AER OPERATING ENVIRONMENT FACTORS (OEFS)

A REPORT PREPARED FOR ENERGY QUEENSLAND

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1 INTRODUCTION

Ergon Energy and Energex are currently in the process of preparing their Regulatory Proposals to the Australian Energy Regulator (AER) for the forthcoming regulatory control period from 1 July 2020 to 30 June 2025. To inform their annual revenue requirements for the 2020–25 regulatory period, Energy Queensland has commissioned Frontier Economics to provide two separate reports.

- **A benchmarking report** outlining our assessment of the comparative efficiency of Energex's and Ergon's proposed base year opex for the 2020–25 regulatory period; and
- **An operating environment factors (OEFs) report** outlining our recommended framework for accounting for OEFs in the AER's benchmarking and how to apply this to Energex and Ergon.

We set out our proposed approach to assessing OEFs in the remainder of this report, which is to be read alongside our benchmarking report titled 'AER benchmarking', henceforth referred to as the **Benchmarking Report**.

1.1 Terms of reference

Energy Queensland has commissioned Frontier Economics to prepare this report outlining our recommended framework for accounting for OEFs in the AER's economic benchmarking analysis. In the remainder of this report we discuss the following topics.

- In Section 2 we provide our assessment of the OEF adjustments underlying the AER's last round of resets for the ACT, NSW, Queensland and SA regulatory determinations, including the 2015-2020 determination for Energex and Ergon (hereafter referred to as **the AER's 2015 OEFs assessment**).
- In Section 3 we provide our views on the AER's most recent OEFs consultation, initiated in December 2017 in collaboration with its economic and engineering consultants Sapere Research Group and Merz Consulting (Sapere-Merz)[1] (hereafter referred to as **the Sapere-Merz consultation**).
- In Section 4 we provide a discussion of possible OEFs for Energex and Ergon that should be considered by the AER; and
- In Section 5 we summarise our conclusions and proposed next steps for the AER.

In the remainder of this introduction, we briefly discuss the following topics.

- What are OEFs? (Section 1.2)
- Why are OEFs important? (Section 1.3)
- How are OEFs accounted for in the AER's benchmarking? (Section 1.4)
- What are limitations to estimating OEFs? (Section 1.5)
- How can these limitations be addressed? (Section 1.6)

[1] Sapere-Merz, *Independent Review of Operating Environment Factors Used to Adjust Efficient Operating Expenditure for Economic Benchmarking*, December 2017 and August 2018.

1.2 What are OEFs?

Since November 2014, the AER has used economic benchmarking to assess the relative efficiency of the Australian DNSPs, and to inform its determination of expenditure allowances for DNSPs, as is required under the National Electricity Rules. The aim of the AER's benchmarking analysis is to estimate ***differences in managerial and operating efficiency*** between the DNSPs, thereby obtaining an assessment of the expected scope for future efficiency improvements.

Typically, benchmarking involves identifying a set of 'inputs' used by the business (e.g., physical inputs such as labour and materials, or financial resources) and a set of 'outputs' (e.g., services delivered and the quality of those services). A business is regarded as performing more efficiently than the benchmark if it is able to deliver the same or more outputs while using less inputs, or more outputs for the same inputs. In order to ensure that comparisons between businesses are made on a like-for-like basis, differences in the operating environment that affect the level of performance across different businesses need to be taken into account when assessing relative efficiency.

The AER's approach to benchmarking the Australian DSNPs is described in detail in our separate Benchmarking Report. This involves an assessment of the DNSPs' opex against a set of cost drivers that include customer numbers, circuit length and ratcheted maximum demand. To account for other cost drivers not included in the AER's benchmarking models, the AER makes some adjustments in an attempt to take account of these factors. The AER refers to these adjustments as OEFs. The AER defines OEFs to be "factors beyond a DNSP's control that can affect its costs and benchmarking performance."[2] They include factors such as cyclones, subtransmission and termite exposure.

We note that despite referring to these adjustments as 'operating environment factor' adjustments, the AER's adjustments encompass factors other than operating environment, such as differences in cost allocation practices, scope of activities, and legacy network configuration decisions. As the intention behind the AER's approach is to make adjustments for cost drivers not included in its econometric benchmarking models, we adopt the following broader definition of OEFs in the remainder of this report: "Factors affecting perceived differences in performance that are not accounted for in the AER's preferred econometric benchmarking models".

1.3 Why are OEFs important?

In the context of regulated electricity distribution network businesses, differences in the operating expenditures can arise from a number of potential sources, including (but not necessarily limited to) differences in:

- core cost drivers (e.g., network scale, demand);
- operating environment (e.g., density, climate, topography, soil properties, vegetation, and the urban/rural nature of certain areas);
- regulatory obligations (e.g. differences in licence conditions across states and territories);
- scope of activities (e.g., sharing of vegetation management roles with local councils);
- input prices (e.g., labour rates);
- cost allocation policies and reporting practices;

[2] *Ibid.*, p. 5.

- past (legacy) network configuration decisions and planning constraints that cannot be altered easily or efficiently within a short period of time (e.g., ownership of subtransmission assets, historical choices in the way networks were constructed); and
- current managerial and operating efficiency.

All of these factors can influence (increase or reduce) a network's actual or reported opex compared to other networks, and therefore its (raw) efficiency score if not controlled for properly.

However, for the purposes of determining efficiency adjustments in regulatory proceedings, it is only the impact on costs due to the last type of underlying difference in the above list – genuine **differences in current managerial and operating efficiency** – that should be measured. Differences in measured performance due to the other factors mentioned above should not be used to justify the imposition of efficiency adjustments.

There is, by international standards, an unusually large degree of heterogeneity of circumstance within the Australian sample of distribution network service providers (DNSPs). We have documented some of the sources of this heterogeneity in a number of past reports.[3] We comment in more detail on the operating environment challenges of Energex and Ergon Energy in the remainder of this report.

1.4 How are OEFs accounted for in the AER's benchmarking?

The AER's approach to accounting for OEFs in its benchmarking analysis is discussed in detail in Section 2.2 of our separate benchmarking report. We briefly summarise this approach below and discuss it in further detail in Section 2.2 of this report.

To determine its base-year opex allowances for the 2015-2020 regulatory review period, the AER applied adjustments of 17.1% and 26.2% to Energex and Ergon Energy respectively to account for differences in OEFs not accounted for in its preferred econometric benchmarking model.

As shown in **Table 6** of this report, the AER's 26.2% OEF adjustment for Ergon comprises adjustments for:

- **the following factors that it considers to be material:** cyclones, subtransmission, division of responsibility for vegetation management, extreme weather events, network accessibility, taxes and levies, termite exposure and license conditions.
- **the following factors that it considers to be immaterial individually, but material in aggregate:** asset age, building regulations, competition from mining, corrosive environments, cultural heritage, environmental regulations, environmental variability, grounding conditions, OH&S regulations, proportion of 11Kv and 22Kv lines, rainfall and humidity, skills required by different DNSPs, solar uptake, topography, traffic management, bushfires, capitalisation practices, private power poles, and transformer capacity owned by customers.

The AER's 17.1% OEF adjustment for Energex comprises adjustments for:

- **the following factors that it considers to be material:** subtransmission, division of responsibility for vegetation management, extreme weather events, taxes and levies and termite exposure
- **the following factors that it considers to be immaterial individually, but material in aggregate:** building regulations, capitalisation practices, corrosive environments, cultural heritage, environmental regulations, fire ants, grounding conditions, OH&S regulations, planning conditions,

[3] For a discussion of some of the very large differences between DNSPs in Australia, Ontario and New Zealand see, for example: Frontier Economics, *Review of the AER's Econometric Benchmarking Models and Their Application in the Draft Determinations for Networks NSW*, February 2015, Section 3.3. For a discussion of the material differences in operating circumstances between DNSPs in Australia alone, see for example: Frontier Economics, *Taking Account of Heterogeneity Between Networks When Conducting Economic Benchmarking Analysis*, February 2015, Section 2.

proportion of 11Kv and 22Kv lines, rainfall and humidity, skills required by different DNSPs, solar uptake, termite exposure, topography, traffic management, asset age, bushfires, environmental variability, private power poles, and transformer capacity owned by customers.

The AER's OEF adjustments have the effect of decreasing the raw benchmarking comparison point for Energex and Ergon Energy by 17.1% and 26.2%, respectively, to make an allowance for perceived exogenous differences particular to their networks. The rationale behind these OEF adjustments is to provide an allowance for factors affecting perceived differences in performance that are not accounted for in the AER's preferred econometric benchmarking models.

The OEF adjustments underlying the AER's last round of resets were based on a consideration of over 60 different OEFs that it had identified in consultation with service providers and other stakeholders in the course of developing its previous round of ACT, NSW, Queensland and SA regulatory determinations.

1.5 What are limitations to estimating OEFs?

At present, there is little agreement between the AER, the DNSPs and other stakeholders on which OEFs should be accounted for within the benchmarking analysis. As discussed above, in its 2015 OEFs assessment the AER had originally identified over 60 different OEFs for consideration in consultation with service providers and other stakeholders in the course of developing its previous round of ACT, NSW, Queensland and SA regulatory determinations. However, in its most recent OEFs review, initiated in December 2017 in collaboration with its economic and engineering consultants Sapere Research Group and Merz Consulting (Sapere-Merz),[4] only a small subset of five OEFs has been considered.

- The 13.6% OEF adjustment for Ergon comprises adjustments for **the following factors that it considers to be material:** cyclones, subtransmission, taxes and levies, termite exposure and license conditions.
- The 3.5% OEF adjustment for Energex comprises **the following factors that it considers to be material:** subtransmission, taxes and levies and termite exposure.

We note that Sapere-Merz's report excludes the consideration of the vast majority of OEFs considered in detail in the AER's original work.

- The following OEFs for which the AER applied material OEF adjustments are yet to be considered by Sapere-Merz: Division of vegetation management responsibility, network accessibility, capitalisation practices and bushfire risk. Extreme weather events and OH&S regulations are yet to be considered fully owing to a lack of available data.
- The following OEFs, which the AER considered to be immaterial individually but material in aggregate, are outside Sapere-Merz's terms of reference: asset age, building regulations, competition from mining, corrosive environments, cultural heritage, environmental regulations, environmental variability, fire ants, grounding conditions, planning regulations, proportion of 11Kv and 22Kv lines, rainfall and humidity, skills required by different DNSPs, solar uptake, topography, traffic management, private power poles, and transformer capacity owned by customers, and underground services.

Furthermore, we note that the poor quality (or lack) of data collected on OEFs to date limits the extent to which any assessment of OEFs can be effectively implemented at present. In our view, there is a need for extensive further consultation and data collection to enhance the quantification of OEFs. Our

[4] Sapere-Merz, *Independent Review of Operating Environment Factors Used to Adjust Efficient Operating Expenditure for Economic Benchmarking*, December 2017.

report provides the AER with a recommended framework for consultation with the DNSPs and relevant stakeholders.

Finally, in our view, the AER's OEF framework for benchmarking is fundamentally confounded by the estimation of raw efficiency scores *before* important OEFs are accounted for. As the AER's relative efficiencies are estimated before the consideration of OEFs, these are distorted by the exclusion of important factors affecting differences in perceived performance. *Ex-post* adjustments for OEFs do not overcome this bias. In our February 2018 report submitted to the AER,[5] we proposed an alternative framework for accounting for OEFs in economic benchmarking, which aligns with the recommendations made in this report

In the remainder of this report, we discuss the AER's OEFs work to date in more detail, set out our proposed approach to overcoming the present limitations, and outline our proposed next steps for the AER.

1.6 How can these limitations be addressed?

Our recommendations and proposed next steps for the AER are discussed in detail in Section 5 of this report. These are summarised below.

- **The AER's review of its approach to OEFs is important and welcome.** Frontier Economics commends the AER's ongoing efforts to improve its approach to economic benchmarking, and its dedicated review of how OEFs should be accounted for when conducting economic benchmarking. In our view, it is not possible to draw meaningful conclusions about the relative efficiency of regulated DNSPs unless OEFs are controlled for appropriately. Failure to control properly for OEFs would defeat the objective of conducting economic benchmarking: namely, to identify the true scope for efficiency improvements by DNSPs. Therefore, we welcome the AER's attention towards this issue, and consider that this is an important opportunity to make lasting improvements to the way the AER conducts economic benchmarking to promote the long-term interest of consumers.
- **Possible OEFs for Energex and Ergon.** In Section 4, we provide a discussion of potentially material OEFs for Ergon and Energex, drawing on previous submissions made to the AER by these businesses. In Section 4.2 we provide our assessment of the extent to which each of these OEFs has been considered by the AER and Sapere-Merz to date. As shown in **Table 8**, our view is that the majority of these OEFs are yet to be considered or have only been partially considered by the AER and Sapere-Merz. In cases where OEFs have been considered by the AER and Sapere-Merz, our assessment is that further work can be done to analyse these OEFs in more detail. Our discussion of this further work is provided in Section 5.
- **Status of Sapere-Merz consultation**. As the Sapere-Merz OEFs consultation considers only a limited subset of relevant OEFs, this is likely to significantly underestimate the challenges associated with the operating environment of Ergon Energy and Energex. In our view, Sapere-Merz's OEFs are too preliminary to be relied on at present for base-year assessment purposes.
- **Need for further work**. In our view, a much more extensive consultation and engagement process (between the AER and relevant stakeholders) is required to determine the impact of important factors that could be driving differences in DNSPs' opex that are not accounted for in the AER's benchmarking models. In Section 5.3 we set out our assessment of the further work that is needed on OEFs. This includes the need to:

[5] Frontier Economics, *An alternative framework for accounting for operating environment factors (OEFs) – A report prepared for Essential Energy*, February 2018.

  - initiate a new consultation on which OEFs should be accounted for within the benchmarking analysis;
  - consult on how each of these OEFs should be quantified in a systematic and reliable manner;
  - work closely with DNSPs to identify the data required, and undertake a rigorous process of checking and improving the veracity of the data, before making OEF adjustments;
  - re-consider how OEFs are applied, and move away from the use of an *ex-post* approach where possible; and
  - interpret benchmarking results with due caution.
- **What this means for Energex and Ergon**. We understand that the AER does not intend to rely on the Sapere-Merz OEFs assessment for base-year assessment purposes, as this work is preliminary and provides an OEF adjustment for only 5 of over 60 possible OEFs. However, our Benchmarking Report assesses the comparative efficiency of Energex's and Ergon's proposed base year opex for the 2020–25 regulatory period using both the AER's 2015 OEF adjustments as well as the lower Sapere-Merz adjustments. We find that there is no strong evidence to suggest that Energex's and Ergon's base year opex for the 2020–25 regulatory period requires an efficiency adjustment. Since this conclusion holds even under the limited set of OEF adjustments considered to date by Sapere-Merz, it holds even more strongly if a more encompassing allowance is made for OEF adjustments in the estimation of Energex's and Ergon's target base year opex.

2 OVERVIEW OF AER'S APPROACH

The OEF adjustments underlying the AER's last round of resets were based on a consideration of over 60 different OEFs that it had identified in collaboration with service providers and other stakeholders in the course of developing its previous round of ACT, NSW, Queensland and SA regulatory determinations. To determine its base-year opex allowances for the 2015-2020 regulatory review period, the AER applied adjustments of 17.1% and 26.2% to Energex and Ergon Energy respectively to make an allowance for perceived differences in OEFs not accounted for in its preferred econometric benchmarking model. In the remainder of this section we describe:

- how the AER's benchmarking scores are estimated before making OEF adjustments;
- how the AER has applied OEFs;
- how the AER estimated OEFs in the last round of resets; and
- our assessment of the limitations associated with the AERs approach.

2.1 How the AER's benchmarking scores are estimated before OEFs

The AER's approach to benchmarking, discussed in detail in our separate Benchmarking Report, is summarised below.

Until recently, the AER has relied on a single econometric benchmarking model (the SFA CD model discussed below) when setting base-year operating opex allowances for DNSPs. In the AER's most recent DNSP draft decisions for the NSW, ACT and TAS businesses, the AER has considered a wider set of evidence from four different econometric models, namely:

- **SFA CD.** Stochastic Frontier Analysis (SFA) using a Cobb-Douglas (CD) functional form;
- **SFA TL.** Stochastic Frontier Analysis using a Translog (TL) functional form;
- **LSE CD.** Least Square Estimation (LSE) using a Cobb-Douglas functional form; and
- **LSE TL.** Least Square Estimation using a Translog functional form.

The set of explanatory variables included in the AER's models are:

- customer numbers;
- circuit length;
- ratcheted maximum demand;
- the share of network that is underground;
- a time trend; and
- since the AER's model makes use of data from overseas, these include dummy variables to identify DNSPs from New Zealand and from Ontario.

A set of 'raw' efficiency scores for each DNSP is obtained from each of the AER's four econometric models. These are presented in **Table 1** below.

Table 1: Efficiency scores from AER's latest benchmarking models

	SFA CD	LSE CD	SFA TL	LSE TL
ActewAGL	43.2%	40.3%	44.6%	39.1%
AusNet	67.2%	67.1%	63.9%	61.9%
Ausgrid	42.9%	40.8%	49.1%	44.3%
Citipower	78.8%	77.9%	91.6%	79.7%
Endeavour	56.7%	54.1%	61.1%	59.3%
Energex	58.7%	56.1%	63.1%	59.7%
Ergon	54.5%	54.6%	63.2%	60.9%
Essential	59.4%	60.1%	69.0%	67.2%
Jemena	60.7%	58.3%	60.8%	50.6%
Powercor	95.0%	100.0%	94.6%	100.0%
SA Power Networks	71.8%	68.1%	76.7%	73.6%
TasNetworks	73.8%	70.6%	72.8%	69.8%
United	75.4%	75.1%	76.9%	66.3%
min	**42.9%**	**40.3%**	**44.6%**	**39.1%**
max	**95.0%**	**100.0%**	**94.6%**	**100.0%**
range	**52.1%**	**59.7%**	**50.1%**	**60.9%**

Source: AER's 2018 annual benchmarking report, Frontier Economics' calculations; Note: These are average efficiency scores over the 2006-2017 sample period.

Table 1 shows that the highest efficiency score estimated by the AER is between 94.6% and 100% and the lowest efficiency score estimated by the AER is between 39.1% and 44.6%. The difference between the highest and lowest scores is between 52.1 and 60.9 percentage points. This represents a very large spread of efficiency scores, and in our view the difference in efficiency scores is likely to be, to a considerable extent, due to genuine and intrinsic differences in DNSPs' operating circumstances that are not captured by the set of explanatory variables included in the AER's models. The AER's approach to adjusting for these differences is described in Section 2.2 below.

We note that the efficiency scores in **Table 1** are average efficiency scores over the 2006-2017 sample period, and do not represent efficiency in the latest year. As shown in Section 4.2.2 of our benchmarking report, for businesses such as Ergon and Energex that have substantially reduced their opex since 2012-13, these are a poor indicator of efficiency in the base year.

2.2 How the AER applies OEFs

To determine its base-year opex allowances for the 2015-2020 regulatory review period, the AER applied adjustments of 17.1% and 26.2% to Energex and Ergon Energy target scores respectively to make an allowance for perceived differences in OEFs not accounted for in its preferred econometric benchmarking model (previously the SFA CD model). The AER's OEF adjustments had the effect of lowering the target score by a factor that depends on these OEF assessments of 17.1% and 26.2%,[6] respectively. As the OEFs are accounted for only *after* the raw efficiency scores have been estimated, we refer to the AER's approach as an *ex-post* adjustment approach. The *ex-post* adjustment approach can be described as follows.

- The 'raw' efficiency scores (before adjustments for OEFs) from the AER's preferred benchmarking model for Energex and Ergon were 61.8% and 48.2%, respectively, at the time of the AER's final decisions for the 2015-2020 reset period.
- The comparison point or target score from the AER's preferred benchmarking model was 76.8% (the top 5th service provider's score in the sample of 13 DNSPs).
- OEF-adjusted target scores were calculated for Energex and Ergon as follows. Adjustments of 17.1% and 26.2% were made for Energex and Ergon Energy to account for differences in OEFs not accounted for in its preferred econometric benchmarking model.[7] These adjustments had the effect of:
  - lowering Energex's target efficiency score by 17.1% from 76.8% to 65.6%; and[8]
  - lowering Ergon's target efficiency score by 26.2% from 76.8% to 60.8%.
- The difference between Ergon and Energex efficiency scores and the OEF-adjusted target scores was used to assess the scope for efficiency savings.[9]

The adjusted target scores resulting from the AER's *ex-post* adjustment approach when applied to the AER's latest four preferred econometric models, are shown in **Figure 1** below.

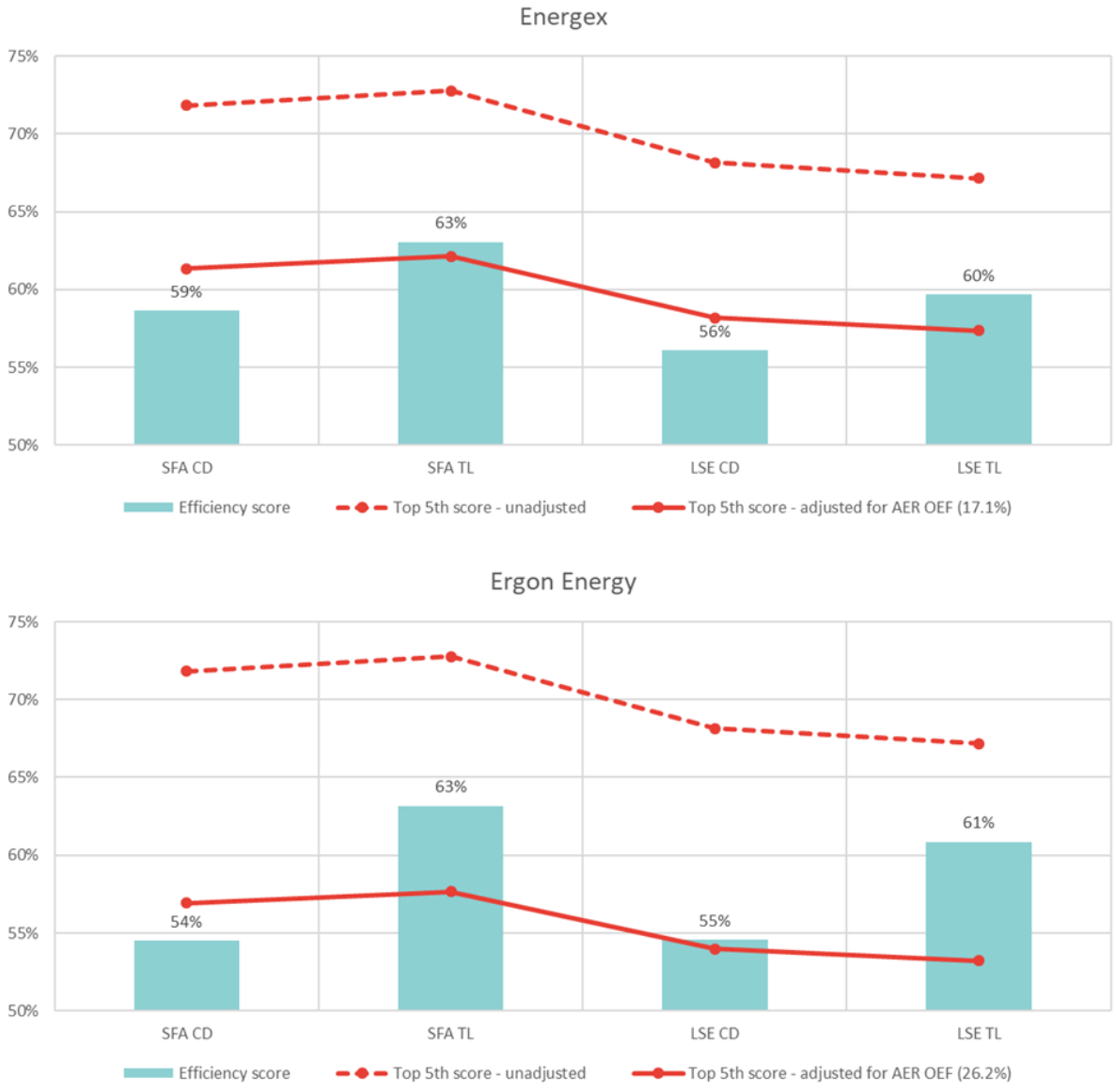
[6] The AER adjusts the target score by dividing the target by a factor equal to (1+OEF). For example, Ergon's target score is adjusted by dividing by (1+26.2%).

[7] The raw SFA efficiency scores displayed are 'rolled forward' from a period-average basis (for 2006-2013) to the 2012–13 base year.

[8] The adjusted target score resulting from an x% OEF is obtained by dividing the target score by (1 + x%).

[9] After a 'roll-forward' assessment from a period-average basis (for 2006-2013) to the 2012–13 base year.

Figure 1: Target scores resulting from AER's ex-post OEF adjustments to its latest models



Source: Frontier Economics

Figure 1 shows that:

- Ergon Energy's efficiency score is higher than the OEF-adjusted target score in three out of the AER's four preferred benchmarking models; and
- Energex's efficiency score is higher than the OEF-adjusted target score in two out of the AER's four preferred benchmarking models.

We note that when the AER has previously found a DNSP's efficiency score to be higher than the OEF-adjusted target score it has not applied an efficiency adjustment to the DNSP's base year opex.[10] **Figure 1** above shows that when the AER's *ex-post* OEF adjustment approach is applied to its latest models,

[10] For example, see AER, *TasNetworks distribution determination 2019 to 2014 – Draft decision, Attachment 6 – Operating expenditure*, September 2018; AER, *AusNet Services distribution determination 2016 to 2020 – Final decision, Attachment 7 – Operating expenditure*, May 2016.

Energex's and Ergon's efficiency scores are higher than the OEF-adjusted target score in two and three out of four models, respectively. In other words, after applying the AER's 2015 OEF assessments to the AER's latest four preferred econometric models there is not a strong case for an efficiency adjustment for either Energex or Ergon, .

2.3 How the AER estimated OEFs in the last round of resets

The OEF adjustments underlying the AER's last round of resets were based on a consideration of over 60 different OEFs, listed in **Table 2** below. The AER identified this list of OEFs in consultation with service providers and other stakeholders in the course of developing its previous round of ACT, NSW, Queensland and SA regulatory determinations.

For each factor above, the AER considered the three criteria of exogeneity, materiality, and duplication.

- **Exogeneity.** The OEF should be outside the control of a service provider's management. The AER states that where the effect of an OEF is within the control of a service provider's management it would not generally provide an adjustment for the OEF.
- **Materiality.** The OEF should create material differences in the service provider's opex. The AER states that where the effect of an OEF is not material, it would generally not provide an adjustment for the factor. The AER did, however, provide a combined adjustment for individually immaterial factors. The AER chose 0.5% as its materiality threshold, because this is the materiality threshold that it uses in its Economic Benchmarking RIN.[11]
- **Duplication.** The OEF should not have been accounted for elsewhere in the AER's benchmarking models. The AER states that where the effect of an OEF is accounted for elsewhere, it would not seek to provide an adjustment for that factor.

Based on the approach and criteria described above, the AER made adjustments:

- for Ergon Energy for 10 material OEFs and 18 immaterial OEFs (the combined effect of which was considered to be material);
- for Energex for 5 material OEFs and 16 immaterial OEFs (the combined effect of which was considered to be material).

[11] The materiality threshold relates to differences between the previous cost allocation method (CAM) and the current CAM. If the service providers' current CAMs lead to material differences in reported opex compared to their past CAM, they are required to backcast their costs using their current CAM.

Table 2: OEFs shortlisted by the AER in 2015

MATERIAL FOR ENERGEX AND ERGON	IMMATERIAL	SHORTLISTED BUT NOT CONSIDERED AS MATERIAL OR IMMATERIAL OEFS
Cyclones	Asset age	Activity scheduling
Division of responsibility for vegetation management	Building regulations	Advanced metering infrastructure
Extreme weather events	Capitalisation practices	Capital contributions
Licence conditions	Competition from mining	Communication networks
Network accessibility	Corrosive environments	Contaminated land management
OH&S regulations	Cultural heritage	Contestable services
Subtransmission	Environmental regulations	Critical national infrastructure
Taxes and levies	Environmental variability	Customer density
Termite exposure	Fire ants	Demand management
Bushfire	Grounding conditions	Economies of scale
	Planning regulations	Line length
	Private power poles	Line sag
	Proportion of 11kV and 22kV lines	Load factor
	Rainfall and humidity	Load growth
	Skills required by different DNSPs	Mix of demand to non-demand customers
	Solar uptake	Network control centres
	Topography	One off base year costs
	Traffic management	Outsourcing
	Transformer capacity owned by customers	Past ownership
		Population growth
		Proportion of wood poles
		Reliability outcomes
		Rising and lateral mains
		Risk appetite
		Safety outcomes
		Shape factors
		Special customer requirements
		SWER
		Temperature
		Transmission connection point charges
		Undergrounding
		Unregulated services
		Work conditions

Source: Ergon Energy's 2015 determination, Essential Energy's 2015 determination.

Table 3 below shows that the AER's OEF adjustments of 17.1% and 26.2% to Energex and Ergon Energy, respectively, comprise:

- Material OEF adjustments of 12.2% and 20.1% to Energex and Ergon Energy, respectively; and
- Adjustments of 5.0% and 6.1% to Energex and Ergon Energy, respectively, for the combined impact of immaterial OEFs.

We discuss the AER's approach to estimating material and immaterial OEFs in turn below.

Table 3: OEF adjustment applied by the AER in 2015 final decisions

OEF	ACTEWAGL	AUSGRID	ENDEAVOUR	ENERGEX	ERGON
Material	18.6%	7.0%	6.3%	12.2%	20.1%
Immaterial	4.4%	4.7%	6.7%	5.0%	6.1%
Total	23.0%	11.7%	12.9%	17.1%	26.2%[12]

Source: AER final determinations for previous regulatory period: ActewAGL distribution determination 2015-16 to 2018-19 (April 2015), Ausgrid distribution determination 2015-16 to 2018-19 (April 2015), Endeavour Energy distribution determination 2015-16 to 2018-19 (April 2015), Energex determination 2015-16 to 2019-20 (October 2015), Ergon Energy determination 2015-16 to 2019-20 (October 2015).

Note: sum of parts is not equal to total due to rounding.

AER's material OEFs

The AER assessed the 13 OEFs in Table 4 below to have a material impact on at least one DNSP's opex. The AER's calculations were largely based on data reported in response to the Economic Benchmarking and Category Analysis RINs, as well as additional data from third-party sources.[13] Each of these OEF adjustments was calculated using a bespoke methodology. The AER provided material OEF adjustments of 12.2% and 20.1%[14] to Energex and Ergon Energy, respectively.

[12] Breakdown does not reconcile with total – as the AER has not published a reconciliation.

[13] For example, confidential data submitted by Ergon Energy was relied upon by the AER to quantify an OEF for cyclones; estimates of implementing OH&S in Victoria contained in PwC's report 'Impact of the Proposed National Model Health Work and Safety Laws in Victoria, April 2017' were used to quantify an OEF for OH&S.

[14] The AER did not publish a split of material and immaterial OEFs for the final determination. The AER reported a total OEF adjustment of 26.2%. As the immaterial OEFs of 6.1% have not changed between draft and final, we inferred that the total material OEF for Ergon in the final determination was 20.1%.

Table 4: AER 2015 OEFs – OEFs considered material for at least one DNSP

OEF	ACTEWAGL	AUSGRID	ENDEAVOUR	ENERGEX	ERGON
Backyard reticulation	5.6%				
Bushfires	0.5%	-0.5%	-0.5%	-0.5%	-2.6%
Capitalisation practices	8.5%	-0.5%	0.5%	0.5%	-0.5%
Cyclones					4.6%
Division of responsibility for vegetation management		0.5%	0.5%	3.4%	4.1%
Extreme weather events	-0.5%	0.5%	0.5%	2.7%	3.0%
Licence conditions		1.2%	0.7%		0.7%
Network accessibility	-0.1%	-0.1%	0.5%	0.0%	1.1%
OH&S regulations	0.5%	0.5%	0.5%	0.5%	0.5%
Service classification	4.0%				
Subtransmission		5.2%	4.9%	3.2%	4.6%
Taxes and levies				2.7%	1.7%
Termite exposure	0.04%	0.03%	0.2%	0.2%	0.5%
Total material OEF	**18.6%**	**7.0%**	**6.3%**	**12.2%**	**20.1%**

Source: AER 2015 determinations.

Note: The last row of the table reports total immaterial OEFs determined by the AER, not the sum of the material OEFs in the table.

AER's immaterial OEFs

The AER also provided an allowance for the 19 OEFs below, which were assessed to be individually immaterial, but collectively material.

- Where the AER expected that an individually immaterial OEF is likely to provide a DNSP with a ***cost disadvantage***, the AER applied a ***positive adjustment*** equal to its materiality threshold of 0.5%. The AER also applied this approach for OEFs where it had some doubt about whether an individually immaterial OEF will provide a cost advantage or disadvantage.
- Where the AER expected that an individually immaterial OEF is likely to provide a ***cost advantage***, the AER applied a ***negative adjustment*** equal to its materiality threshold of 0.5%.

The AER's assessments above were largely based on its own judgement of whether each OEF was likely to be material or immaterial. With the exception of a few OEFs[15] which the AER attempted to

[15] Such as fire ants.

quantify and assessed to have an individually immaterial impact, the majority of the AER's assessments of materiality were not based on any quantitative information.

As can be seen from **Table 5** below, the AER provided OEF adjustments of 5.0% and 6.1% to Energex and Ergon Energy, respectively, for the combined impact of immaterial OEFs.

Table 5: AER 2015 OEFs – OEFs considered immaterial for all DNSPs

OEF	ACTEWAGL	AUSGRID	ENDEAVOUR	ENERGEX	ERGON
Asset age	-0.5%	0.5%	0.5%	-0.5%	0.5%
Building regulations	0.5%	0.5%	0.5%	0.5%	0.5%
Competition from mining					0.5%
Corrosive environments	0.5%	0.5%	0.5%	0.5%	0.5%
Cultural heritage	0.5%	0.5%	0.5%	0.5%	0.5%
Environmental regulations	0.5%	0.5%	0.5%	0.5%	0.5%
Environmental variability	-0.5%	-0.5%	-0.5%	-0.5%	0.5%
Fire ants				0.1%	
Grounding conditions	0.5%	0.5%	0.5%	0.5%	0.5%
Planning regulations	0.5%	0.5%	0.5%	0.5%	0.5%
Private power poles			-0.5%	-0.5%	
Proportion of 11kV and 22kV lines	0.5%	0.5%	0.5%	0.5%	0.5%
Rainfall and humidity	0.5%	0.5%	0.5%	0.5%	0.5%
Skills required by different DNSPs	0.5%	0.5%	0.5%	0.5%	0.5%
Solar uptake	-0.5%	-0.5%	-0.5%	0.5%	0.5%
Topography	0.5%	0.5%	0.5%	0.5%	0.5%
Traffic management	0.5%	0.5%	0.5%	0.5%	0.5%
Transformer capacity owned by customers	0.1%	-0.2%	0.1%	-0.1%	-0.4%
Underground services	0.4%				
Total immaterial OEF	4.4%	4.7%	6.7%	5.0%	6.1%

Source: AER 2015 determinations.

Note: The last row of the table reports total immaterial OEFs determined by the AER, not the sum of the immaterial OEFs in the table.

2.4 What this means for Energex and Ergon

In Section 2.4 of our Benchmarking Report, we set out our base-year assessment of Energex's and Ergon's proposed base year opex of $371m ($2019-20) and $376m ($2019-20), when the AER's 2015 OEFs are applied. We show that when the AER's 2015 OEF adjustments of 17.1% and 26.2% are applied to Energex and Ergon Energy, respectively:

- Energex's proposed base year opex of $371m ($2019-20) is significantly below the range of opex levels of $437m-$475m estimated by the AER's four econometric models.
- Ergon's proposed base year opex of $376m ($2019-20) falls also below the range of opex levels of $406m-$484m estimated by the AER's four econometric models.

These models do not provide any evidence to suggest that Energex's and Ergon's base year opex for the 2020–25 regulatory period requires an efficiency adjustment. However, we note that there are a number of limitations associated with the AER's 2015 OEFs assessment.

- At present, there is little agreement between the AER, the DNSPs, and relevant stakeholders on which OEFs should be accounted for in the benchmarking analysis. As discussed above, in its 2015 OEFs assessment, the AER had originally identified over 60 different OEFs for consideration. However, this list of OEFs was identified within a short period of time, drawing on submissions received by the AER from multiple DNSPs and stakeholders in response to the AER's initial 2014 annual benchmarking report, and its draft decisions in the previous round of ACT, NSW, Queensland and SA regulatory determinations. The AER is yet to consult on the long list of OEFs considered in its 2015 assessment, including the validity of its criteria for selecting these OEFs (these criteria are: "exogeneity", "materiality" and "duplication", as discussed in Section 2.3 above). While the AER initiated a new OEFs review in December 2017in collaboration with its economic and engineering consultants Sapere Research Group and Merz Consulting (Sapere-Merz),[16] only a small subset of five OEFs has been considered in this consultation, as discussed in Section 3.2 below.
- A number of the AER's 2015 OEF adjustments were highly subjective, as these were largely based on its own judgement of whether each OEF was likely to be material or immaterial. With the exception of a few OEFs which the AER attempted to quantify, the majority of the AER's assessments of materiality were not based on any quantitative information. Furthermore, of the OEFs that were quantified by the AER, the vast majority were quantified using RIN data submitted by the DNSPs, which are compromised by a number of data reporting and quality issues.
- The poor quality (or lack) of data collected on OEFs to date limits the extent to which any assessment of OEFs can be effectively implemented at present. In our view, there is a need for extensive further consultation and data collection to enhance the quantification of OEFs. Our report provides the AER with a recommended framework for consultation with the DNSPs and relevant stakeholders.
- In our view, the AER's OEF framework for benchmarking is fundamentally confounded by the estimation of raw efficiency scores *before* important OEFs are accounted for. As the AER's relative efficiencies are estimated before the consideration of OEFs, these are distorted by the exclusion of important factors affecting differences in perceived performance. *Ex-post* adjustments for OEFs do not overcome this bias. In our February 2018 report submitted to the AER,[17] we proposed an alternative framework for accounting for OEFs in economic benchmarking.

[16] Sapere-Merz, *Independent Review of Operating Environment Factors Used to Adjust Efficient Operating Expenditure for Economic Benchmarking*, December 2017, and August 2018.

[17] Frontier Economics, *An alternative framework for accounting for operating environment factors (OEFs) – A report prepared for Essential Energy*, February 2018.

Our recommended approach to overcoming the limitations above, and our proposed next steps for the AER are discussed in Section 5 below.

3 LATEST SAPERE-MERZ OEFS CONSULTATION

In December 2017, the AER initiated an OEFs review in collaboration with its economic and engineering consultants Sapere Research Group and Merz Consulting (Sapere-Merz).[18] In our view, it is not possible to draw meaningful conclusions about the relative efficiency of regulated DNSPs unless OEFs are controlled for appropriately. Failure to control properly for OEFs would defeat the objective of conducting economic benchmarking: namely, to identify the scope for efficiency improvements for the DNSPs. Therefore, we welcome the AER's directing attention towards this issue, and consider that this is an important opportunity to make lasting improvements to the way the AER conducts economic benchmarking to promote the long-term interest of consumers.

In the remainder of this section, we discuss:

- The scope of the Sapere-Merz consultation;
- The OEFs that have been considered in the consultation process;
- How these OEFs were estimated; and
- What this means for Ergon and Energex.

3.1 Scope of Sapere-Merz consultation

In September 2018, Sapere-Merz provided a report that:

- Identified what, in its view, were the most material factors driving apparent differences in estimated productivity and operating efficiency between the distribution networks in the NEM; and
- quantified the likely effect of each factor on operating costs in the prevailing conditions.

Importantly, in its report Sapere-Merz limited the investigation to only a small subset of the over 60 OEFs that the AER considered in a number of recent decisions. Further, Sapere-Merz adopts the "materiality" criterion used by the AER for identifying material OEFs and, consequently, Sapere-Merz largely accepts the AER's list of material OEFs identified in 2015 (discussed in Section 2.3 above).

- **The following OEFs for which the AER applied material OEF adjustments are yet to be considered in detail by Sapere-Merz**: Division of vegetation management responsibility, network accessibility, capitalisation practices, bushfire risk, extreme weather events and OH&S regulations.
- **The following OEFs, which the AER considered to be immaterial individually, but material in aggregate, are outside of Sapere-Merz's terms of reference:** asset age, building regulations, competition from mining, corrosive environments, cultural heritage, environmental regulations, environmental variability, fire ants, grounding conditions, planning regulations, proportion of 11Kv and 22Kv lines, rainfall and humidity, skills required by different DNSPs, solar uptake, topography, traffic management, private power poles, and transformer capacity owned by customers, and underground services. An assessment of the combined impact of immaterial OEFs is excluded from Sapere-Merz's terms of reference.

[18] Sapere-Merz, *Independent Review of Operating Environment Factors Used to Adjust Efficient Operating Expenditure for Economic Benchmarking*, December 2017.

A comparison of the list of OEFs considered by the AER in 2015 for Energex and Ergon with those considered by Sapere-Merz is provided in **Table 6** below.

Table 6: List of OEFs quantified for Energex and Ergon by the AER in 2015 and comparison with OEFs quantified by Sapere-Merz in 2018

	CLASSIFIED AS MATERIAL BY THE AER IN 2015?		AER 2015 OEFS		SAPERE-MERZ 2018 OEFS	
OEF	ERG	ENX	ERG	ENX	ERG	ENX
Cyclones	material		5.40%		5.2%	
Subtransmission	material	material	4.59%	3.22%	6.1%	1.2%
Division of responsibility for vegetation management	material	material	4.07%	3.39%		
Extreme weather events	material	material	2.99%	2.67%		
Taxes and levies	material	material	1.70%	2.70%	1.1%	1.9%
OH&S regulations	material		1.20%	0.50%		
Network accessibility	material		1.09%	-0.04%		
Licence conditions	material		0.73%	0.00%		
Termite exposure	material		0.53%	0.22%	1.1%	0.3%
Building regulations			0.50%	0.50%		
Corrosive environments			0.50%	0.50%		
Cultural heritage			0.50%	0.50%		
Environmental regulations			0.50%	0.50%		
Grounding conditions			0.50%	0.50%		
Planning regulations			0.50%	0.50%		
Proportion of 11kV and 22kV lines			0.50%	0.50%		
Rainfall and humidity			0.50%	0.50%		
Skills required by different DNSPs			0.50%	0.50%		
Topography			0.50%	0.50%		
Traffic management			0.50%	0.50%		
Solar uptake			0.50%	0.50%		
Competition from mining			0.50%	0.00%		
Environmental variability			0.50%	-0.50%		
Asset age			0.50%	-0.50%		
Transformer capacity owned by customers			-0.35%	-0.15%		
Capitalisation practices			-0.50%	0.50%		
Private power poles			-0.50%	-0.50%		
Bushfires	material	material	-2.60%	-0.50%		
Fire ants				0.10%		
Total material OEFs			**19.7%**	**11.5%**	**13.6%**	**3.5%**
Total immaterial OEFs			**6.1%**	**5.6%**	**not assessed**	**not assessed**
Total OEFs			**26.2%[1]**	**17.1%**	**13.6%**	**3.5%**

Source: AER 2015 OEFs and Sapere-Merz 2018 OEFs.

Note: [1] breakdown does not reconcile with total as the AER has not published a reconciliation.

3.2 The OEFs that have been considered in the consultation process

Sapere-Merz's proposed preliminary and illustrative OEF adjustments are summarised in **Table 7** below.

Table 7: Summary of Sapere-Merz OEF adjustments

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

DNSP	Sub-transmission (Licence conditions)	Vegetation Management	Taxes and levies	Termite exposure	Cyclones	Back yard Reticulation	Total (inc T&L)	Total (ex T&L)
Evoenergy	-0.84%	Nil	Nil	0.00%	NA	1.66%	0.82%	0.82%
Ausgrid	1.62%	Nil	-0.87%	-0.05%	NA	NA	0.70%	1.57%
CitiPower	1.41%	Nil	0.70%	-0.07%	NA	NA	2.04%	1.33%
Endeavour	3.98%	Nil	-0.87%	0.25%	NA	NA	3.36%	4.22%
Energex	1.25%	Nil	1.94%	0.33%	NA	NA	3.52%	1.57%
Ergon	6.10%	Nil	1.13%	1.10%	5.24%	NA	13.57%	12.44%
Essential	6.06%	Nil	-0.88%	0.94%	NA	NA	6.11%	6.99%
Jemena	-1.28%	Nil	0.30%	-0.08%	NA	NA	-1.06%	-1.36%
Powercor	-0.01%	Nil	-0.02%	0.17%	NA	NA	0.15%	0.17%
SAPN	0.19%	Nil	0.54%	-0.11%	NA	NA	0.63%	0.09%
AusNet	-0.71%	Nil	-0.78%	0.02%	NA	NA	-1.47%	-0.69%
TasNetworks	-4.03%	Nil	5.33%	-0.11%	NA	NA	1.19%	-4.14%
United Energy	-0.18%	Nil	-0.19%	-0.05%	NA	NA	-0.42%	-0.23%
Reference Point	4.08%	Nil	0.88%	0.11%	0.00%	0.00%	5.07%	4.19%

Source: Sapere-Merz analysis

1. Nil indicates that data is insufficient to quantify the OEF; NA indicates the OEF is not applicable.
2. Total includes only material OEFs; the quantification of taxes and levies OEF is indicative only.
3. The reference point values reflect the AER's preference to use the customer number weighted average of OEF estimates for the reference group. See section 2.2.4for more detail

Source: Sapere-Merz's report, August 2018.

As can be seen from **Table 7**, Sapere-Merz's report is limited to the consideration of only a small subset of the total of over 60 OEFs considered in the AER's 2015 OEFs assessment. Of the OEFs considered by Sapere-Merz, quantification has been attempted only for 5 OEFs, namely:

- sub-transmission and licence conditions;
- taxes and levies;
- termite exposure;
- cyclones; and
- backyard reticulation.

Furthermore, Sapere-Merz has not provided an OEF adjustment for vegetation management – as indicated by the 'Nil' entries in **Table 7** above – even though vegetation management is likely to represent a material OEF for many networks, including Energex and Ergon Energy. Sapere-Merz notes that there are, at present, gaps in the Economic Benchmarking RIN data that mean certain OEFs cannot be quantified reliably without further data collection and verification.

Sapere-Merz is also yet to comment in any detail on a number of other material OEFs considered by the AER its in 2015 OEFs assessment, such as extreme weather events, OH&S regulations, network accessibility and planning regulations.

Finally, as discussed in Section 3.2, an assessment of the combined impact of immaterial OEFs is excluded from Sapere-Merz's terms of reference.

3.3 How these OEFs were estimated

As summarised in **Table 7** above, Sapere-Merz's proposed preliminary and illustrative OEF adjustments for Energex and Ergon Energy are 3.52% and 13.57%, respectively. In keeping with the AER's approach in 2015 to quantifying these OEFs, Sapere-Merz's calculations are largely based on data reported in the Economic Benchmarking and Category Analysis RINs, supplemented by data from third-party sources.[19] Each of these OEF adjustments is calculated using a bespoke methodology. In our view, there are a number of problems with this approach:

- Firstly, Sapere-Merz's quantification of OEFs is limited to only 5 OEFs out of over 60 OEFs identified by the AER in its 2015 assessment to be potential candidate OEFs. Therefore, the preliminary and illustrative OEF adjustments calculated by Sapere-Merz are likely to significantly understate the OEFs adjustments that are necessary to explain the vast differences in the operating environment of the different DNSPs in the NEM.
- Secondly, whether or not an OEF meets the AER's materiality criterion can only be determined *after* the impact of the OEF is quantified. In the past the AER seems to have made this decision prior to quantification. By accepting the AER's short-list of material OEFs as its starting point, Sapere-Merz has implicitly accepted the AER's subjective assessment of the materiality of each OEF, which was based on limited quantitative evidence. We note that the process used by the AER to assess the materiality of individual OEFs has been challenged recently through an appeal process. In light of the outcome of that appeal decision (and the upholding of that decision by the Full Federal Court), it would seem appropriate for more work to be conducted to develop an appropriate process for determining the materiality of individual OEFs.
- Thirdly, we note that Sapere-Merz's quantification of its five preliminary OEF adjustments for cyclones, sub-transmission and licence conditions, taxes and levies, termite exposure and backyard reticulation is compromised by problematic data sourced from the RINs. Sapere-Merz has expressed reservations about the quality and reliability of some of these data. We also note that Sapere-Merz's calculations are based on 2006-2015 RIN data, and are therefore two years out of date.
- Fourthly, we note that Sapere-Merz has not considered a long list of "immaterial" OEFs that the AER accounted for in some recent decisions. Even if each of these OEFs is not material on its own, they may collectively exert a material influence. The question of how to treat the joint impact of a large number of such OEFs has not been resolved. In addition, the analysis by Sapere-Merz has not resolved how to deal with OEFs that are difficult to quantify reliably or those that are directionally-ambiguous.
- Finally, Sapere-Merz adopts the AER's existing approach of conducting *ex-post* OEF adjustments without considering whether this is appropriate, or whether alternative approaches (such as those investigated in Section 3.2 of our February 2018 OEFs report) would be preferable.

Our recommended approach to overcoming the limitations above, and our proposed next steps for the AER are discussed in Section 5 below.

[19] For example, to quantify an OEF adjustment for cyclones, the AER relied on confidential data submitted by Ergon Energy.

3.4 What this means for Ergon and Energex

We understand that the AER does not intend to rely on the Sapere-Merz OEFs assessment for base-year assessment purposes for the time being, as this work is preliminary and considers only five of over 60 possible OEFs that are relevant to the DNSPs. Nevertheless, our Benchmarking Report assesses the comparative efficiency of Energex's and Ergon's proposed base year opex for the 2020–25 regulatory period using both the AER's 2015 OEFs adjustments as well as the lower Sapere-Merz adjustments.

As set out in Section 2.4 of our Benchmarking Report, we find that:

- When the AER 2015 OEFs are used:
  - Energex's proposed base year opex of $371m ($2019-20) is significantly below the range of opex levels of $433m-$529m estimated by all of the AER's four econometric models.
  - Ergon's proposed base year opex of $376m ($2019-20) falls also below the range of opex levels of $404m-$484m estimated by all the AER's four econometric models.
- When the preliminary and limited Sapere-Merz OEFs are used:
  - Energex's proposed base year opex of $371m ($2019-20) is below the range of opex levels of $383m-$467m estimated by all the AER's four econometric models.
  - Ergon's proposed base year opex of $376m ($2019-20) is towards the lower end of the range of opex levels of $364m-$436m estimated by the AER's four econometric models.

Hence. these models do not provide any evidence to suggest that Energex's and Ergon's base year opex for the 2020–25 regulatory period requires an efficiency adjustment. Since this conclusion holds even under the limited set of OEF adjustments considered to date by Sapere-Merz – which we consider underestimates the OEFs faced by the two networks – this conclusion holds even more strongly if a more comprehensive allowance is made for OEF adjustments in the estimation of Energex's and Ergon's target base year opex.

4 POSSIBLE OEFS FOR ERGON AND ENERGEX

Energex and Ergon have provided a number of submissions to the AER explaining the ways in which their operating circumstances differ substantially from most other DNSPs in Australia. In the remainder of this section, we provide our preliminary qualitative assessment of the possible OEFs for Ergon and Energex, drawing on the following submissions that have been made to the AER.

- Regulatory Submission Document "How Ergon Energy Compares"[20]
- Regulatory Submission Document "Parametric Insurance_redacted CONF"[21]
- Ergon-Energex response to Sapere-Merz OEFs consultation.[22]

Extensive additional detail on the evidence presented in this section can be found in the submissions above to the AER. We note that as these submissions were largely focused on OEFs for Ergon Energex, our preliminary qualitative assessment of OEFs at this stage is also focused possible OEFs for Ergon. We note that while a separate qualitative review of the OEFs for Energex was outside our terms of reference, we understand that a number of Ergon's OEFs are also relevant to Energex, such as extreme weather and vegetation.

The vast amount of information included in Ergon's and Energex' submissions to the AER demonstrates that the Queensland distribution networks have evolved to operate in different and challenging physical environments when compared with other DNSPs operating in the NEM. For instance[23]:

- Ergon Energy's distribution area covers 97 per cent of the State of Queensland, with around 70 per cent of the network's powerlines considered rural. This network not only covers large distances (over one million square kilometres) but has a very low customer density compared to other DNSPs, a relatively large amount of subtransmission network and a large proportion of network which is radial in design. Ergon Energy's operating environment is significantly impacted by harsh environmental and climate factors, including tropical cyclones.
- Energex's distribution area (South East Queensland) is characterised by significant high density major urban areas serviced by over 52,000 km of overhead and underground distribution lines. Energex is also impacted by severe weather events, with South East Queensland having one of Australia's highest incidences of lightning strikes and commonly experiencing wind gusts in excess of 80 kilometres per hour, which can expose the network to significant damage.

In the remainder of this section we summarise:

[20] Ergon Energy, 'Supporting Documentation; How Ergon Energy Compares', October 2014; See: https://www.ergon.com.au/__data/assets/pdf_file/0011/228467/Supporting-Document-How-Ergon-Energy-Compares.pdf

[21] Ergon Energy, 'AER 002 response to AER information request', December 2014.

[22] Energex/Ergon Energy, 'Joint submission review of Operating Environment Factors for Distribution Network Service Providers', February 2018; See: https://www.aer.gov.au/system/files/Energex%20Ergon%20Energy%20-%20Review%20of%20Operating%20Environment%20Factors%20for%20Distribution%20Network%20Service%20Providers%20-%2016%20February%202018.pdf

[23] Energex/Ergon Energy, 'Joint submission review of Operating Environment Factors for Distribution Network Service Providers', February 2018, Section 2.

- the possible OEFs for Ergon and Energex, drawing on information from previous submissions made to the AER by these businesses (Section 4.1); and
- our assessment of the extent to which these have been considered by the AER and Sapere-Merz (Section 4.2).

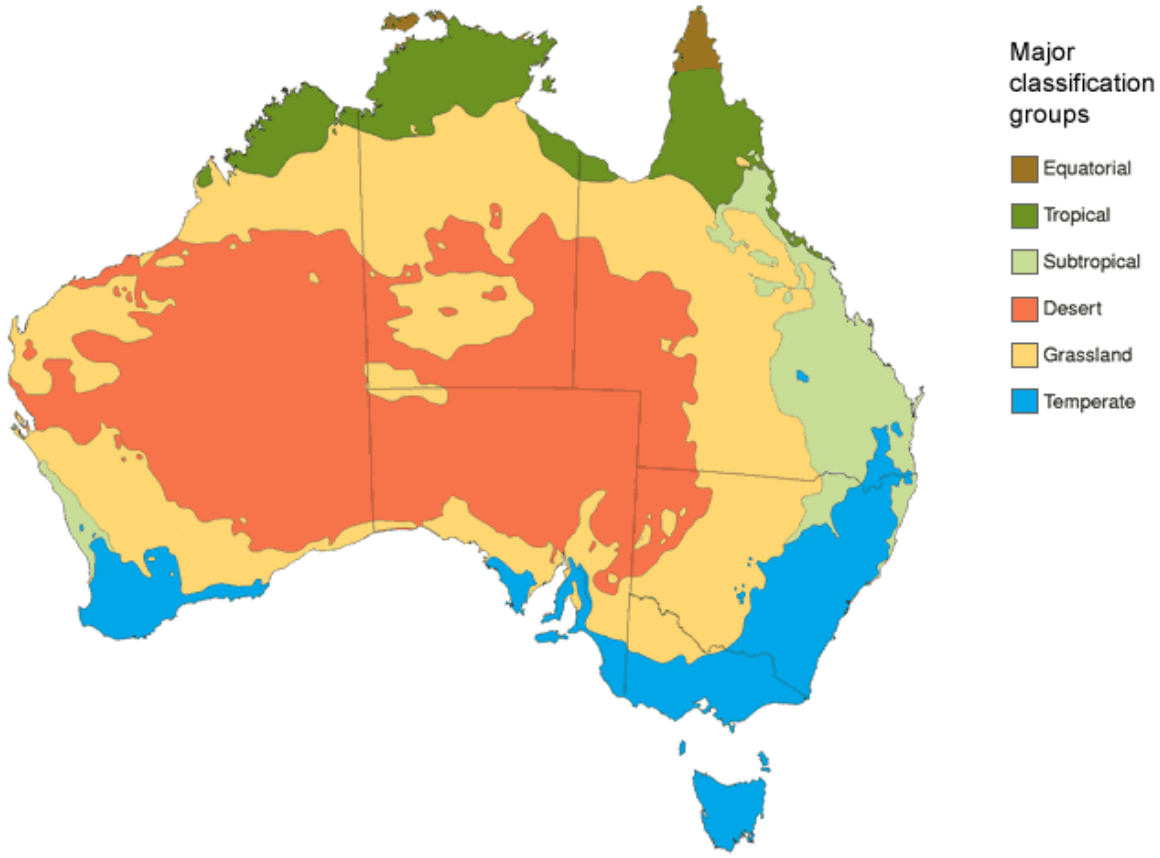
We provide a discussion on the possible OEFs for Ergon and Energex in the remainder of this section.

4.1 Possible OEFs for Ergon and Energex

4.1.1 Diversity of weather

As can be seen from **Figure 2** below, Ergon's footprint covers temperate, grassland, subtropical, tropical, equatorial, and desert climate zones. As a result, its network is exposed to the effects of a wide variety of weather-related factors such as sub-zero temperatures, extreme high temperatures, lightning, wind, high rainfall, hail and bushfires across its vast service area. Energex shares a border with Ergon and its footprint covers the temperate as well as the subtropical climate zones. It is also exposed to many of the weather-related factors mentioned above.

Figure 2: Key climate groups within Australia



Source: Bureau of Meteorology, http://www.bom.gov.au/iwk/climate_zones/map_1.shtml

The harsh extremes of geography and climate combine to present one of the most difficult environments in which to provide the requisite service delivery obligations of all the Australian DNSPs.

- **Cyclones.** Of all the Australian DNSPs overseen by the AER, we understand that Ergon is almost unique in having to deal with cyclones, which involves both advance preparation in readiness for cyclones and dealing with the aftermath. Events such as Cyclones Anthony, Oswald, Yasi, Larry, and Tracey, and flooding events such as those in recent years in Brisbane and Bundaberg, have demonstrated the devastating and destructive power and impact of cyclones. Cyclones generally form in tropical waters and impact Queensland coastal areas at a rate of around 1 to 2 events per year.
- **Storms.** On an annual basis, typically between September and December, atmospheric instability initiates severe storms across Queensland. We understand that the storms have a number of impacts on Ergon Energy assets, including pole and cross failures, wires down and pole top fires. During the build-up period prior to the storm season, Ergon Energy also conducts aerial inspections of feeders traversing rainforest areas and escarpment areas to identify potential vegetation and specific asset pre-defect conditions that can be resolved in a planned fashion before access becomes restricted during the storm season.
- **Floods and storm surges.** Storm surge is a phenomenon where the sea level rises significantly above the highest astronomical tide levels as a result of the very low atmospheric pressure experienced at the centre of a cyclone. This results in extensive coastal flooding. We understand that flooding results in travel restrictions and prevents Ergon Energy from performing many of its inspection and maintenance tasks, undermines assets – which then requires maintenance and repair work, destroys access tracks – which then requires track maintenance and repair, limits and prevents operational switching – which typically extends outage durations and severity; and submerges assets – which reduces asset lives.
- **Rainfall.** Tropical and coastal rainfall has substantial impact upon Ergon Energy's opex. Unlike most other DNSPs, Ergon Energy's geographic area of cover includes tropical and sub-tropical areas, and rainfall occurs mostly during the hotter months when plants are normally in their active growth cycles. We understand that the combination encourages significant tree and vegetation growth, with many tropical plants growing several metres annually.
- **Humidity.** Ergon Energy's geographic area extends from tropical to temperate climates. A significant proportion of its assets are exposed to high level average humidity for extended periods. We understand that humidity and moisture represent significant issues for Ergon Energy in its efforts to maintain and operate its assets to achieve its service delivery obligations.
- **Drought.** At the other end of the rainfall scale, western Queensland experiences drought cycles. Drought reduces deep soil moisture, and this lack of water becomes a significant factor in earthing system efficacy. We are informed that Ergon Energy opex contains costs to inspect and test earthing systems (as required under regulatory obligations) to ensure safe step and touch potentials for the public).
- **Bushfires.** Bushfires represent a significant risk to Ergon Energy. Unlike southern states, Queensland coastal region bushfires tend to be of lower intensity due to the higher average humidity, and typically occur between August and January each year. Bushfires in the northern and western parts of Queensland tend to be short, fierce events due to prevalence of turpentine bushes and spinifex which burn rapidly and almost completely.
- **Salt spray in coastal areas.** Mounted assets near the coast that are exposed to wind-born sea salt are more likely to suffer the effects of corrosion which creates the need for more asset replacement.

We understand that Ergon Energy's Network Operations function has been developed with a prudent level of redundancy to enable it to operate in these extreme conditions. This involves an active duplication of some functions, with geographically separate and fully functional network operations control centres. The duplicated control centres are manned 24/7. This duplication is necessary to reduce the risk of control centre failure during natural disaster (notably cyclone) situations.

4.1.2 Network scale

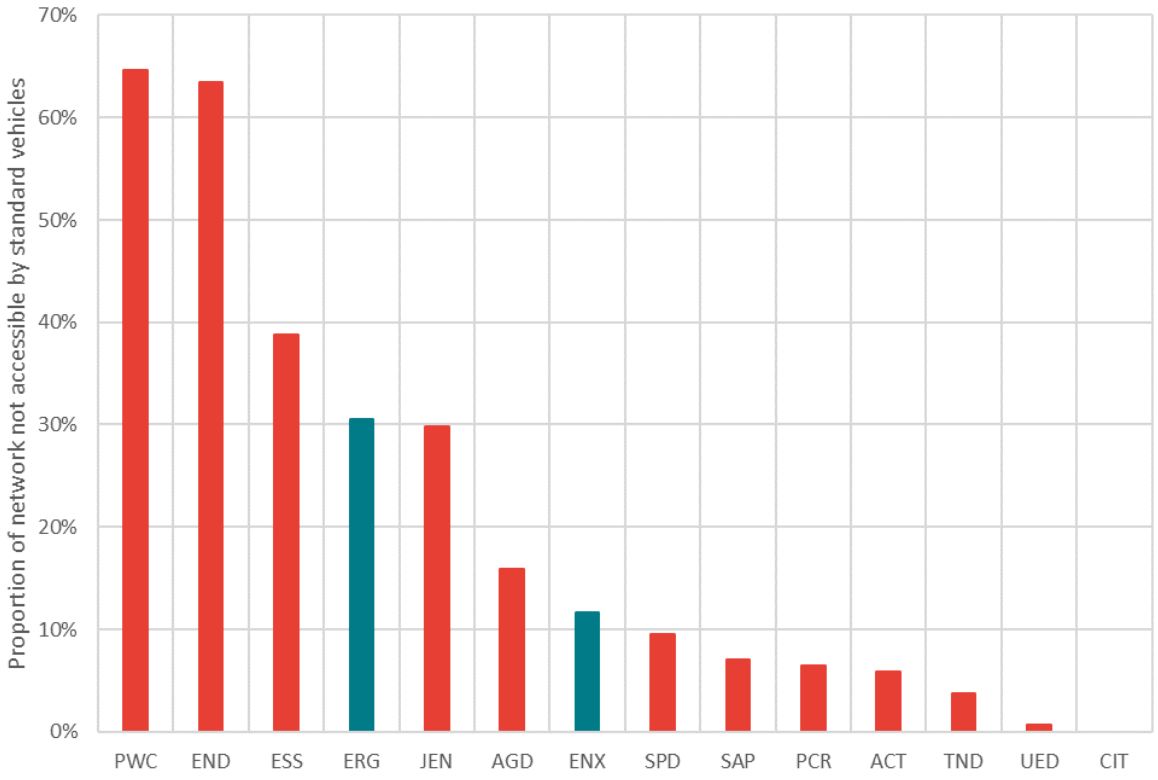
Magnifying the effect of these location-based (and therefore inherent) cost drivers is the large network area. We understand that the size of Ergon Energy's service delivery area presents numerous operational challenges.

- **Travel distances.** The geographic area and distances involved to supply standard control services are extensive. This lead to a number of challenges.
  - **Additional property and depot costs.** The distances involved and the obligations for service delivery resulted in the establishment by Ergon Energy and its predecessor businesses of 69 separate service depots, each staffed appropriately to support the immediate locality network assets, and equipped with sufficient tools and vehicles to manage the diverse terrain they are expected to encounter. We are informed that this leads to higher property and depot maintenance and servicing costs.
  - **Technical specialties.** The more complex and technical components of the power system, such as protection and telecommunications, requires specialist staff and training to maintain. The staff must be trained to maintain, operate, diagnose and repair all of the associated assets, including any subtransmission, distribution, low voltage equipment. It is impractical to hold these resources at every depot, so they are generally centralised at major community locations and moved around the network as required. We understand that this incurs additional travel and accommodation expenses in compensation, thereby increasing Ergon Energy's opex costs for routine maintenance functions.
- **Travel costs.** We understand that travel costs related to simply accessing Ergon Energy assets are extensive. Travel, accommodation, meals, Living Away from Home Allowances (LAHA) are significant inherent costs required just to get to a remote centre. For example, travel from Rockhampton to the Longreach area requires at least 1 day travel out and back. This extensive travel component means that mobilisation and demobilisation costs must be incurred regularly for technical staff, and contract works, including vegetation management and asset inspection. We understand that Ergon Energy takes reasonable management action, where practicable, to combine distant works to minimise costs. However, the extensive geographic area and the large distances to customer sites have a substantial and material impact upon opex. This is considerably different to most other DNSPs in Australia, where more central bases are possible and limited mobilisation is required.
- **Additional costs associated with lack of standard vehicle access.** We understand that vast tracts of land, particularly in the north and western parts of Ergon Energy's service area, become impassable following rain – requiring use of all-terrain caterpillar track vehicles, helicopters and fixed wing aircraft to traverse them. Ergon Energy's assets operate across such "black soil" plains. Commensurately, Ergon Energy opex allocations must account for this geography. This impacts travel arrangements to meet inspection obligations (required by regulation), repair, equipment transfer, overall time to complete work and other logistical issues.
- **Fleet ownership.** Due to the combination of significant distances and low asset density, we understand that Ergon Energy is forced to procure some specialist items of equipment even though the utilisation can be quite low. That is, the logistics cost associated with moving key items of equipment makes ownership the only viable alternative.

Figure 3 shows that a third of Ergon's route line length does not have standard vehicle access and a tenth of Energex's route line length does not have standard vehicle access. Although in proportional terms this is not as high as for other DNSPs, such as Power and Water Corporation, Endeavour Energy

or Essential Energy, in absolute terms Ergon has more than twice as much non-standard access route length as almost all other DNSPs (see **Figure 4**).

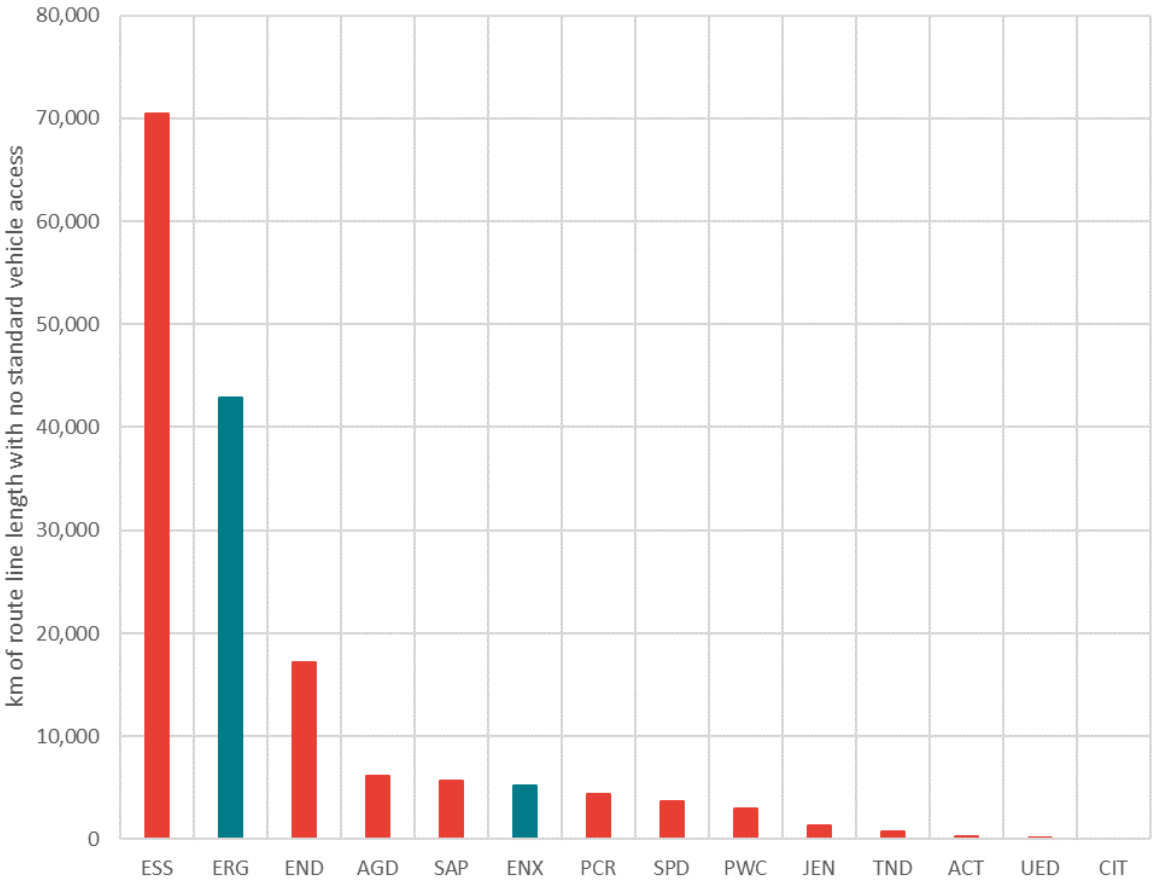
Figure 3: Proportion of route line length not accessible by standard vehicles



Source: 2017 Economic Benchmarking RIN data

Note: Jemena's and Essential's basis of preparation of the RIN data indicate that these DNSPs have reported the network accessible by standard vehicles. However, the AER defines this variable as the network that is not accessible by standard vehicles. We have corrected Jemena and Essential's reported data for consistency with the AER's definition.

Figure 4: Total route line length that does not have standard vehicle access



Source: 2017 Economic Benchmarking RIN data

Note: Jemena's and Essential's basis of preparation of the RIN data indicate that these DNSPs have reported the network accessible by standard vehicles. However, the AER defines this variable as the network that is not accessible by standard vehicles. We have corrected Jemena and Essential's reported data for consistency with the AER's definition.

4.1.3 Network configuration

In addition to the challenges associated with the size of Ergon Energy's service delivery area, its network configuration also presents numerous operational challenges. Supplying a service to its customers involves the distribution (and sometimes transmission) of electricity over large distances to often lightly populated areas. In response to these challenges, we understand that there are two specific features that set the Ergon Energy network apart from other Australian DNSPs. The first of these is the relatively large amount of sub-transmission network that Ergon Energy has had to build and manage. The second factor is the relatively large proportion of the network that is radial rather than meshed in design (in this case the proportion of the network that is rural and long rural has been used as a reasonable proxy).

- **Subtransmission.** Ergon Energy's subtransmission system provides a substantial backbone for electricity delivery. We understand that Ssubtransmission systems require larger and more expensive infrastructure to operate when compared to distribution systems – the higher voltages and potential fault energy involved dictates stronger structures, more extensive clearances and greater insulation requirements. The electrical network protection and switching components must be more complex, duplicated (as required under the NER), and must generally operate faster to ensure power system stability, when compared to purely distribution systems. Ergon Energy's subtransmission

systems, which operate at 33kV, 66kV, 110 kV, 132kV and 220kV (unregulated) in various parts of Queensland, span across much of the diverse climate and geography highlighted above. The variation of these standard levels is the result of differing legacy organisation design standards over the previous decades. Ergon Energy cannot prudently change such proliferation cheaply or easily. It is more prudent to retain the assets and voltage levels. In addition, the inventory of spares suitable for the different voltage levels must be maintained and managed, ready for use in emergency situations.

- **Radial network.** Because Ergon's network is mostly radial in nature, alternate supply sources are not available if there is a fault that causes an outage. We are informed that this means power on a radial line cannot be re-routed or switched to restore power during supply interruptions. Ergon Energy employs temporary generation as well as extensive live line techniques in order to achieve the requisite service reliability targets. In addition, the inventory of spares suitable for the different components of the radial network must be maintained and managed, ready for use in emergency situations.
- **SWER.** Ergon Energy provides electricity to a vast network of very small, very remote customers across rural and remote Queensland. This supply is cost effectively provided by Single Wire Earth Return (SWER) techniques. SWER systems cover almost 65,000 kms (40%) of Ergon Energy's delivery network. SWER is an extensive system, with each individual feeder consisting of hundreds of kilometres of conductor route length. We understand that fault finding and patrolling to identify fault location is therefore problematic. Ergon Energy employs various approaches to managing this appropriately, including use of helicopters and fixed wing aircraft to support fault finding, travel for switching when the black soil prevents vehicle access, and when repair and maintenance is required.

4.1.4 Other potentially important material OEFs

Vegetation management

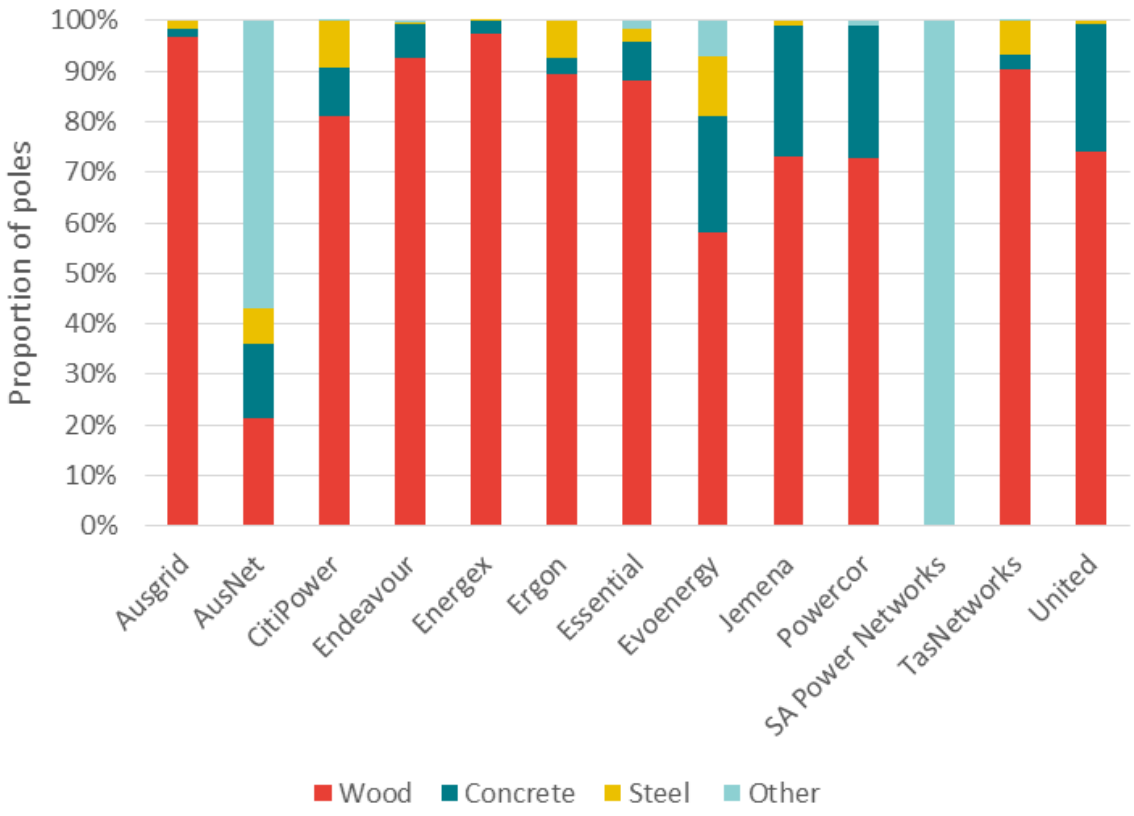
In a number of Australian jurisdictions, local councils perform vegetation management near electric lines, particularly in urban areas that form part of the licence area covered by a particular DNSP. In contrast, Ergon Energy performs this function. Additionally, we understand that Ergon Energy undertakes vegetation clearance along service lines to the point of attachment on customer premises and that other DNSPs outside Queensland, including in Victoria, may not undertake these works.

Proportion of timber poles

As Energex and Ergon have a relatively high proportion of timber poles compared to other DNSPs, we understand that they are more exposed to the factors causing timber decay than other service providers.

Figure 25 summarises the types of poles used by DNSPs in the NEM. It can be seen that there is considerable heterogeneity in the types of poles used across DNSPs, with the six DNSPs in New South Wales, Queensland and Tasmania having a higher proportion of timber poles (close to 90% and above) than DNSPs in Victoria and South Australia. The prevalence of timber decay in a DNSP's network area depends on the proportion of its pole configuration that is timber, the type of timber, and the intensity of factors causing timber decay in its network area. Energex and Ergon have the second and third highest proportion of timber poles amongst the 13 DNSPs in the NEM.

Figure 5: Proportion of poles by pole type

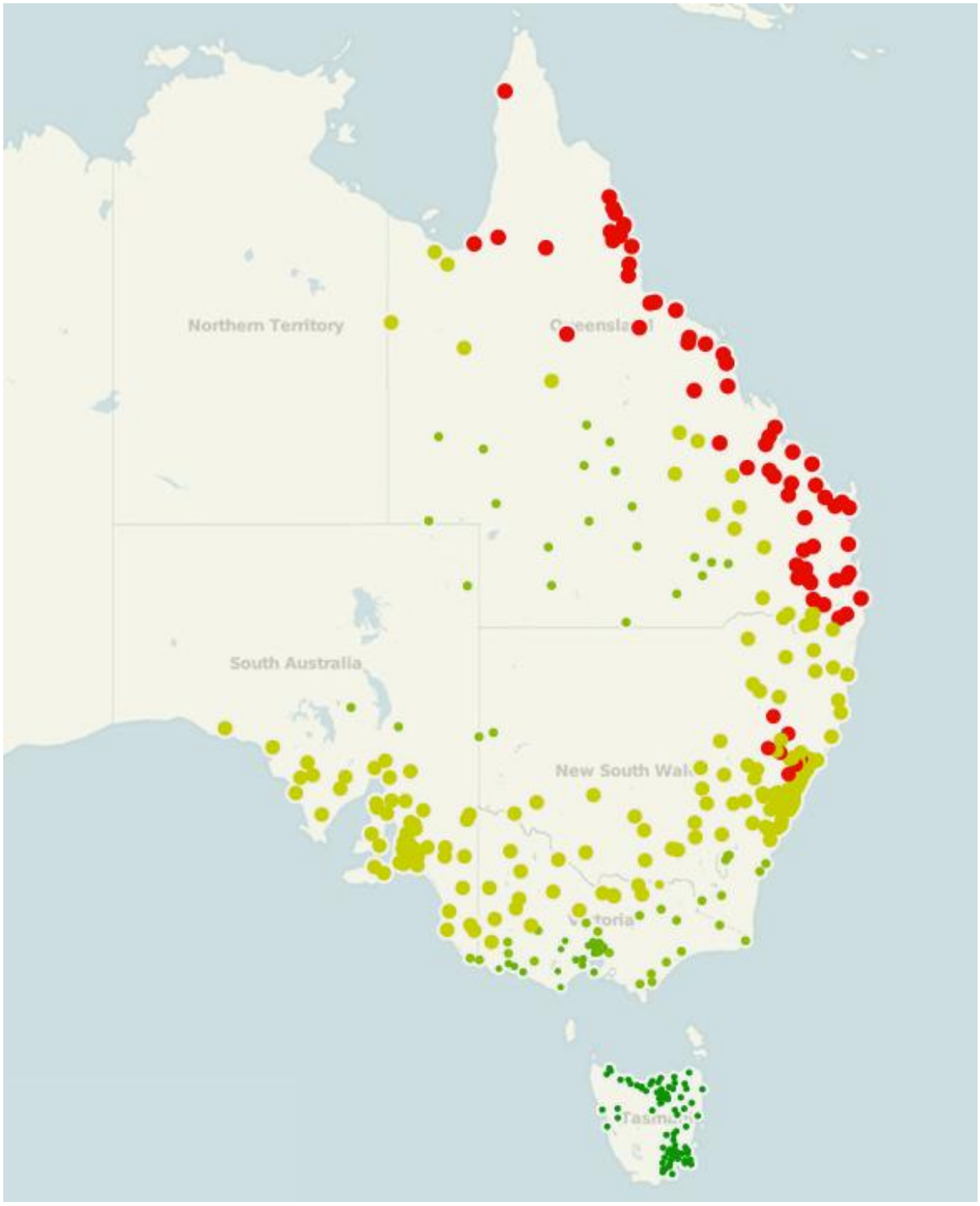


Source: Economics' calculations using Category Analysis RIN data. 2015 Category Analysis RIN data for Victorian DNSPs except AusNet, 2014 Category Analysis RIN data for AusNet, and 2016 Category Analysis RIN data for the remaining DNSPs.

Termites

As with other exogenous factors, the prevalence of (and therefore risk posed by) termites is not uniform across the areas in which the NEM businesses build, maintain and operate their networks. Wood poles within the Ergon Energy network are at significant risk of attack from termites. As with the environmental (weather based) factors, the complicating factor for Ergon Energy is the significant variance in risk across the network.

Figure 6: Relative termite risk in the NEM (excluding the Northern Territory)



Source: Ergon Energy's "How Ergon Compares"

Note: locations with high risk are marked in red, low risk in green, and intermediate risk levels in lighted shades.

Solar PV installation

Ergon Energy has a very high uptake of solar photovoltaic (PV) installations compared to many other DNSPs in the NEM. Most installations to date do not control terminal voltage and their combined impact

is resulting in an increasing level of voltage management complaints. We understand that Ergon Energy incurs opex to identify and manage these issues.

Taxes and levies

A number of jurisdictions require the payment by DNSPs of State taxes and levies that are not classified as jurisdictional schemes or 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. In a previous decision, the AER accepted that jurisdictional taxes and levies represent an OEF for the two Queensland DNSPs. There appear to be significant differences in the treatment of taxes and levies in regulatory arrangements between jurisdictions.

4.1.5 Other potentially relevant OEFs

We understand from submissions made by Ergon Energy that the following OEFs may also be relevant for the AER's consideration.

- Information technology
- Mining leases
- Asbestos management
- Contaminated land management
- Mining labour impacts
- Fire ants
- License conditions
- Environmental and cultural heritage issues

While it is possible that the impact of some of these OEFs may be immaterial, we note that it would be important to consider the possible combined material impact of a large number of individually immaterial OEFs. Finally, in order to provide a balanced assessment, it would be important for the AER to consider the potential impact of negative OEFs which have not been included in the terms of reference for this report.

4.2 Our assessment of the extent to which OEFs in Section 4.1 have been considered by the AER and Sapere-Merz

In **Table 8** below we summarise the list of possible OEFs for Ergon and Energex summarised in Section 4.1 above, and set out our assessment of the extent to which each of these OEFs has been considered by the AER and Sapere-Merz to date. As shown in **Table 8**, our view is that the majority of these OEFs are yet to be considered or have only been partially considered by the AER and Sapere-Merz. In cases where OEFs have been considered by the AER and Sapere-Merz, our assessment is that further work can be done to analyse these OEFs in more detail. Our assessment of the further work needed on OEFs is discussed in detail in Section 5 below.

Table 8: Possible OEFs for Energex and Ergon and comparison with AER and Sapere-Merz's assessment

CATEGORY	SUB-CATEGORY	ASSESSED BY AER	ASSESSED BY SAPERE-MERZ?
Diversity of weather	Cyclones	**Partially**, impact of cyclone considered only for Ergon and for actual damage. No OEF granted for preparation for cyclones. No OEF granted for spillover effects.	**Partially**, impact of cyclone considered only for Ergon and for actual damage. No OEF granted for preparation to cyclones. No OEF granted for spillover effects.
	Storms	**Partially**, overall impact of extreme weather events considered, but no detail assessment of unique weather-events affecting Ergon and Energex service areas.	**No, OEF for extreme weather event considered not to meet non-duplication criterion.**
	Floods and storm surge		
	Rainfall		
	Humidity		
	Drought		
	Bushfires	**Yes, but further work needed in this area**	**No**, considered under vegetation management
	Salt spray in coastal areas		
Network scale	Travel distances	**Partially**, but only one dimension considered (length of network not accessibility)	**No**, more data required
	Travel costs		
	Lack of standard vehicle access		
	Fleet ownership		
Network configuration	Subtransmission	**Partially**, only km of subtransmission considered	**Partially**, only km of subtransmission and number of assets considered. Differences in network topology is a candidate OEF
	Radial network		
	SWER		
Vegetation management		**Partially**, only division of responsibility	**No**, more data required
Proportion of timber poles		**Partially**, only in respect to termite OEF	**Partially**, only in respect to termite OEF
Termites		**Yes, quantified but estimate compromised by issues with RIN data**	**Yes, quantified but estimate compromised by issues with RIN data**
Solar PV installation		**Yes, considered to be likely immaterial, but no quantification provided**	**No**, but flagged as candidate OEF
Environmental and cultural heritage issues		**Yes, considered to be likely immaterial, but no quantification provided**	**Yes, considered to be likely immaterial, but no quantification provided**
Information technology expensing		**No, not considered**	**No, not considered**
Mining leases conditions			**No, not considered**
Asbestos management		**No, not considered**	**No**, more data required
Contaminated land management		**No, not considered**	**No, not considered**
Mining labour impacts		**Yes, considered to be likely immaterial, but no quantification provided**	**No, not considered**
Private power poles		**Yes, considered to be likely immaterial, but no quantification provided**	**No**, not sufficient evidence
Technical specialities		**Yes, considered to be likely immaterial, but no quantification provided**	**No, not considered**

Source: Frontier Economics

5 CONCLUSIONS AND PROPOSED NEXT STEPS FOR THE AER

Our conclusions and proposed next steps for the AER are set out in the remainder of this section.

- In Section 5.1, we reiterate our view that the AER's step of reviewing its approach to OEFs is important and welcome
- In Section 5.2, we comment on the preliminary nature of the Sapere-Merz consultation at present
- In Section 5.3, we set out our proposed next steps for the AER for further work on OEFs
- In Section 5.4 we set out the OEF implications for Ergon and Energex at present.

5.1 The AER's step of reviewing its approach to OEFs is important and welcome

Frontier Economics commends the AER's efforts to improve its approach to economic benchmarking, and its dedicated review of how OEFs should be accounted for when conducting economic benchmarking. In our view, it is not possible to draw meaningful conclusions about the relative efficiency of regulated DNSPs unless OEFs are controlled for appropriately. Failure to control properly for OEFs would defeat the objective of conducting economic benchmarking: namely, to identify the true scope for efficiency improvements by DNSPs. Therefore, we welcome the AER's attention towards this issue, and consider that this is an important opportunity to make lasting improvements to the way the AER conducts economic benchmarking, to promote the long-term interest of consumers.

5.2 Status of Sapere-Merz work

As discussed in detail in Section 3 above, the Sapere-Merz OEFs assessment includes only a limited subset of relevant OEFs. We therefore consider Sapere-Merz's current preliminary OEF adjustment of 13.6% for Ergon Energy and 3.5% for Energex to be significantly underestimating the challenges associated with the operating environment of Ergon Energy and Energex. More generally, in our view, Sapere-Merz's latest report significantly underestimates the OEFs adjustments that are necessary to explain the vast differences in the operating environment of the different DNSPs in the NEM.

By way of example, Sapere-Merz concludes that there is insufficient reliable data at the present time in the RIN data to quantify an OEF adjustment related to vegetation management even though vegetation management is likely to represent a material OEF. We note that vegetation management opex comprises over 30% of the total opex for some DNSPs, and the exclusion of an OEF adjustment for vegetation management is likely to materially compromise the AER's base-year efficiency assessment. We therefore recommend that Sapere-Merz's OEFs be considered too preliminary to be relied on at present for base-year assessment purposes.

5.3 Need for further work

In the remainder of this sub-section we set out our assessment of the further work that is needed on OEFs. Our proposed next steps for the AER are to:

- initiate a new consultation on which OEFs should be accounted for within the benchmarking analysis;
- consult on how each of these OEFs should be quantified in a systematic and reliable manner;
- work closely with DNSPs to identify the data required, and undertake a rigorous process of checking and improving the veracity of the data, before making OEF adjustments;
- re-consider how OEFs are applied, and move away from the use of an *ex-post* approach where possible; and
- interpret benchmarking results with due caution.

These steps are discussed in-turn in the sub-sections below.

5.3.1 Need for further consultation

At present, there is little agreement between the AER and relevant stakeholders on which OEFs should be accounted for within the benchmarking analysis. Whilst the AER's current consultation process takes a step towards addressing this question, in our view a much more extensive consultation and engagement process (between the AER and relevant stakeholders) is required to determine the most important factors that could be driving differences in the DNSPs' opex that are not accounted for within the AER's benchmarking models.

Clearly, the factors not accounted for in the AER's benchmarking models will depend on *how* those models are specified. The AER itself has indicated that more work needs to be done to improve its benchmarking models and techniques. Therefore, the question of what OEFs should be quantified and adjusted for cannot be divorced from the process of reviewing and improving the AER's benchmarking models: these two processes need to occur together.

We recommend that efforts to improve the AER's benchmarking analysis and approach to OEFs should not be viewed by the DNSPs or the AER as a one-off exercise but, rather, as an iterative process that improves gradually the quality of information and analysis available to the regulator, the businesses and consumers as a means of promoting better regulatory outcomes.

5.3.2 Need for bespoke methodology for each OEF

Once agreement is reached on the most important OEFs to be accounted for, a process will be required to decide how each of these OEFs should be quantified in a systematic and reliable manner. Owing to the wide-ranging characteristics of relevant OEFs, there is unlikely to be a 'standard' approach that can be applied to quantifying all (or even some) OEFs. It is more likely that the quantification of each OEF will require a bespoke calculation. The process for agreeing how each OEF should be quantified would entail:

- developing an appropriate methodology for quantification;
- identifying the data required to apply each method, including the data that can be sourced from respected third-party sources such as the BOM or the CSIRO;
- agreeing on the sources of data that should be used; and

- developing data templates and detailed, standardised data definitions if (as is likely) some of the data are to be collected from the DNSPs.

We recommend that a bespoke methodology be developed for quantifying each of the possible OEFs for Ergon and Energex discussed in Section 4.

5.3.3 Need for further data collection

While we have not had the opportunity to undertake an exhaustive audit of the RIN data on OEFs within the scope of this report, we note that that significant problems of comparability exist both across DNSPs, across time, and across templates. There are, at present, major gaps in the data required to quantify and adjust appropriately for the most material OEFs. Reliance on only the data presently available to the AER has two major disadvantages:

- Firstly, the data are limited in their scope and coverage, which in turn may limit considerably and unreasonably the OEFs that the AER can quantify. For example, this could result in important OEFs being omitted from the analysis or being adjusted for in an ad hoc fashion.
- Secondly, as the data currently available to the AER have not been tested thoroughly and corrected for errors, there can be little confidence that the data are reliable or reported consistently (e.g., if some DNSPs have misinterpreted the guidance for what data that should be reported).[24] If the data are of poor quality or are unreliable, the resulting OEF adjustments will not provide a true indication of the DNSPs' relative efficiencies.

In order to overcome these problems, we recommend that, before making OEF adjustments, the AER work closely with DNSPs to identify the data required and undertake a rigorous process of checking and improving the veracity of the data. Further, we recommend that this data collection and auditing process be undertaken in a collaborative way between the AER, the industry and other stakeholders. This would:

- ensure better consistency of data, as all DNSPs develop a common understanding of the information the AER is seeking and the uses to which it will be put;
- help the AER to identify early any potential inconsistencies in how data are being reported between DNSPs or over time; and
- provide the AER with valuable opportunities to learn more about individual businesses and their operations, which would aid its regulatory determinations and its interpretation of the quantitative benchmarking analysis.

It appears that the AER's processes for checking the RIN data on OEFs and resolving any potential inconsistencies in the data reported by the DNSPs, are not yet well developed. The processes of verifying the accuracy and consistency of data intended for benchmarking purposes need to be careful, unrushed and undertaken collaboratively between the AER, the industry and other stakeholders. Because the robustness of benchmarking analyses is so dependent on the quality and consistency of the data used, a careful and considered due diligence process needs to be undertaken to be confident in the benchmarking results.

The challenges involved in the preparation by DNSPs of data for benchmarking – and the amount of work that is required to create a consistent dataset – should be acknowledged in the AER's consultation process on OEFs and benchmarking.

[24] As discussed in Section 5 of our February 2018 report, Sapere-Merz has expressed reservations about the quality and consistency of the data available to quantify some OEFs.

5.3.4 Need to re-consider how OEFs are applied

To date, prior to determining efficiency adjustments in regulatory proceedings, the AER has attempted to account for OEFs only *after* the raw efficiency scores of its benchmarking models have been estimated (i.e., the *ex-post* adjustment approach).

The key disadvantage of the *ex-post* approach is that the data to which the benchmarking model is applied is not made more comparable between DNSPs before the raw efficiency scores are estimated. As a result, the true relationship between the DNSPs' costs and cost drivers will be distorted by the inclusion of non-comparable opex data.[25] As a consequence the estimates of raw relative efficiency (including the efficiency of the comparison point and the identification of the comparison point itself) will be distorted. *Ex-post* adjustments for OEFs do not address the fact that the true cost relationship determined by the benchmarking model will have been mis-estimated due to the inclusion of non-comparable data.

In Section 3.2 of our February 2018 report, we described a number of alternative approaches that could be considered, which do not suffer from the weakness associated with the application of *ex-post* adjustments. These approaches are the following.

- Including additional explanatory variables in the benchmarking model to control for differences in OEFs.
- Making *ex-ante* adjustments for OEFs to the data, before the benchmarking models are applied to the data.
- Making second-stage adjustments for OEFs after efficiency scores are estimated.

Our recommended approach for the AER is a combination of:

- investigating the inclusion of some additional cost driver variables in its model, which should become more feasible over time as the sample size increases; and
- making *ex-ante* adjustments for any costs associated with OEFs that are unexplained, or poorly explained, by the cost driver variables that are included in the model – as Ofgem does.

Second-stage adjustments could be considered as the next available option to account for any additional factors not accounted for through the combination of approaches above. In our view, all three of these approaches are superior to the AER/Sapere-Merz *ex-post* OEF approach.

5.3.5 Need to interpret benchmarking results with due caution

Finally, we note that even if the AER successfully undertakes a significant program of ongoing improvements to its approach to benchmarking and OEFs, along the lines we recommend, there will still be a need to treat its benchmarking results with appropriate caution. This is because it will never be possible to account perfectly for OEFs due to data and methodological limitations. However, this should not deter the AER from embarking on a program to improve significantly its existing approach to OEFs. It is clear to us that with cooperation between the AER, the DNSPs and other stakeholders, the usefulness of the AER's economic benchmarking analysis can be enhanced greatly.

[25] Technically, the omission of relevant explanatory variables leads to inconsistent estimates of the coefficients of the model. As a result, the raw estimates of efficiency will also be biased.

5.4 What this means for Ergon and Energex

Our benchmarking report assesses the comparative efficiency of Energex's and Ergon's proposed base year opex for the 2020–25 regulatory period using both the AER's 2015 OEFs adjustments as well as the lower Sapere-Merz adjustments.

As set out in Section 2.4 of our benchmarking report, we find that:

- When the AER 2015 OEFs are used:
  - Energex's proposed base year opex of $371m ($2019-20) is significantly below the range of opex levels of $433m-$529m estimated by the AER's four econometric models.
  - Ergon's proposed base year opex of $376m ($2019-20) falls also below the range of opex levels of $404m-$484m estimated by the AER's four econometric models.
- When the preliminary and limited Sapere-Merz OEFs are used:
  - Energex's proposed base year opex of $371m ($2019-20) is below the range of opex levels of $383m-$467m estimated by the AER's four econometric models.
  - Ergon's proposed base year opex of $376m ($2019-20) is towards the lower end of the range of opex levels of $364m-$436m estimated by the AER's four econometric models.

These models do not provide any evidence to suggest that Energex's and Ergon's base year opex for the 2020–25 regulatory period requires an efficiency adjustment. Since this conclusion holds even under the very limited set of OEF adjustments considered to date by Sapere-Merz, that conclusion holds even more strongly if a reasonable allowance is made for OEF adjustments in the estimation of Energex and Ergon's target base year opex.

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