efficient OPEX** of exogenous variables that are candidates for classification as material OEFs, not otherwise accounted for or fully accounted for in **econometric benchmarking**. For most jurisdictions there is a limited number of material OEFs that need to considered in comparing benchmarking results.

The present report is intended to contribute to the AER's economic benchmarking. Benchmarking is a high-level, top down tool. OEFs are an adjunct, complementary component of this tool. The estimates are the best possible with the available data but are by their very nature less precise than would be the case using data rich bottom-up techniques.

The primary preliminary results of this study are the efficient **OEF estimates** for each DNSP in dollar terms for the **reference year**. They are intended to be illustrative as a starting point for discussion.

The subsequent results are conditional on either temporal assumptions or the preferences of the regulator regarding the selection of the **comparison point** for determining the **efficiency target** and **reference point** for determining the **OEF adjustment**. The derivation of **OEF optimised OPEX** from these **OEF adjustments** is strongly dependent on regulatory discretion over a range of decisions in their application, with two overall processes available for application to the entire group of DNSPs. The outcomes demonstrated in the following findings have been derived by adhering to the AER's previous approaches except where stated otherwise (see Section 2).

Key findings

Table 1 below provides an overview of preliminary aggregate **OEF adjustments** that may be derived from the OEF estimates in percentage and dollar terms for each DNSP, relative to a base year, as illustration of the methodology. The aggregate OEF adjustment columns represent the total estimated adjustments to the econometric modelling outputs to account for OEFs that meet the **OEF criteria**.

Table 1 Overview of preliminary aggregate OEF adjustments ($000, $June 2015)

DNSP	Ideal Optimised OPEX	Aggregate OEFs Adjustments	$ OEF Adjustment	Efficiency target post OEF	OEF optimised OPEX
ActewAGL	$42,402	9.6%	$4,071	62.6%	$46,473
Ausgrid	$383,230	6.1%	$23,200	62.3%	$406,430
Citipower	$55,840	4.5%	$2,516	104.5%	$58,355
Endeavour	$208,106	8.8%	$18,278	82.9%	$226,384
Energex	$311,043	9.7%	$30,229	88.7%	$341,272
Ergon	$244,630	10.5%	$25,752	73.9%	$270,382
Essential	$289,591	4.6%	$13,341	76.8%	$302,932
Jemena	$68,661	0.7%	$476	94.6%	$69,137
Powercor	$190,734	-0.1%	-$245	99.9%	$190,488
SAPN	$248,377	0.0%	$105	100.0%	$248,483
Ausnet	$206,141	-1.1%	-$2,300	98.9%	$203,842
TasNetworks	$62,684	-2.1%	-$1,296	95.0%	$61,388
United Energy	$117,721	0.3%	$345	100.3%	$118,066

Regarding each column:

- The left hand column provides **ideal optimised OPEX**. This is used as the denominator to convert the dollar OEF adjustments to percentage OEF adjustments for each DNSP. This is illustrative of the outputs of econometric benchmarking.
- The two middle (green) columns provide the estimated aggregate OEF adjustments in dollar and percentage terms (i.e. change in efficient OPEX relative to ideal optimised OPEX). These are the illustrative outputs from the present project.

- The two right hand (orange) columns reflect the outcomes from the preliminary OEF estimates – that is the total effect on OEF adjustments on efficiency targets and OEF optimised OPEX. This is illustrative of one process of applying the OEF adjustments to modify the outputs of econometric benchmarking.

As can be seen, the aggregate OEF column represents an increase in the optimised OPEX (or a reduction in OPEX optimised) in the second column. The individual OEF adjustments are set out in more detail in Table 2 and Table 3below. This details the reference point utilised to derive the OEF adjustments from OEF estimates. [1]

As it happens, in the present instance the OEF adjustment does not change the rankings of the top five DNSPs. Consequently, the comparison point happens to be the same before or after OEF adjustment and the order of the calculation does not affect the outcome for OEF optimised OPEX (see Section 2.2.1). This could, however, change in a future update of the econometric benchmarking.

For the vegetation management OEF category, no estimates are offered at present. This is also the case for some DNSPs in the taxes and levies OEF category. This does not reflect a preliminary assessment that the OEF adjustment is zero, but rather a view there is insufficient data from which to derive an OEF estimate.

The largest aggregate OEFs in percentage and dollar terms relate to the two Queensland DNSPs (Ergon and Energex), followed by ActewAGL. The three NSW DNSPs (Endeavour, Ausgrid, and Essential,) have significant aggregate OEFs. Citipower and Jemena have material aggregate OEFs.

Two DNSPs (CitiPower and United Energy) in the reference group have an OEF adjusted efficiency target exceeding 100 per cent. This is a consequence of the selections of the comparison point, reference point, and the method used for deriving efficiency targets. It does not imply these DNSPs have been over-compensated for their outputs.

Three DNSPs (Powercor, AusNet, and TasNetworks, including two in the reference group) have negative OEF adjustments. Again, this is a consequence of the selection of the comparison point, reference point and the method used for deriving efficiency targets.

Overview of OEF adjustments

A summary of preliminary findings on the estimated dollar value of each material OEF adjustment for each DNSP is set out in Table 2 below. For illustrative purposes in Table 3, these are expressed as percentages of ideal optimised OPEX excluding OEFs, as set out in Table 1.

For some OEFs, especially in relation to the DNSPs for which OEFs have not previously been determined, there is insufficient data to reach a preliminary finding. These have been denoted by 'Nil". Further data is sought on these OEFs.

There is at present no recent econometric benchmarking of Power and Water's core distribution service. Similarly, there is at present no RIN data. As a result it is not possible

[1] The OEF estimates from which these are derived are set out in Table 20 and Table 21

to quantify any OEFs that may be required to address systemic environmental operating variables affecting Power and Water. We have provided a very preliminary overview and qualitative assessment of variables suggested by Power and Water for consideration as candidate OEFs.

Table 2 Summary of preliminary OEF findings OEF adjustment ($000, $June 2015)

DNSP	actewAGL	Cyclones	Extreme weather storms	OH&S regulations	Sub-transmission (Licence conditions)	Taxes and levies	Termite exposure	Vegetation Management	Total
ActewAGL	$3,555	NA	$0	$5.2	$510	Nil	$0	Nil	$4,071
Ausgrid	NA	NA	$2	$1.8	$23,728	Nil	-$205	Nil	$23,200
Citipower	NA	NA	$0	-$0.6	$1,914	$643	-$41	Nil	$2,516
Endeavour	NA	NA	$2,321	$3.5	$15,436	Nil	$517	Nil	$18,278
Energex	NA	NA	$3,081	$2.5	$18,200	$7,932	$1,014	Nil	$30,229
Ergon	NA	$12,828	$755	$3.2	$9,482	Nil	$2,684	Nil	$25,752
Essential	NA	NA	$354	$2.7	$10,271	Nil	$2,713	Nil	$13,341
Jemena	NA	NA	$2	-$0.7	-$186	$718	-$56	Nil	$476
Powercor	NA	NA	$0	-$1.9	-$1,660	$1,086	$330	Nil	-$245
SAPN	NA	NA	$0	$3.1	$373	Nil	-$271	Nil	$105
Ausnet	NA	NA	$0	-$2.1	-$2,347	Nil	$49	Nil	-$2,300
TasNetworks	NA	NA	$192	$5.0	-$1,425	Nil	-$68	Nil	-$1,296
United Energy	NA	NA	$0	-$1.2	$406	Nil	-$60	Nil	$345

Source: Sapere-Merz analysis

Table 3 Summary of preliminary OEF findings – OEF adjustment (as percentage of Optimised OPEX)

DNSP	actewAGL	Cyclones	Extreme weather storms	OH&S regulations	Sub-transmission (Licence conditions)	Taxes and levies	Termite exposure	Vegetation Management	Total
ActewAGL	8.39%	NA	0.00%	0.01%	1.20%	Nil	0.00%	Nil	9.60%
Ausgrid	NA	NA	0.00%	0.00%	6.11%	Nil	-0.05%	Nil	6.05%
Citipower	NA	NA	0.00%	0.00%	3.43%	1.15%	-0.07%	Nil	4.51%
Endeavour	NA	NA	1.12%	0.00%	7.42%	Nil	0.25%	Nil	8.78%
Energex	NA	NA	0.99%	0.00%	5.85%	2.55%	0.33%	Nil	9.72%
Ergon	NA	5.24%	0.31%	0.00%	3.88%	Nil	1.10%	Nil	10.53%
Essential	NA	NA	0.12%	0.00%	3.55%	Nil	0.94%	Nil	4.61%
Jemena	NA	NA	0.00%	0.00%	-0.27%	1.05%	-0.08%	Nil	0.69%
Powercor	NA	NA	0.00%	0.00%	-0.87%	0.57%	0.17%	Nil	-0.13%
SAPN	NA	NA	0.00%	0.00%	0.15%	Nil	-0.11%	Nil	0.04%
Ausnet	NA	NA	0.00%	0.00%	-1.14%	Nil	0.02%	Nil	-1.12%
TasNetworks	NA	NA	0.31%	0.01%	-2.27%	Nil	-0.11%	Nil	-2.07%
United Energy	NA	NA	0.00%	0.00%	0.35%	Nil	-0.05%	Nil	0.29%
Reference Point	0.00%	0.00%	0.00%	0.00%	2.29%	0.37%	0.11%	Nil	2.4-2.8%

Source: Sapere-Merz analysis

1. The taxes and levies OEF reference point only applies to those DNSPs where there is a calculation of this OEF. Thisleasd to two values of the overall reference point, where the lower reference point applies to those DNSPs with Nil calculation for taxes and levies

Comparison with previous AER decisions

Table 4 below compares the OEF adjustments in this report with previous AER decisions. Note that the AER's previous decisions refer to seven (7) out of the total 13 DNSPs.

Table 4 Comparison with previous AER decisions

DNSP	AER OEF adjustment	SRG/Merz OEF adjustment	SRG/Merz c.f. AER
ActewAGL	10.1%	9.6%	-0.5%
Ausgrid	6.9%	6.1%	-0.8%
Citipower	0.0%	4.5%	NA
Endeavour	6.3%	8.8%	2.5%
Energex	12.2%	9.7%	-2.5%
Ergon	18.6%	10.5%	-8.1%
Essential	5.4%	4.6%	-0.8%
Jemena	0.0%	0.7%	NA
Powercor	0.0%	-0.1%	NA
SAPN	0.0%	0.0%	NA
Ausnet	0.0%	-1.1%	NA
TasNetworks	0.0%	-2.1%	NA
United Energy	0.0%	0.3%	NA
Reference point	0.0%	2.4 or 2.8%	2.4 or 2.8%[2]

Source: Sapere-Merz analysis and AER

For most DNSPs, the proposed aggregate OEF adjustments (expressed as percentages of ideal optimised OPEX) are lower than the previous AER adjustments. Ergon and Energex would experience significant reductions (-8.1 and -2.5 per cent respectively). Ausgrid and Endeavour would both receive reductions of -0.8 per cent and ActewAGL -0.5 per cent.

The proposed reductions reflect a combination of:

1. More extensive analysis of OEFs as they relate to the reference group. The significant OEF estimates for the reference group result in a reference point of 2.8 per cent for the calculation of the OEF adjustments, whereas the AER previously had an effective reference point of zero. The extension of the OEF assessments means all OEF adjustments for the non-reference group are reduced by the estimate for the reference point.

2 Note that the lower reference point applies to those DNSPs with Nil calculation for taxes and levies

2. The finding that a number of candidate OEF categories do not meet the OEF criteria. The OEF candidates excluded include licence conditions, except perhaps for Ausgrid, and OH&S regulations.

3. Changes to the quantification of some OEFs (including sub-transmission, extreme weather, and termites).

4. The decision at this point not to estimate an OEF for vegetation management (including bushfires and division of responsibility).

Further to these matters, even in cases where the OEF dollar estimate as used by the AER have been applied, the percentage OEF adjustment may be different due to a number of factors in the calculation including:

- the periods used for an adjustment for inflation;
- the periods used for annualisation;
- the reference year used for the productivity scores and historical OPEX employed to obtain the ideal optimised OPEX used in the denominator; and
- the reference year used for the customer numbers employed in the weighted average calculation of the reference point.

Relative to previous decisions by the AER, the preliminary results vary between two sets of individual OEFs:

- Substantial change – where the review is proposing substantial changes relative to previous consideration by the AER; and
- Little change and modest refinement – where the review is proposing little change or modest refinement compared with previous consideration by the AER.

We discuss each in turn below.

Substantial change

Sub-transmission and licence conditions

It is proposed that the sub-transmission and licence conditions OEFs should be considered together. On reviewing licence conditions, these overwhelmingly relate to reinforcements to sub-transmission capacity. As a result, almost all the licence condition **candidate OEF** is not considered to meet the **non-duplication** criterion. We therefore propose to consider all of the licence conditions OEF within the sub-transmission OEF.[3]

The sub-transmission OEF should seek to incorporate the incremental OPEX for both higher capacity transformers, and higher capacity lines. These should be estimated separately, with the line length component also taking into account overhead and underground line lengths. This reflects significant variations between DSNPs with respect to the balance of sub-transmission lines and transformers.

[3] The one exception relates to Ausgrid where licence conditions relating to distribution may not be duplicative and may be material. For convenience, the Ausgrid distribution OEF has been rolled into the sub-transmission and licence conditions column in Tables 2 and 3 above.

The preliminary result is that transformer capacity is found to represent 84 per cent of the total value of the sub-transmission/licence conditions OEF. The proportion varies between DNSPs, reflecting variations in transformer and overhead sub-transmission asset densities between DNSPs.

DNSP views are sought on the proposal to consider sub-transmission and licence conditions as a single OEF category, and the inclusion of transformer capacity as well as lines capacity in the quantification.

Vegetation (including Bushfires and Division of responsibility for vegetation)

The preliminary finding is that variations in vegetation density and growth rates, along with variations in regulation around vegetation management, are together likely to be a material driver of variations in efficient vegetation OPEX. Analysis of vegetation, bushfire and division of responsibility variables indicate a high level of overlap between these variables. It is probable that a vegetation management OEF candidate (or set of OEF candidates) meets the OEF criteria for a significant portion of DNSPs. As this includes the reference DNSPs, this OEF candidate (or set) is also likely materially to influence the reference point for this OEF candidate (or set).

Because of the likely materiality of a vegetation OEF reference point (or set), this may in turn result in a change (increase) in the overall reference point and hence affect the aggregate OEF adjustment outcomes for a significant sub-set of DNSPs. This effect may be greatest for those DNSPs with the highest (or lowest) vegetation OPEX as a proportion of total OPEX, depending on the extent observed vegetation OPEX is assessed to be efficient.

No quantification of a candidate vegetation management OEF candidate (or set of OEF candidates) has been able to be estimated at this time. The summary results for this OEF candidate (or set) have therefore been reported as nil in Table 2 and Table 3.

For the avoidance of doubt, this does not indicate the vegetation management OEF candidate (or set) should be zero, or that it cannot feasibly be quantified in the future. As discussed further in Section 3.8, several possible approaches and methods have been explored. However, EBRIN data on vegetation density is considered less mature than other EBRIN data, upon which the EI model and some other OEF estimates have been developed or otherwise considered. Further refinement and consultation with DNSPs to ensure consistency of EBRIN data is required before it can be relied upon to the extent necessary to quantify this OEF candidate (or set) within an acceptable margin for error.

In the absence of such data, and within the scope of the present project, we have so far been unable to identify sufficient evidence on which to distinguish between the effect of exogenous and endogenous variables on variations in observed vegetation OPEX. The methods that have been applied to quantifying unit costs and volumetric variables to support the quantification of other candidate OEFs have so far not been able to be applied to vegetation OPEX.

As a result, the error margins for any quantification of this OEF category (or set) are considered to be significantly higher than for the quantification of other OEF categories. The likely result would be a material over estimation of the efficient OEF for some DNSPs alongside a material under-estimation for others. Because of the likely scale of the errors, and in particular the impact on the comparison point, these errors would in turn be likely to result in significant errors being introduced into the aggregate OEF adjustments and OEF adjusted efficient OPEX estimates.

DNSP views are sought on proposals toward the future quantification of the vegetation candidate OEF (or set), encompassing the previous bushfire and division of responsibility OEF categories.

Occupational health and safety
The previous AER assessment for this OEF is found to rely on a misinterpretation of the single supporting report, for the then Victorian government. This misinterpretation resulted in a very large over-estimation of the impact of differences in Work Health Safety laws and regulations between Victoria and all other NEM jurisdictions. With corrected inputs, also having a regard to two later regulatory assessments of Work Health and Safety laws in WA and NSW, the OEF estimate for this OEF candidate is not considered material relative to the **zero point** for this OEF.

Changes in OEF methodology and estimates

The proposed refinements to the underlying methodology, along with additional information available to this review, together contribute to changes in OEF estimates for the following candidate OEFs.

Extreme weather – cyclones
The approach taken by the AER in the previous assessment for the cost impacts, of the then seven cyclones for Ergon Energy in the benchmarking period, is considered sound. Our approach extends the previous analysis to include three subsequent cyclones up to the end of financial year 2015, based on public emergency response data.[4] This assessment is an under-estimate, and a fuller assessment could be made with additional cost data, as provided confidentially to the AER previously, for all cyclones in the benchmark period.

Extreme weather – severe storms
Our approach accepts the AER's principles for recognition of variable weather conditions as the basis for potential OEFs. We propose changes to the implementation of these principles with respect to severe storms. In its assessments, the AER does not appear to have made annualisation adjustments that reflect the expected return period for a major weather event may significantly exceed the benchmarking period. In addition the econometric benchmarking is capable of normalising these non-recurrent OPEX shocks, so that inclusion as an OEF would be duplicative. The OEF estimates reflect the pattern anticipated from variations in geographical exposure to this variable; that is variable impact along the eastern seaboard with maximum impact for south-east Queensland and north-east New South Wales.

4 This includes the Townsville mini tornado 2011-12 and Cyclones Larry 2005-06, Ului 2009-10, Tasha 2010-11, Anthony 2010-11, Yasi 2010-11, Oswald 2012-2013, and recently Ita 2013-14, Dylan 2013-14, Marci 2014-15.

Taxes and levies
Our preliminary assessment is this OEF appears to relate at least in part to differences in the treatment of taxes and levies in RIN returns. This reflects the AER's finding that for some DNSPs levies are addressed in annual pricing variations and excluded from historical RIN data.[5] Where this arises, a taxes and levies OEF may not meet the non-duplication criterion.

The apparent differences in the treatment of this matter are not obvious from the available RIN data. There appear to be significant inconsistencies in reported tax and levies paid by different DNSPs within jurisdictions where regulations around taxes and levies could be expected to be the same for all DNSPs. RIN returns for three of the five Victorian DNSPs provide no data for taxes and levies. RIN returns for NSW/ACT and SA DNSPs do not include a line item for jurisdictional levies. For SAPN, the data for taxes and levies appear in a RIN return for just one year in the benchmarking period.

DNSP views are sought on apparent inconsistencies in RIN returns with respect to taxes and levies and options for quantification of this OEF category in future.

Termites
Our approach for this candidate OEF incorporates and builds on the approach articulated in previous AER assessments. The main proposed change is to include OPEX for a more termite prevalent DNSP in the calculation of unit costs, despite its relatively low productivity score. The analysis leads to drawing on a larger set of data regarding OPEX related to this OEF. The revised analysis results in significant upward revisions for DNSPs with higher rates of termite prevalence and larger numbers of wood poles.

DNSP views are sought on the proposals for modifying the quantification of this OEF category.

Proposed changes to OEF methodology

Some clarifications and changes to the underlying OEF methodology, and for greater consistency in the application of the methodology across OEFs and DNSPs, are proposed. The proposed changes do not affect the exercise of regulatory discretion in terms of the selection of the comparison point for deriving ideal optimised OPEX, the selection of the reference point for deriving OEF adjustments, or the capping of the efficiency target for the reference group. These proposals have a significant impact on the quantification of some individual OEFs and also on the determination of the denominator used to convert OEF estimates to OEF adjustments in percentage terms. These issues are briefly summarised here and discussed at length in Section 2 below.

Selection of the comparison and reference points
The selection of the reference group, and thereby the comparison point for deriving efficiency targets and ideal optimised OPEX as well as the reference point for deriving OEF

[5] See page 17 of Attachment 7 to the AER's Final Decision on ActewAGL distribution determination, dated April 2015.

adjustments, are a matter of regulatory discretion. There are additional challenges associated with applying an OEF adjustment framework coherently for both **reference** and **non-reference group** DNSPs, and annually rather than periodically.

Annualisation and consideration of intermittent events or step changes
In deriving OEF adjustments, there should be an explicit **annualisation** step, consistently applied. This step involves assessing the duration or probabilistic incidence of the OEF within the benchmarking period. For example, if a regulatory OEF is deemed to meet the criteria for five years out of the benchmarking period, then the initial estimate of the OEF will be divided by two in the annualisation calculation.

Method for deriving OEF adjustments
The primary results of this study are the OEF estimates in dollar terms for the reference year. The subsequent results are conditional on either temporal assumptions or the preferences of the regulator regarding the selection of the comparison or reference points.

The OEF estimates in percentage terms have been calculated assuming as the denominator the ideal optimised OPEX derived from the productivity scores and historical OPEX for the reference year. The OEF adjustments have been calculated using the reference point selected by the AER's existing practice (customer weighted average of the reference group).

The derivation of OEF optimised OPEX from these OEF adjustments is strongly dependent on regulatory discretion in a range of decisions in their application, with two overall processes available for application to the entire group of DNSPs. For demonstration purposes the overall values have been calculated using a process similar to the AER's previous practice as applied to DNSPs in the non-reference group.

ActewAGL

Almost one third of ActewAGL's overhead lines are located in backyard easements, rather than street frontages. The AER has previously reviewed these incremental costs and found they satisfied the OEF criteria and accepted ActewAGL's estimate of additional OPEX incurred. The AER's previous estimates for this OEF have been applied in this report.

To be consistent with the proposal not to include vegetation related costs in OEF adjustments for all other DNSPs (and for the bulk of ActewAGL's overhead network), vegetation related OPEX, other than that directly related to backyard reticulation, should be removed (that is, the unrecovered cost of emergency trimming). There is, however, no information on which to make such an adjustment. Further data on this matter is therefore sought.

ActewAGL classifies some connection services costs as standard control services, in accordance with previous AER decisions, resulting in higher standard control service costs than other DNSPs that classify connection service costs differently. The AER's previous estimates for this OEF have been applied in this report.

ActewAGL views are sought regarding the significance of incremental backyard reticulation costs includes arising from unrecovered vegetation management OPEX.

1. Introduction

1.1 Purpose

The Australian Energy Regulator (AER) has retained the present authors to provide independent technical advice about material differences in operating environments between the Australian electricity distribution network service providers (henceforth "DNSP"). This will form a technical input into the AER's annual benchmarking analysis and future regulatory determinations.

The final report is required to:

- identify the most material factors driving apparent differences in estimated productivity and operating efficiency between the distribution networks in the NEM, and
- quantify the likely effect of each factor on operating costs in the prevailing conditions.

The present report is an initial draft of the final report. The primary objectives of the draft report are to:

- explain Sapere-Merz's preliminary OEF findings;
- test the preliminary OEF findings with stakeholders; and
- seek input and further information from stakeholders.

1.2 Background

The AER uses economic benchmarking as a means of satisfying itself it is appropriate to use revealed actual OPEX.[6] To ensure that the AER is comparing 'like-with-like' to the greatest extent possible, the AER's benchmarking modelling takes into account the effect of differences in operating environments by:

- Directly accounting for the effects of customer density, network length, undergrouning, and network construction as output variables in the benchmarking models. These factors account for significant differences in costs between networks.
- Limiting benchmarking to network services activities, excluding costs related to metering, connections and other negotiated services which can differ across jurisdictions or are outside the scope of regulation.

As a second step, the AER also adjusts the econometric modelling results for differences in other exogenous operating conditions such as geography, climate, and jurisdictional obligations. The AER refers to these as "OEFs". The focus of this report is the estimation of OEF adjustments.

[6] AER, Draft Decision, TasNetworks Distribution Determination 2017-19, Attachment 7, September 2016, p. 14; AER, Final Decision, South Australia Power Networks Distribution Determination 2015-20, Attachment 7, October 2015, p. 21

The AER publishes an annual benchmarking report that presents the benchmark rankings and efficiency scores of each network service provider in the National Electricity Market (NEM). The most recent report was published in November 2016.[7]

The AER's annual benchmarking reports do not reflect the additional adjustments for OEFs. Instead, the AER has only applied adjustments for OEFs for the Queensland, NSW and ACT distribution network service providers in the context of their regulatory determinations. This is because the AER used economic benchmarking to inform its five-year OPEX forecasts for these service providers.[8] The AER used its benchmarking techniques to compare the historical benchmark operating efficiency of these networks against the benchmark comparison Victorian and South Australian networks over an eight year historical period.

Table 5 sets out the OEFs the AER identified and adjusted for each of the NSW, Queensland and ACT DNSPs, for which OEF assessments have so far been made. These calculations represent the percentage increase or decrease in efficient costs relative to reference Victorian and South Australian DNSPs, as estimated from the chosen benchmarking model.[9]

While the OEFs in Table 5 apply to the Queensland, NSW and ACT DNSPs, they could equally apply to the Victorian and South Australian DNSPs, with the reverse effect. That is, they reflect cost advantages faced by the Victorian and South Australian networks when compared to the Queensland, NSW and ACT networks.

The AER has not directly identified OEFs for Victorian, South Australian and Tasmanian distribution networks. This was primarily because the AER uses actual OPEX as a starting point to determine forecasts of efficient OPEX, rather than the results of econometric benchmarking.

The AER has acknowledged that its information about the operating environments faced by the Victorian and South Australian networks is partial and asymmetric. The AER has noted that its current approach may favour the ACT, NSW, and Queensland DNSPs to the extent that not all of their cost advantages relative to the reference group have been revealed.[10]

The AER's analysis of OEFs relied substantially on information provided by service providers, including through regulatory submissions and consultants reports. While the AER considered all information provided to it, it did not always have sufficient evidence to quantify the effect of individual factors. This contributed to the AER applying a conservative approach to immaterial factors, which it considered was appropriate given this was the first time benchmarking had been applied, and the level of information on OEFs

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7 The AER'2016 annual benchmarking reports are available at http://www.aer.gov.au/networks-pipelines/network-performance/annual-benchmarking-report-distribution-and-transmission-2016

8 See Attachment 7 of the AER's final decisions for the NSW and ACT DNSPs 2014-19 regulatory period, and QLD DNSPs 2015-20 regulatory period. Available at http://www.aer.gov.au/networks-pipelines/determinations-access-arrangements

9 For explanation of the AER's methodology for calculating these adjustments, see AER, Final Decision, Ausgrid Distribution Determination , Attachment 7, April 2015, pp. 184-189

available at that stage.[11] The AER noted that it may reconsider its approach to immaterial OEFs in the future as its information set improves.[12]

Table 5 Summary of OEF adjustments compared to reference networks

OEF	Ausgrid	Endeavour	Essential	ActewAGL	Energex	Ergon
Sub-transmission assets	5.2%	4.9%	3.1%		3.2%	4.6%
Licence conditions	1.2%	0.7%	1.2%			0.7%
OH&S regulations	0.5%	0.5%	0.5%	0.5%	0.5%	1.2%
Termite Exposure	0.0%	0.2%	0.6%		0.2%	0.5%
Bushfires					-0.5%	-2.6%
Extreme weather					2.7%	3.0%
Cyclones						5.4%
Vegetation management					3.4%	4.1%
Taxes and levies					2.7%	1.7%
Capitalisation Practices				8.5%		
Backyard reticulation				5.6%		
Standard control services connections				4.0%		
Total	**6.9%**	**6.3%**	**5.4%**	**18.6%**	**12.2%**	**18.6%**

Source: Australian Energy Regulator final decision for NSW and ACT DNSPs 2014-19, and QLD DNSPs 2015-20.

The AER also received responsibility for the economic regulation of the North Territory electricity network, Power and Water Corporation, in July 2016. It will incorporate Power and Water Corporation into its 2018 annual benchmarking report. The AER has not yet considered appropriate OEFs for the Northern Territory.

The AER's use of economic benchmarking and in particular its econometric and OEF adjustments have been the subject of extensive litigation, first in the Australian Competition

[11] AER, Final Decision, Ausgrid Distribution Determination , Attachment 7, April 2015, p. 180

[12] AER, Final Decision, Ausgrid Distribution Determination , Attachment 7, April 2015, p. 180

Tribunal and then in the High Court. In a decision handed down in May 2017[13], the Federal Court made various findings with respect to these matters.

The Federal Court (and earlier Australian Competition Tribunal) consideration of OEFs has informed this report. This report was commissioned before the Federal Court decision was handed down and does not form an element of any response to that decision by the AER. It is nevertheless intended that the present project will contribute to the ongoing improvement of future economic regulation of DNSPs.

1.3 Structure of this report

The remainder of this report is structured as follows:

Section 2 sets out the conceptual framework and approach applied in this report. It provides a narrative for the interconnected stipulative definitions of technical terms set out in the glossary. It identifies a series of issues that cut across multiple OEF estimations and which influence OEF estimates.

Section 3 applies the analytical framework developed in Section 2 to individual candidate OEFs. A standard structure is applied to each OEF:

- Preliminary finding
- Reasons
- Additional information or guidance sought

Section 4 provides a discussion of candidate OEFs that have so far not been quantified with respect to non-assessed DNSPs.

Section 5 provides a summary of overall results.

The terms of reference are provided in an appendix.

13 Federal Court of Australia: Australian Energy Regulator v Australian Competition Tribunal (No 2) [2017] FCAF 79, 24 May 2017.

2. Approach

2.1 Introduction

This section sets out the conceptual framework and approach adopted. Along with the definitions in the Glossary, it clarifies key terms and concepts.

- The first section seeks to clarify the conceptual framework, especially to distinguish between the criteria and conditions for accepting and quantifying a candidate OEF from the larger processes for applying OEFs, including the decision points where and how the regulator has previously applied its discretion.
- The second section seeks to clarify particular issues in the calculation of OEF estimates.
- The third section reflects on the data sources available to make calculations of OEF estimates.

2.2 Conceptual framework

2.2.1 Derivation and application of OEFs

OEF benchmarking is a supplement to econometric benchmarking and forms part of the larger economic benchmarking undertaken by the AER in the course of determining efficient OPEX for the purpose of regulated price setting, and in the future for periodic performance benchmarking.

Generalised, the effect of such factors for an individual firm is to increase its efficient OPEX required for the same productive outputs. Hence the effect of each OEF estimate for individual firms is to improve the productivity score from economic benchmarking, or ultimately optimised OPEX. Recognising the econometric benchmarking as a relative measure of firm performance among a group of firms, a relative OEF adjustment is derived from the individual OEF estimates. This is to recognise the cost impact of a non-systemic environmental operating factor not otherwise taken into account in the econometric benchmarking.

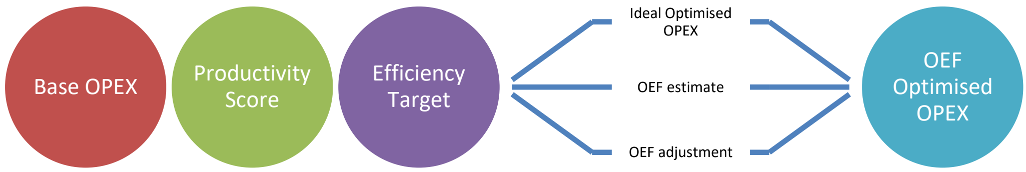
The overall scheme of applying economic benchmarking to optimising OPEX is illustrated in Figure 1: the economic benchmarking comprising both econometric productivity scores and OEF adjustments is employed to derive an efficiency target that generates an optimised OPEX inclusive of operating environment factors (OEF optimised OPEX)from a Base OPEX. As indicated, there are two optional economic benchmarking processes combining the productivity scores and OEF adjustments.

Identifying these two processes clearly assists to distinguish the steps necessary for deriving the OEF estimates (and adjustments), which are the focus of this report, from those steps that involve the regulator's discretion in decision making in the application of the OEF adjustments.

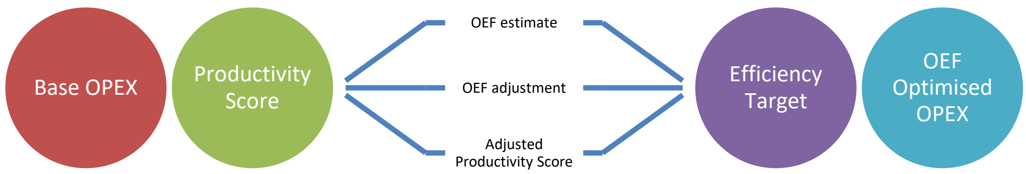
Most significantly, the process for determination of the OEF adjustments is independent from the alternative processes that apply the OEF adjustments for either benchmarking or regulatory decision making purposes. Hence, for the same OEF adjustments, there is some variation in outcomes for OEF Optimised OPEX between the two processes, determined by the regulator's choices in the application of these OEF adjustments with regard to certain procedures. In particular there is no difference in the outcomes derived from each process for the non-reference group when certain procedures are aligned.

Figure 1 Processes for the application of OEFs

Process A



Process B



The following sections elucidate these topics and decision points for both the derivation and application of OEF adjustments. In particular for understanding the difference between the two processes it is important clearly to:

- distinguish between the three separate 'fixed' points – the identification of the zero point for calculation of OEF estimates from the selection of the comparison and reference points; and
- articulate the derivation of the efficiency target for estimate of efficient OPEX from the benchmarking processes generating raw and adjusted productivity scores.

The discussion of the OEF conceptual framework concludes with the demonstration of the variations arising from these choices in Section 2.2.9

Productivity scores and efficiency

The starting point for the present analysis is the Cobb Douglas Stochastic Frontier Analysis (SFA) production model. SFA is an econometric modelling technique that uses advanced statistical methods to estimate the frontier relationship between inputs and outputs. SFA models allow for economies and diseconomies of scale and estimates efficiency for each DNSP relative to estimated best performance. That is, differences in productivity scores relative to a comparator firm or set of firms are a guide to differences in efficiency between firms.

2.2.2 Non-systemic operating factors

For present purposes an OEF is an operating environment factor that is **non-systemic**. Reference to an OEF is necessary to explain variations in efficient OPEX between equally efficient DNSPs (other things being equal). If, for example, in the case of a regulatory OEF, the OEF was introduced or increased over the course of the benchmarking period, then reference to the OEF is necessary to explain the increase in efficient OPEX (other things being equal) over the course of the benchmarking period.

Some operating environment factors are experienced by all DNSPs and may be described as systemic. This reflects basic facts about the nature of the world and the business of maintaining and operating electricity networks. DNSPs operate under less than perfect conditions and their efficient OPEX is therefore higher than it could be under perfect conditions.

Systemic operating environment factors include the fact that electricity conductors are extremely hazardous and that DNSPs in all mature economies need to comply with a large suite of legislation and regulations around safety and environmental matters. Similarly, all DNSPs of concern to this project are required to comply with legislation and regulation applying to all Australian corporations, and across the NEM.

For present purposes, these common operating environment factors are described as systemic operating environment factors. They are distinguishable from non-systemic operating environment factors that are candidates for consideration as OEF adjustments. Non-systemic operating environment factors are necessary to explain differences in efficient OPEX for equally efficient firms.

2.2.3 Candidates for OEF adjustments

In its decisions the AER has required that an OEF candidate must meet three criteria for OEF adjustments. These OEF criteria are applied in the present analysis. They are as follows.

5. Exogeneity: The first criterion is that an OEF should be outside the control of service providers' management. Where the effect of an OEF is within the control of service provider's management providing an adjustment for the OEF may mask inefficient investment or expenditure.

6. Materiality: The second criterion is that an OEF should create material differences in service providers' OPEX. Where the effect of an OEF is not material, there is no motive to provide an OPEX adjustment for the factor.

7. Duplication: The third criterion is that the OEF should not have been accounted for elsewhere. Where the effect of an OEF is accounted for elsewhere, to provide an adjustment for that factor would be to double count the effect of the OEF. This includes overlaps with econometric benchmarking.

2.2.4 Factors already addressed in econometric benchmarking

Systemic factors are already addressed in the economic benchmarking and therefore there is no requirement to make any further adjustment. Note that non-systemic environment factors may not always be **candidate OEFs**. To the extent non-systematic environment factors are already addressed in econometric benchmarking, they may not require OEF adjustments.

Some candidate OEFs may be accounted for entirely or partly via consideration of differences in DNSP outputs taken into account in econometric benchmarking. Other differences in operating environments addressed in econometric benchmarking outputs include:

- Customer numbers
- Circuit line length
- Maximum ratcheted demand
- Energy delivered.

These variables also allow at least a partial assessment of important operating environment factors that can be derived from the list above, such as customer density (circuit line length divided by customers). This is relevant to the criteria for OEF adjustments. Other variables such as the balance between overhead and underground assets are also captured in the econometric benchmarking.

2.2.5 Boundary with econometric benchmarking

Consequently there are significant interactions between the analysis for OEF adjustments and econometric benchmarking. For example in the sub-transmission OEF, some difference in the density of sub-transmission assets may be reflected in adjustments to reflect the circuit length kilometres. This suggests that only a residual for differences in sub-transmission asset density should be addressed in the sub-transmission OEF. (See Section 3.2 for the detail discussion with regards to sub-transmission.) This highlights the need for careful consideration in the OEF analysis of the boundary between the econometric and OEF benchmarking.

2.2.6 Zero point, reference point and comparison point

In the present analysis, each OEF estimate is a positive value relative to a defined **zero point** for each candidate OEF. This need not be absolute zero and may instead be the minimum expression of the OEF across the DNSPs. That is, the candidate OEF accounts for the variation in the additional OPEX for DNSPs above the OPEX that they all incur.

For example, all DNSPs have some sub-transmission assets. Accordingly, for this OEF, the zero point is the DNSP with the lowest density of sub-transmission assets, and the OEF estimates accounts for OPEX other DNSPs incur for their additional sub-transmission assets above this level (as a proportion). (See Section 3.2 for the detail discussion with regards to sub-transmission.) Under the approach set out in this report, all calculations are OEF estimates positive relative to the zero point.

It is important to recognise that although the selection of the zero point will affect the OEF estimates it will not affect the OEF adjustments (following the selection and application of the of the reference point) if applied in calculations in a manner that maintains the relativity between firms. That is, the OEF adjustment outcomes are unaffected by the selection of the zero point.

The zero point for making an OEF estimate should not be confused with the **reference point** for making an OEF adjustment. The OEF estimates represent the absolute variations across the sector regarding a candidate OEFs. The econometric benchmarking produces relative productivity scores; that is the productivity scores represent not only the absolute productivity of a firm employing its inputs to produce its outputs but also the relative productive performance between firms in the sector. Hence the OEF adjustments represent the relative differences candidate OEFs make to the productivity scores of all firms compared in the econometric benchmarking. The OEF adjustments are calculated, from the OEF estimates relative to a representative reference point. The selection of the point defined as a zero OEF does not change the relativity of the scores between the firms.

The AER's OEF adjustments reflect a non-zero reference point for analysing OEFs, consciously set as the customer-weighted average OEF estimates of the five DNSPs that form the **reference group** for the relevant period. Under this approach, by definition there may be negative OEF adjustments, including for around half of those in the reference group.[14] In this report we adopt the AER's practice of determining the reference point from the customer-weighted average OEF estimates of the reference group.

While both selected in relation to the reference group, it is also important not to confuse the reference point for making an OEF adjustment with the **comparison point** selected for the derivation of efficiency targets from productivity scores (see detailed discussion on efficiency target in Section 0 and examples in Table 8). These decisions are independent, and of significant consequence in the outcomes of the two processes illustrated in Figure 1. In particular, in the case that both the comparison point and reference point are determined by the same procedure, say the fifth ranked firm, then the two processes provide identical outcomes barring the capping function in determining the efficiency target, which only applies to the reference group.

2.2.7 OPEX for estimating OEFs

OEF costs are identified as costs that a firm would not otherwise have expended for the achievement of its productive outputs. These are additional expenses, so that the proportionate $OEF\%_A$ for firm A is defined relative to the excess costs over the efficient OPEX exclusive of OEFs:

$$OEF\%_A = \frac{OPEX\$^A_{exc\ OEF} + OEF\$_A}{OPEX\$^A_{exc\ OEF}} - 1 = {OEF\$_A}\big/{OPEX\$^A_{exc\ OEF}}$$

This is consistent with the positive adjustment with respect to a firm's own productivity score or OPEX. Furthermore where the OEFs are defined with reference to a common denominator, then the total OEF factor is equal to

14 Being more or less than half depends on the number in the reference group, and on their relative weightings.

$$Total\ OEF\%_A = \sum_{OEFs} \left(\frac{OPEX\$^{Efficient}_{exc\ OEF} + OEF\$_A}{OPEX\$^{Efficient}_{exc\ OEF}} - 1 \right)$$
$$= \frac{1}{OPEX\$^{Efficient}_{exc\ OEF}} \sum_{OEFs} OEF\$_A$$

Further, as discussed relative to the calculation of OEFs in Section 2.3.2 below, employing as the denominator anything other than than $OPEX\$^{A}_{exc\ OEF}$ introduces a significant error that is likely to exceed an error associated with an inefficient component in the costs used to identify $OEF\$_A$. Hence we wish to identify the efficient OPEX exclusive of OEFs.

2.2.8 Efficient OPEX exclusive of OEFs

As a top-down benchmarking method, the efficient OPEX exclusive of OEFs is not known or knowable prior to the quantification of efficient OPEX and of OEFs – a hermeneutic circle.

As a first estimate, the AER obtains the efficient OPEX exclusive of OEFs $OPEX\$^{Efficient}_{exc\ OEF}$ from the productivity metrics. The productivity score is a function of, among other things, a firm's efficiency in operational expenditure. Hence, all other things being equal, and already accounting for scale, the productivity score is a proxy for economic efficiency. An ideal efficiency target ET^{ideal}_A for firm A can be set by renormalizing the productivity score PS_A to a comparison point, that is the productivity score PS_{CP} of a comparison DNSP (or group of DNSPs) deemed to be efficient

$$ET^{ideal}_A = {}^{PS_A}/_{PS_{CP}}$$

The efficient OPEX exclusive of OEFs is then equated with an ideal efficient base OPEX obtained with this efficiency target

$$OPEX\$^{Efficient}_{exc\ OEF} = {}^{PS_A}/_{PS_{CP}} \times OPEX\$_{Base}\ {}^{PS_A}/_{PS_{CP}} \times \mathrm{f}(OPEX\$_{historical})$$

where the base OPEX is derived from adjustments to the firm's historical OPEX taking into account various trends and growth factors.

Provisionally for the purpose of demonstrating the calculations in this report we use an $OPEX\$^{Efficient}_{exc\ OEF}$ derived using the productivity scores from the latest 2016 productivity report and OPEX data in the accompanying benchmark RINs. The historical OPEX, efficiency target and resulting ideal optimised OPEX equated with the efficient OPEX exclusive of OEFs are provided in Table 8 below for each DNSP.

2.2.9 Processes for application of OEF estimate

Figure 1 in Section 2.2.1 introduced the optional processes for application of the OEF estimates to modify the productivity scores and/or ideal optimised OPEX. We distinguish these processes as they depend on the AER's regulatory discretion in the selections of the comparison point and reference point, and in the process for deriving efficiency targets from productivity scores.

In particular, as demonstrated for the current OEF estimates in Table 9, the OEF optimised OPEX derived by these two processes is identical when the method of selecting the reference point is the same as that for selecting the comparison point, except for members of the reference group. The difference for members of the reference group occurs because of the AER's process of capping efficiency target for members of the reference group as the comparison point is selected as the lowest member of that group. [15]

Table 6 Process outcomes are dependent on the selection of comparison/reference points

DNSP	Reference Group	OEF adj Efficiency Target - Process A	OEF Optimised OPEX - Process A	OEF adj Efficiency Target - Process B	OEF Optimised OPEX - Process B
ActewAGL	No	62.63%	$46,473	63.34%	$46,997
Ausgrid	No	62.27%	$406,430	62.97%	$411,015
CitiPower	Yes	104.51%	$58,355	100.00%	$55,840
Endeavour	No	82.85%	$226,384	83.79%	$228,938
Energex	No	88.72%	$341,272	89.72%	$345,122
Ergon	No	73.90%	$270,382	74.73%	$273,432
Essential	No	76.77%	$302,932	77.63%	$306,349
Jemena	No	94.61%	$69,137	95.67%	$69,918
Powercor	Yes	99.87%	$190,488	100.00%	$190,734
SAPN	Yes	100.04%	$248,483	100.00%	$248,377
AusNet	Yes	98.88%	$203,842	100.00%	$206,141
TasNetworks	No	94.98%	$61,388	96.06%	$62,081
United	Yes	100.29%	$118,066	100.00%	$117,721

To reiterate, in this report the ideal optimised OPEX has been utilised as the denominator in calculating percentage OEF estimates from dollar OEF values estimates as the first, best estimate of efficient OPEX exclusive of OEFs. While useful to the derivation of OEF adjustments, this is not integral to the process of applying these OEF adjustments to the derivation of either productivity scores or OEF Optimised OPEX.

There are different outcomes for all DNSPs when the AER's previous practices for selection of the comparison point (as the lowest of the reference group) and reference point (as the customer weighted average of the reference group) are followed, as demonstrated in Table 7.

15 In mathematical terms, the function of limiting the efficiency target of those in the reference group with productivity scores greater than the comparison point to one (or 100 percent) is a non-distributive function. Unlike simple multiplication where $A*(B+C) = A*B+A*B$, where $f(x)$ describes the capping function then $f(A*B) \neq f(A)*f(B) \neq A*f(B)$.

In this case not only is the effect of the capping function observed for the reference group, but also the effect of the slightly negative OEF adjustment for the comparison firm (Powercor) translates into a slight lift for non-reference group firms when taken into account in Process B.

Table 7 Alternative process outcomes with previous practice for selection of comparison/reference points

DNSP	Reference Group	OEF adj Efficiency Target - Process A	OEF Optimised OPEX - Process A	OEF adj Efficiency Target - Process B	OEF Optimised OPEX - Process B
ActewAGL	No	62.63%	$46,473	63.34%	$46,997
Ausgrid	No	62.27%	$406,430	62.97%	$411,015
CitiPower	Yes	104.51%	$58,355	100.00%	$55,840
Endeavour	No	82.85%	$226,384	83.79%	$228,938
Energex	No	88.72%	$341,272	89.72%	$345,122
Ergon	No	73.90%	$270,382	74.73%	$273,432
Essential	No	76.77%	$302,932	77.63%	$306,349
Jemena	No	94.61%	$69,137	95.67%	$69,918
Powercor	Yes	99.87%	$190,488	100.00%	$190,734
SAPN	Yes	100.04%	$248,483	100.00%	$248,377
AusNet	Yes	98.88%	$203,842	100.00%	$206,141
TasNetworks	No	94.98%	$61,388	96.06%	$62,081
United	Yes	100.29%	$118,066	100.00%	$117,721

2.3 Calculation approach

The starting point for the present analysis is the key outputs from the econometric benchmarking. Our interpretation of relevant outputs for the purpose of assessing OEFs is set out in Table 8.

The first column (historical OPEX) represents historical OPEX as reported in RIN data for the year to 30 June 2015. This represents the study year for the present OEF analysis. Historical OPEX is used as a proxy substitute for the base OPEX that is an input into the economic benchmarking process. For simplicity, historical OPEX is used to illustrate how these calculations work, and is not a representation of the AER's calculation of base OPEX.

The next two columns represent the results from econometric benchmarking. The second column represents the relative productivity score output from the EI model for the 2016 benchmarking report (up to 2015), highlighting the 0.772 score for AusNet as the fifth ranked score.

The fourth column represents the efficiency target obtained by the AER from the ratio of a DNSP's productivity score with that of the DNSP selected as the comparison point; in this case this fifth ranked score in keeping with AER's past practice. As a result of selecting a firm other than the first ranked DNSP as the comparison point, all firms in the reference group with scores above/equal to the comparison point are deemed efficient, and their efficiency targets are capped at 100 per cent.

Table 8 Departure point for OEF analysis ($June 2015)

DNSP	Historical OPEX	Productivity score	Rank	Efficiency Target	Optimised OPEX
ActewAGL	$74,201	0.441	13	57.1%	$42,402
Ausgrid	$652,692	0.453	12	58.7%	$383,230
Citipower	$55,840	0.922	2	100.0%	$55,840
Endeavour	$273,242	0.588	9	76.2%	$208,106
Energex	$384,682	0.624	8	80.9%	$311,043
Ergon	$365,893	0.516	11	66.9%	$244,630
Essential	$394,604	0.566	10	73.4%	$289,591
Jemena	$73,080	0.725	7	94.0%	$68,661
Powercor	$190,734	0.957	1	100.0%	$190,734
SAPN	$248,377	0.809	4	100.0%	$248,377
Ausnet	$206,141	0.772	5	100.0%	$206,141
TasNetworks	$64,629	0.749	6	97.0%	$62,684
United Energy	$117,721	0.871	3	100.0%	$117,721

Source: Sapere interpretation of AER econometric modelling outputs and RIN data

The final column provides the resulting ideal optimised OPEX for each DNSP, being the product of the historic OPEX and the efficiency target for the relevant benchmark period. Being derived from the 'raw' productivity scores, the ideal optimised OPEX is prior to any consideration of OEF adjustments.

Section 2.2.7 discusses the definition of quantified OEFs as a percentage relative to a DNSP's efficient OPEX exclusive of OEFs. As a top down method the efficient OPEX exclusive of OEFs is not known, *ex ante*. Hence we follow the AER's practice to approximate a DNSP's efficient OPEX exclusive of OEFs with the ideal optimised OPEX.

2.3.1 How OEFs increase OPEX

To ensure clarity over causal connections between OEFs and OPEX, we consider three main aspects of OPEX. This is consistent with the format for RINs as well as previous advice for the AER from EMCa AER.[16] OPEX consists of the following.

1. Network maintenance costs: including preventative, corrective and fault maintenance activities on the electricity network. These costs can also be split into direct (field) maintenance costs and indirect maintenance costs (i.e. maintenance support);
2. Network operating costs: including costs, other than maintenance costs, that are associated with the safe and reliable operation of the electricity network; and
3. Corporate overheads: including other costs associated with the operation of the electricity network business, not specific to the operation of the electricity network. These include customer services, demand management and corporate functions.

In addition, the AER requires that DNSPs nominate OPEX by major activity type, namely:

> (a) routine and non-routine maintenance; (b) emergency response; (c) vegetation management; (d) network overheads; and (e) corporate overheads.

For each OEF, we have considered which type of OPEX and activity categories may be affected. Some OEFs may relate just to one type of activity or cost category, while others may relate to multiple activities or cost categories.

2.3.2 Overall approach to quantifying OEFs

In assessing the impact of a candidate OEF on OPEX, we have referred to evidence regarding the impact on the actual OPEX of each of the 13 DNSPs. This includes reference to evidence on the relative exposure to an OEF category, along with relevant individual OPEX line items in RIN returns, where available.

A key challenge is assessing whether all of the incremental OPEX arising from a candidate OEF is attributable to that OEF, or whether some proportion is endogenous and represents inefficiency. If the assessment relied solely on actual OPEX for the DNSP under consideration, and this included an inefficient component, then the OEF adjustment could overstate the impact of the OEF candidate on efficient OPEX for that DNSP. On the other hand, if the productivity score for any (non-frontier) DNSP were applied, this would likely understate the impact of the OEF candidate on efficient OPEX for that DNSP.

This is because, to the extent the OEF candidate meets the OEF criteria and is material, then the productivity score is not a useful guide to assessing the efficiency of the OPEX associated with the OEF in question. The productivity score does not decompose OPEX and hence represents a relationship between total OPEX and the outputs as defined in the SFA model. It could be expected, however, that productivity may vary between different activities within a DNSP. Consequently, overall productivity for an individual DNSP may not be a useful guide to the efficiency of any particular activity within that DNSP. These

[16] See page 5, Report to AER on sparse rural network cost relationships- April 2015, EMCa.

two points are independent but may interact, further reducing the usefulness of total productivity scores for assessing the efficiency of any activities significantly affected by a candidate OEF.

The chosen approach is to seek to navigate a middle course between over or under-estimating the quantification of an OEF. As explained in detail for example in Section 2.3.2 below regarding the quantification of the sub-transmission/licence condition OEF category, the approach seeks to identify:

- a verifiable volume metric for differences in exposure to an OEF category – for example the proportion or count of assets affected; and
- an efficient unit cost metric relative to the OEF category (or cost subcomponent of that category).

While the approach to calculating an unit cost metric varies between OEF candidates relative to available data, in each case an assessment is made that the metric reflects efficient costs. This includes consideration of the reference group, but it is not assumed that the unit costs of non-reference group DNSPs are automatically inefficient (and conversely that the unit costs of a reference group firm are automatically efficient).

The unit cost metric is then applied to the volume metric to derive an initial total estimated efficient cost. This is compared with an estimated or observed actual cost. This may be from an individual OPEX line item where available. Where there is a difference, this implies that some portion of the observed OPEX is attributable to factors other than the OEF in question. Where there is no difference, this may indicate that estimated total (or actual) OPEX in relation to that OEF is likely to be efficient.

Once an assessment of total OPEX in relation to an OEF category has been identified, consideration is given to whether the initial estimate needs to be amended to reflect the efficient OPEX incremental to that already provided for in ideal optimised OPEX. For example, for sub-transmission overhead lines, the initial estimate is adjusted to reflect an assessment that the SFA model would already compensate for the efficient OPEX as if the same overhead line length were distribution instead of sub-transmission. In this case, the AER's previous view is that the incremental unit OPEX of sub-transmission overhead lines is two times the distribution unit OPEX. Accordingly, in this assessment, the initial estimate of total OPEX for overhead sub-transmission is divided by half so that only the incremental component represents the OEF estimate. As discussed earlier in this section, there is a further adjustment to the OEF estimate to take into account the reference point for each OEF.

The approach adopted for quantification is, by construction, a first order, linear estimate of the efficient OEF OPEX. This reflects both that, in terms of developing an economic model that reflects the reality of the industry, OEFs represent a second order improvement of the accuracy of the SFA model and that OEFs are focused on variable costs.

While the approach adopted is considered better than relying either on estimated incremental OPEX or applying productivity scores to estimated, incremental OPEX, it is recognised the resulting estimates are nevertheless imperfect. This reflects for example differences in efficient unit rates that are attributable to the nature and impact of the OEF, to differences in scale and other non-linear effects.

One further consideration is that, in previous approaches to quantifying OEFs, in the process of converting an OEF dollar value into an OEF percentage estimate, the error arising from any inefficient component of the numerator/denominator is less significant than the use of a denominator that is inclusive of OEFs. This underpins our consistent adoption of ideal optimised OPEX as the denominator in such calculations.

While acknowledging these limitations, it should be noted that the AER's OEF framework is an adjunct to econometric benchmarking. It is therefore fundamentally more of a 'top down' costing approach than a 'bottom up', engineering or activity based costing approach. The objective is to optimise the economic benchmarking outputs relative to varying operational environments, to the extent the econometric benchmarking does not fully take into account candidate OEFs that meet the OEF criteria. As such, the current project fits into a program of continuous development of the econometric benchmarking.

2.3.3 OPEX-CAPEX trade-offs

Differences in OPEX over time or between firms can in part be accounted for by variations in OPEX vs. CAPEX decisions over time or between firms. For example a DNSPs utilising more expensive steel poles and termite proof cables will have an insignificant termite related OPEX compared with DNSPs with a large fleet of cheaper untreated wood poles will have a material OPEX cost to manage the impact termites can have on these assets.

This means that, over time, OPEX-CAPEX trade-offs are within management control. Hence OEF candidates relating to these trade-offs may not meet the exogeneity criterion.

CAPEX / OPEX trade-offs for candidate OEFs in this project have been considered. If the CAPEX / OPEX trade-off is a material driver of the efficiency target, then an inverse relationship between CAPEX benchmarks and OPEX benchmarks would be evident in the econometric analysis.

In general, OPEX/CAPEX trade-offs do not appear to be a significant driver of variations in OPEX productivity scores between DNSPs. This reflects our understanding that the partial and total productivity scores from the econometric benchmarking are broadly in alignment.[17] This suggests that differences in apparent OPEX productivity are unlikely to be attributable to differences in asset intensity.

Looking forward, some industry dynamics need to be taken into account in considering OPEX vs. CAPEX. An example presented by a non-assessed DNSP is cloud based provision of information technology services, as an alternative to the capital purchase of technology assets. This suggests that OPEX vs. CAPEX may continue to require attention in the AERs OPEX benchmarking process and the evolution of the AERs benchmarking program. This can be addressed under the 'step change' assessment in the consideration of OPEX in future regulatory resets. We understand that the AER is currently reviewing differences in cost allocation and capitalisation polices between DNSPs, and their effect on benchmarking.

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17 The one exception ActewAGL and related to the capitalisation OEF, As discussed in Section 3.9, following revisions to RIN data, this OEF is no longer required.

2.3.4 Adjustment for inflation

Quantifying OEFs inevitably involves comparing and/or combining expenditure from different reporting periods. For comparison on an equal basis nominal dollars must be converted into real dollars at a particular point in time, using a series of multiplication factors to convert $1 in the calendar/financial year to $(real, year). This has been done by the AER for each previous decision at that time. Complicating this, DNSPs vary on the basis for reported data between calendar and financial years, requiring two conversion series.

There is some variation between our estimates from the AER's previous findings on OEFs simply from updating various OEF estimates from different periods to one common period.

The AER's calculations have been consistent in that all AER methods utilise the same Australian Bureau of Statistics 6401.0 Consumer Price Index series, specifically series A2325846C (Index Numbers; All groups CPI; Australia). However, we have observed a variety of calculations for obtaining conversion factors from ABS indices.

We have obtained two conversion series of the multiplications factor to convert $1 in the calendar/financial year to $(June 2015) – the latest year for which we have benchmarking data, including operating expenditure – by the ratio of the ABS indices for June 2015 and either June (mid-calendar year) or December (mid-financial year).

2.3.5 Annualisation

As noted earlier, the efficiency target used to derive ideal optimised OPEX flows from the benchmarking period applied in the econometric benchmarking. This means that in deriving OEF estimates, duration and frequency issues need to be taken into account as the impact of the OEF over the period is summarised in a annual average value.

Benchmarking period

The latest 2016 economic benchmarking report provides analysis for a ten year benchmarking period. It should be noted the data reporting periods are calendar years for Victorian DNSPs and financial years for all other DNSPs. For commensurability, all dollar values are converted into June 2015 dollars in this report.

The previous results of the AER's benchmarking analysis reflect the average distance from the defined frontier for the relevant DNSPs over defined benchmarking periods.[18] The period varies depending on the DNSP, and the time of the previous AER decision. Consequently updating information for this report may involve either extending the benchmarking period, updating the real dollar value, or both.

Annualisation of effects shorter than the benchmarking period

A number of material OEFs have undergone step changes over the benchmarking period. This often reflects changes in regulation. A notable example is the introduction of new bushfire regulations in Victoria. In its 2015 Queensland decisions, the AER noted regarding

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18 See for example AER, Annual benchmarking report - Electricity distribution network service providers, November 2016 and AER, Ausgrid final decision, Attachment 7 page 70.

bushfires that regulatory costs for Black Saturday regulations were in place for three of eight benchmarking years, so diluted annualised cost based on available data by three eighths.

For consistency, we have applied this approach for every OEF, where applicable. Most notably, however, the dilution factor has changed compared with prior analyses because the benchmarking period is longer – in the bushfire example the regulations have now been in effect for half of the benchmarking period.

Consequently, for a number of OEFs, there is an explicit annualisation step. This involves assessing the duration or probabilistic incidence of the OEF within the benchmarking period. For example, if a regulatory OEF is deemed to meet the criteria for five years out of the benchmarking period, then the initial estimate of the OEF will be divided by two in the annualisation calculation.

We are aware of the potential objection to this approach, namely that data toward the beginning of the benchmarking period may not be as useful as data toward the latter part of the benchmarking period. We consider that is principally a matter to be addressed in the economic benchmarking analysis. The annualisation step in the OEF analysis may be adjusted accordingly, following any change to the economic benchmarking analysis.

Low frequency events

A number of OEFs relate to events, typically climate related, that, while randomly occurring at low frequency are nevertheless regular enough to be annual or semi-annual events with associated expenditure that may systematically differ between firms. There is some likelihood in any cyclone season, for example, that Ergon will incur OPEX associated with the minimisation, preparation and response to cyclone damage in its network area, although the total impact of individual events will vary.

It is useful to think of these events as a group and to apply a consistent approach to estimation of the effect on OPEX of these OEFs. This also highlights potential boundary issues. For example, for bushfires, a significant element of expenditure is risk avoidance and minimisation, and this may form part of ongoing OPEX, not captured in emergency response expenditure data.

In considering OPEX costs in relation to low frequency events, we consider the following four elements.

1. **Avoidance/minimisation.** This includes OPEX incurred at any time to avoid or minimise the impact of future low frequency events. This may include incremental asset inspection and maintenance cycles. These may in turn relate to vegetation management (bushfires and storms), earthworks management (floods) and ongoing asset checking and maintenance (e.g. to maintain adequate tension on feeders to reduce line sag etc.).

2. **Emergency preparation.** This includes costs incurred in preparation for an expected event, even if the event does not incur. This may include pre-positioning crews and equipment and additional avoidance/minimisation activities over and above "normal". It may also include increasing call centre resources and other additional activity.

3. **Emergency response.** This includes additional truck rolls in response to specific reports of damage etc. It may also include hiring additional resources, repositioning resources, over time, and so on.

4. **Repair and restoration.** This may include the incremental cost of short term fixes (e.g. portable generators etc.), along with any additional repair and restoration costs, depending on capitalisation policies.

Annualising these costs must give consideration not only to the total costs within the benchmarking period, but also to the relative frequency with which such costs are incurred.

Very low frequency events

Both the frequency and severity of climatic events damaging to network services occur under probability distributions that include rare, high impact events. What sort of OEF adjustment to productivity measures is appropriate for such events? A calculation of an annualised value would need to incorporate variations between DNSPs in the probability of such an event occurring within the benchmarking period.

At some point where events are so rare that they do not qualify as recurrent costs. These costs are not recovered from OPEX set on an *ex ante* basis but perhaps under an *ex post* (pass through) approach where they constitute *Force Majeure* and meet the pass through threshold test in the National Electricity Rules. In principle this is similar to the STPIS where some types of event are excluded. It is also similar to the AER's discussion in its decisions regarding non-recurrent costs (see box).

AER on non-recurrent costs[19]

'We are not satisfied that an OEF adjustment should be made for non-recurrent costs. Providing an OEF for non-recurrent costs would treat those costs as if they were recurrent. Economic Insights' benchmarking results are used as the basis for our forecast of opex. If we adjust the benchmarking results with an OEF adjustment for non-recurrent costs, it has the effect of including those non-recurrent costs in our opex forecast.

Additionally, an OEF adjustment for a non-recurrent cost would not meet the duplication OEF criterion. Economic Insights' SFA model takes non-recurrent costs into account. The SFA efficiency scores are based on the average performance of service providers over the period. Therefore the effects of transitory increases or decreases in relative opex efficiency are reduced. Also SFA modelling accounts for transitory variations in data using a compound stochastic variance term. This statistical technique accounts for random shocks in opex.[20]

The SFA model already accounts for random shocks in OPEX such that such shocks for rare high impact events should be excluded from OEF adjustments on the principle of duplication. This requires care in the assessment of climatic events and the corresponding

19 AER, Ausgrid final decision 2015–19,Attachment 7 – Operating expenditure, p7-184

20 Aigner, D.J., C.A.K. Lovell and P. Schmidt, Formulation and estimation of stochastic frontier production function models, Journal of Econometrics 6, 21-37, 1977, p. 25.

DNSP expenditures to determine whether these costs are low frequency or very low frequency or some mixture of the two, and their inclusion or exclusion in the OEF adjustments, as appropriate.

2.4 Data sources

The project began with a desk top review of existing material held by and generated for the AER in the course of previous regulatory decisions with respect to Queensland, NSW and the ACT.

Among the challenges in extending the OEF framework to non-assessed DNSPs is the relative absence of data on OEFs for the other eight DNSPs in the NEM or in the process of joining the NEM (P+WC). Accordingly, in the course of this project additional data was sought from the non-assessed DNSPs.

The information sought, with assistance from the AER, was readily available qualitative information. Views of the eight non-assessed DNSPs were sought on whether any of the current material OEFs would be applicable, and whether any other OEF categories might be material.

We refer to and rely on the same data sources as the AER, except where explicitly stated otherwise. Data sources include:

- Information in the AER's Appendix 7 for each Draft and Final Regulatory Determination for the group of six.
- Data supplied by DNSPs for the purpose of both Economic Benchmarking and Categorical Analysis Regulatory Information Notices (RIN).
- Data supplied by DNSPs in or accompanying submissions from DNSPs through regulatory decision making processes
- Information in the AER's Appendix 7 for each Draft and Final Regulatory Determination for the remaining DNSPs.
- Other publicly available relevant data regarding weather and other extreme events, including from the Bureau of Meteorology (BOM) and the Australian Bureau of Statistics (ABS)
- Publicly available information regarding the economic impact of regulations. For example, regulatory impact assessments of Work Health Safety regulations for the Commonwealth, NSW and WA governments.

In assessing information for the purpose of quantifying an OEF (accepted as meeting the three OEF criteria), for an individual DNSP or set of DNSPs, we have set aside consideration of productivity scores. This reflects a view that productivity scores may not provide a useful guide as to the relative performance of the DNSP with respect to the OEF in question. As discussed below, this approach has contributed to method and data that has been applied to quantify the OEF in question. This in turn has influenced the quantification with respect to a number of OEFs, including those related to: sub-transmission, extreme weather, termite exposure and vegetation management.

For a number of candidate OEFs, currently available data is not sufficient to form even a preliminary view. In other cases, preliminary estimates set out in this report could be amended in light of new information and data.

2.5 Conclusion

Overall, care must be taken in describing and calculating the likely effect of each operating factor as these calculations intertwine with the processes for their application, and hence decisions subject to regulatory discretion, in addition to issues to do with their definition, sources of data and calculations.

Some clarifications and changes to the underlying OEF methodology, and for greater consistency in the application of the methodology across OEFs, are proposed. The proposed changes do not affect the exercise of regulatory discretion in terms of the selection of the comparison point for deriving ideal optimised OPEX, the selection of the reference point for deriving OEF adjustments, or the capping of the efficiency target for the reference group.

Therefore the primary results of this study are the OEF estimates in dollar terms for the reference year, where the subsequent results are conditional on either temporal assumptions or the preferences of the regulator in decisions that accommodate regulatory discretion.

- The OEF estimates in percentage terms have been calculated assuming as the denominator the ideal optimised OPEX derived from the productivity scores obtained in 2016 applied to historical OPEX.
- The OEF adjustments have been calculated using the reference point selected by the AER's existing practice (customer weighted average of the reference group in the reference year).
- The derivation of OEF Optimised OPEX from these OEF adjustments is strongly dependent on regulatory discretion in a range of decisions in their application, with two overall processes available for application to the entire group of DNSPs. The overall values calculated here have been calculated using the process more similar to previous practice as applied to DNSPs in the non-reference group.

After these conditions of the conceptual framework, there are a range of practical considerations in the calculation of OEF estimates. Some of these calculation issues lead to OEF adjustments varying from the AER's previous adjustments even when where we have concurred on candidate OEF and used the AER's data for the OEF dollar estimate. These factors include the periods used for adjustment for inflation and annualisation.

3. Analysis of material OEFs

3.1 Introduction

Building on the analysis set out in Section 2, this section:

- identifies the most material factors driving apparent differences in estimated productivity and operating efficiency between the distribution networks in the NEM, and
- quantifies the likely effect of each factor on operating costs in the prevailing conditions.

Use of regression analysis in this report

The use of regression analysis to establish relationships between key factors must be interpreted with care. Correlation does not imply causality.

Across a sample size of 13, regression analysis can assist in identifying relationships between variables that may require further investigation. For example, if a material OEF is not accounted for in the econometric benchmarking, other things being equal, a firm with the greatest exposure to that OEF is more likely to have a lower productivity score than a firm with the lowest exposure to that OEF. Where an apparent correlation exists, it is of course possible there are explanations other than the OEF of interest.

Regression analysis has been used in the report to identify areas for further analysis. Examples of this are when seeking to test whether a candidate OEF may have already been addressed in the econometric analysis and hence affected by the non-duplication criterion. In general, a weak correlation between a candidate OEF factor (or a secondary determinate of a factor) and productivity scores has been interpreted as indicating that the candidate OEF is more likely to have been addressed in the econometric analysis (duplication may be present). On the other hand, a stronger correlation between a candidate OEF factor and productivity score has been interpreted as indicating the candidate OEF is less likely to have been addressed in the econometric analysis (non-duplication is more likely). In either case, further inquiries and consideration are required before firm conclusions as to causality can be drawn.

3.2 Sub-transmission and licence conditions

The boundary between transmission and distribution varies as a result of historical decisions made by state governments when establishing distribution and transmission electricity corporations. These decisions in turn reflected variations in the historical boundaries between vertically integrated bulk supply organisations, owned by the State government, on the one hand, and distribution and retail, often owned by local governments, on the other. Consequently, DNSPs are responsible for varying amounts of higher voltage assets.

Variations in sub-transmission OPEX between DNSPs reflect a number of variables including differences in:

- total sub-transmission capacity as a proportion of maximum demand; and
- within overall sub-transmission capacity, the mix of sub-transmission transformer and lines capacity.

These variables in turn reflect differences in:

- the historical boundaries between transmission and distribution assets on the establishment of DNSPs;
- the extent to which the DNSPs supplies large customers at sub-transmission voltages;
- density of sub transmission substations resulting in varying installed transformer density as a result of the efficient application of planning criteria ;
- planning and reliability regulations ("licence conditions"); and
- the extent capacity investment responded to changing forecast and actual demand patterns ('capital governance').

These differences may result in under or over-estimation of OPEX efficiency between DNSPs. The AER has previously determined that both sub-transmission and licence conditions meet the OEF criteria and made two OEF adjustments accordingly. For reasons explained below, in this report the sub-transmission and licence conditions OEFs are considered jointly.

3.2.1 Assessment against OEF criteria

Sub-transmission

Sub-transmission related OPEX is assessed to meet all three OEF criteria. The historical boundary between transmission and distribution businesses, and the extent of demand provided at medium to high voltage (greater than 33kV), are outside the control of DNSPs. These are exogenous variables.

Variations in sub-transmission OPEX are not fully accounted for in the econometric benchmarking. The line length metric only partly accounts for sub-transmission line length. It captures the length but not the incremental cost of maintaining sub-transmission lines compared with distribution lines. Similarly, the ratcheted maximum demand metric does not take the cost of servicing sub-transmission transformer capacity into account. Sub-transmission is assessed to meet the materiality criterion.

What drives higher sub-transmission OPEX?

Sub-transmission assets require more OPEX than distribution assets. From our analysis of RIN data, we have concluded that average efficient per kVA corrective and preventative operating and maintenance OPEX for zone substation is almost four (4) times that for distribution substations. The maintenance of sub-transmission conductors is also more costly than for distribution. In its previous decisions, from analysis of Ausgrid data, the

AER found the unit cost of maintaining transmission assets was around double that for distribution line assets.[21]

Sub-transmission assets principally consist of transformers, conductors and associated facilities. For conductors, the associated facilities include underground and overhead structures. For transformers, the associated facilities include the land and property on which the transformers are located and housed.

For both types of sub-transmission assets, there is associated OPEX. For transformers this involves operating and maintaining sub-transmission substations. For open switchyards, this includes maintaining security and fencing, along with vegetation management and ground surface water control. For substations in urban areas, and especially in CBDs, this is likely to require operating, maintaining and protecting a significant enclosed space.

Sub-transmission transformers are significantly larger and more complex to maintain compared with distribution transformers. This is a function of the more regular on-site inspections and the need to maintain more complicated equipment such as automatic tap changes, bulk oil transformers with cooling and breathing systems, large scale breakers and switches, and secondary systems.

As a larger transformer generates more heat, there is also a higher cooling requirement. For closed substations, in urban and especially CBD areas, this may require air conditioning. Since the reliability impact of any sub-transmission outage is more significant than a distribution outage, there is a need for increased monitoring, maintenance and physical protection of sub-transmission transformers.

Distribution transformers, the low voltage system and, in part the high voltage system, offer a reasonable degree of flexibility in terms of relocations, alternations, modifications and new connections. This means that excess capacity resulting from historical licence conditions can be more readily relocated or diverted to areas where that capacity can be better utilised. On this basis, we consider that this suggests that higher OPEX attributable to licence conditions should not be sustained following removal of the licence condition and should therefore be reconsidered from time to time.

Differences in sub-transmission asset density

Figure 2 compares sub-transmission assets scaled to OPEX for each DNSP. DNSPs have been ranked from left to right depending on the extent of sub-transmission capacity per a standardised $1m of historical OPEX (total) for this activity. This can be further analysed into line lengths (km of sub-transmission line per $1million OPEX) and sub-transmission transformer capacity (kVA per $1million OPEX).

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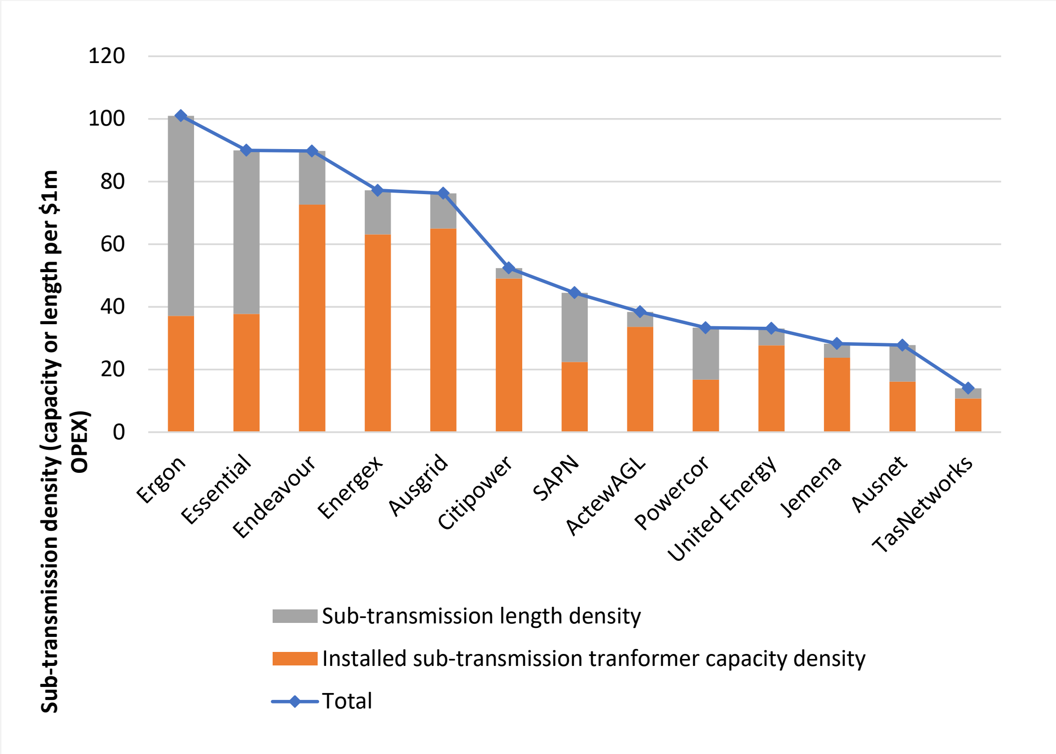
21 AER, Draft decision Ausgrid distribution determination 2014-19, Attachment 7: Operating expenditure, p7-192.

Figure 2 Sub-transmission asset density

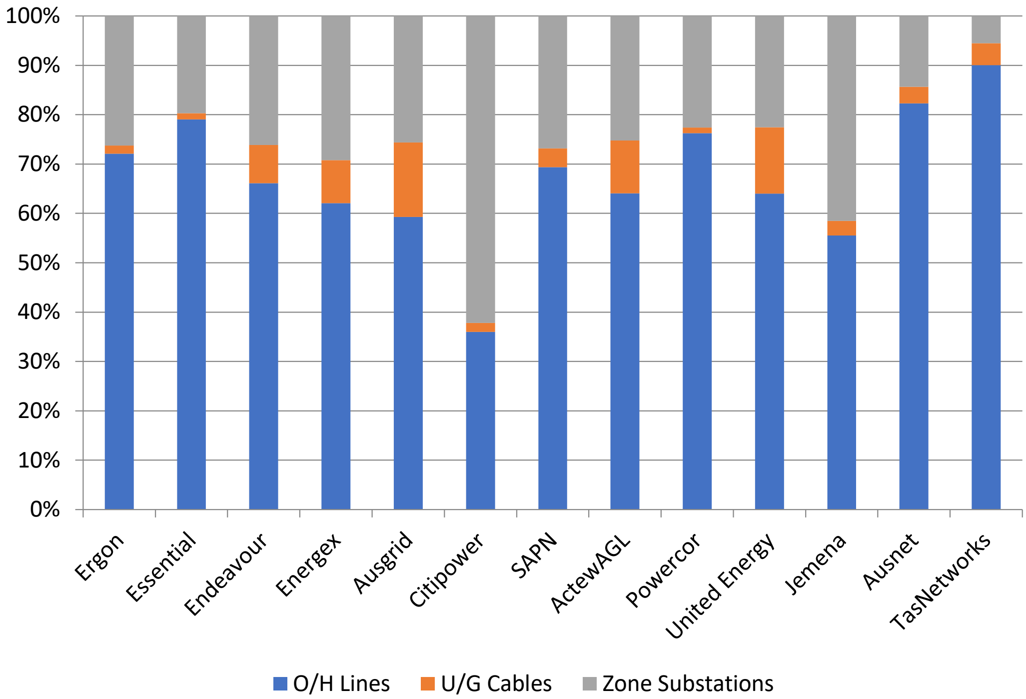


This highlights that Queensland and NSW DNSPs have the highest overall sub-transmission asset density over the group. CitiPower is the only member of the reference group of DNSPs with significant sub-transmission. This analysis also highlights that there is significant variation in the make-up of sub-transmission assets between DNSPs.

Figure 3 below provides further detail regarding variations in the composition in reported sub-transmission OPEX. This chart highlights the high proportion of sub-transmission transformer OPEX reported by CitiPower. It also reflects differences in the proportion of overhead and underground line related OPEX.

This suggests that OPEX for both major sets of sub-transmission asset types needs to be accounted for in a sub-transmission OEF. Accordingly, we have sought to account for transformer-related as well as conductor-related OPEX.

Figure 3 Variations in reported sub-transmission OPEX components



Source: Sapere- Merz analysis of CaRIN data

Reliability standards ('licence conditions')

Viewed independently from other OEFs, regulations or Codes requiring higher levels of network reliability clearly meet the OEF criteria for NSW and Queensland. These reliability requirements are imposed by State based regulation, or a State based Code, pursuant to State statutes. The DNSPs may seek to influence but do not control these regulations.

For the period they were in force, these State based regulations required substantial increases in sub-transmission capacity, in order to meet mandated reliability standards. The additional sub-transmission capacity gives rise to higher OPEX than otherwise and this increase is material relative to total OPEX.

Queensland

In Queensland, under an Electricity Industry Code, operating under the Electricity Amendment Bill (2004), Energex and Ergon were required to meet Minimum Service Standard (MSS) arrangements. The MSS limits are a set of network reliability standards that establish minimum levels of network performance for the duration and frequency of outages on the electricity distribution networks. The MSS were set out in Section 2.4 of the Code.

The Code required that Energex and Ergon must use their best endeavours to meet these standards.[22]

The Code was implemented in 2005, in response to recommendations made by the Electricity Distribution and Service Delivery (EDSD) review panel. The Queensland Competition Authority (QCA) reviewed MSS limits and reset the initial EDSD targets in 2009. The outcome of the 2009 QCA review was a scaling down of the improvement in reliability targets envisaged by the EDSD, based on the QCA's views on the level of reliability for which customers were willing to pay.

In 2014, the Queensland government decided to implement the recommendations of the Independent Review Panel on Network costs[23]. Accordingly, MSS were removed from the Code effective from 1 July 2014. In its place, it appears the MSS requirements were transferred to Ergon and Energex pursuant to a Ministerial direction under S115 of the Government Owned Corporations Act (Qld.). In addition, MSS were set at levels applying at 2010-11 levels, being significantly lower than would have otherwise applied from 1 July 2014.

NSW

In NSW, DNSPs operate under licence conditions under the Electricity Supply Act 1995 (NSW). A set of licence conditions for DNSPs, dated 1 December 2007, established design, reliability and performance requirements.[24] Following a review undertaken by the AEMC in 2012, these licence conditions were amended. In the current version of these licence conditions, the former schedule 1 (Design Planning Criteria) to NSW licence conditions has been removed entirely.[25]

Duplication between licence condition and sub-transmission OEFs

On reviewing licence conditions for NSW, and especially Schedule 1, it is clear these conditions overwhelmingly relate to sub-transmission, not distribution.[26] In its original form, under Schedule 1, the highest security standard (N-2) applied to sub-transmission lines and sub-transmission substations. The same standard also applied to zone substations in the CBD.

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22 See page 1, *Review of Minimum Service Standards and Guaranteed Service levels to apply in Queensland from 1 July 2015*, Queensland Competition Authority Draft Decision, March 2014.

23 See page 1 *Review of Minimum Service Standards and Guaranteed Service Levels to apply in Queensland from 1 July 2015,* Queensland Competition Authority, Final Decision, June 2014,

24 See *Design, reliability and performance licence conditions for Distribution Network Service Providers*, Ian Macdonald MLC, Minister for Energy, 1 December 2007.

25 See for example the current version of these licence conditions for Ausgrid, dated 28 November 2016 and available at: https://www.ipart.nsw.gov.au/files/sharedassets/website/shared-files/licensing-administrative-electricity-network-operations-proposed-new-licence-conditions/ausgrid-ministerial-licence-conditions-1-december-2016.pdf

26 See Schedule 1 (Design Planning Criteria) of the design reliability and performance – distribution network service provider's licence conditions – 1 December 2007, NSW Government.

A lower standard applied to distribution substations in the CBD (N-1), and to CBD and urban distribution feeders. For urban distribution feeders, the customer interruption duration was four hours compared with nil in the CBD.

The term "CBD" is defined in the definitions as the area within the City of Sydney that is supplied by the triplex 11kV cable system.[27] Ausgrid is therefore the only NSW DNSP that appears to be materially affected by the distribution component of the licence condition. This is not to say that the licence conditions had a zero impact outside the CBD, only that it is unlikely to be a significant component of OPEX.

Similarly, as noted in a 2015 AER draft decision, in Queensland reliability standards that applied from financial year 2005 to financial year 2012 applied to bulk supply substations and zone substations. Energex was also required to have N-1 redundancy on sub-transmission feeders.[28]

Accordingly, it appears the major impact of the licence conditions in both Queensland and NSW relates to sub-transmission. This reflects the basic point that improvements in sub-transmission reliability may have a significant effect on reliability and security for end users, while avoiding the very substantial cost of duplicating the entire low voltage network.

This suggests that the OPEX impact of the largest component of the licence condition OEF would be fully accounted for in the sub-transmission OEF estimate. Incorporating the OPEX impact of greater sub-transmission density in the licence conditions OEF estimate would not be consistent with the non-duplication criterion. Accordingly, any adjustment for this OEF is limited to distribution. As discussed below, in our quantification, we did not identify any material incremental distribution OPEX attributable to licence conditions.

Figure 4 below compares distribution and sub-transmission transformer capacity relative to ratcheted maximum demand and raw productivity scores from econometric benchmarking.

While there is a clear pattern relating higher sub-transmission capacity with the five DNSPs that operated under licence conditions. The distribution data indicates that, with the exception of one outlier, the DNSPs provide capacity at a relatively constant multiplier of demand independent of productivity outcomes. This lends support to the view that the distribution component of the licence condition OEF is unlikely to be material.

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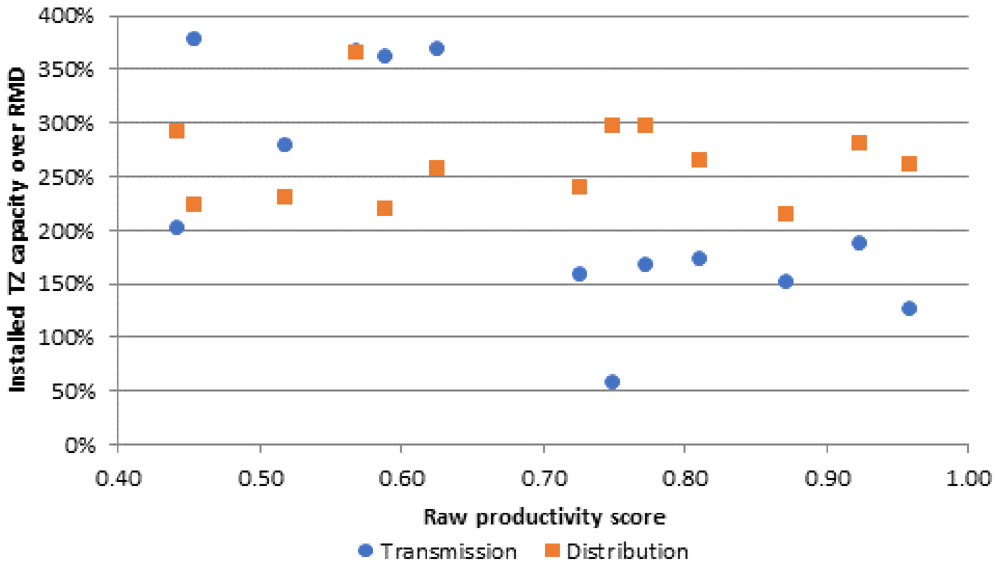
27 Ibid. see page 12

28 See page 232 of Attachment 7 – Operating expenditure; Ergon Energy preliminary determination 2015-20, dated April 2015.

Figure 4 Productivity score relative to sub-transmission capacity over ratcheted maximum demand



Source: Sapere/Merz analysis of RIN data

3.2.2 The preliminary finding

Our preliminary assessment of the OPEX impact of this OEF relative to the AER's previous assessment of sub-transmission and licence conditions OEFs is set out in Table 9 below.

Table 9 Sub-transmission and Licence Conditions (%, $000, $June 2015)

DNSP	AER OEF adjustment		S-M OEF estimate		S-M OEF adjustment	
ActewAGL	0.00%	$0	3.49%	$1,480	1.20%	$510
Ausgrid	6.40%	$24,527	8.39%	$32,162	6.11%	$23,402
Citipower	0.00%	$0	5.71%	$3,191	3.43%	$1,914
Endeavour	5.60%	$11,654	9.70%	$20,193	7.42%	$15,436
Energex	3.20%	$9,953	8.14%	$25,311	5.85%	$18,200
Ergon	5.30%	$12,965	6.16%	$15,074	3.88%	$9,482
Essential	4.30%	$12,452	5.83%	$16,891	3.55%	$10,271
Jemena	0.00%	$0	2.01%	$1,383	-0.27%	-$186
Powercor	0.00%	$0	1.42%	$2,701	-0.87%	-$1,660
SAPN	0.00%	$0	2.44%	$6,051	0.15%	$373
Ausnet	0.00%	$0	1.15%	$2,366	-1.14%	-$2,347
TasNetworks	0.00%	$0	0.01%	$8	-2.27%	-$1,425
United Energy	0.00%	$0	2.63%	$3,097	0.35%	$406
Reference point	0.00%		2.29%			

For most of the OEF assessed DNSPs, the proposed sub-transmission/licence conditions OEF is significantly higher than the combined AER's adjustments for sub-transmission and licence conditions. This reflects the net effect of:

- The significant OEF estimates for the reference group, including CitiPower as the 3rd ranked DNSP for this OEF, such that the reference point for the calculation of the OEF adjustment is significantly higher than previously assumed, being 2.3 per cent.
- The calculation of the OEF estimates based only on the direct cost impacts differences in sub transmission density in contrast to averages based on each DNSPs total OPEX adopted by the AER.
- The removal of the sub-transmission component of the licence conditions OEF, which we consider does not meet the non-duplication criterion;
- The finding that the distribution component of the licence conditions OEF does not meet the materiality criterion; and
- The inclusion of sub-transmission transformer capacity as well as lines capacity in the sub-transmission OEF (representing 84 per cent of the total value of this OEF).

3.2.3 Quantification

This section discusses the quantification of the sub-transmission-licence condition OEF.

Derivation of sub-transmission OEF adjustment

The sub-transmission OEF estimate is the sum the efficient costs for each asset class (overhead and underground lines, and transformers). This is derived by multiplying, for each asset class, an efficient unit cost derived from the reference group by an asset volume adjusted to the zero point for sub-transmission (see discussion on zero point for sub - transmission below).

We use specific information within the categorical RIN data on the cost and density of the three classes of sub transmission assets. The costs included are combined direct costs (routine and corrective maintenance) of maintaining overhead and underground assets and of maintaining zone substations. Asset densities are derived from total overhead and underground sub-transmission and distribution line lengths and zone substation installed transformer capacity and distribution transformer installed capacity.

Zero point adjustment of asset volumes

The cost calculation applies the unit cost to the volume of each sub-transmission asset class in excess of the minimum density of sub-transmission assets (the zero point).

For each asset class (line length or installed transformer capacity) is expressed as a percentage density relative to the ideal optimised OPEX. The sub-transmission percentage of an asset class for a DNSP is reduced by the minimum percentage for that class, and that adjusted percentage is applied to total line length or transformer capacity to obtain the adjusted sub transmission line length and installed sub-transmission substation capacity for that DNSP. For example TasNetworks has the lowest proportion of overhead sub-transmission lines (0.2 percent), so the adjusted kilometres of overhead transmission line length of each DNSP is the product of their percentage of overhead sub-transmission line length reduced by 0.2 percent applied to their total line length.

Derivation of efficient unit costs

There are several issues in deriving a unit cost for each asset class from the source data. In the first step the RIN data is applied to determine a direct cost per km or direct cost per installed zone substation capacity for each DNSP.

The direct overhead/underground maintenance costs do not directly provide the direct maintenance costs associated with the sub-transmission line lengths, so that it is necessary to separate sub-transmission direct maintenance costs from the total direct maintenance. This requires understanding the differential cost factor between maintaining a kilometre of sub-transmission line and a kilometre of distribution line.

For current purposes we have adopted the AER's assumption of a factor of two between maintaining a kilometre of sub-transmission line and a kilometre of distribution line (see discussion above). The use of this factor is not ideal and could be addressed by separating the sub-transmission and distribution direct maintenance costs within the RINs, as is the case with transformer direct maintenance costs.

Then the AER stated that the sub-transmission OEF was in part already accounted for by the inclusion of the circuit kilometres parameter in the economic benchmarking. The OEF then provides a correction for the additional rather than the total costs – in this case one unit out of two, so that the incremental unit cost is equal to the unit cost of distribution line.

Zone substation maintenance costs are identified separately within the RINs and are used directly, so a similar calculation using the two times factor for line lengths is not required.

There is a material difference between the highest and lowest cost DNSP, for example by a factor exceeding ten for line lengths. This cost difference is beyond what the authors would expect because of situational or environmental factors between the firms. This suggests that each firm may be using a different method to establish these costs in the Category RINs. This situation could be improved over time with better clarity for DNSPs on how to calculate these costs and/or a process of audit on the calculation of these costs.

For current purposes, we have adopted the direct costs of the reference firms as the basis of the efficient unit costs. We exclude any DNSPs with costs below 30 per cent or above 300 per cent of the average of all DNSPs as outliers[29]. The direct costs of the reference firms, excluding outliers are used to calculate an efficient unit cost on a weighted average basis.

The preliminary result is that transformer capacity is found to represent 84 per cent of the total value of the sub-transmission/licence conditions OEF. The proportion varies between DNSPs, reflecting variations in transformer and overhead sub-transmission asset densities between DNSPs.

3.2.4 Areas for further consideration

The analysis detailed in the chapter would benefit from additional data and information on the following matters.

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29 SAPN is excluded as an outlier from the reference group for the calculation of both overhead and underground costs per km.

1. Evidence or data on the materiality of additional investment in distribution assets, in response to licence conditions in NSW and Queensland.

2. Evidence or data regarding constraints on the relocation or re-use of any distribution transformer capacity in response to licence conditions in NSW and Queensland, and hence whether higher related OPEX is persistent after the removal of licence conditions.

3. Planned and emergency maintenance costs in the category RINs to be calculated on a common and defined basis across the DNSPs to improve confidence in the data set across all DNSPs.

4. Separation of the planned and emergence maintenance costs for sub-transmission lines and distribution lines in the Category RINs.

3.3 Harmonisation of WHS regulations

All NEM jurisdictions other than Victoria have enacted Model WHS laws.[30] National harmonisation of WHS legislation forms part of the Council of Australian Government's National Reform Agenda (NRA), agreed through a 2008 Intergovernmental Agreement for Regulatory and Operational Reform in Occupational Safety (IGA).[31] As with other aspects of the NRA, the IGA aims to reduce regulatory burdens and create a seamless national economy.

The Victorian government decided in 2012 not to adopt the Model WHS laws. This decision accompanied publication of a report by PWC prepared for the Victorian Government.[32] This report concluded 'the costs of adoption of the Model WHS laws were significant, while it was unlikely the work safety and health benefits necessary, at least to offset these costs, would be achieved.'[33]

3.3.1 Assessment against OEF criteria

Differences in Work Health and Safety (WHS) regulation[34], between Victoria (and hence four of the reference group of DNSPs) and other NEM jurisdictions, do not appear to contribute to material differences in efficient OPEX between DNSPs. Accordingly, differences in WHS regulations do not appear to qualify as material OEFs for DNSP OPEX efficiency benchmarking purposes.

30 Albeit that of the nine jurisdictions that adopted the model laws, seven have made significant variations. See https://www.ohsalert.com.au/nl06_news_selected.php?selkey=51608 (Accessed August 2017)

31 See page i of Decision Regulation Impact Statement for National Harmonisation of Work Health and Safety Regulations and Codes of Practice, 7 November, 2011, Safe Work Australia.

32 See Impact of the proposed national Model Work Health and Safety Laws in Victoria, Summary Report of the Supplementary Impact Assessment, 4 April 2012, PWC.

33 See page 1, PWC, Op Cit.

34 We have adopted the term 'Work Health and Safety' to reflect the terminology used in national regulation.

3.3.2 The preliminary finding

Our estimation of the WHS OEF compared with the AER estimation is set out in Table 10 below. The key finding is that the OEF adjustment is immaterial for all DNSPs.

Table 10 Harmonisation of WHS regulations (%, $000, $June 2015)

DNSP	AER OEF adjustment		S-M OEF estimate		S-M OEF adjustment	
ActewAGL	0.50%	$212	0.01%	$6	0.01%	$5
Ausgrid	0.50%	$1,916	0.00%	$6	0.00%	$2
CitiPower	0.00%	$0	0.00%	$0	0.00%	-$1
Endeavour	0.50%	$1,041	0.00%	$6	0.00%	$4
Energex	0.50%	$1,555	0.00%	$6	0.00%	$2
Ergon	1.20%	$2,936	0.00%	$6	0.00%	$3
Essential	0.50%	$1,448	0.00%	$6	0.00%	$3
Jemena	0.00%	$0	0.00%	$0	0.00%	-$1
Powercor	0.00%	$0	0.00%	$0	0.00%	-$2
SAPN	0.00%	$0	0.00%	$6	0.00%	$3
AusNet	0.00%	$0	0.00%	$0	0.00%	-$2
TasNetworks	0.00%	$0	0.01%	$6	0.01%	$5
United Energy	0.00%	$0	0.00%	$0	0.00%	-$1
Reference point	0.00%		0.00%			

3.3.3 Quantification – considered immaterial

The previous AER assessment for this OEF is found to rely on a misinterpretation of the single supporting report, for the then Victorian government. This misinterpretation resulted in a very large over-estimation of the impact of differences in Work Health Safety laws and regulations between Victoria and all other NEM jurisdictions.

The AER's previous decisions regarding WHS constituting an OEF was based on the 2012 report prepared for the Victorian government.[35] Our finding is also based principally on the 2012 PWC report.

Table 4 on page 9 of the 2012 PWC report shows that, of the total annualised ongoing cost ($586m), less than $0.05m in aggregate is attributable to power generators (used by the AER as a proxy for DNSPs). This corresponds to an average cost per business of $5,210. This annualised cost per business is not material relative to the OPEX of any of the DNSPs.

If the PWC report is taken at its face value, and the cost per DNSP is around $5,210, then the impact of WHS is clearly well below the materiality threshold. This suggests that, on the

35 See Impact of the proposed national Model Work Health and Safety Laws in Victoria, Summary Report of the Supplementary Impact Assessment, 4 April 2012, PWC.

basis of the 2012 PWC report, the WHS candidate OEF does not meet the AER's materiality criterion.

In addition, it is also possible that WHS does not meet criteria relating to excluding inefficient expenditure, or duplication of factors already accounted for in other OEFs. In this respect it is important to note that the $5,000 per generator incremental WHS cost is attributed by PWC to an increase in wages and conditions. In other words, to the extent there is an impact of WHS on labour costs, it would overlap with any observed differences in labour costs (price and volume) between networks, attributable to a range of potential market and regulatory variables. Some or all of this difference may be deemed to be inefficient rather than an exogenous environmental or regulatory factor. The wider issue of labour cost (price and volume) efficiency is addressed elsewhere in the AER's deliberations of efficient OPEX and should be accounted for there, not with respect to WHS law.[36]

3.4 Termite exposure

Termite prevention, monitoring, detecting and responding to termite damage, altogether increase efficient OPEX. The extent to which these cost increases are incurred is driven the number of assets that can be termite affected. There is considerable variation in this risk across the 13 DNSPs. According to the CSIRO termite hazard map, the likely cost of managing assets exposed to termites ranges from negligible in Tasmania to high in Australia's sub-tropical north.

3.4.1 Assessment against OEF criteria

For existing assets the termite OEF fully meets the OEF criteria. Exposure to termite related costs is beyond the control of the DNSPs, and it is not accounted for in the econometric benchmarking. The cost is material.

The extent to which incremental termite management OPEX is incurred is driven by the number of assets that can be termite affected. Over the long run, this is within the control of DNSPs.

For example, untreated wood poles will require a termite related maintenance response whilst steel poles and termite proof cables will require little or no termite response. The incremental cost of installing appropriately treated assets is likely to warrant the savings in ongoing maintenance response for most DNSPs. Given this, the efficient termite exposure OEF should reduce over time as assets are replaced with termite tolerant assets.

3.4.2 Preliminary finding

Our preliminary assessment has resulted in a higher estimation of this OEF compared with the AER. This is set out in Table 11 below.

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36 See for example Deloitte Access Economics, *NSW Distribution Network Service Providers Labour Analysis*, October 2014, pp. i-iii.

Table 11 Termite exposure (%, $000, $June 2015)

DNSP	AER OEF adjustment		S-M OEF estimate		S-M OEF adjustment	
ActewAGL	0.00%	$0	0.11%	$46	0.00%	$0
Ausgrid	0.00%	$0	0.06%	$213	-0.05%	-$205
CitiPower	0.00%	$0	0.04%	$20	-0.07%	-$41
Endeavour	0.20%	$416	0.36%	$744	0.25%	$517
Energex	0.20%	$622	0.43%	$1,353	0.33%	$1,014
Ergon	0.50%	$1,223	1.21%	$2,950	1.10%	$2,684
Essential	0.60%	$1,738	1.05%	$3,029	0.94%	$2,713
Jemena	0.00%	$0	0.03%	$19	-0.08%	-$56
Powercor	0.00%	$0	0.28%	$538	0.17%	$330
SAPN	0.00%	$0	0.00%	$0	-0.11%	-$271
AusNet	0.00%	$0	0.13%	$274	0.02%	$49
TasNetworks	0.00%	$0	0.00%	$0	-0.11%	-$68
United Energy	0.00%	$0	0.06%	$68	-0.05%	-$60
Reference point	0.00%		0.11%			

3.4.3 Quantification

Our approach for this candidate OEF incorporates and builds on the approach articulated in previous AER assessments. The main proposed change is to include OPEX associated with this OEF for a more termite prevalent DNSP, despite its relatively low productivity score.

We update the AER method of multiplying a unit cost by the number of wood poles for the DNSP. The unit cost is adjusted for the incidence of termites using the cost equation derived from Figure 5 below. This methodology could be significantly improved by using data on untreated wood poles as the basis of measuring exposure but this data is not currently available.

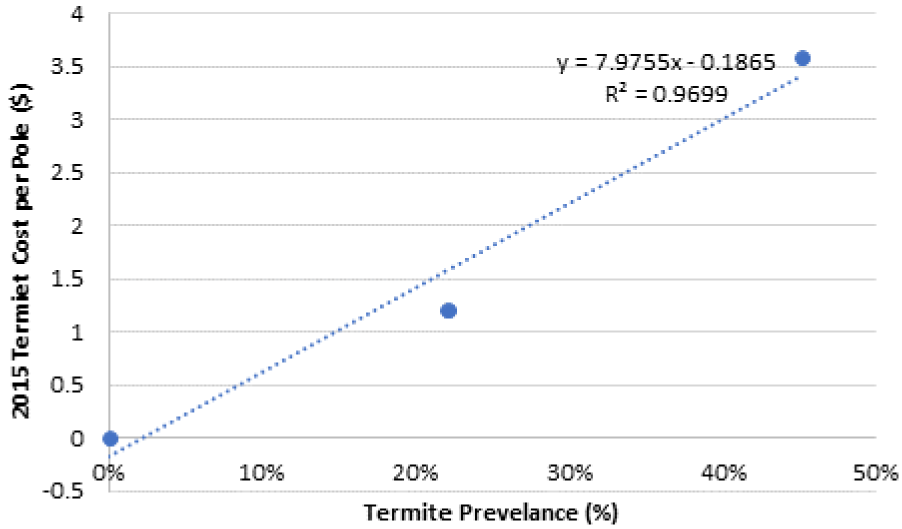
Figure 5 provides the three available references plotted against the CSIRO Termite Exposure prevalence metric.

In calculating the cost per pole, the AER used a single efficient reference (Powercor, 22 percent). Figure 5 provides both the zero cost- zero termite prevalence point and the high prevalence point (Ergon, 45 percent). The tramline added to Figure 5 provides a cost equation to derive the unit cost for each region according to termite prevalence.

The AER excluded the higher termite prevalence metric from its analysis as it was from a firm with a lower productivity score. As explained in Section 2, the efficiency of OPEX for each OEF needs to be reviewed independently of the productivity score.

Accordingly, we include all data points in developing a function between terminate maintenance cost per wood pole and termite prevalence. Consequently the cost equation derived from the tramline added to Figure 5 using all three points is steeper than the AER's, but is nonetheless still considered to reflect efficient costs.

Figure 5 Termite cost per pole



Source: Sapere analysis

Although the zero cost-zero termite prevalence is a known point it is likely there will be zero termite costs up to higher levels of prevalence. This would result in the trend line crossing the x-axis at a termite-prevalence greater than indicated in Figure 5. Hence, the efficient cost equation is likely to be steeper still.

3.4.4 Areas for further consideration

Additional data from a greater number of DNSPs on the cost of termite treatments and corrective maintenance response would improve confidence in the estimated cost curve for this OEF. The analysis detailed in the chapter would benefit from additional data and information on the following matters.

1. The prevalence threshold at which termite management costs become significant.
2. Termite treatment costs from all impacted DNSPs and the extent these costs have been market tested.
3. The cost of corrective maintenance response to termite infestation including the average age of assets replaced because of termite infestation.
4. The identification of extent of un-treated wood poles to use as a base for the calculations.

By increasing compensation for termite OPEX, the proposed approach potentially mutes incentives for efficient investment in termite proof assets (e.g. concrete or steel poles). We would welcome comments on whether this is considered to be an issue and if so, potential options in response.

3.5 Cyclones

Cyclones are clearly distinguished as a form of extreme weather that regularly occurs in limited geographical areas (i.e. (sub-tropical) with material impact upon the OPEX of a small number of service providers. In particular, the characteristics of cyclones and DNSP procedures in the event of cyclones are well defined. In these senses they are distinct from irregular occurrences of severe storms discussed in Section 3.6.

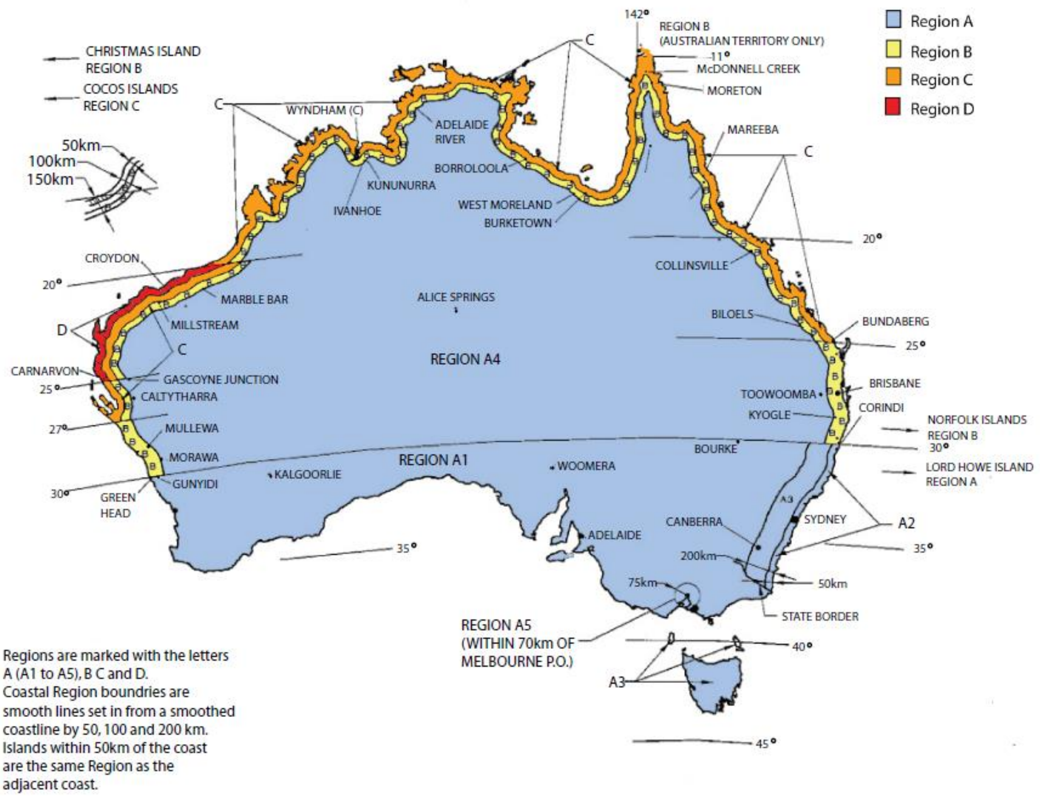
3.5.1 Assessment against OEF criteria

Cyclones result in a combination of higher insurance OPEX and higher OPEX that it is not feasible to insure. In either case, OPEX is higher than otherwise.

Our approach incorporates and builds on that articulated through the AER decisions. Extreme weather of all kinds is a likely OEF candidate as both exogenous and outside the econometric benchmarking.

Cyclones originate in the tropics in significant numbers every year, so while the systematic risk is temporally even it is geographically unequal. In Australia DNSPs systematically at risk of cyclonic levels of wind operate in regions C and D of the wind zone categories defined in AS/NZS 1170:2:2002 as illustrated in Figure 6. For current purposes that includes only Ergon.

Figure 6 Wind Zone Categories



Source: AS/NZS 1170:2:2002

Cyclones require a significant operational response including planning, mobilisation, fault rectification and demobilisation. These responses have direct costs and interfere with the business as usual work being delivered in an efficient manner. Service providers in cyclonic regions may also have higher insurance premiums and / or higher non-claimable limits.

As a result of the likelihood to provide documentary support for subsequent insurance claims, it is industry best practice for service providers with operations in cyclonic regions to establish specific records of the costs impacts of each cyclone. These records typically capture all of the direct costs of mobilising in response to a potential cyclone, addressing the faults and demobilising. These records may also include bookings from business as usual projects adversely impacted by each cyclone. As the basis for potential insurance claims, these records represent an auditable record of the direct cost impacts of each cyclonic event.

3.5.2 Preliminary finding

Our preliminary assessment has resulted in a comparable estimation of this OEF compared with the AER. This is set out in Table 12 below. As noted above, the cyclones OEF' is, presently, specific to Ergon. Not being applicable to the reference group, the OEF adjustments equal to the estimate.

Table 12 Cyclones (%, $000, $June 2015)

DNSP	AER OEF adjustment		S-M OEF estimate		S-M OEF adjustment	
Ergon	5.40%	$13,210	5.24%	$12,828	5.24%	$12,828
Reference point	0.00%		0.00%			

3.5.3 Quantification

Our approach for this candidate OEF incorporates and builds on the approach articulated in previous AER assessments. The approach taken by the AER in the previous assessment for the cost impacts of the then seven cyclones for Ergon Energy in the benchmarking period is considered sound. This is based on the position that the AER's input data is drawn from costs captured consistent with the requirements of any potential insurance claim. Further, the costs should be net the contribution from any successful insurance claim.

Our approach extends the previous analysis to include the three subsequent cyclones up to the end of financial year 2015.[37] These total costs are annualised by the benchmarking period.

On the one hand this incorporates more information on the costs of cyclone events derived from a large set of such events (see note below). On the other hand this data is captured over a longer period for annualisation, as well as the generalisation of our denominator. The net result is a minor change relative to the AER's previous OEF adjustment.

[37] This includes the Townsville mini tornado 2011-12 and Cyclones Larry 2005-06, Ului 2009-10, Tasha 2010-11, Anthony 2010-11, Yasi 2010-11, Oswald 2012-2013, and recently Ita 2013-14, Dylan 2013-14, Marci 2014-15.

3.5.4 Areas for further consideration

Previous AER estimation of this OEF includes data on costs that were sourced, in part, from a confidential Ergon submission regarding cyclone impacts. For the last three cyclones we have not had access to similar information and have used emergency response expenditure that is only part of OPEX. The present assessment may therefore an under-estimate, and a fuller assessment could be made with equivalent cost data for all cyclones in the benchmark period. In any future enquiries on this topic, it is suggested the AER should confirm the basis for the data and the deduction of any income from related insurance claims.

3.6 Severe storms

Variations in exposure to severe storms result in a combination of variations in insurance OPEX as well as in OPEX that it is not feasible to insure. In either case, OPEX is higher or lower than otherwise.

Previous AER decisions have referred to Bureau of Meteorology maps of the prevalence of thunder and lightning averaged over a 10 year period. These indicate that SE Queensland and NE New South Wales experience the highest frequency of such storms in the NEM states.[38]

The severe storms (extreme wet/windy weather) OEF is intended to account for systematic differences in the regular occurrence of severe storms giving rise to incremental OPEX. Note this candidate OEF does not address OPEX intended to prevent asset failures during storms – for example vegetation management.

Extreme storms affect OPEX predominantly through emergency response expenditures following asset failures. DNSP's incur incremental OPEX to make their networks safe and to restore supply in the short term. This may include intensive maintenance until such time that any assets, where repair is uneconomic, are replaced, in part or in full.

The discussion here is limited to consideration of an extreme weather OEF for the purpose of economic benchmarking. It does not consider seek to quantify the cost of, or threshold for, an event to be declared a material natural disaster, in which case the pass through provisions in the National Electricity Rules may be activated.

3.6.1 Assessment against OEF criteria

Like other kinds of extreme weather, severe storms are exogenous and, not being included in the econometric benchmarking, a likely OEF candidate.

Exposure to these events varies geographically and hence between DNSPs, in incidence and impact. Unlike cyclones in sub-tropical northern Australia, the severe storms OEF applies to all geographical regions, and hence affects all DNSPs, to some degree.

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38 See for example in Energex, Response to AER information request AER EGX 001, 17 December 2014, p. 4

Variations in OPEX arising from extreme weather are not accounted for in econometric benchmarking. However, as noted below, OPEX shocks from very low probability events are accounted for in the econometric modelling. Like cyclones, the severe storm OEF candidate is intended to account for extreme but predictably regular weather events, requiring care to distinguish high impact, very low frequency extreme weather events.

3.6.2 The preliminary finding

The preliminary findings for a severe storm OEF are set out in Table 13 seek to address variation between DNSPs from the impact of extreme weather storms.

Table 13 Severe storms (%, $000, $June 2015)

DNSP	AER OEF adjustment		S-M OEF estimate		S-M OEF adjustment	
ActewAGL	0.00%	$0	0.00%	$0	0.00%	$0
Ausgrid	0.00%	$0	0.00%	$2	0.00%	$2
CitiPower	0.00%	$0	0.00%	$0	0.00%	$0
Endeavour	0.00%	$0	1.12%	$2,321	1.12%	$2,321
Energex	2.70%	$8,398	0.99%	$3,081	0.99%	$3,081
Ergon	3.00%	$7,339	0.31%	$755	0.31%	$755
Essential	0.00%	$0	0.12%	$354	0.12%	$354
Jemena	0.00%	$0	0.00%	$2	0.00%	$2
Powercor	0.00%	$0	0.00%	$0	0.00%	$0
SAPN	0.00%	$0	0.00%	$0	0.00%	$0
AusNet	0.00%	$0	0.00%	$0	0.00%	$0
TasNetworks	0.00%	$0	0.31%	$192	0.31%	$192
United Energy	0.00%	$0	0.00%	$0	0.00%	$0
Reference point	0.00%		0.00%			

The findings reflect the pattern anticipated from the geographical exposure, that is variable impact along the eastern seaboard with maximum impact for south-east Queensland and north-east New South Wales. None of the reference group report major storm event costs, hence the reference point is zero and the OEF adjustment is the same as the estimate.

The OEF adjustments appear lower than the AER's previous determination of OEF adjustments. The different outcomes are driven by a combination of: reference to data for individual DNSPs; methods accounting for annualisation; and the treatment of low frequency and very low frequency events. The treatment of annualisation, and low and very low frequency events is set out in Section 2.3.5 and the following section.

3.6.3 Quantification

Our approach accepts the AER's principles for recognition of variable weather conditions as the basis for potential OEFs. There are, however, some significant changes to the quantification, as set out below.

Low frequency severe storms

The results presented in Table 13 are estimates of the systemic differences in emergency response expenditure for severe storms across all NEM DNSPs. These use the average Major Event emergency response expenditure for each DNSP where, as discussed above, exceptional events for Energex and Ausgrid are excluded. These results partially reflect varying the estimate of the variation in environmental risk from Bureau of Metrology maps of the prevalence of thunder and lightning averaged over a 10 year period[39], and also the variation in per customer costs in Figure 7 below.

Consideration by the AER

The AER examined the trend in category analysis over the 2009 to 2014 period to reach a preliminary judgement of the materiality of the impact of extreme weather events. In Figure A.35 of its Preliminary Decision, the AER compared the average cost of emergency response per customer across service providers in the NEM, with two data points for Energex including and excluding the three identified severe storms.[40] On the basis of this figure the AER concludes:

> *When the extreme weather events are excluded Energex's average emergency response expenditure per customer falls to the trend for the comparison firms. This suggests that, excluding extreme weather events, Energex's emergency response expenditure is comparable to that of the comparison firms.*

As presented, the data in this figure are clearly in a reciprocal relationship, and no relationship is clearly discernible. The figure effectively shows the average OPEX per kilometre line length increases for remote and rural areas and is a minimum for the wholly urban CitiPower. This relationship is unsurprising and reflects the fact differences in the time required to restore services will be related to the distances emergency crews have to drive to failed assets.

Figure 7 inverts the data of the horizontal axis of Figure A.35 so that the expected linear relationship is revealed, including three trend lines:

- one inclusive of all services providers (solid line)
- one exclusive of Energex and Ergon (dashed line), and
- one for the reference group (dotted).[41]

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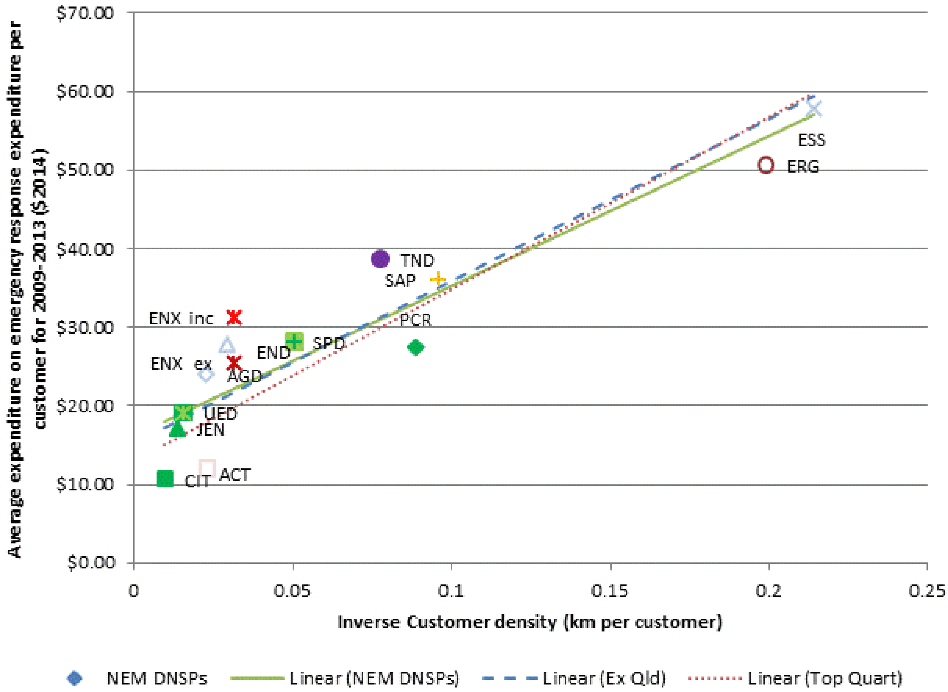
39 See BoM at http://www.bom.gov.au/jsp/ncc/climate_averages/thunder-lightning/index.jsp and http://www.bom.gov.au/jsp/ncc/climate_averages/thunder-lightning/index.jsp

40 See Figure A.35, AER Preliminary Decision Ergon Energy determination 2015–16 to 2019–20, Attachment 7 – Operating expenditure, April 2015

41 Powercor, CitiPower, United, SAPN, AusNet

Figure 7 Average emergency response per customer for 2008/09 to 2013/14 against inverse customer density ($000 2014)



Source: Sapere analysis of AER data

In this presentation of the data it is apparent that as a whole there is a clear trend in emergency response costs that includes the two regional outliers, Essential Energy and Ergon Energy (exclusive of cyclones). This occurs within a natural spread of cost per customer such that the trend line does not substantially deviate with the exclusion of the Queensland DNSPs or when constrained to the reference group. By removing the identified very low frequency severe storm costs (see following section), the Energex estimated average expenditure per customer is lowered. It is then comparable with a group of service providers more tightly group around these trends. In particular it is on par with Ausgrid and Endeavour.

Exclusion of costs accounted for elsewhere

In line with previous consideration by the AER, we have referred to Bureau of Meteorology maps of the prevalence of thunder and lightning averaged over a 10 year period.[42] These maps indicate that, outside cyclone regions, storm weather variations over the longer term is most extreme in the coastal regions for south-east Queensland and north-east New South Wales, with slight variations between other network areas.

However unlike cyclones and bushfires, it is important to distinguish between low frequency but nonetheless systematic variations between geographic areas, and the impact of very low

42 See BoM at http://www.bom.gov.au/jsp/ncc/climate_averages/thunder-lightning/index.jsp and http://www.bom.gov.au/jsp/ncc/climate_averages/thunder-lightning/index.jsp

frequency, high impact events. As discussed in Section 2.3.5, rare events that cause random shocks in OPEX within the benchmarking period are accounted for with the stochastic economic benchmarking method – also applying an OEF for these events therefore fails the non-duplicative principle.

So before addressing any systematic impact of varying environmental risk of severe storms, very low frequency extreme storms need to be identified so that their additional costs may be properly excluded from the examination of emergency response expenditures.

To begin with, cyclones are addressed as a separate OEF and these costs are excluded from consideration of Ergon's emergency response expenditure. Ergon's emergency response expenditure is dominated by cyclones. Major storm events only comprise 1.8 percent of Ergon's emergency response expenditure over a six year period, after excluding cyclones.

In response to questions on its operating environment, Energex identified three significant events that materially increased its costs during the 2008/9 to 2012/13 period.[43]. While the AER's analysis focused on the additional cost of these events, it did not recognise the low probability of occurrence (or reoccurrence), even at the level of their frequency within the benchmarking period. It also did not recognise that no preceding or subsequent similar event had occurred (see, for example, Figure 8 below). By annualising over the period of available data the AER quantified the cost of these storms as if they were one-in-two year events, whereas the Queensland Flood Commission received evidence that at least one of these was a 1 in 100 year event (see Section 2.3.5).[44]

Ausgrid RINs include a few thousand dollars emergency response expenditure annually for major events. A significant exception is an April 27 2015 storm that accounts for 36 percent of all emergency response costs in that year (see Figure 8). This event had an impact across a geographical area focused in the Hunter Valley. Within this area, its probability has been assessed as one in 75 year event.[45]

Material impact of very low frequency severe storms

The AER presents analysis of the category analysis RIN as evidence that the impact of extreme weather events is material. Figure 8 provides a version of the AER's Figure A.34 that focuses on the Queensland service providers and Ausgrid modified to show:

- the impact of cyclones, and
- the material impact of the low probability severe storms in Energex and Ausgrid's network areas.

Figure 8 indicates the material impact of cyclones is negligible for Energex, while substantial for Ergon. The material impact of the three events identified for Energex indicate significant deviations from a base level of emergency response expenditure typical of the

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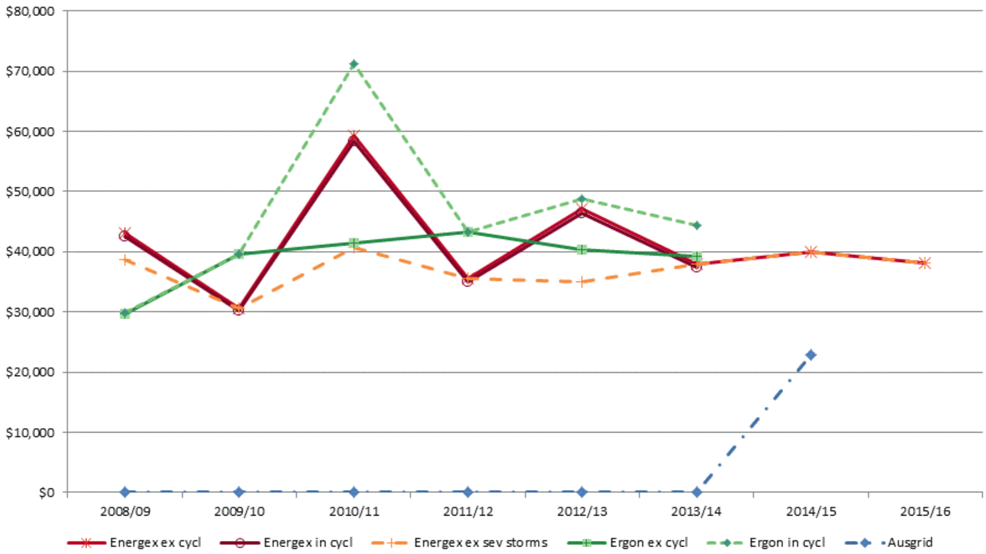
43 The Gap storm in November 2008, the Brisbane floods in 2011 and ex tropical cyclone Oswald in 2013, cited in Energex, Response to AER information request AER EGX 001, 17 December 2014, p. 4.

44 Expert witness reports on flood frequency analysis, Queensland Flood Commission, available at www.floodcommission.qld.gov.au

45 https://theconversation.com/explainer-was-the-sydney-storm-once-in-a-century-40824

period of available data. Likewise, the April 2015 storm in the Hunter Valley is dramatically uncharacteristic of Ausgrid's typical emergency expenditure for major events.

Figure 8 Annual Emergency response expenditure for 2009 to 2016 ($000 2014)



Source: Sapere analysis of AER data

For the purposes of making a comparison only, Table 14 includes an estimate of these storms based on annualising the incremental costs by the 10 year period used for benchmarking.

Table 14 Annualisation of very low frequency events (%, $000, $June 2015)

DNSP	AER (%)	AER ($'000)	Sapere/ Merz (%)	Sapere/ Merz ($'000)
Ausgrid	0%	$0	0.60%	$2,283
Energex	2.7%	$8,398	0.97%	$3,028

2. The costs for very low frequency events are annualised using the period of benchmarking that is less than the period associated with their probability of occurrence, such that these costs are over-estimated.

Such events are non-recurrent OPEX shocks, which are accounted for in the econometric benchmarking. Consistent with the non-duplication criterion, the incremental costs should therefore be excluded from the quantification of the OEF. The cost data presented below to indicate the potential impact on the OEF quantification of such events.

3.6.4 Areas for further consideration

The analysis of very low frequency events above has proceeded by comparing the frequency of the occurrence of high impact events based on material impacts on emergency response costs. This has demonstrated the effect on the calculation of effective annual average expenditure of the over-estimate of the frequency of such events.

However even this demonstration based on the benchmark period is, in all likelihood, an over-estimate. Based on the frequency of occurrence, the example provided by Ausgrid should perhaps be further reduced by a further factor of seven. The effective annual average expenditure of the Energex network would be strengthened with reference to an assessment of probability based climate data. Such assessment would require metrological expertise.

The Major Event emergency response expenditure represents the best available data regarding the direct costs of severe storms. It is noted that there appear to be inconsistent methods in completing the RIN Emergency Response data, particularly regarding the categorisation of Total, Major Events and Major Event Days. The AER can issue clearer guidelines, and DNSPs have an incentive to improve the quality and accuracy of this data in the future.

3.7 Taxes and levies

A number of jurisdictions require the payment by DNSPs of State taxes and levies that are not classified as jurisdiction schemes, excluded from OPEX reported for economic benchmarking purposes. As they are State based, any such taxes or levies could vary between jurisdictions and hence DNSPs.

3.7.1 Assessment against OEF criteria

Taxes and levies are outside the control of DNSPs and cost data from RIN indicate these costs may be material. Any such costs are not accounted for in the econometric benchmarking and hence could adversely affect productivity scores.

In a previous decision, the AER accepted that jurisdictional taxes and levies represent an OEF for the two Queensland DNSPs. In the case of NSW and ActewAGL, it found that no OEF adjustment was required because these costs are not included as line items in RIN returns and jurisdictional levies are compensated through annual price variations.

3.7.2 Preliminary finding

Table 17 below provides a preliminary quantification of a taxes and levies OEF. Note, however, that we consider some of the zero estimates are unlikely to be accurate, for the reasons explained below. Similarly, the reference point may not be accurate.

Our preliminary assessment is this OEF may partly relate to differences in treatment of taxes and levies in RIN returns. This reflects the AER's previous finding that for some DNSPs levies are addressed in annual pricing variations and excluded from historical RIN data.[46] The available RIN data appears to reflect some inconsistencies between DNSPs within jurisdictions where regulations around taxes and levies could be expected to be applied consistently between DNSPs. We suggest there is room for discussion on whether this candidate OEF could be addressed in part by more consistent treatment of taxes and levies in RIN returns.

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46 See for example page 227 of Attachment 7 – Operating expenditure; ActewAGL Final Decision 2015-19, dated April 2015.

Table 15 Taxes and levies ($000, $June 2015)

DNSP	AER OEF adjustment		S-M OEF estimate		S-M OEF adjustment	
ActewAGL	0.00%	$0	0.00%	$0	Nil	-$156
Ausgrid	0.00%	$0	0.00%	$0	Nil	-$1,410
CitiPower	0.00%	$0	1.52%	$849	1.15%	$643
Endeavour	0.00%	$0	0.00%	$0	Nil	-$766
Energex	2.70%	$8,398	2.92%	$9,076	2.55%	$7,932
Ergon	1.70%	$4,159	0.00%	$0	Nil	-$900
Essential	0.00%	$0	0.00%	$0	Nil	-$1,066
Jemena	0.00%	$0	1.41%	$971	1.05%	$718
Powercor	0.00%	$0	0.94%	$1,788	0.57%	$1,086
SAPN	0.00%	$0	0.00%	$0	Nil	-$914
AusNet	0.00%	$0	0.00%	$0	Nil	-$759
TasNetworks	0.00%	$0	0.00%	$0	Nil	-$231
United Energy	0.00%	$0	0.00%	$0	Nil	-$433
Reference point	0.00%		0.37%			

3.7.3 Quantification

On reviewing RIN data,[47] we identified line items labelled "levies" in the case of three of the five Victorian DNSPs (CitiPower, Jemena and Powercor). With the exception of one year for Jemena, the values met the materiality criterion.

We have been able to quantify this OEF using available RIN data for three of the five Victorian DNSPs. Consistent with previous AER determinations, RINs for NSW/ACT and DNSPs do not include a line item for jurisdictional levies.

For SAPN, the OEF appears in a RIN return for just one year in the benchmarking period (2014). It is described as 'distribution licence fee.' However, in other years, this cost appears to have been subsumed under other overhead line items and is not separately itemised.

3.7.4 Areas for further consideration

With respect to the two Queensland DNSPs, this OEF does not appear to be about levies, *per se*, but rather about whether this cost has been included in the OPEX used for economic benchmarking. Given the treatment of this matter for some DNSPs, we have some doubts as to whether jurisdictional levies do in fact meet the duplication criterion.

It would seem that for at least some DNSPs this matter is conveniently and efficiently addressed by excluding the cost from OPEX and instead addressed via the annual price

47 We specifically reviewed Table 2.10.1 – network overheads expenditure – standard control services.

variation process. Alternatively, of this matter is retained within OPEX, then transparency and consistency of approach could be improved if all DNSPs treat levies as a separate line item. This may include breakdowns into different components to enable greater transparency.

Additional information is sought regarding whether DNSPs are including jurisdictional levies within total OPEX in category analysis RINs. This is especially relevant to AusNet, United Energy and SAPN.

3.8 Vegetation management

DNSPs are obliged to ensure the integrity and safety of overhead lines by maintaining adequate clearances from any vegetation that could interfere with lines or supports. This is especially important under severe or extreme weather events, including high wind, rainfall and snow or ice, and also extreme heatwaves, during which bushfire related risks are most severe.

Vegetation management OPEX represents around a fifth (20 per cent) of total OPEX for a number of DNSPs, notably: Essential Energy, Powercor, Ausnet and SAPN (see Table 16 below). On the other hand, for some DNSPs, notably CitiPower and ActewAGL, vegetation management OPEX is less than three per cent of total OPEX.

To the extent these variations in observed OPEX reflect differences in efficient OPEX, they may give rise to OPEX advantages or disadvantages not otherwise accounted for in the SFA model. Given the scale of vegetation management OPEX for some DNSPs, the OEF candidate is likely to be material for these firms.

The fundamental drivers of variations in efficient vegetation management costs are:

- the length of overhead lines requiring active vegetation management; and
- the vegetation density and rate of growth (which can vary both by location and over time at a location) in those areas requiring vegetation management.

In combination, these factors arise from the intersection between vegetation density and network assets. This intersection depends on the network footprint and configuration relative to land use, vegetation type and climate.

These fundamental drivers may in turn be modified between jurisdictions by variations in regulated responsibilities for vegetation management, including:

- variations in mandated standards (notably bushfire regulations in Victoria); and
- the allocation of responsibility for vegetation management (or its ultimate cost recovery) between DNSPs, landowners and local government.

In its previous determinations, the AER has accepted that the two regulatory related drivers of vegetation OPEX variations may meet the OEF criteria (see Table 5). Vegetation management OPEX represents the bulk of the incremental OPEX related to the Bushfire

OEF category[48]. In addition to the direct cost of vegetation management, the Victorian Bushfire relations impose additional overhead costs relating to creating and maintaining records of vegetation management activities and outcomes.

The full set of vegetation management cost drivers is largely outside the control of the network service providers. Some portion of the variation in observed vegetation OPEX may, however, arise from differences in efficiency; therefore not all of the differences in observed vegetation OPEX may be attributable to exogenous variables.

As discussed earlier (notably in relation to sub-transmission/licence conditions), our preferred overall approach to assessing OEF candidates is to seek to quantify the effects of one or more qualifying variables on efficient OPEX, rather than to seek to quantify the individual causes of higher OPEX (i.e. the individual variables set out above). Treating one or more causal variables as independent OEFs is problematic in that it can result in various combinations of double counting or omission (discussed further below with regard to related OEF candidates).

This reflects the fact that vegetation management OPEX is often multi-purpose. Ensuring adequate clearances protects lines from both bushfires and extreme storms. Attributing vegetation management activities (and related cost) to one environmental risk or another is challenging.

The remainder of this section seeks to identify the extent to which:

- exogenous factors are accounted for within the average outcome allowed for in the econometric benchmarking model; and
- residual cost differences between DNSPs may be captured through one or possibly multiple candidate OEF categories.

3.8.1 Assessment against OEF criteria

Exogeneity

To the extent that it is not economic to underground the existing overhead lines network, the consequent variations in efficient vegetation management OPEX are beyond the control of DNSPs. The AER has previously made reference to vegetation density maps such as those in Figure 9 in recognition that the vegetation management burden varies geographically. [49]

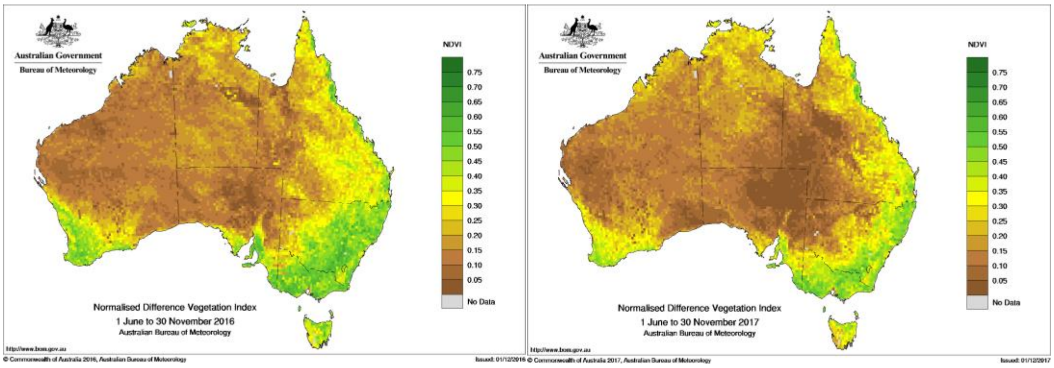
While useful, on their own, these maps do not allow conclusions to be drawn regarding differences in growth rates relative to the geographical distribution of network assets within a DNSP's total footprint. In addition, the two periods mapped in Figure 9, as well as the temporal rainfall anomaly series in Figure 10, highlight that both the seasonal and inter-annual variation of vegetative growth can be substantial. This suggests that associated

[48] The largest part of these step changes in OPEX (75-95 percent) were related directly to changes in the Victorian Electric Line Clearance obligations; p 220 of Ausgrid distribution determination 2015−16 to 2018−19, Final Decision, Attachment 7 – Operating expenditure, dated April 2015

[49] See for example page 202 of Ergon Energy preliminary determination 2015-20, dated April 2015.

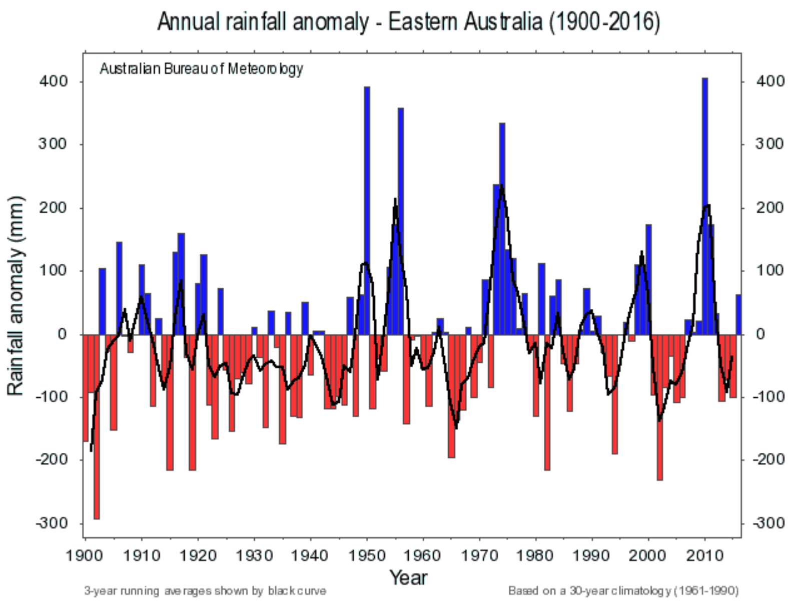
vegetation management OPEX may also vary substantially over time and careful consideration is required in annualisation of observed OPEX in any one year (see Section 2.3.5).

Figure 9 Six-monthly Normalised Difference Vegetation Index Average for Australia, November 2016 and November 2017



Source: Bureau of Meteorology, http://www.bom.gov.au/jsp/awap/ndvi/index.jsp

Figure 10 Eastern Australian annual rainfall anomaly



Source: Bureau of Meteorology
http://www.bom.gov.au/climate/change/index.shtml#tabs=Tracker&tracker=timeseries

Materiality

Vegetation management OPEX is a significant cost category reported in RINs, as summarised in Table 16. For most DNSPs, a high proportion of total vegetation OPEX is represented by payments to third parties. As a result, most of the variation in OPEX is considered to reflect real differences in expenditure between firms and not differences in cost allocation policies within overall OPEX.

Table 16 Vegetation management costs ($2014/15, $'000)

DNSP	Total Vegetation Management	Proportion of Total OPEX	Contracted Vegetation Management	Proportion of Total Veg Man OPEX	Proportion of Total OPEX
ActewAGL	$2,446	3%	$886	36%	1%
Ausgrid	$39,914	6%	$36,229	91%	6%
Citipower	$1,083	2%	$1,079	100%	2%
Endeavour	$38,551	14%	$36,277	94%	13%
Energex	$45,750	12%	$45,645	100%	12%
Ergon	$48,930	13%	$44,942	92%	12%
Essential	$91,473	23%	$80,799	88%	20%
Jemena	$3,431	5%	$3,381	99%	5%
Powercor	$36,221	19%	$34,936	96%	18%
SAPN	$45,572	18%	$43,806	96%	18%
Ausnet	$37,820	18%	$32,271	85%	16%
TasNetworks	$10,753	17%	$10,435	97%	16%
United Energy	$11,381	10%	$11,381	100%	10%

Source: EBRIN/CARIN

While year to year costs vary, from Table 16 it may be observed that vegetation management OPEX constitutes a significant component of total OPEX for many DNSPs – for 2014/15 exceeding 10 percent for nine of the 13 DNSPs. As noted earlier, it is possible that some of the explanation for these cost variations arises from differences in efficiency.

Nevertheless, even if efficient vegetation OPEX is only some fraction of observed vegetation OPEX, even, say, one quarter, it could be a material OEF for a majority of DNSPs (to the extent it is non-duplicative). Moreover, since this candidate OEF category has very significant effects for four of the five reference group firms, then the effect on the reference point itself is likely to be material, which in turn affects every other DNSP.

Duplication

Econometric benchmarking

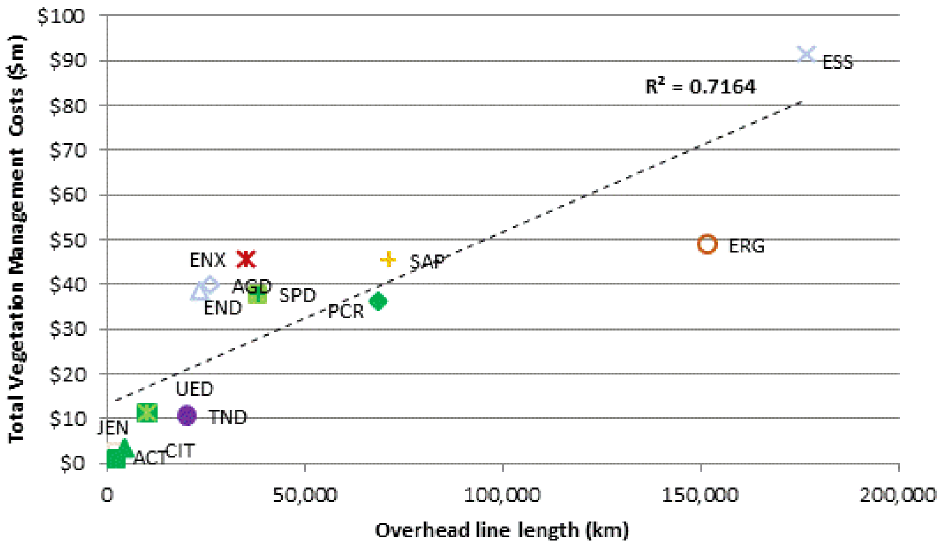
Further information on the SFA model was provided by Economic Insights to assist in the assessment of the duplication criterion for this candidate OEF category (or set). This included the observations that effectively the SFA model:

- Accounts for the average relationship between vegetation management OPEX and overhead line length (in terms of circuit length) across the set of DNSPs. It therefore assumes the average density and growth rate applies to all DNSPs.

- Does not allow for variations in the proportion of overhead line length requiring active vegetation management from this average across DNSPs, or take into account temporal variations in vegetation density.[50]

Consideration of the relationship between circuit line lengths[51] and vegetation OPEX suggests a high proportion of the variation in vegetation OPEX may be accounted for in the econometric benchmarking. This can be seen in Figure 11 below, which compares total vegetation management costs with overhead line length, drawing on RIN data.

Figure 11 Total Vegetation Management as a function of overhead line length



Source: Sapere-Merz analysis of AER RIN and econometric benchmarking data

Figure 11 illustrates a moderate to weak relationship between vegetation management OPEX and total overhead line length. That is, vegetation OPEX varies with overhead line length, but this variation does not fully explain variations in observed vegetation OPEX between DNSPs. This is consistent with the proposition that overhead line length, while being the supervening variable, is a poor proxy for the length of lines requiring active vegetation management.

Given the scale and variability of vegetation OPEX, it is possible that, if the benchmarking process did not fully account for this OPEX, there may be a relationship with raw productivity outcomes. This is explored in Figure 12 below which demonstrates there is no relationship between total vegetation management costs and raw productivity outcomes.

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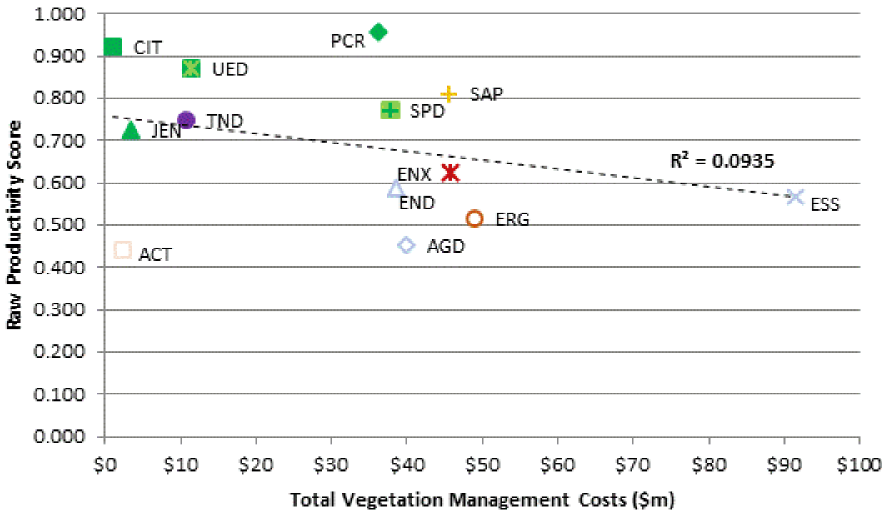
50 This was reflected to some extent in the AER's 2016 benchmarking report that identified decreases in productivity results for the Victorian DNSPs were largely due to factors not accounted for by the benchmarking models, including heavy rainfall.

51 As defined by the AER's internal licence conditions OEF asset volumes spreadsheet.

Figure 12 Raw productivity outcomes as a function of Total Veg. Mgt, Costs



Source: Sapere-Merz analysis of AER RIN and econometric benchmarking data

Taken together, these two points suggest the SFA model addresses differences in vegetation management OPEX to a substantial degree. On the other hand, it is recognised that, for a number of DNSPs, the residuals not accounted for in the SFA model may well meet the materiality criterion. Further, as noted above, there is evidence that variations in vegetation management over time, and perhaps also between DNSPs, may not be fully captured by the SFA model.

Economic Insights advised that it is difficult to quantify the extent that differential vegetation management OPEX is indirectly picked up by the line length variable. There is insufficient information to disentangle the various effects related to line length, and the high correlation between some output variables in the SFA model means particular coefficients may not be interpreted in isolation.

Considering the set of related OEF candidates

As noted above, the causal drivers of variations in efficient vegetation management OPEX are interrelated. For example, in the AER Queensland and NSW decisions, higher OPEX associated with higher vegetation density in some network areas of those States was offset against higher OPEX associated with bushfire regulations among the reference group firms.[52]

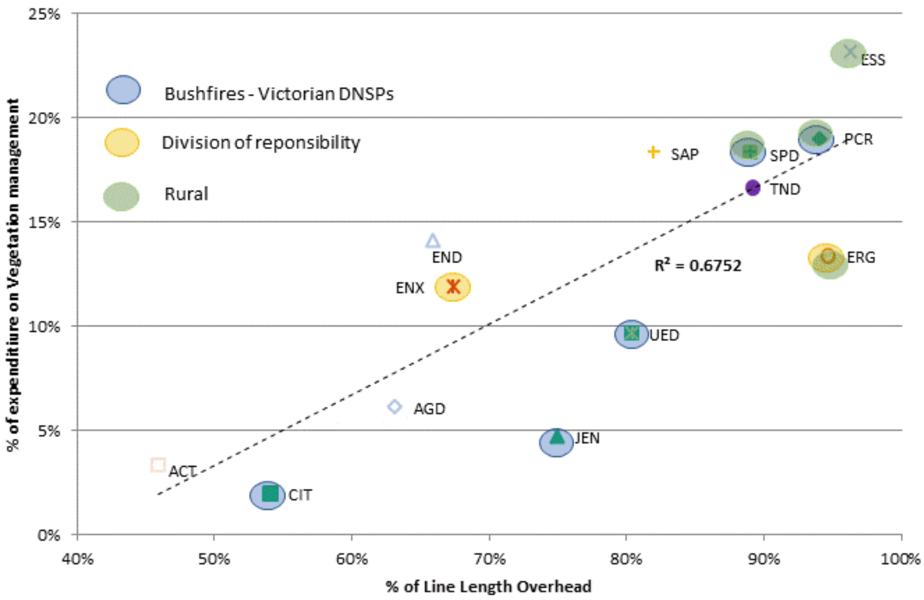
The interaction between vegetation density and regulation is exemplified by AusNet and Powercor, where total vegetation OPEX in response to additional bushfire regulations was

52 See for example page 202ff of Ergon Energy preliminary determination 2015-20, dated April 2015, and p226ff of Ausgrid distribution determination 2015–16 to 2018–19, Final Decision, Attachment 7 – Operating expenditure, dated April 2015..

broadly equivalent, despite AusNet having only half the overhead network length. This reflected the significantly higher vegetation density in the AusNet region.[53]

The complexity of interactions between causal OEF candidates is illustrated in Figure 13. The trend line represents the "average" relationship between the percentage of vegetation management OPEX as percentage of total OPEX, on the one hand, with the percentage of overhead line in the SFA model, on the other.[54]

Figure 13 Variations in observed average vegetation OPEX



Points above the diagonal line represent percentage observed vegetation management OPEX that is higher than average and points below represent lower than average observed vegetation management OPEX. Bushfire OEFs (for Victoria) and Division of responsibility variables are denoted by blue and yellow circles (respectively) around the relevant DNSPs. The predominantly rural DNSPs are denoted with green circles.

Figure 13 highlights several points that have been discussed already, but are worthwhile summarising together:

- To the extent the observed variations relative to the trend line are efficient, they are likely to be material (positive or negative) for a majority of DNSPs.
- The Bushfire candidate OEF does not on its own seem to explain variations in efficient vegetation OPEX among the reference firms.

53 See for example p202 of Preliminary Decision, Ergon Energy determination 2015–16 to 2019–20, Attachment 7 – Operating expenditure, April 2015

54 The trend line is not an indicator of the actual allowance for vegetation OPEX in the SFA model (and hence ideal optimised OPEX), as this information cannot be determined. As already noted above, line length parameter itself is only a partial proxy for assets requiring active vegetation management.

- The Division of Responsibility candidate OEF does not on its own seem to explain variations in efficient vegetation OPEX among the reference firms.
- Predominantly rural DNSPs are identified in Figure 13 as a proxy for firms likely to be exposed to a greater proportion of lines requiring active vegetation management and higher efficient vegetation OPEX. Even for these DNSPs, however, there is some variation that relates to other variables (possibly also including differences in vegetation OPEX efficiency).

Together, these points suggest reference to matters other than the regulatory variables is necessary to derive a comprehensive estimate of this candidate OEF category (or set). This is so, even if the vegetation OEF category is split into multiple OEF categories.

To be clear, these variations are not readily explained by differences in total productivity (see Figure 12). There is no evidence identified so far that the principal explanation for the variations above is related to variations in efficiency.

3.8.2 Preliminary finding

The preliminary finding is that variations in vegetation density and growth rates, along with variations in regulation around vegetation management, are together likely to be a material driver of variations in efficient vegetation OPEX. Analysis of vegetation, bushfire and division of responsibility variables indicate a high level of overlap between these variables. It is probable that a vegetation management OEF candidate (or set of OEF candidates) meets the OEF criteria for a significant portion of DNSPs. As this includes the reference DNSPs, this OEF candidate (or set) is also likely materially to influence the reference point for this OEF candidate (or set).

Because of the materiality of any resulting OEF reference point, this may in turn result in a change (increase) in the overall reference point and hence affect the aggregate OEF adjustment outcomes for a significant sub-set of DNSPs. This effect may be greatest for those DNSPs with the highest (or lowest) vegetation OPEX as a proportion of total OPEX, depending on the extent observed vegetation OPEX is assessed to be efficient.

No quantification of a candidate vegetation management OEF candidate (or set of OEF candidates) has been able to be estimated at this time. The summary results for this OEF candidate (or set) have therefore been reported as nil in Table 2 and Table 3.

For the avoidance of doubt, this does not indicate the vegetation management OEF candidate (or set) should be zero, or that it cannot feasibly be quantified in the future. As discussed further in Section 3.8, several possible approaches and methods have been explored. However, EBRIN data on vegetation density is considered less mature than other EBRIN data, upon which the EI model and some other OEF estimates have been developed or otherwise considered. Further refinement and consultation with DNSPs to ensure consistency of EBRIN data is required before it can be relied upon to the extent necessary to quantify this OEF candidate (or set) within an acceptable margin for error.

In the absence of such data, and within the scope of the present project, we have so far been unable to identify sufficient evidence on which to distinguish between the effect of exogenous and endogenous variables on variations in observed vegetation OPEX. The methods that have been applied to quantifying unit costs and volumetric variables to support the quantification of other candidate OEFs have so far not been able to be applied to vegetation OPEX.

As a result, the error margins for any quantification of this OEF category (or set) are considered to be significantly higher than for the quantification of other OEF categories. The likely result would be a material over estimation of the efficient OEF for some DNSPs alongside a material under-estimation for others. Because of the likely scale of the errors, and in particular the impact on the comparison point, these errors would in turn be likely to result in significant errors being introduced into the aggregate OEF adjustments and OEF adjusted efficient OPEX estimates.

3.8.3 Areas for further consideration

It does not follow from the preliminary conclusion that a vegetation candidate OEF (or set) could not be quantified in the context of a future regulatory determination by the AER, in response to proposals submitted by DNSPs. With adequate supporting data and information, including improved evidence and data on exposure to the exogenous variables identified, and the efficiency of related OPEX (including any significant inter-annual factors), this OEF candidate (or set) should be capable of being quantified by individual DNSPs and the AER.

To progress the discussion, the remainder of this section considers options for addressing this candidate OEF (or set of OEFs), to enable quantification by DNSPs (in their proposals), and by the AER, in future price setting processes. Two broad approaches suggest themselves:

1. An ‘additive’ approach individually assessing separate causes of cost differences, taking care of issues of duplication and omission. Any residual would represent the inefficient component of total vegetation management OPEX.

2. A ‘subtractive’ approach, removing a (possibly deemed) inefficient component from total vegetation management OPEX. Being based on the effect revealed by actual costs, this method would be inclusive of the range causes varying the vegetation management task, whether identified or not.

The full set of variables identified at the beginning of this section could be assessed and considered to identify volumes and efficient unit costs. The initial estimates would be modified to take into account variations in regulated responsibilities – the bushfire and division of responsibility OEF candidates previously quantified by the AER. Any remaining difference between estimated efficient OPEX and observed vegetation management OPEX would indicate inefficiency and would not form part of the OEF adjustment.

While total vegetation management OPEX is identified as a separate OPEX line item in RIN returns, the associated volume data (the count of spans affected) and the density of vegetation (trees per span) needs refinement and consultation with DNSPs to ensure consistency. If reliable and consistent volume data were available, then indicative unit rates could be estimated and assessed.

While some of this data is already collected, it is recognised that refining the development of reliable and consistent volume and other relevant data could be a significant undertaking. Given the materiality of the potential OEF adjustment for all DNSPs either directly or indirectly, this effort is likely to be worthwhile.

There are likely to be a variety of potential methods and data sources for developing volume data. This would include consideration of alternative vegetation categorisation methods and the sampling of vegetation density within each of the selected vegetation categories. This suggests there would be value in a co-ordinated and consultative approach so that resulting estimates of overall vegetation volume are comparable. In assessing the efficiency of the derived estimated actual unit rates, other relevant factors could be considered, including any differences in regulatory obligations and division of responsibility.

As a starting point for discussion, consideration could be given to data, information and evidence regarding the following points (whether in refinements to EBRIN returns, in regulatory proposals, or any collaborative process between DNSPs and perhaps the AER).

1. **Vegetation intensity (volume).** This includes:

    (a) the circuit length requiring active vegetation management (this should be comparable between networks and independent of any differences in average span length or similar). This is the vegetation-exposed network.

    (b) The overall coincidence between the network footprint and available data on vegetation density and growth rates, for example using the index of growth rates established by the Australian Government State of the Environment analysis[55] (likely simplified to a smaller set of categories – e.g. quintiles – covering multiple gradations within the selected index). This enables comparisons between networks and inter-annually for individual networks.

    (c) Information on variations in the cycle length (frequency) for scheduled activities for all of the defined growth categories. This may include reference to any legal or other restrictions increasing the frequency from what might otherwise be cost effective. The between scheduled and spot (reactive) activities and the rationale for this. Any evidence regarding the impact of inter-annual climate variations.

2. **Unit costs per a unit of line length vegetation (per category).** This includes:

    (a) The extent vegetation management activities are procured from third parties, and why, and the market testing, contract design and evidence of efficient costs for each defined growth categories. This would include the impact of any accessibility or other access issues arising.

    (b) The cost of inspections. This would include evidence on any accessibility issues relative to the mix of inspection approaches used (e.g. road or aerial – drone or helicopter).

The core vegetation management data above could be supplemented by further data relating to regulatory matters, including the following.

[55] Information available at https://soe.environment.gov.au/theme/land/topic/2016/vegetation-0

3. **Bushfires:**

   (a) For DNSPs in jurisdictions not directly subject to the Victorian Bushfire regulations, an estimate of any incremental vegetation management activities (beyond vegetation trimming) for the purpose of minimising bushfire risks (such as advertising and educational campaigns).

   (a) For Victorian DNSPs, the proportion of the vegetation exposed network that is affected by the Victorian Bushfire regulations, in particular the proportion defined in the regulations as high risk. This would include evidence on the additional costs (above standard vegetation trimming) of creating and maintaining auditable records on compliance with bushfire regulations.

4. **Division of responsibility:**

   (a) Reference to the *de-jure* allocation of responsibility for vegetation management under which each DNSP operates and an estimate of the proportion of the exposed network (broken down using the growth rate index categories discussed in point 3 above).

   (b) Any evidence regarding whether, and to what extent, *de facto* responsibility varies from *de-jure* responsibility for vegetation management. This would include any evidence that costs are shifted to or from DNSPs relative to local governments and property owners, and the reasonable recovery actions and other steps undertaken by the network to remedy any shortfalls.

5. Any other information or data that may be deemed to be pertinent.

6. A reconciliation between a unit-cost/activity volume build up assessment of efficient costs, drawing on a combined analysis of the evidence from the points above, on the one hand, with the total reported vegetation OPEX in any given EBRIN/CARIN return for a reporting year, on the other, and an explanation of any material differences.

If high quality information that is consistent between DNSPs can be developed, then it should be feasible to apply either additive or subtractive approaches. Similarly, it should be possible to estimate this set of OEF candidates either as a single multi-factorial OEF or as sub-components (cancelling out duplication and accounting for any omissions).

3.9 ActewAGL

The AER has previously identified three OEFs exclusively applicable to ActewAGL that are here considered together:

- **Capitalisation practices:** Historical differences in accounting treatment of capital and operating costs between ActewAGL and other DNSPs meant that reported operating costs were not directly comparable. The AER investigated this issue as part of its earlier decisions and benchmarking, and determined that an OEF of 8.5% was applicable to correct this anomaly.
- **Backyard reticulation:** Historical planning practices in the ACT mean that in some areas overhead distribution lines are run along a corridor through backyards rather than the street frontage as is the practice for other DNSPs. In previous decisions and benchmarking reports the AER has investigated this issue and previously determined

that an OEF of 5.6% is appropriate, to account for additional costs incurred by ActewAGL that are not incurred by comparable DNSPs.

- **Service classification (standard control services connections):** ActewAGL classifies some connection service costs as standard control services which are not similarly classified for other DNSPs. This results in additional reported OPEX for ActewAGL compared to other networks. Service classifications are in part determined by the AER, meaning the adjustment meets the AER's criteria for consideration as an OEF.

3.9.1 Assessment against OEF criteria

Our approach incorporates and builds on that articulated through the AER decisions.

Capitalisation practices

The accounting methodology difference giving rise to this OEF was not related to capitalisation per se, but rather the allocation of overheads. ActewAGL historically allocated overheads such as management and corporate costs to its operating costs only, whereas other DNSPs allocated these overheads across both capital and operating cost activities. Vehicle and IT lease costs were treated as operating costs whereas these were capitalised or allocated across capital and operating activities by other DNSPs This meant that ActewAGL's reported operating costs were higher (and its reported capital costs lower) than comparable DNSPs.

ActewAGL has subsequently changed its accounting policies to align with other DNSPs, and now allocates overheads across both capital and operating cost activities. While we have not reviewed the allocation methodology of ActewAGL and other DNSPs in detail (for example, the finer details of how costs are allocated according to labour-hours or as a percentage of costs across different activities, allocation to plant and equipment etc.), we do not consider any residual differences in accounting policies will give rise to material differences in reported operating costs.

ActewAGL has revised its RINs based on the new accounting policies, and the RIN data on operating costs now used by AER for benchmarking purposes is now comparable to other DNSPs so far as allocation of overheads is concerned. This OEF is now duplicative and discontinued. We understand that the AER is currently reviewing differences in cost allocation and capitalisation polices between DNSPs, and their effect on benchmarking.

Backyard reticulation

Backyard reticulation accounts for 755km or approximately 31% of ActewAGL's overhead network. Land owners are in theory responsible for tree trimming and vegetation management for the majority of this length, with ActewAGL having primary responsibility for only around 10km or 1.3% of the network. ActewAGL does, however, have responsibilities under the Utilities Act to ensure public safety even when it does not have primary responsibility for vegetation management of backyard lines.

In practice, this requires ActewAGL to conduct inspections of backyard lines to ensure appropriate clearances are maintained, issue notices where trimming is required, conduct follow-up inspections to ensure the necessary works have been carried out, and in some cases conduct emergency trimming itself if the landowner has not done so after repeated notice.

Other costs associated with backyard reticulation include additional costs associated with line and poletop maintenance, pole inspections etc which incur additional costs due to difficulty arranging access, and in some cases having to carry in scaffolding etc to access the poletop.

These costs primarily relate to:

- notification letters prior to inspections
- cancelled inspections
- additional time for inspections
- access issues .

Additional costs are incurred due to issues such as locked gates, animals preventing access, rescheduled inspections, and additional costs associated with conducting works in backyards rather than on the street – such as carrying in scaffolding by hand, reinstating damaged garden beds etc. Where tree trimming is conducted by landowners, they often trim the minimum amount necessary to provide required clearances, rather than an additional amount to allow for regrowth as is common practice for DNSPs conducting tree trimming. This means that the inspection and trimming cycle is often shorter than for other DNSPs and thus less efficient due to factors beyond ActewAGL's control. Even where some landowners may trim to allow for regrowth, some don't and ActewAGL must inspect all properties more frequently in order to identify properties where appropriate clearances have not been maintained and safety is compromised.

We concur with the AER's previous assessment of this OEF as exogenous and non-duplicative.

Standard control services connections

Differences in service classifications are not typically an issue for economic benchmarking. This is because the AER benchmarks OPEX using 'network services OPEX' only, which accounts for 'poles and wires' OPEX and excludes costs associated with connections, metering and public lighting services. The ActewAGL service classification OEF was originally applied by the AER in the context of setting an efficient OPEX forecast for the 2014-19 period. As noted by the AER in its draft decision (p. 165):

> *…. service classification must be considered when applying the results to produce our opex forecast. This is because if we do not provide an operating environment adjustment for service classification, service providers that provide standard control services that are not network services will be penalised. ActewAGL classifies some of the costs it incurs for connection services as standard control services.*
>
> *Our opex forecast, based on the Cobb Douglas SFA opex cost function, is for network services so it excludes connection services. Therefore, in order to make our network services forecast comparable to ActewAGL's standard control services opex forecast it is necessary to make an adjustment to account for connection services.*

Going forward, where the AER applies OEFs in the context of its annual benchmarking reports, there may not be a need to apply OEF adjustment for connection services for ActewAGL.

3.9.2 Preliminary finding and quantification

The OEF's that are specific to ActewAGL are summarised in Table 17 exclusive of capitalisation processes. Not being applicable to the reference group, the OEF adjustment is equal to the estimate.

Table 17 ActewAGL (%, $000, $June 2015)

DNSP	AER OEF adjustment		S-M OEF estimate		S-M OEF adjustment	
Backyard reticulation	5.60%	$2,375	4.93%	$2,091	4.93%	$2,091
Service classification	4.00%	$1,696	3.45%	$1,464	3.45%	$1,464
ActewAGL	9.60%	$4,071	8.39%	$3,555	8.39%	$3,555
Reference point	0.00%		0.00%			

As these OEF candidates are unique to ActewAGL, the reference point is zero and the OEF estimate is the OEF adjustment. This is a different percentage figure compared to previous AER calculations due to differences in base year and base for OEF percentage calculations.

3.9.3 Quantification

The AER has previously investigated backyard reticulation, and accepted an estimate of additional costs of $2.0M (2013) provided by ActewAGL as a fixed cost. Similarly over the benchmarking period, connections service costs classified as standard control services by ActewAGL averaged $1.4M ($2013).

We have undertaken a review of these costs and consider that given the extent of backyard reticulation (755km in total), the large number of individual properties involved, significant access issues and administrative overhead involved in managing this issue, we consider these costs to be reasonable. Likewise we find no contention with the AER's previous assessment of service classifications costs. Hence the valuations in $2013 have been indexed to $2015.

3.9.4 Areas for further consideration

Regarding backyard reticulation, we consider that ActewAGL may be able to recover some costs from landowners, recognising there are difficulties with collection and debtor management. We seek additional information regarding the recovery of costs associated with backyard reticulation by ActewAGL, including:

- The proportion of landowners where ActewAGL seeks to recover the cost of missed appointments, failed access, additional inspections, emergency trimming by ActewAGL and other costs where such costs are incurred by ActewAGL due to landowner action / failure to act.
- Any limitations on ActewAGL's ability to recover such costs (for example no basis in the Utilities Act, difficulty identifying landowner vs. account holder, etc.).
- Whether billing and debt recovery costs are such that pursuing such costs is inefficient?

- Any actions being taken by ActewAGL to increase the cost recovery percentage of backyard reticulation related costs.
- Any actions being taken by ActewAGL to minimise and reduce future backyard reticulation related costs, such as coordinating line maintenance with trimming or inspection activities when scaffolding must be erected, conversion to conventional reticulation, ABC or undergrounding?
- A breakdown of the $2.0M per annum figure[56] ActewAGL has previously provided the AER, detailing the costs associated with administration and notifications to landowners, inspections and maintenance relating to "poles and wires", inspections relating to vegetation and safety clearances, and emergency trimming costs.

Regarding service classifications, we seek additional information on whether other DNSPs also classify some connection services costs as standard control services, and if so what amount of these costs are included?

56 Or an updated or more accurate estimate of marginal costs associated with backyard reticulation

4. Power and Water Corporation

4.1 Introduction

The Northern Territory has acceded to parts of the National Electricity Law, including Chapter 6 of the National Electricity Rules, regarding regulation of electricity network prices. It is intended that the Power and Water Corporation in the Northern Territory (Power and Water) will be included in the AER benchmarking process in the future. This section is intended to identify the OEFs that may be material to Power and Water and how these OEFs may be addressed.

4.2 Initial assessment

There is at present no recent econometric benchmarking of Power and Water's core distribution service. Similarly, there is at present no RIN data. As a result it is not possible to quantify any OEFs that may be required to address systemic environmental operating variables affecting Power and Water.

Power and Water is unique amongst the DNSPs within the benchmarking process as it remains a vertically integrated power utility and a water utility. This highlights the importance of careful classification of services deemed to be standard control. This is to ensure they are clearly separated from the generation, transmission and water functions, in the AER's framework and process determination. This will include cost allocation of shared or common costs.

There will an interrelationship between the cost allocation process and the OEF quantification process that should be considered for each OEF. It may be appropriate for the AER to include an additional test for a valid OEF for Power and Water that considers if the costs associated with the OEF have not been addressed in the cost allocation process.

In response to a request from the AER, Power and Water provided a preliminary list of OEFs it believes will be relevant to any benchmarking process. The authors of this report have also been provided a report by Meyrick and Associates, which include quantification of material OEFs.[57] This Meyrick and Associates report includes a quantification of material OEFs.

Based on this information, a summary of the potential OEFs / differential costs identified in each document is provided below. The summary provides an opinion on whether the identified costs are likely to be material and how these costs may best be addressed in the benchmarking process.

[57] See *Benchmarking Power and Water Corporation's Power Networks O&M Costs*, dated 7 January 2003.

Table 18 Power and Water Corporation - qualitative assessment

Description of Cost	Discussion
Expenditure capitalisation – Allocation of corporate IT costs as OPEX to the DNSP function	The treatment of business process support costs that have typically been capitalised is a growing issue with the advent of external cloud based solutions. These costs are within management control. Incurring these costs as OPEX may be the most economically prudent course of action for management.
Population – NT has the lowest average population growth of any state or territory in Australia	It is noted that customer numbers is addressed within the benchmarking model. Differences in population growth have generally not been viewed in the rest of this report as a significant driver of variations in efficient OPEX. The sensitivity of aggregate demand to population change has weakened over the last decade. High population growth may require higher rates of network augmentation and place additional demand for planning and decision-making activities that can result in marginal increases in OPEX. Accordingly, it is possible this variable advantages rather than disadvantages Power and Water.
Base / unavoidable costs – fixed corporate allocation costs.	Power and Water suggests that corporate overhead costs may be higher than for other DNSPs, due to scale effects. Power and Water is substantially smaller than the other NEM DNSPs in terms of customers served. In terms of total OPEX, as a vertically integrated utility, Power and Water is broadly comparable with other DNSPs in the benchmarking program (especially, Actew AGL, CitiPower, and TasNetworks).
Proportion 11kV and 22kV lines driven by historical network designs	Power and Water identified that an historical decision to operate at 11kV results in greater feeder length and a larger number of lower capacity zone substations. Distribution line length is an output of the benchmarking process and the AER has stated that its accounts for customer density when combined with the customer number output, but not on its own. Zone substation density is not necessarily driven be the selection of feeder voltage. Similar zone substation capacities can be used for 22 or 11kV. It is assumed that Power and Water is referring to the distance that 22kV and 11kV can reticulate power over before voltage control becomes problematic. If this is the case, for a given customer density, 11kV will result in less total distribution line length (as the feeder lengths are lower as they originate from more localised zone substations), and more substations. Adopting an N-1

Description of Cost	Discussion
	planning criterion, a greater number of substations will result in more installed zone substation capacity (this position may be partially impacted by the use of distribution transfer capacity). This suggests the modes of cost increase resulting from increased 11kV network are either addressed within the benchmarking process (distribution line length) or within the proposed sub-transmission OEF (including zone substation capacity).
Four Separate Networks – PWC must provide services in 4 highly remote locations with little population between.	Power and Water suggested three modes of OPEX increase associated with the four isolated separate networks. 1. The loss of economies of scale that come from requiring localised specialist resources to respond to fault / outage conditions in order to maintain supply reliability within acceptable limits. Given the scale of the local asset base, these specialist resources may not be economically utilised on an ongoing basis. We acknowledge there may be some specialised technical resources that may be required to be located at remote networks to maintain supply reliability to an acceptable level. The requirement to locate resources in areas where these resources may be under-utilised is driven by the need to respond to fault conditions in acceptable time. The acceptable time is often detailed in local customer quality of supply regulation. 2. The development and implementation of specific technical standards for each system. Technical standards in electricity networks do not require significant ongoing development once established. Implementing technical standards is largely through the development of new assets. It would therefor likely have a more significant impact on CAPEX but less effect on variations in OPEX. 3. Higher procurement costs due to scale effects. This mode of cost increase is discussed further below. The loss of economies of scale within the network could meet the OEF criteria and may represent a new OEF category. *Development and implementation of specific technical standards:* It is not considered likely that the development and implementation of specific technical standards would meet the OEF criteria.

Description of Cost	Discussion
Higher cost of labour inputs	Based on Australian Bureau of Statistics Wage Price Index[58] Northern Territory public service labour cost are 20% higher than East Coast states. This suggests that higher labour unit rates are a factor that needs to be considered in the overall economic benchmarking. This matter has not been addressed elsewhere in this report and may meet the OEF criteria.
Higher costs of materials and inputs	Based on the Rawlinson's construction cost data referenced, it seems likely that Power and Water will experience higher procurement costs, some of which will affect OPEX levels, other things being equal. This matter has not been addressed elsewhere in this report and may meet the OEF criteria.
Lack of competition	This factor may already be reflected in variables related to labour rates and construction cost data, already discussed above. However, to the extent it is not, then any differences in the competitiveness of OPEX procurement needs to be accounted for in economic benchmarking, possibly via an OEF.
Building regulations	Further data on the content of differences in building regulations and any OPEX effects is required in order to consider this matter. An initial view is this matter may not meet the OEF criteria.
Environmental regulations	Further data on the content of differences in environmental regulations and any OPEX effects is required in order to consider this matter. An initial view is this matter may not meet the OEF criteria.
Disposal of asbestos	Disposal of asbestos is likely to be a systemic issue facing numerous DNSPs. Further data on any higher rates of asbestos affected assets is required to assess whether there are any OPEX effects in relation to this matter.
Vegetation management	As discussed in Section 3, variations in vegetation management OPEX do not appear to be fully accounted for in econometric benchmarking. Proposals for reviewing the treatment of variations in vegetation management costs discussed earlier

[58] http://www.abs.gov.au/ausstats/abs@.nsf/mf/6345.0

Description of Cost	Discussion
	should also be considered for Power and Water.
Compliance monitoring and reporting	Further data on the content of differences in compliance monitoring and reporting regulations, and any OPEX effects, is required in order to consider this matter. An initial view is this matter may not meet the OEF criteria.
OH&S Regulations – compliance safety.	Power and Water Corporation suggest two modes of cost increase in this area. On satisfying different legislative and regulatory obligations; in the discussion on the Work Health Safety law in Section 3.3, it is considered unlikely differences between Victorian WHS laws and national WHS laws have significant impacts for OPEX. On extreme heat resulting in different work practices and lower productivity; further data on the content of differences in environmental regulations and any OPEX effects is required in order to consider this matter.
Increased input costs due to NT Government policies	Increased material costs due to locational factors are addressed elsewhere. In this discussion, it is assumed that the purchasing policy of the NT Government is a policy and not implemented through regulatory or legislative requirements. It is arguable whether a policy of the owner of a DNSP would be considered outside management control and therefore an OEF. For example, if the owner of a privately owned DNSP was to establish a policy that resulted in cost increases it would be unlikely that the impact of this policy would considered an OEF. The determination of this mode of cost increase as an OEF is matter of clarification of AER policy and beyond the scope of this report.
Cultural heritage	It is noted that cultural heritage obligations more directly impact new construction and augmentation. In planning for and constructing any asset right of access should be resolved. The costs of achieving this should be captured in the capital costs of establishing the asset. An initial view is that this matter may not meet the OEF criteria.
Uptake of embedded generation creating localised cost increases	The cost increases described by Power and Water can be managed through effective technical requirements for the connection of new embedded generation. An initial view is that this matter may not meet the OEF criteria.
Diversity of skill	More information on this item would be required to consider

Description of Cost	Discussion
requirements	whether it represents an issue for benchmarking.
Extreme weather – cyclones, lightning, extreme precipitation and constant high temperatures	A proposed methodology for addressing the extreme weather OEFs, as set out in this report, and consistent with previous AER decisions, appears to provide a sound basis for considering variations in OPEX attributable to this candidate OEF. This matter may meet the OEF criteria and can be addressed within an existing OEF category and methodology.
Reduced network accessibility	Network accessibility is a systemic issue for all DNSPs. Further data would be required to consider whether this issue would represent a candidate OEF.
Termites	The approach set out for consideration of termite-related costs as an OEF, set out in Section 3.4 should be applicable to Power and Water. This matter may meet the OEF criteria.
Grounding conditions	Further data would be required to consider whether this matter would meet the OEF criteria. This OEF category has so far not been found material for any of the DNSPs that have been assessed so far.

5. Overall results

The preliminary output of this project is the aggregate OEF adjustment columns highlighted in green in Table 19 below. The aggregate OEF column represents the total estimated adjustments to the econometric modelling outputs to account for OEFs that meet the OEF criteria. The individual OEF estimates are set out in more detail in Table 20 and Table 21 below, including the reference point utilised to derive the OEF adjustments set out in Table 23 and Table 24.

Table 19 Overview of preliminary aggregate OEF adjustments ($000, $June 2015)

DNSP	Ideal Optimised OPEX	Aggregate OEFs Adjustments	$ OEF Adjustment	Efficiency target post OEF	OEF optimised OPEX
ActewAGL	$42,402	9.6%	$4,071	62.6%	$46,473
Ausgrid	$383,230	6.1%	$23,200	62.3%	$406,430
Citipower	$55,840	4.5%	$2,516	104.5%	$58,355
Endeavour	$208,106	8.8%	$18,278	82.9%	$226,384
Energex	$311,043	9.7%	$30,229	88.7%	$341,272
Ergon	$244,630	10.5%	$25,752	73.9%	$270,382
Essential	$289,591	4.6%	$13,341	76.8%	$302,932
Jemena	$68,661	0.7%	$476	94.6%	$69,137
Powercor	$190,734	-0.1%	-$245	99.9%	$190,488
SAPN	$248,377	0.0%	$105	100.0%	$248,483
Ausnet	$206,141	-1.1%	-$2,300	98.9%	$203,842
TasNetworks	$62,684	-2.1%	-$1,296	95.0%	$61,388
United Energy	$117,721	0.3%	$345	100.3%	$118,066

Regarding each column:

- The left hand column provides **ideal optimised OPEX**. This is used as the denominator to convert the dollar OEF adjustments to percentage OEF adjustments for each DNSP. This is illustrative of the outputs of econometric benchmarking.
- The two middle (green) columns provide the estimated aggregate OEF adjustments in dollar and percentage terms (i.e. change in efficient OPEX relative to ideal optimised OPEX). These are the illustrative outputs from the present project.
- The two right hand (orange) columns reflect the outcomes from the preliminary OEF estimates – that is the total effect on OEF adjustments on efficiency targets and OEF optimised OPEX. This is illustrative of one process of applying the OEF adjustments to modify the outputs of econometric benchmarking.

Overview of OEF adjustments

A summary of preliminary findings on the estimated dollar value of each material OEF for each DNSP is set out in Table 23 below. For illustrative purposes in Table 24, these are expressed as percentages of ideal optimised OPEX excluding OEFs, as set out in Table 22.

For some OEFs, especially in relation to the DNSPs for which OEFs have not previously been determined, there is insufficient data to reach a preliminary finding. These have been denoted by 'Nil''. Further data is sought on these OEFs. In addition, as noted below, we have so far not been able to quantify a vegetation management OEF. In the meantime, no estimates have been made in and a vegetation management OEF is not shown Table 23 and Table 24 in this draft report.

There is at present no recent econometric benchmarking of Power and Water's core distribution service. Similarly, there is at present no RIN data. As a result it is not possible to quantify any OEFs that may be required to address systemic environmental operating variables affecting Power and Water. We have provided a very preliminary overview and qualitative assessment of variables suggested by Power and Water for consideration as candidate OEFs.

The largest aggregate OEFs in percentage and dollar terms relate to the two Queensland DNSPs (Ergon and Energex), followed by ActewAGL. The three NSW DNSPs (Endeavour, Ausgrid, and Essential,) have significant aggregate OEFs. Citipower and Jemena have material aggregate OEFs.

Two DNSPs (CitiPower and United Energy) in the reference group have an OEF adjusted efficiency target exceeding 100 per cent. This is a consequence of the selections of the comparison point, reference point, and the method used for deriving efficiency targets. It does not imply these DNSPs have been over-compensated for their outputs.

Three DNSPs (Powercor, AusNet, and TasNetworks, including two in the reference group) have negative OEF adjustments. Again, this is a consequence of the selection of the comparison point, reference point and the method used for deriving efficiency targets.

Table 20 Summary of preliminary OEF findings – OEF estimates ($000, $June 2015)

DNSP	actewAGL	Cyclones	Extreme weather storms	OH&S regulations	Sub-transmission (Licence conditions)	Taxes and levies	Termite exposure	Vegetation Management	Total
ActewAGL	$3,555	NA	$0	$5.6	$1,480	Nil	$46	Nil	$5,086
Ausgrid	NA	NA	$2	$5.6	$32,162	Nil	$213	Nil	$32,383
Citipower	NA	NA	$0	$0.0	$3,191	$849	$20	Nil	$4,059
Endeavour	NA	NA	$2,321	$5.6	$20,193	Nil	$744	Nil	$23,264
Energex	NA	NA	$3,081	$5.6	$25,311	$9,076	$1,353	Nil	$38,826
Ergon	NA	$12,828	$755	$5.6	$15,074	Nil	$2,950	Nil	$31,613
Essential	NA	NA	$354	$5.6	$16,891	Nil	$3,029	Nil	$20,279
Jemena	NA	NA	$2	$0.0	$1,383	$971	$19	Nil	$2,374
Powercor	NA	NA	$0	$0.0	$2,701	$1,788	$538	Nil	$5,026
SAPN	NA	NA	$0	$5.6	$6,051	Nil	$0	Nil	$6,057
Ausnet	NA	NA	$0	$0.0	$2,366	Nil	$274	Nil	$2,639
TasNetworks	NA	NA	$192	$5.6	$8	Nil	$0	Nil	$206
United Energy	NA	NA	$0	$0.0	$3,097	Nil	$68	Nil	$3,165

Table 21 Summary of preliminary OEF findings – OEF estimates (as percentage of Optimised OPEX)

DNSP	actewAGL	Cyclones	Extreme weather storms	OH&S regulations	Sub-transmission (Licence conditions)	Taxes and levies	Termite exposure	Vegetation Management	Total
ActewAGL	8.39%	NA	0.00%	0.01%	3.49%	Nil	0.11%	Nil	12.00%
Ausgrid	NA	NA	0.00%	0.00%	8.39%	Nil	0.06%	Nil	8.45%
Citipower	NA	NA	0.00%	0.00%	5.71%	1.52%	0.04%	Nil	7.27%
Endeavour	NA	NA	1.12%	0.00%	9.70%	Nil	0.36%	Nil	11.18%
Energex	NA	NA	0.99%	0.00%	8.14%	2.92%	0.43%	Nil	12.48%
Ergon	NA	5.24%	0.31%	0.00%	6.16%	Nil	1.21%	Nil	12.92%
Essential	NA	NA	0.12%	0.00%	5.83%	Nil	1.05%	Nil	7.00%
Jemena	NA	NA	0.00%	0.00%	2.01%	1.41%	0.03%	Nil	3.46%
Powercor	NA	NA	0.00%	0.00%	1.42%	0.94%	0.28%	Nil	2.64%
SAPN	NA	NA	0.00%	0.00%	2.44%	Nil	0.00%	Nil	2.44%
Ausnet	NA	NA	0.00%	0.00%	1.15%	Nil	0.13%	Nil	1.28%
TasNetworks	NA	NA	0.31%	0.01%	0.01%	Nil	0.00%	Nil	0.33%
United Energy	NA	NA	0.00%	0.00%	2.63%	Nil	0.06%	Nil	2.69%
Reference Point	0.00%	0.00%	0.00%	0.00%	2.29%	0.37%	0.11%	Nil	2.4-2.8%

Source: Sapere-Merz analysis

1. The taxes and levies OEF reference point only applies to those DNSPs where there is a calculation of this OEF. Thisleasd to two values of the overall reference point, where the lower reference point applies to those DNSPs with Nil calculation for taxes and levies

Table 22 Summary of preliminary OEF findings OEF adjustment ($000, $June 2015)

DNSP	actewAGL	Cyclones	Extreme weather storms	OH&S regulations	Sub-transmission (Licence conditions)	Taxes and levies	Termite exposure	Vegetation Management	Total
ActewAGL	$3,555	NA	$0	$5.2	$510	Nil	$0	Nil	$4,071
Ausgrid	NA	NA	$2	$1.8	$23,728	Nil	-$205	Nil	$23,200
Citipower	NA	NA	$0	-$0.6	$1,914	$643	-$41	Nil	$2,516
Endeavour	NA	NA	$2,321	$3.5	$15,436	Nil	$517	Nil	$18,278
Energex	NA	NA	$3,081	$2.5	$18,200	$7,932	$1,014	Nil	$30,229
Ergon	NA	$12,828	$755	$3.2	$9,482	Nil	$2,684	Nil	$25,752
Essential	NA	NA	$354	$2.7	$10,271	Nil	$2,713	Nil	$13,341
Jemena	NA	NA	$2	-$0.7	-$186	$718	-$56	Nil	$476
Powercor	NA	NA	$0	-$1.9	-$1,660	$1,086	$330	Nil	-$245
SAPN	NA	NA	$0	$3.1	$373	Nil	-$271	Nil	$105
Ausnet	NA	NA	$0	-$2.1	-$2,347	Nil	$49	Nil	-$2,300
TasNetworks	NA	NA	$192	$5.0	-$1,425	Nil	-$68	Nil	-$1,296
United Energy	NA	NA	$0	-$1.2	$406	Nil	-$60	Nil	$345

Source: Sapere-Merz analysis

Table 23 Summary of preliminary OEF findings – OEF adjustment (as percentage of Optimised OPEX)

DNSP	actewAGL	Cyclones	Extreme weather storms	OH&S regulations	Sub-transmission (Licence conditions)	Taxes and levies	Termite exposure	Vegetation Management	Total
ActewAGL	8.39%	NA	0.00%	0.01%	1.20%	Nil	0.00%	Nil	9.60%
Ausgrid	NA	NA	0.00%	0.00%	6.11%	Nil	-0.05%	Nil	6.05%
Citipower	NA	NA	0.00%	0.00%	3.43%	1.15%	-0.07%	Nil	4.51%
Endeavour	NA	NA	1.12%	0.00%	7.42%	Nil	0.25%	Nil	8.78%
Energex	NA	NA	0.99%	0.00%	5.85%	2.55%	0.33%	Nil	9.72%
Ergon	NA	5.24%	0.31%	0.00%	3.88%	Nil	1.10%	Nil	10.53%
Essential	NA	NA	0.12%	0.00%	3.55%	Nil	0.94%	Nil	4.61%
Jemena	NA	NA	0.00%	0.00%	-0.27%	1.05%	-0.08%	Nil	0.69%
Powercor	NA	NA	0.00%	0.00%	-0.87%	0.57%	0.17%	Nil	-0.13%
SAPN	NA	NA	0.00%	0.00%	0.15%	Nil	-0.11%	Nil	0.04%
Ausnet	NA	NA	0.00%	0.00%	-1.14%	Nil	0.02%	Nil	-1.12%
TasNetworks	NA	NA	0.31%	0.01%	-2.27%	Nil	-0.11%	Nil	-2.07%
United Energy	NA	NA	0.00%	0.00%	0.35%	Nil	-0.05%	Nil	0.29%
Reference Point	0.00%	0.00%	0.00%	0.00%	2.29%	0.37%	0.11%	Nil	2.4-2.8%

Source: Sapere-Merz analysis

1. The taxes and levies OEF reference point only applies to those DNSPs where there is a calculation of this OEF. Thisleasd to two values of the overall reference point, where the lower reference point applies to those DNSPs with Nil calculation for taxes and levies

Comparison with previous AER decisions

Table 24 below compares the OEF adjustments in this report with previous AER decisions. Note that the AER's previous decisions refer to seven (7) out of the total 13 DNSPs.

Table 24 Comparison with previous AER decisions

DNSP	AER OEF adjustment	SRG/Merz OEF adjustment	SRG/Merz c.f. AER
ActewAGL	10.1%	9.6%	-0.5%
Ausgrid	6.9%	6.1%	-0.8%
Citipower	0.0%	4.5%	NA
Endeavour	6.3%	8.8%	2.5%
Energex	12.2%	9.7%	-2.5%
Ergon	18.6%	10.5%	-8.1%
Essential	5.4%	4.6%	-0.8%
Jemena	0.0%	0.7%	NA
Powercor	0.0%	-0.1%	NA
SAPN	0.0%	0.0%	NA
Ausnet	0.0%	-1.1%	NA
TasNetworks	0.0%	-2.1%	NA
United Energy	0.0%	0.3%	NA
Reference point	0.0%	2.4 or 2.8%	2.4 or 2.8%[59]

Source: Sapere-Merz analysis and AER

For most DNSPs, the proposed aggregate OEF adjustments (expressed as percentages of ideal optimised OPEX) are lower than the previous AER adjustments. Ergon and Energex would experience significant reductions (-8.1 and -2.5 per cent respectively). Ausgrid and Endeavour would both receive reductions of -0.8 per cent and ActewAGL -0.5 per cent.

The proposed reductions reflect a combination of:

1. More extensive analysis of OEFs as they relate to the reference group. The significant OEF estimates for the reference group result in a reference point of 2.8 per cent for the calculation of the OEF adjustments, whereas the AER previously had an effective reference point of zero. The extension of the OEF assessments means all OEF adjustments for the non-reference group are reduced by the estimate for the reference point.

59 Note that the lower reference point applies to those DNSPs with Nil calculation for taxes and levies

2. The finding that a number of candidate OEF categories do not meet the OEF criteria. The OEF candidates excluded include licence conditions, except perhaps for Ausgrid, and OH&S regulations.
3. Changes to the quantification of some OEFs (including sub-transmission, extreme weather, and termites).
4. The decision at this point not to estimate an OEF for vegetation management (including bushfires and division of responsibility).

Further to these matters, even in cases where the OEF dollar estimate as used by the AER have been applied, the percentage OEF adjustment may be different due to a number of factors in the calculation including:

- the periods used for an adjustment for inflation;
- the periods used for annualisation;
- the reference year used for the productivity scores and historical OPEX employed to obtain the ideal optimised OPEX used in the denominator; and
- the reference year used for the customer numbers employed in the weighted average calculation of the reference point.

Relative to previous decisions by the AER, the preliminary results vary between two sets of individual OEFs:

- Substantial change – where the review is proposing substantial changes relative to previous consideration by the AER; and
- Little change and modest refinement – where the review is proposing little change or modest refinement compared with previous consideration by the AER.

Appendix 1 Terms of reference

The terms of reference for the project are set out below.

The AER seeks an independent technical advice about material differences in operating environments between the Australian electricity distribution service providers.

The consultant will be required to provide a written report that:

- *identifies the most material factors driving apparent differences in estimated productivity and operating efficiency between the distribution networks in the NEM, and*
- *quantifies the likely effect of each factor on operating costs in the prevailing conditions.*

The consultant is expected to only focus on those operating environment factors that contribute to a material difference in relative costs between businesses. As noted in the Appendix below, the AER has previously defined material as a 0.5 per cent difference in relative costs. The consultant may wish to consider the level and appropriateness of this materiality threshold.

The consultant should initially conduct a desktop review of the AER's existing OEF analysis and methodology for the distribution networks, including the relevant submissions and consultants' reports from the Australian distribution service providers. This desktop review is expected to reduce the scope of work and information requirements necessary to identify the most material OEFs.

Following this desktop review, the consultant may need additional information about the Victorian, South Australian, Tasmanian and Northern Territory networks. The consultant may need to consult with, or seek additional information from, the relevant distribution network services providers.

*For Northern Territory, the consultant can use as a starting point previous benchmarking analysis for Power and Water Corporation and the Northern Territory Utilises Commission from 2005.*60 *This analysis suggested that Power and Water Corporation has a number of cost disadvantages when compared to other Australian distributors, including high transport and construction costs, extreme weather, climate conditions and termites.*61

60 Meyrick and Associates, *Benchmarking Power and Water Corporation's Power Networks O$M Costs — A Report Prepared for Power and Water Corporation & Utilities Commission*, 7 January 2003. Available online at https://www.erawa.com.au/cproot/5427/2/AMENDED%20ACCESS%20ARRANGEMENT%20INFORMATION%20-%20APPENDIX%201%20-%20Meyrick%20Benchmarking.pdf

61 Meyrick and Associates, *Benchmarking Power and Water Corporation's Power Networks O$M Costs — A Report Prepared for Power and Water Corporation & Utilities Commission*, 7 January 2003, pp. 36-42