cy

2025-2030 Regulatory proposal

Validity of Ergon Energy versus peer comparisons for pole replacements

Ergon Energy

Reference: P527533

Revision: 1.2

2024-10-03

aurecon

Bringing ideas to life

Document control record

Document prepared by:

Aurecon Australasia Pty Ltd
ABN 54 005 139 873
Level 11, 73 Miller Street
North Sydney 2060 Australia
PO Box 1319
North Sydney NSW 2059
Australia

T +61 2 9465 5599
F +61 2 9465 5598
E sydney@aurecongroup.com
W aurecongroup.com

Document control						aurecon
Report title	Validity of Ergon Energy versus peer comparisons for pole replacements					
Document code			**Project number**		P527533	
File path	Https://aurecongroup.sharepoint.com/sites/527533/5_WorkingFiles/03.					
Client	Ergon Energy					
Client contact	Benson Heng		**Client reference**			
Rev	**Date**	**Revision details/status**	**Author**	**Reviewer**	**Verifier** (if required)	**Approver**
1.0	2024-09-23	Issued for Client Review (Draft)	SL	SK	TK	
1.1	2024-09-26	Final Draft	SL		TK	
1.2	2024-10-03	Final (Client feedback incorporated)				TK
Current revision	**1.2**					

Approval			
Name	S Liles	Name	T Keraitis
Title	Senior Consultant, Asset Management & Performance	Title	Principal, Asset Management & Performance

Executive Summary

This report provides an independent technical review of the validity and appropriateness of the comparisons made between Ergon Energy and its distribution network peers, particularly Essential Energy, in relation to poles replacement volumes. The report has been produced as part of Ergon's response to the Australian Energy Regulator's (AER) draft determination for the 2025-2030 regulatory period and assesses whether comparisons drawn in the AER's consultant's report, prepared by Energy Market Consulting Associates (EMCa), accurately reflects the contextual differences between Ergon and its peers.

Ergon Energy operates in a uniquely challenging environment, encompassing diverse and extreme climatic conditions, including high humidity, significant rainfall, cyclonic winds, and legislated performance requirements for pole reliability under the Queensland Electrical Safety Code of Practice (ESCOP) 2020. These factors, along with a population of legacy low-strength poles, faster growth timber poles with shorter lifespans and a lower historical design safety factor, materially impact pole degradation rates and the frequency of replacements.

Key findings from the report indicate that direct comparisons between Ergon Energy and peers such as Essential Energy are not valid without adjustment for these operational and environmental differences. Essential Energy operates in less severe climates with non-cyclonic conditions, operates poles sourced from different timber and does not face the same legislated reliability mandates or challenges with low-strength poles, thus making their lower replacement rates less applicable as a benchmark for Ergon Energy.

The review concludes from a risk perspective, Ergon's higher pole replacement rates are explainable based on its unique risk profile, which includes more rapid pole degradation due to environmental factors, a higher number of low-strength legacy poles, and stringent regulatory requirements. The report recommends that any future comparisons between Ergon Energy and other DNSPs should take these factors into account to ensure valid benchmarking.

The findings of this review will contribute to Ergon Energy's revised regulatory proposal, supporting the case for continued investment in pole replacements to meet both regulatory compliance and safety performance objectives.

Poles sourced from Queensland grow faster but have lower strength, leading to shorter lifespans and increased maintenance needs compared to New South Wales poles, despite meeting the same nominal strength ratings on the pole disc.

Contents

Figures

Tables

1 Introduction

1.1 Purpose

The purpose of this report is to provide an independent technical review of the validity and appropriateness of the comparisons made between Ergon Energy (Ergon) and distribution network peers in relation to poles repex in the Australian Energy Regulator's consultant's report *"Ergon Energy 2025/26 to 2029/30 Regulatory Proposal Review of Aspects of Proposed Expenditure"*, prepared by Energy Market Consulting Associates (EMCa) August 2024. Aurecon's expectation is this report will form part of Energy Queensland's revised regulatory proposal to be submitted December 2024.

1.2 Scope

Aurecon's scope was to provide an independent technical review of the appropriateness of EMCa's approach in comparing Ergon Energy with Essential Energy and peers. Primary items for review to effectively assess the appropriateness of the comparison are:

- Findings from EMCa's report *"Ergon Energy 2025/26 to 2029/30 Regulatory Proposal Review of Aspects of Proposed Expenditure"*
- Ergon's pole data and network context, including items such as:
  - Pole population characteristics
  - Regulatory environment
  - Climate factors
  - Design and serviceability assessment methodology

This report is a technical comparison of Ergon and peers (primarily focused on Essential Energy). It is not a review of the prudency and efficiency of Ergon Energy's poles investment case. However, Aurecon expects the findings of this report would inform a revised business case for Ergon Energy's poles repex.

1.3 Methodology

As part of this review, Aurecon:

- Reviewed the EMCa report, "Ergon Energy 2025/26 to 2029/30 Regulatory Proposal Review of Aspects of Proposed Expenditure", supplied by Ergon Energy, with a focus on pole repex and the comparisons with peers, in particular Essential Energy.
- Consulted with Ergon's asset management and regulatory teams to obtain information, clarify our understanding and challenge relevant underlying assumptions.
- Reviewed additional information provided by Ergon Energy, including information provided to Ergon by Essential Energy relating to poles asset population and asset management.
- Collated and reviewed publicly available information from Essential Energy and other DNSPs', specifically, information provided as part of recent poles repex proposals.
- Compared Ergon Energy's and Essential Energy's repex business cases, design standards, asset bases, asset lifecycle management plans, forecasting methodologies and works delivery practices as related to poles.
- Completed independent analysis to validate the appropriateness of using Essential Energy as a benchmark for Ergon Energy and formulated our own conclusions on EMCa's findings as related to the Essential Energy/Ergon Energy comparison.
- Formed conclusions based on the above steps and provided recommendations to Ergon Energy on our findings.

2 Background

Ergon Energy submits a Regulatory Proposal (RP) to the Australian Energy Regulator (AER) every five years which proposes the amount of capital required to build, operate and maintain its electricity distribution network, and the revenue it intends to collect from customers through distribution charges. Ergon's next five-year Regulatory Control Period (RCP) commences 1 July 2025 and ends on 30 June 2030. Ergon submitted its 2025-2030 Regulatory Proposal on 31st January 2024.

To support their review and draft determination, the AER engaged EMCa to undertake a review of both the 2025-2030 RP and the 2020-2025 ex post justification paper and provide economic advice of aspects of Ergon's proposed capital allowance, with primary focus on replacement (repex) and augmentation (augex) expenditure proposed for the next RCP and that incurred during the ex post period, as well as reviewing the governance, management and forecasting methods applied by Ergon relevant to their incurred and proposed expenditure.

The AER/EMCa report: *Ergon Energy 2025/26 to 2029/30 Regulatory Proposal Review of Aspects of Proposed Expenditure* was provided to Ergon September 2024. Information obtained and reviewed by EMCa throughout this period (up to 21st June 2024) includes Ergon's publicly available regulatory proposal submission and supporting documents, additional information specifically requested by EMCa and AER, and information obtained from workshops with Ergon during 2024.

2.1 EMCa report conclusions

EMCa's report makes several inferences relating to Ergon's proposed poles replacement expenditure, with comparison to Essential Energy and peers:

1. As illustrated in Figure 4.7 of the EMCa report, the failure rates per 10,000 poles for Ergon Energy and Essential Energy are relatively similar, even though Ergon Energy's replacement rates are higher, implying Essential Energy's approach is more cost effective and efficient.
2. The report implies Essential Energy's increasing pole replacement rate is due to a proactive approach including transitioning to composite poles program and including at risk poles in its resilience programs (Section 320 and Footnote 85). Section 696 suggests Ergon's poles asset management approach is indicatively reactive.
3. While both Ergon and Essential Energy are managing an aging poles asset base, Essential Energy has a higher proportion of older poles compared to Ergon and some peers. Table 4.5 of the EMCa report asserts 17.5% of Essential's poles are over 60 years old, whereas only 7.2% of Ergon's poles are over 60 years old. The implication is Essential Energy is managing their aging pole population in a more efficient manner.

3 Ergon Energy Poles Operating Context

The following section of the report provides summary contextual information on Ergon Energy's operating context in relation to poles. We consider: Ergon's asset base, lifecycle management strategies, design practices, legislative requirements and other key factors which are relevant to make a valid comparison with an alternate DNSP.

3.1 Network size and pole population

Ergon Energy's distribution network covers over 1.7 million km^2 (approximately 97% of the geographical area Queensland) and consists of 981,665 poles. The pole population is predominantly timber (89%), with a smaller population of steel (8%) and concrete (3%) poles. Limited use of composite poles exists.

3.2 Legacy design practices

Ergon has a considerable population of known legacy low strength 3kN rated poles (approximately 10% of the total pole population) which disproportionality contribute to total annual pole failures (approximately 30% of total historical failures). A large proportion of this population is expected to approach end of life (EOL) within the next decade.

3.3 Legislated requirements

Pole assets in Queensland are subject to several legislative and regulatory standards. The Queensland Electrical Safety Code of Practice (ESCOP) 2020 stipulates expectations for pole reliability, specifically clause s5.1, which states that pole structures must achieve a minimum three-year moving average pole reliability target of 99.99% per annum (p.a.).

That is, a maximum failure rate of 0.01% p.a. Based on Ergon's pole population, this equates to 97 pole failures p.a. Based on data as of 2023, Ergon's pole failure performance is trending down, however the three-year moving average is still above the threshold, at 101 failures on average annually.

3.4 Queensland climate zones and conditions

Ergon's supply area covers a wide range of climate zones from desert and grassland through to tropical and equatorial zones, as indicated in Figure 1. This means the pole population is subject to a wide range of challenging climatic conditions for which poles are to perform reliably, including:

- Large temperature differentials between seasons (desert areas).
- High rainfall, humidity and flooding which contributes to elevated rates of timber degradation due to rot (equatorial, tropical and sub-tropical zones).
- Cyclonic conditions and extreme wind loading (coastal regions in above zones).
- Bushfire risks (grassland zones).

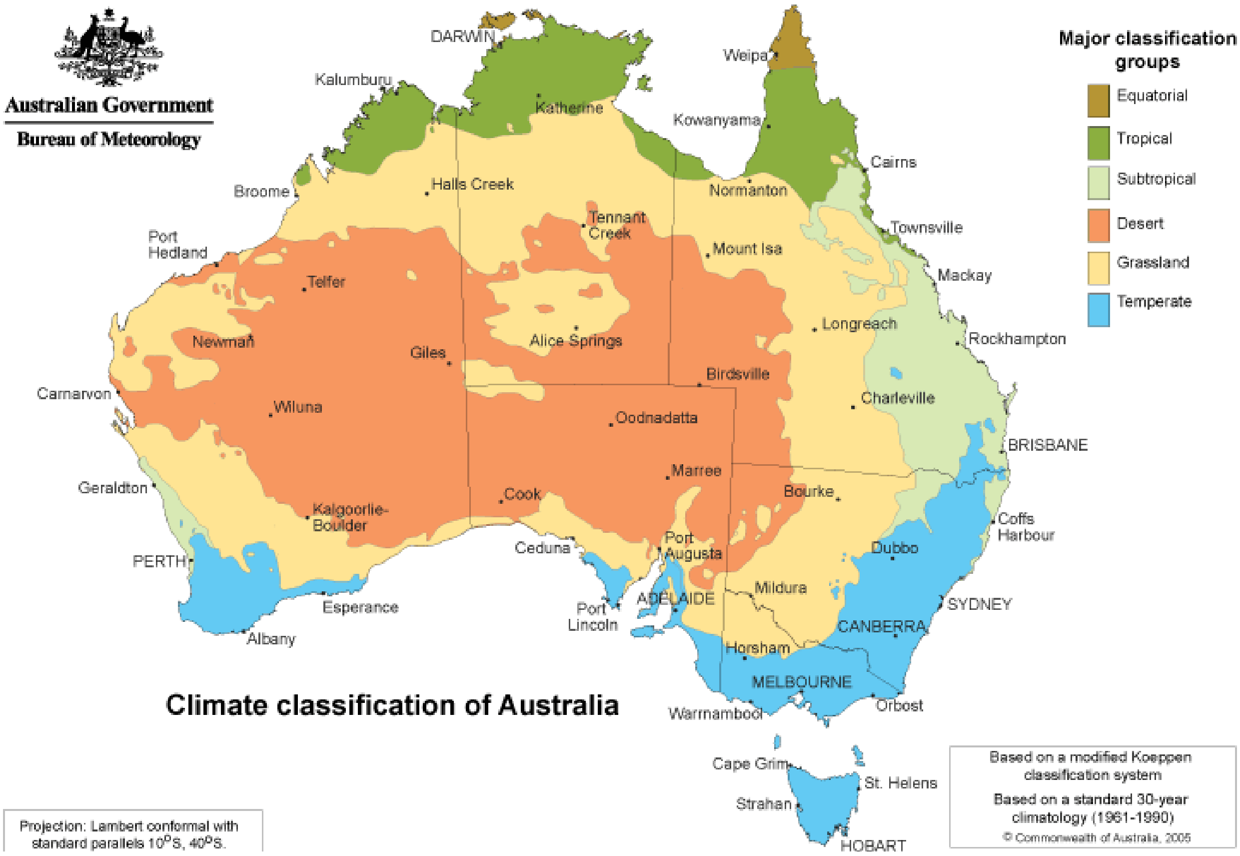

Figure 1: Australian Government Bureau of Meteorology Climate Zones based on temperature and humidity

3.5 Wind levels and extreme wind conditions

As indicated above, a large portion of Ergon's network resides within tropical regions of northern Queensland. These regions typically experience more extreme winds associated with cyclonic weather conditions.

A comparison of wind speeds and potential wind pressures applied to poles for cyclonic and non-cyclonic as per AS/NZS1170 (see Figure 2 below – cyclonic conditions labelled Region C, non-cyclonic regions labelled A) shows that cyclonic areas, which are experienced throughout Ergon's network area, experience wind speeds up to 33-54% greater and wind pressures of 78-137% greater than non-cyclonic regions, which are more consistent, for example, across Essential Energy's NSW network area[1].

[1] Wind speeds refer to regional gust wind speeds (m/s) for a given average recurrence interval (assumed 50 years) outlined in Table 3.1(A). Wind pressures calculated from wind speeds as per AS/NZS1170 equation 2.4.(1)

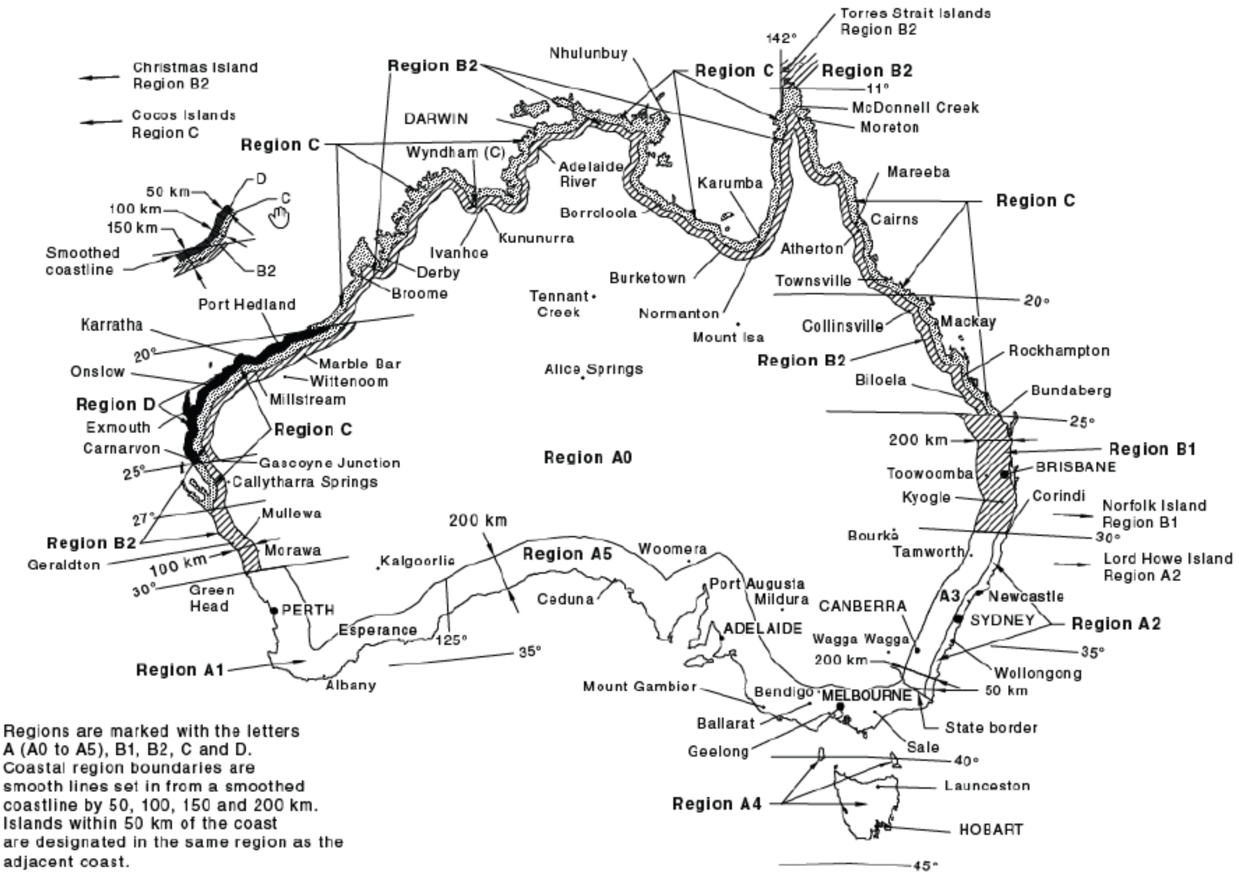

Figure 2: Wind regions as per AS/NZS1170.2 Figure 3.1(A)

3.6 Serviceability criteria

Ergon utilises limit state design methodology as per AS/NZS7000 for overhead line design purposes, with an initial 'Factor of Safety' (FOS) of 2.5 utilised during the design process to select suitable pole profiles based on applied pole loads. Once poles are in-service, inspections are carried out at set intervals to determine the serviceability of a pole, that is, it's ability to provide the required level of service as an overhead live conductor supporting structure.

In 2019, Ergon revised the methods for assessing pole serviceability, utilising Field Mobile Computing software, to more accurately assess pole serviceability and residual strength based on observed pole condition in accordance with AS/NZS7000. Furthermore, the frequency of inspections changed from a mix of 4, 6 and 8 yearly to a standardised 5 yearly inspection cycle. This change was to align with the Queensland WorkSafe Code of Practice (COP) requirement for 5 year averaged performance reporting.

Analysis of defect data since 2019 implies such changes have driven an increase in pole replacement rates due to the combination of more frequent inspections and more strict serviceability criteria whereby more poles are being identified as unserviceable than pre-2019 levels.

Ergon currently employs a limit state approach to determine the serviceability of its pole assets. Table 1 below shows the serviceability criteria used by Ergon's pole inspectors. The Sound Wood criteria is a measurement taken from the observed weakest point on the pole. The % Serviceability and Calculated Limit State (LS) Strength criteria are based on results from the measured points and a serviceability calculation.

Table 1: Ergon's current Serviceability Criteria

Description	Serviceable	Unserviceable	
		Priority P2	*Priority P1*
Sound Wood	≥30mm	<30mm, ≥16mm	<16mm
% Serviceability	≥100%	<100%, ≥35%	<35%
Calculated LS Strength	≥5kN	<5kN	-

3.7 Asset lifecycle management approach

Ergon manages their pole population in accordance with the approach set out in their Asset Management Plan – Poles, which defines asset management objectives and desired level of performance. Ergon undertakes a condition-based inspection program, whereby poles are inspected every five years to assess the current condition of the pole, against minimum criteria, to define pole serviceability.

Fundamentally, this is a proactive asset lifecycle management strategy, as action is taken before failures occur, based on asset condition and regular assessment. The approach allows for preventative action or replacement to be taken before in service failures occur.

A defect classification system for assessing poles is utilised, whereby based on inspection results, a defect is classified as either Priority 1 (P1) or Priority 2 (P2), or minor defect (C3). Where a pole is assessed as unserviceable, a decision is made on the remediation action to take (replacement or staking) and a P1 or P2 defect is raised.

3.8 Works delivery

Ergon's large geographical footprint and relatively small pole low density population base compared to (some) other DNSP's means Ergon faces potentially higher logistical costs when delivering work packages. Ergon have therefore undertaken a consequential replacement approach in recent years to bundle pole-related asset replacement works together to reduce time and costs associated with re-mobilisation, multiple site visits for incremental asset replacement activities.

3.9 Composite Pole Strategy

Ergon do not currently have a strategy for increasing the use of composite poles across their network, however, are presently undertaking a trial of the technology.

Ergon Energy is trialling composite poles as its supply of timber poles may experience constraints in the future.

3.10 Pole sourcing

Energex has historically sourced poles from northern New South Wales with the small balance from Queensland. Essential Energy traditionally sourced poles from New South Wales.

Ergon Energy however has historically sourced poles from suppliers based in Queensland due to preferable logistics, considering the remote and regional areas of the state. Due to climatic influences of the predominant tropical and sub-tropical areas where poles are grown, poles that are grown in Queensland grow taller faster due to additional rainfall and sunlight however this timeline means that the poles also develop with lower strength (still within the envelope for strength class but at the lower percentile).

From a design perspective, this has no influence. The designer will be specifying the size/strength of the pole required as per their tip load design based on the strength ratings. When the pole is sourced, it will be as per these design requirements and protocols in Queensland for the nominal strength rating applied to the pole's specifications.

From an asset lifecycle perspective however, poles in Queensland will have with a lower ultimate strength and smaller cross-sectional area than poles in New South Wales with the same nominal strength on the pole specification. Poles in Queensland will be expected to reach end of life earlier due to the reduced cross-sectional area in the inspection zone and the increased stress on the wood fibres due to the higher conductor loads applied.

4 Impacts of Operating Context on Investment

The following is Aurecon's assessment of the specific operating context of Ergon Energy's poles assets and the validity and relevance of comparison with Essential Energy and/or other DNSP's.

4.1 Climate zones

Being outdoor assets, climate conditions have a material effect over the long term on the health of timber pole assets. The following table provides an assessment of the impact of Ergon's operating climate zones on pole assets.

Table 2: Comparison of climate zones

Ergon Energy:	NEM peer comparison:	Implication:
▪ A significant proportion of Ergon's network experiences tropical conditions with high humidity, high rainfall, flooding etc.	▪ Essential Energy's network area is more reflective of arid and temperate climate conditions. ▪ Other jurisdictions in the Australian NEM do not fall into tropical climate	▪ *Ergon's pole population is subject to increased humidity and rainfall, driving increased timber degradation, bacterial rot and fungal decay. Degradation over time induce internal and external defects, which can result in rapid degradation patterns and reduced pole life.* ▪ *Wetter conditions may also contribute to pole foundation issues, including erosion and instability.*

4.2 Impact of wind loading conditions

Wind loading conditions have an impact on pole loading scenarios, and thus, pole design and minimum strength requirements. Especially for short term loading conditions during high speed wind gusts. The following table provides a comparison of the wind loading conditions the pole asset bases have to operate in.

Table 3: Comparison of wind loading conditions

Ergon Energy:	Peer comparison:	Implication:
▪ A large proportion of Ergon's coastal network experiences cyclonic weather conditions and has a higher chance of experiencing extreme wind loads.	▪ Essential Energy's network area is predominantly categorised as non-cyclonic, and thus and a far lower chance of experiencing extreme cyclonic winds.	▪ *Ergon's pole population is subject to more extreme ultimate wind loading (80 – 130% greater than non-cyclonic areas). This means, for a like-for-like pole profile between Ergon and Essential, Ergon's poles are subject to higher ultimate wind loads and thus have a reduced margin of safety between design pole strength and potential ultimate applied loads.*

4.3 Design safety factors

Ergon presently employs limit state design principles for design of new poles Historically however, Factor of Safety was used to define the ratio of ultimate strength of the pole compared to the working stress the pole is expected to withstand.

Table 4: Comparison of design safety factors

Ergon Energy:	Peer comparison:	Implication:
▪ Historically, Ergon used a design Factor of Safety of 2.5. ▪ Ergon Energy poles are therefore designed with an ultimate strength 2.5 times the allowable design load. For example, a 5kN pole would have an ultimate strength of 12.5kN.	▪ Essential Energy is understood to use a Factor of Safety of 4. ▪ A 4kN pole from Essential Energy would therefore have an ultimate strength of 19.91kN, while an Ergon 3kN pole has an ultimate strength of 7.5kN. ▪ This demonstrates Essential Energy poles tend to have higher ultimate strength under the same design tip-load scenario.	▪ *A higher Factor of Safety means poles with the same nominal rating will have higher ultimate strength and potentially longer service life.* ▪ *Essential Energy's higher factor of safety allows for more tolerance to degradation and pole strength over time.* ▪ *Poles in Ergon's service area may be deemed unserviceable sooner than Essential Energy's due to lower ultimate strength and faster degradation.*

4.4 Legacy (low strength) asset base

The following table provides an assessment on the effect of legacy "low strength" poles on the Ergon pole's asset base.

Table 5: Comparison of legacy (low strength) asset base

Ergon Energy:	Peer comparison:	Implication:
▪ Ergon have 90,736 in service 2kN (228) and 3kN (90,508) wood poles. These are classified as "low strength" poles which based on inspections are forecast to be approaching end of life within the next decade.	▪ Essential Energy are understood to not have any 3kN rated poles.	▪ *Ergon's low strength pole population disproportionately contributes to annual pole failures (approximately 30%) and poses a known material risk.*

4.5 Jurisdictional legislated requirements

Each state has different regulatory requirements, and this affects the compliance requirements for DNSPs that operate in different regulatory jurisdictions. The following table provides and overview on the different regulatory requirements related to pole assets.

Table 6: Comparison of jurisdictional legislated requirements

Ergon Energy:	Peer comparison:	Implication:
▪ Ergon is subject to the legislative requirements outlined in the Queensland Electrical Safety Code of Practice (ESCOP) 2020. Clause s5.1 specifically states that poles must achieve a three-year moving average pole reliability target of 99.99% per annum. This equates to 98 pole failures per annum.	▪ DNSP's located within the NSW jurisdictional region do not have any such mandates, and rather, must prove that they are prudently managing their safety risks.	▪ *Ergon must ensure they achieve the mandated pole reliability targets set out in ESCOP 2020. Failure to do so may result in penalties and loss of customer trust. While Ergon's recent performance indicates the rate is trending downwards, they have not yet achieved the required target rate. Essential Energy is not subject to this mandate.*

4.6 Pole Sourcing

Ergon sources its poles from Queensland. Due to climactic conditions (rainfall and sunlight) the timber grows taller faster compared to that of New South Wales poles. This does not impact design ratings but does impact lifecycle management.

Table 7: Comparison of pole sourcing

Ergon Energy:	Peer comparison:	Implication:
▪ Ergon poles sourced from regional Queensland where climate conditions and therefore timber growth rates differ from New South Wales sourced poles.	▪ Essential Energy sources poles from New South Wales with different timber compared to Queensland (Ergon) sourced poles.	▪ *Poles sourced from Queensland grow faster but have lower strength, leading to shorter lifespans and increased maintenance needs compared to New South Wales poles, despite meeting the same nominal strength ratings on the pole disc.*

5 Conclusions

Ergon's pole population and operating context is unique. Whilst comparisons between DNSP's across the NEM may be appropriate in certain circumstances, it's critical to consider the differences between DNSP's operational risk profile when undertaking benchmarking and determining what constitutes a valid comparison. The following factors were identified as being material differences between Ergon Energy and peers:

5.1 Climate

A significant portion of Ergons network experienced tropical conditions with hot and humid summer conditions as compared to NEM peers which experience more temperate conditions.

Increased humidity and rainfall in these areas contributes to increased levels of timber degradation, bacterial rot and fungal decay, resulting in a more rapid degradation pattern and reduced pole life.

5.2 Wind loading

Similarly, a significant portion of Ergon's network area is also subject to cyclonic wind conditions, as classified in AS/NZS1170.2, whereas, for example Essential Energy's network is predominantly classified as non-cyclonic. Due to elevated wind speeds, ultimate wind loading on poles in cyclonic zones can be up to 80-130% greater than those experienced in a non-cyclonic area.

5.3 Design safety factors

Ergon uses an initial design Factor of Safety of 2.5, whereas Essential Energy is understood to use a Factor of Safety of 4 when designing timber poles as per AS/NZS7000. As mentioned above, a significant portion of Ergon's existing poles are designed with less buffer between ultimate pole strength and ultimate applied loads, which reduces the allowable window of degradation before a pole is deemed unserviceable.

5.4 Legacy low strength pole population

Ergon have 90,736 in service 2kN (228) and 3kN (90,508) wood poles. These assets materially contribute to total failures per year (approximately 30%). Many of these poles are approaching end of life within the next decade. Within this low strength pole profile, reductions in sound wood may more rapidly impact residual pole strength and increase the risk of failure. Essential Energy are understood to not have such legacy assets in their network.

5.5 Jurisdictional legislated requirements

Ergon must comply with the requirements outlined in ESCOP 2020, which effectively sets an upper limit on the total allowable pole failures at 0.01% per annum (trailing three-year average). Essential Energy and others are not bound this specific quantified target.

5.6 Pole Sourcing

Poles sourced from Queensland grow faster but have lower strength, leading to shorter lifespans and increased maintenance needs compared to New South Wales poles, despite meeting the same nominal strength ratings on the pole disc.

6 Recommendations

Based on the conclusions of this report, Aurecon recommends the following as key considerations for valid peer to peer comparisons of pole replacement volumes against Ergon Energy:

1. Comparisons of poles operating expenditure between Ergon Energy and other DNSPs, particularly Essential Energy, should consider significant differences in operating environments and asset bases. Climate differences, wind loads, and legislated requirements in Queensland create a risk profile which is not directly comparable to other jurisdictions such as New South Wales.
2. High pole replacement rates for Ergon Energy reflect the risk profile which includes the various factors such as low strength poles, climatic conditions, design considerations, wind loads and legislative requirements. A one-to-one comparison with a peer should consider these factors in relation to pole replacements.
3. A legacy population of low strength 3kN poles on the Ergon Energy network and a lower design safety factor for poles may necessitate a higher frequency of replacements. This is a critical factor which differentiates Ergon Energy's situation and should be accounted for in comparative replacement volume analyses.
4. Logistical considerations including Queensland's expansive geographical footprint impact unit rates and contribute to the need for consequential replacements. Comparison with peers which have more concentrated service areas should not overlook these drivers.
5. Despite having the same nominal strength rating Ergon's Queensland sourced poles may degrade at more rapid rate compared to New South Wales sourced poles given faster timber growth rates despite having the same design rating.

Document prepared by

Aurecon Australasia Pty Ltd
ABN 54 005 139 873
Level 11, 73 Miller Street
North Sydney 2060 Australia
PO Box 1319
North Sydney NSW 2059
Australia

T +61 2 9465 5599
F +61 2 9465 5598
E sydney@aurecongroup.com
W aurecongroup.com

Bringing ideas to life