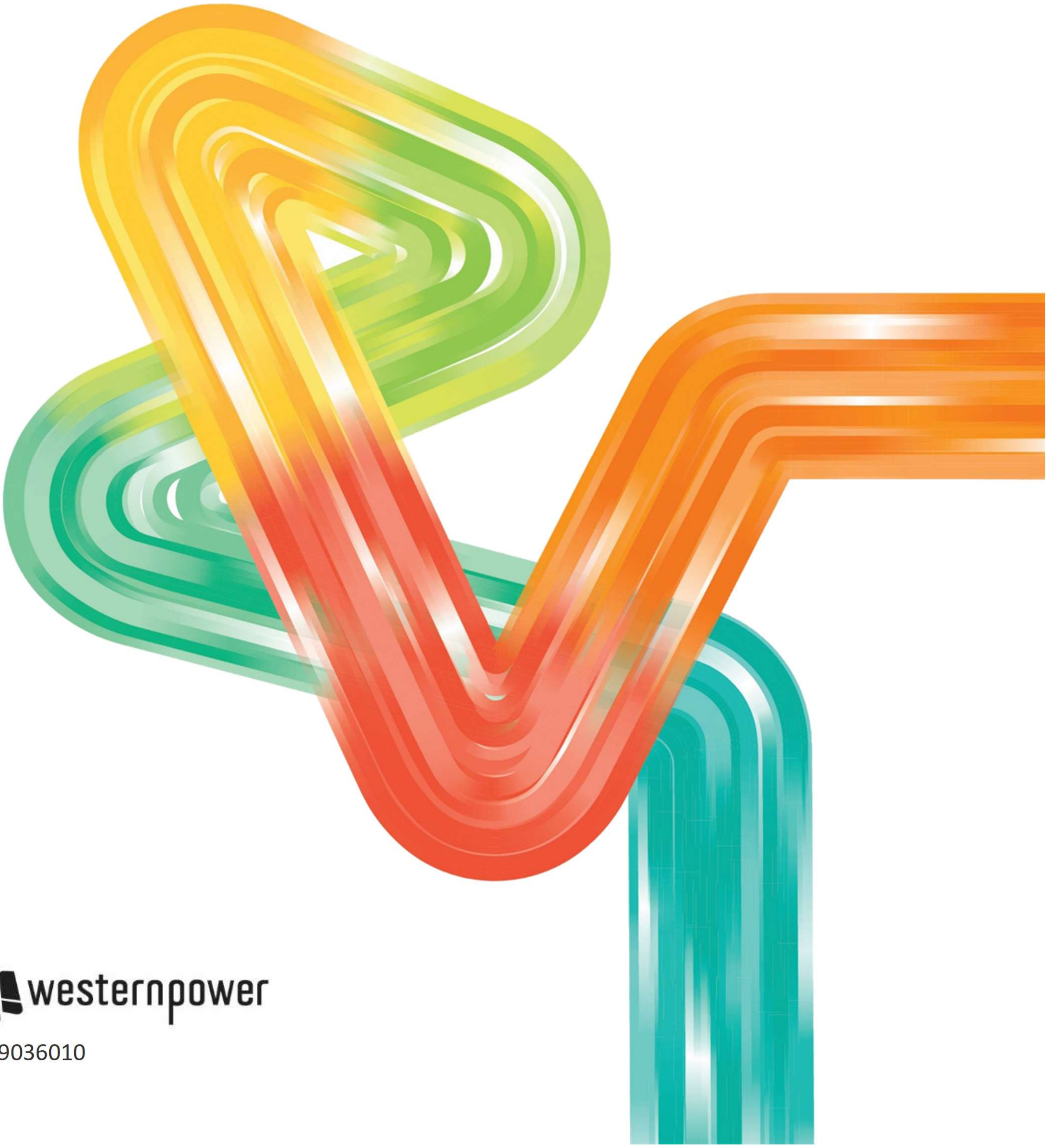
Attachment 7.4

Network Growth Factors Review for Western Power Report

Access Arrangement Information

1 February 2022



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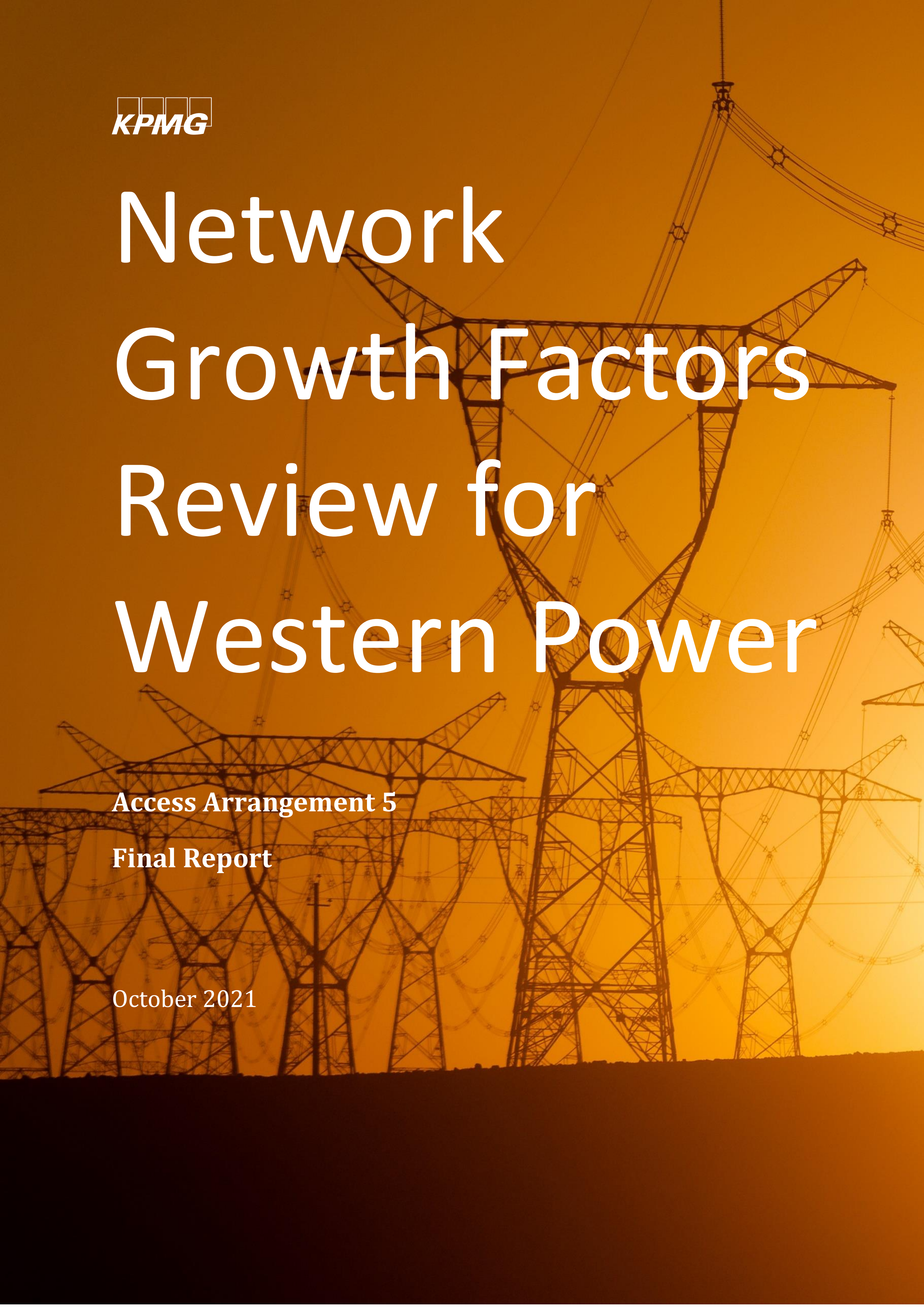

KPMG

Network Growth Factors Review for Western Power

Access Arrangement 5

Final Report

October 2021

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Executive Summary

The ERA applies a Base-Step-Trend approach to forecasting allowed operating expenditure (opex) over the regulatory control period. The role of the trend component is to adjust the opex allowance to changing circumstances and comprises three elements to account for expected changes in input prices, network (or output) growth and productivity growth.

Western Power has engaged KPMG to advise on the appropriate approach for determining the output growth element to the opex Trend for the AA5 period. This includes considering how to select network growth factors and how to assign appropriate weightings to each.

Network growth is estimated through identifying a number of output factors which are expected to drive changes in operating costs over the period. Each factor is assigned a weighting to represent the relative strength of the relationship between the output metric and changes in costs. The contribution of the network growth element to the Trend component is then calculated as the weighted average expected change across the identified growth factors.

As cost conditions and operating drivers differ by transmission and distribution networks, it may be appropriate to apply different factors and weightings. For AA4, the ERA used the following four network growth factors for both transmission and distribution, with different weighting between transmission and distribution:[1]

1) Customer numbers
2) Circuit length
3) Ratcheted maximum demand, and
4) Energy delivered/ throughput.

The changing operating environment and the increasing uptake of technologies such as solar PV, batteries and Stand-alone Power Systems over AA5 could impact on the relevance of the existing network growth factors – the relationship between the growth factors used in AA4 and opex could weaken or no longer exist.

Role of network growth factors

The purpose of network growth factors is that through the choice of suitable factors and their relative weightings, allowed opex will trend in line with changes in the drivers of operating costs. The selected factors should therefore reflect the drivers of change to operating expenditure on the networks such that there is a clear and verifiable relationship between changes in each factor and changes in operating expenditure.

The respective weightings applied to each factor should represent the relative strength of that relationship compared to the other chosen factors. For example, a weight of 20% applied to customer numbers means that for every 1% increase in customer numbers there should be a 0.2% increase in allowed opex. If all growth factors increased by 1%, then allowed opex would also increase by 1%.

The application of network growth factors in this way helps ensure that the network business has an adequate expenditure allowance to deliver customer services consistent with customer preferences and performance standards. Application of inadequate factors and weights can result in either under-funding of network operations or excess funding.

Network growth rates also impact on the application of Western Power's gain sharing mechanism, particularly under AA4 as the output of the mechanism is adjusted for differences between forecasts and actuals in the growth factors over the period. If the network growth rates fail to adequately reflect the drivers of opex over the period, then the gain sharing mechanism could unduly either penalise or reward the network. We note it is not clear if such an adjustment will apply for AA5.

[1] Definitions of the network growth factors are provided on p 13.

ERA likely approach to network growth factors for AA5

For AA4, the ERA decided to adopt the AER's approach to network growth factors and weightings. The ERA considered that if the AER network growth escalation method was to be used, it had to reflect the most recent data from the AER, including the current weightings used by the AER.

The ERA accepted that while Western Power expected minimal overall network growth over AA4, with only pockets of growth in some areas, there should be an allowance for network growth included in the operating expenditure.

The AA4 approach was based on the AER's 2017 benchmarking studies for DNSPs and TNSPs.[2]

The AER benchmarking approach relies on a series of complex total and partial factor productivity models and regression analysis to select the most appropriate factors which demonstrate a strong correlation with network growth and to estimate the weightings for each factor. The regression analysis is based on historical data collected from all networks located in the National Electricity Market and is supplemented with some international data. Data from Western Power is not included in this methodology.

Networks have criticised the AER methodology for several reasons[3]:

a) The factor weights in the AER's consultant - Economic Insights'- multilateral total and partial factor productivity (MTFP and MPTF) models were based on total costs and not opex and therefore should not be used to roll forward opex.

b) Errors in the modelling were identified.

c) Economic Insights' factor weight models predominately have insignificant coefficients and low R^2 values (the latter being a measure of how well the model explains the variance in the data). This suggests that the modelling is not statistically robust.

A key concern with the AER methodology has been that the factor weights have been materially shifting over time and providing results which were not conceptually sensible given the drivers of network costs and changes in operating environment. Table 1 shows a comparison of the benchmarking results from the multilateral total and partial factor productivity models and from the econometric models over varying time periods.

Table 1: Comparison of AER's distribution network weights

Output weights	2019 MTFP/ MPFP	Average of the econometric models 2006-19	Average of the econometric models 2012-19
Customer numbers	18.52%	55.95%	53.35%
Circuit length	39.14%	15.48%	21.30%
Ratcheted maximum demand	33.76%	28.58%	25.35%
Energy throughput	8.58%	–	–
Total	**100%**	**100%**	**100%**

Source: CEPA, The Australian Energy Regulator's operating expenditure benchmarking – a review of the impact of capitalisation and model reliability, prepared for Jemena, 13 November 2020, Table 1.4 – pg. 9

In response, the AER recently departed from its methodology in its final decision for the Victorian distribution networks (2021-2026 determination)[4]. The AER agreed that it should not include the opex weights from the MPFP model (which are also used for the MTFP analysis) because these weights reflect drivers of, and relationships with total costs and not only opex. As a result, the AER removed energy throughput as a network growth factor and instead calculated Translog elasticities at the full sample means only for the Australian data set. The revised weights for distribution networks are set out in the table 2. As

[2] Economic Insights, Position Paper for Review of TNSP Economic Benchmarking, 9 August 2017, p. 31. & Economic Insights, Economic Benchmarking Results for the Australian Energy Regulator's 2017 DNSP
Benchmarking Report, 31 October 2017, section 1.1, p. 1

[3] AER, United Energy Distribution Determination – 2021 to 2026 – Attachment 6, Operating expenditure, April 2021 p. 6-26; and AER, Annual Benchmarking Report – Electricity distribution network service providers, November 2020, Appendix C, pp. 77-81; and NERA, *Review of the AER's Proposed output weightings*, pp. 24-26.

[4] United Energy, CitiPower, Powercor, Jemena, AusNet Services – Distribution Determination 2021-26, Attachment 6 – Operating expenditure

shown these are materially different from the initial weights from the AER's 2020 benchmarking study and the weightings applied by the ERA in AA4.

Table 2: Distribution network growth factors and weightings applied by the ERA and AER in 2016, 2020, 2021

Distribution factor	AA4 Weighting applied by ERA	2020 AER benchmarking study (2019 MTFP/MPFP)	Revised AER methodology (2021)[a]
Customer numbers	45.8%	18.52%	55.7%
Circuit length	23.8%	39.14%	15.5%
Ratcheted maximum demand	17.6%	33.76%	28.8%
Energy delivered (throughput)	12.8%	8.58%	0%
Total	**100%**	**100%**	**100%**

a. The weightings published by the AER in April 2021 have been adjusted slightly to account for rounding.

The weightings under the revised AER methodology are better aligned with the cost conditions of a distribution network. Opex can be expected to be associated primarily with customer numbers. For example, opex associated with repairs and maintenance activities can be expected to be responsive to complaints by customers and to action customer requests for service. Ratcheted maximum demand (as proxy for network capacity) and circuit length are also important as drivers for asset management and network operations. The relationship between network costs and energy volumes however is a lot weaker especially given the increased uptake of distributed energy resources.

Given the different nature and drivers of transmission services versus distribution, the weights applied to the output factors will differ. The main function of transmission networks is the transport of bulk electricity from generation points to load centres. As such, circuit length and capacity (measured via ratcheted maximum demand) should be the most important outputs. End–user customer numbers and energy throughput is also included in the AER methodology size and complexity – however Economic Insights recognises that these factors are of secondary role in relation to transmission costs.[5] Further, the AER notes that similar to the case for distribution networks, if there is sufficient capacity to on the network to meet current energy throughput levels, changes in throughput are unlikely to materially impact on a TNSP's costs.[6]

The AER explains in its most recent transmission benchmarking report that top-down benchmarking studies of transmission networks is relatively new, and that the MTFP analysis used by the AER is still in a relatively early stage of development. Further, the small number of electricity transmission networks on the NEM (five) makes comparisons at the aggregate expenditure level difficult.[7]

Unlike for distribution, the AER does not currently have alternative econometric cost models to the MTFP for transmission. We understand this is a key reason why the AER did not make the equivalent change to that for distribution in the growth factors applied in the AER's September 2021 transmission draft decision for Powerlink.[8]

While it is possible that Economic Insights and the AER will reconsider the use of energy throughput in its transmission benchmarking model in their November 2021 benchmarking reports, we consider the case is strong for Western Power to adjust the AER results to exclude energy throughput for transmission in its proposal regardless. We have recommended transmission growth factors on that basis.

Table 3: Transmission network growth factors and weightings applied by the ERA and AER in 2016, 2020, 2021

Transmission factor	AA4 Weighting	2020 AER benchmarking study	2021 AER Draft decisions
Customer numbers	19.9%	7.6%	7.6%

[5] Economic Insights, Economic Benchmarking Results for the Australian Energy Regulator's 2020 TNSP Annual Benchmarking Report, October 2020, p 2
[6] Australian Energy Regulator, *Annual Benchmarking Report, Electricity transmission network service providers*, November 2020, p 36.
[7] Australian Energy Regulator, *Annual Benchmarking Report, Electricity transmission network service providers*, November 2020, p 11.
[8] AER, Draft Decision – Powerlink Queensland Transmission Determination 2022 to 2027, Attachment 6 Operating Expenditure, September 2021, p. 20.

Circuit length	37.6%	52.8%	52.8%
Ratcheted maximum demand	19.4%	24.7%	24.7%
Energy delivered (throughput)	23.1%	14.9%	14.9%
Total	**100%**	**100%**	**100%**

We do not see any reasonable justification for the ERA to continue the AER's previous methodology including energy throughput for either distribution or transmission, given the weaknesses identified and recognised by both Economic Insights and the AER. Such an approach would not be consistent with the Access Code requirement of efficiently minimising costs.

This means that the approach to network growth escalation for AA4 is not suitable for AA5. We therefore consider that the options for the AA5 determination would be to:

1) Apply (once they are available) the most up to date factors and weightings as set out in the AER November 2021 benchmarking studies for both distribution and transmission, if these no longer include energy throughput as a factor.
2) Adjust the AER's November 2021 benchmarking results to exclude energy throughput. For distribution, that would mean applying the same adjustment as the AER did for its 2021 distribution determinations. For transmission, that would mean making an adjustment based on KPMG's methodology presented in this report.
3) Adapt the AER approach to take into account Western Power data and operating conditions.
4) Develop a new approach for network growth factors based on datasets from networks that better align with Western Power's operating conditions.
5) Develop a new approach for network growth factors based solely on Western Power data and operating conditions.

Considerations

In assessing these options, the following are important considerations.

Energy throughput is not appropriate for distribution nor for transmission

The removal of energy throughput and greater weight on customer numbers under the AER revised methodology for DNSPs better aligns with evidence on how changes in the operating environment, e.g. greater penetration of distributed energy resources (DER) impacts on operating expenditure.

Recent developments in the sector such as the deployment of customer-sited solar photovoltaics (PV) and other technologies have altered traditional customer load profiles. Due to the growing use of load altering technologies, network-wide changes in energy throughput no longer accurately predict proportionate changes in peak demand or distributors' costs.

Changes in energy throughput do not drive changes in DNSPs' efficient operating costs, as noted by the AER in its 2018 Annual Benchmarking Report: "energy throughput is not considered a significant driver of costs as networks are typically engineered to manage maximum demand rather than throughput".[9] As noted above, the same point is recognised by Economic Insights and the AER in relation to transmission. In Western Power's context, the continued application of energy throughput as a growth factor for either distribution or transmission is unlikely to satisfy the Access Code Objectives.

The impact of the revised AER methodology for DNSPs applied in its 2021 decisions for VIC distributors increased the relative weight of ratcheted maximum demand to 28.7% compared with 17.6% applied by the ERA for AA4. The risks to Western Power of the change in weighting is likely to be low given the peak demand figure does not decrease under the ratcheted measure of maximum demand.

Stand-alone Power Systems will require changes to approach in the long term

Western Power is pursuing stand-alone power systems (SPS) where it is the most prudent and efficient option to providing covered services in that area, particularly in remote locations where customers are

[9] AER, Annual Benchmarking Report, Electricity distribution network service providers, November 2018, p. 51

connected at the end of long feeder lines on the distribution network. This network transformation is currently progressing through trials and early stage rollouts, and will progress significantly over the duration of AA5 and in subsequent access arrangement periods. Western Power forecasts approximately 1,800 customers will be transitioned to SPS between 2022 and 2027, increasing to approximately 4,000 in total by 2032.

There are two potential issues to consider:

1) Firstly, current base opex will not reflect the impact of SPS installations given that the opex required to serve a SPS customer may be materially different to that required to serve a grid-connected customer. As such, Western Power's total opex and opex per customer could materially change as more customers are transitioned off the grid and onto SPS.
2) Secondly, the installation of SPS will impact network growth metrics under existing factor definitions, primarily through the calculation of circuit length and also potentially through ratcheted maximum demand.

Challenges for Western Power in developing a different methodology to the AER's (revised) methodology

There are considerable challenges if Western Power wanted to propose a completely different methodology for network growth rates for AA5 to that which underpins the AER's growth factors.

The AER has established the principle that input and output weights should be based on industry benchmarks and not to be set at the individual network level based on actual data specific to each network. This principle would exclude an approach based entirely on Western Power's own data. The AER's main argument against the use of actual weights is that using the revealed output mix of NSPs to set future allowances would create an incentive for NSPs to adopt an inefficient mix to secure higher opex allowances for the next regulatory period.

In our view, this rationale is incorrect because the AER's current regulatory framework provides strong incentives for NSPs to adopt an efficient, rather than inefficient, input mix. These incentives include financial payoffs and penalties under the Efficiency Benefit Sharing Scheme (EBSS) and the reputational benefits of being identified by the AER's benchmarking analysis as an efficient NSP. However, the ERA may take a similar position to the AER.

Other approaches that included data from other DNSPs would also face challenges. Developing, testing and refining a new approach to determining growth factors and weights is a significant undertaking. It could also be challenging to source data of sufficient quality to develop a credible and robust method. Further, to be successful with the ERA, the development of a new approach would require significant involvement and buy in from the ERA and other key stakeholders. Any such new approach would therefore not be achievable for AA5.

At this stage, we therefore consider a change away from the AER's revised methodology would be hard to justify and obtain acceptance from the ERA, except for potential tweaks to exclude energy throughput (if necessary). This may change for the next access arrangement period (AA6), if the operating cost conditions and network services for Western Power materially change compared to East Coast networks. While we note that the AER has commented that as more data becomes available they will consider the possible extension of output coverage to include DER variables, there could still be significant changes that would justify a departure from the AER methodology.

Recommendations

KPMG has assessed the network growth factors and weightings for use in the AA5 determination from both an engineering and economic perspective. We have had regard to the appropriateness of the current factors in forecasting changes in opex and also the changing operating environment going forward. The key findings for Western Power to consider in preparing its proposal to the ERA for AA5 are set out below:

- Western Power should propose the revised AER methodology employed for the recent Victorian distribution determinations. The removal of energy delivered and the shifting of increased weights towards customer numbers should better capture changes in operating costs over the period.

- Western Power should take the same position for transmission subject to confirmation that the AER will also amend its methodology for TNSPs to remove energy throughput as a growth factor. If the AER does not make such a change, Western Power should apply an adjustment to remove energy throughput, such as under the option presented in section 5.5.
- A revised AER methodology that excludes energy throughput as a growth factor will better accommodate the increased penetration of DER on the network. However, such a revised AER methodology may not be appropriate in the long term if DER penetration continues, especially in relation to the weighting applied for ratcheted maximum demand. The AER is considering how to update its methodology to take better account of DER impacts on operating costs. That said, it may become more appropriate for Western Power and the ERA to agree on a separate methodology more specific to the conditions on the SWIS and this could be investigated further during the AA5 period.
- While the removal of energy delivered as a network growth factor for DNSPs goes some way in addressing the issues associated with DER, it will not account for existing known impacts on Western Power's opex due to increasing DER penetration. We further recommend that Western Power includes a step change to account for known impacts on base opex due to DER, and we note that this has been a successful approach under the AER framework.
- Regarding how best to account for the adoption of SPS during AA5, we recommend that:
    1) A step change in the baseline is proposed to account for the additional opex of serving SPS customers compared to grid connected customers. While this will help to account for the majority of the change in costs due to SPS we note this will not account for the impact on growth factors resulting from decommissioning of lines due to SPS;
    2) The calculation of forward-looking circuit length is based on historical trends over AA4 adjusted for expected decommissioning of lines due to SPS. We note that historical trends for circuit length have been used in previous determinations. Further, most of the increase in circuit length will be a result of customer driven projects, which are highly volatile and whether they proceed (or not) is outside Western Power's control. This makes them difficult to forecast with any reasonable degree of accuracy.
    3) Consideration be given to the inclusion of a growth factor in future periods (AA6 onward) that appropriately captures the impact of SPS on opex to counter negative growth factor implications resulting from the decommissioning of lines due to SPS.

Scope of operating costs subject to network growth factors

Western Power also asked KPMG to consider the appropriate scope of operating expenditure that should be subject to the network growth rates.

- In its AA4 decision, the ERA excluded corporate and indirect costs from the network growth trend, arguing that business support activities such as information technology, levies, fees and insurance are not proportional to any growth in service outputs that may result from changes in customer demand.
- This position taken by the ERA is inconsistent with both the methodology used by the AER to determine the output weights and also the AER approach to opex forecasts. The output factor weightings derived by the AER and Economic Insights, and ultimately applied by Western Power and the ERA in AA4, were derived using *all* opex, including corporate opex and indirect costs.
- Fundamentally, a larger network will require greater opex to manage. Hence, there is likely to be a positive correlation between network growth and corporate and indirect costs, even if network growth is not a direct driver of corporate and indirect costs.
- If the ERA adopts the AER methodology for output weightings for AA5 (whether or not adjusted for energy throughput), it should also be internally consistent and adopt the AER's application of network growth factors to all opex, including corporate and indirect costs.

Contents

1. Introduction

1.1. What has KPMG been engaged to do?

As part of the Access Arrangement 5 (AA5) Submission Program, Western Power has engaged KPMG to advise on the appropriate network growth factors to apply to the trend in allowed operating expenditure over the AA5 period. In particular, Western Power has asked KPMG to consider whether continuation of the existing AA4 factors remains appropriate and if not, to assess alternative approaches.

To assist Western Power, KPMG has developed a set of assessment criteria against which network growth factors can be assessed. Using these criteria, KPMG has:

- Considered how a changing operating environment and new technologies over AA5 could impact on the relevance of network growth factors. As cost conditions and operating drivers differ by transmission and distribution networks, it may be appropriate to apply different factors and weightings; and
- Assess a range of options for AA5 including the continuation of the existing AA4 approach. These options include introducing alternative factors, or placing different weights and definitions on existing factors for the AA5 submission.

On the basis of this evaluation, KPMG has provided a set of recommendations to Western Power, setting out a pathway for the robust consideration of the options available to Western Power.

1.2. Role of network growth factors

The purpose of network growth factors and their relative weightings is to allow opex to appropriately trend over time in line with changes in the drivers of opex. The selected factors should have a clear and verifiable relationship in terms of changes in each factor and changes in opex. The weightings applied to each factor should represent the relative strength of that relationship compared to the other chosen factors. For example, a weight of 20% applied to customer numbers means that for every 1% increase in customer numbers there should be a 0.2% increase in allowed opex.

This helps to ensure that the network has adequate expenditure to deliver customer services consistent with customer preferences and performance standards. Application of inappropriate factors and weights can result in either under-funding of network operations or excess funding.

Network growth rates also impacts on the application of the gain sharing mechanism, particularly under AA4 as the output of the mechanism is adjusted for differences between forecasts and actuals in the growth factors over the period. If the network growth rates fail to adequately capture the drivers of opex over the period, then the gain sharing mechanism could unduly either penalise or reward the network. We note it is not clear if such an adjustment will apply for AA5.

1.3. Context and background

1.3.1. How are network growth factors applied in regulatory determinations?

The Economic Regulation Authority (ERA) applies a 'Base-Step-Trend' (BST) approach to forecast operating expenditure (opex) over the regulatory control period in regulating distribution and transmission networks.[10]

This methodology involves using actual operating expenditure in the most recent available year of the previous period as a starting point to represent a base level of opex. This is adjusted down to remove one-off expenditures, and then adjustments for forecast discrete step changes to opex in the upcoming regulatory period are added. This adjusted baseline opex is then trended forward to account for changes in input prices,

[10] This is consistent with the approach applied by the Australian Energy Regulator (AER) for networks operating in the National Electricity Market.

outputs and productivity. The output growth component of the rate of change reflects the forecast annual change in selected output indices, whilst the input price component forecasts the annual change in the network input costs using a combination of labour and non-labour input price changes.

In applying the 'trend' portion of the methodology, opex forecasts should adapt and change as the network changes over the period. Therefore, a set of factors must be determined that reflect this network growth and provide a robust methodology for it to be incorporated in the estimation of opex for the upcoming regulatory period.

In the current AA4 determination, these factors included: customer numbers, circuit length, maximum demand and energy delivered. The same factors were used for both transmission and distribution determinations but the relative weightings were different as set out in Table 4.

Table 4: Network growth factors and weightings applied under the ERA's final AA4 decision

Distribution factor	Weighting
Customer numbers	45.8%
Circuit length	23.8%
Ratcheted maximum demand	17.6%
Energy delivered (throughput)	12.8%
Total	**100%**
Transmission factor	**Weighting**
Customer numbers	19.9%
Circuit length	37.6%
Ratcheted maximum demand	19.4%
Energy delivered (throughput)	23.1%
Total	**100%**

Source: Economic Regulation Authority – Final Decision on Proposed Revisions to the Access Arrangement for the Western Power Network 2017/18 – 2021/22, Table 37, pg. 82

The ERA accounts for the possibility of further modifications to opex forecasts whenever there are opex components that are not compensated for in the base opex or in the rate of change. In general, the ERA includes step changes only if there is strong justification that the cost circumstances will not be adequately accounted for in the base and trend. Step changes work through increasing or decreasing the base opex allowance to account for the change.

1.3.2. Why review network growth factors for AA5?

The selection of network growth factors and weights in previous access arrangements, including AA4 most recently, have historically been aligned with those set out by the AER in regulatory determinations of networks operating in the National Electricity Market (NEM). As explained in the next section, the methodology used by the AER has recently been amended to remove energy delivered as a factor for DNSPs.

In the context of Western Australia's transitioning energy market under the WA Government DER Roadmap, it is relevant to:

- re-evaluate the ongoing suitability of the AA4 network growth factors over the AA5 period from 2022 – 2027;
- consider whether the AER updated methodology should be applied to AA5;
- consider the relevance of any potential alternative approaches related to network growth that may capture opex impacts on Western Power's network in the future.

Since the AA4 determination, stand-alone power systems have emerged as an alternative network solution and uptake of solar PV and other DER technologies has continued to progress. These factors are introducing different drivers of opex, and are similarly impacting the appropriateness of existing network growth factors in reflecting the key drivers of opex.

Furthermore, the transitioning market presents risks to Western Power and their consumers if the current approach to the application of network growth factors is continued into AA5 without careful consideration of the market transitions that have occurred over the previous 5-year period and those that may occur in the next 5 years. As such, it is important that Western Power considers how changes to the composition of their network and the way their customers use energy are driving their opex outcomes, and ensures that the ERA is aware of these factors in regulating allowed opex over the AA5 period.

There are various options available to reflect the impact of these transitions in opex forecasting, including through step-changes, implementing new approaches to growth factors or weightings of existing factors.

1.3.3. Access Code requirements

Section 6.40 of the Access Code[11] provides for approved total costs and target revenue to include an amount for forecast non-capital costs (opex) for the access arrangement period.

> *6.40 Subject to section 6.41, the non-capital costs component of approved total costs for a covered network must include only those non-capital costs which would be incurred by a service provider efficiently minimising costs.*

"Efficiently minimising costs" is defined in the Access Code as meaning:

> *the service provider incurring no more costs than would be incurred by a prudent service provider, acting efficiently, in accordance with good electricity industry practice, seeking to achieve the lowest sustainable cost of delivering covered services and without reducing service standards below the service standard benchmarks set for each covered service in the access arrangement or contract for services.*

"Good electricity industry practice" is defined in the Access Code to mean:

> *the exercise of that degree of skill, diligence, prudence and foresight that a skilled and experienced person would reasonably and ordinarily exercise under comparable conditions and circumstances, consistent with applicable written laws and statutory instruments and applicable recognised codes, standards and guidelines.*

Therefore, the approach to network growth factors and weightings should as accurate as possible represent the underlying cost drivers and conditions facing the network businesses.

1.3.4. Structure of this report

- **Section 2: Recent approaches to network growth escalation**

  This section captures the recent approaches of regulatory bodies in different jurisdictions to network growth escalation in opex forecasting. It outlines the approaches of the AER in the NEM and the ERA in Western Australia, as well as providing some background on recent developments in international jurisdictions.

- **Section 3: Issues with existing measures of network growth**

  This section outlines the documented challenges regarding the model currently used by the AER to determine output growth factors and weightings for NSPs in the NEM, as well as addressing the emerging issues brought forward by WA's transition to standalone power systems, microgrids and DER technology which may impact how network growth escalation is measured and applied.

- **Section 4: Assessment of existing growth factors used for AA4**

  This section provides an assessment of the existing growth factors used for both distribution and transmission opex trends against three criteria: (a) there is a clear and verifiable relationship between the growth factor and changes in opex; (b) the data required is available and robust; and (c) the use of the growth factor is transparent and can be easily understood by stakeholders. Our assessment identifies concerns in particular with the use of energy throughput as a growth factor for both distribution and transmission.

[11] Electricity Networks Access Code 2004

- **Section 5: Options for determining network growth factors and weightings for AA5**

  This section provides an assessment of the options for growth factors and weights for AA5. Four options are assessed against the assessment criteria. The recommended option for AA5 for distribution is to update network growth factors and weightings to align with the AER's recently applied approach for DNSPs, which excludes energy delivered. We also recommend an adjustment to the AER's approach for transmission, again to exclude energy throughput.

- **Section 6: Options for addressing energy transition issues in AA5**

  This section provides an assessment of a range of options for addressing the impact of solar PV, DER and SPS for AA5. Each option is assessed against 4 assessment criteria. Our assessment finds that including step changes is the preferred short-term option to address issues around solar PV, DER and SPS in Western Powers AA5 proposal.

2. Recent approaches to network growth escalation in the National Electricity Market and Western Australia

This section outlines the AER's methodology and current thinking regarding network growth escalation, and the approach of the ERA in assessing and approving network growth escalation for AA4. A brief summary of key developments in the approaches of regulatory bodies in the UK and US with respect to the drivers of opex is also provided.

The ERA and Western Power have historically adopted the AER's approach at the time when applying network growth escalation to opex forecasts. This was the case for AA4 in 2017, where the ERA applied the AER's most up-to-date factors and weightings at the time, being those in the 2016 Benchmarking Report.

The AER's broad approach to opex forecasting with respect to constructing a rate of change as a trend component in the base-step-trend methodology has remained unchanged from the methodology adopted by Western Power and the ERA for AA4. However, since the ERA's final determination was reached for AA4 in 2017, there have been material shifts in the methodology used by the AER and Economic Insights to determine the output growth component of the rate of change.

Specifically, certain benchmark models included in the framework set out by Economic Insights have been removed or treated differently, which has had a material impact on the factors and weights used to determine output growth. This means that the approach to network growth escalation for AA4 is no longer aligned with the AER's current approach and is unlikely to be suitable for AA5.

Sections 2.1 and 2.2. consider in further detail the AER's and the ERA's approaches respectively. Section 2.3 includes a brief summary of key developments in the approaches of regulatory bodies in the UK and US with respect to the drivers of opex. Although the methodologies for escalating opex for network growth are not directly comparable across jurisdictions, it is clear that electricity networks and regulators internationally are recognising similar challenges regarding the changing drivers of opex. Key shifts in the approaches taken in the UK and US are broadly reflective of transitions that have occurred or are emerging in the AER's methodology and should be considered by the ERA in approaching AA5.

2.1. The Australian Energy Regulator's approach to output growth in the National Electricity Market

As explained in section 1, for AA4 the ERA decided to adopt the AER's approach to output growth factors and weightings. We provide here an overview of the AER's methodology and current thinking.

The trend component of the AER's approach to forecasting opex is applied as an annual rate of change comprised of three components: real price escalation and output growth, which are offset by forecast productivity growth. The output growth component of the rate of change allows opex to change to reflect changes in the size of the physical network and the customer base it serves. This aims to capture the movement in opex due to changing outputs provided by the network.

The AER generally applies output growth factors to all opex, including corporate and indirect opex. The AER recognises that there will be fluctuations at a category level from one year to the next, and that not all opex categories grow in line with network growth. However, the AER's top-down approach reflects its view that at the overall level, opex is largely recurrent and relatively stable. The AER therefore sparingly uses category specific forecasts (or step changes for that matter). One example where the AER consistently applies a category specific forecast is in relation to debt raising costs, where its preference is to use a benchmark estimate to ensure the estimate aligns with the approach to cost of debt in determining the Weighted Average Cost of Debt.

The AER's approach to forecasting opex is set out in the expenditure forecast assessment guidelines for distribution[12] and transmission[13], published in November 2013, as well as the economic benchmarking methodology developed by the AER's consultant Economic Insights in 2013[14] and updated on an annual basis, most recently in November 2020.

AER methodology for calculating network growth factors weightings

The AER uses a number of measurable factors to represent output growth, and the contributions of each factor to increases in opex are weighted using complex econometric methods consisting of a series of regression analysis and total and partial factor productivity indices. Data inputs consists of historical data collected from 13 DNSPs operating in the NEM on the east-coast, over a short period (previous 7 years) and long period (previous 13 years), as well as DNSPs in New Zealand and Ontario. The regression analysis is used to both determine that there is a positive relationship between the factor and opex over time plus the relative strength of that relationship. Economic Insights uses a number of different techniques to verify its findings.

The methodology requires that the measures used to determine output growth should be the same as those used to determine productivity growth adjustment to opex trend to maintain logical consistency across the set of econometric models used to determine factor weightings. This acts as a limitation to some extent on the factors that can be used to determine output growth, as they must similarly be feasible for inclusion in total factor and multi-factor productivity models. This means that there must be robust and consistent time series of data points for the factors to be included in the output growth rate.

The AER's annual benchmarking reports for distribution and transmission network service providers provide annual updates to inform the factors the AER use in determining output and productivity growth, and the relevant weights on each factor. The most recent annual updates were published in November 2020[15].

Table 5: Definitions of output growth factors as set out in the AER's 2020 DNSP and TNSP benchmarking reports

Distribution factor	Definition
Customer numbers	The number of active connections on the distribution network, represented by each national metering identifier.
Circuit line length	The total length in kilometres of overhead and underground lines.
Ratcheted maximum demand	The highest value of peak demand observed in the benchmarking period up to the year in question for the DNSP.
Energy delivered (throughput)	The total volume of energy delivered to customers over the distribution network, measured in gigawatt hours, captured at the customer meter.
Transmission factor	**Definition**
Customer numbers	The number of end-user customers the TNSP is required to provide a service for. We note Western Power and the ERA used only Transmission customers as the customer number metric in AA4. However this is not consistent with the AER approach, which uses *all end-user customers*, including distribution customers.
Circuit line length	The total length in kilometres of lines, measured as the length of each circuit span between poles and/or towers and underground.
Ratcheted maximum demand	The highest value of peak demand observed in the benchmarking period up to the year in question for the TNSP.
Energy delivered (throughput)	The total volume of electricity throughput that is transported through the transmission network, measured in gigawatt hours.

[12] AER - Expenditure Forecast Assessment Guideline for Electricity Distribution, November 2013
[13] AER - Expenditure Forecast Assessment Guideline for Electricity Transmission, November 2013
[14] Economic Insights - Economic Benchmarking of Electricity Network Service Providers, June 2013
[15] AER - 2020 distribution and transmission network service provider benchmarking reports, November 2020

Table 6: Network growth factors and weightings set out in the AER's November 2020 Benchmarking Report

Distribution factor	Weighting
Customer numbers	18.52%
Circuit line length	39.14%
Ratcheted maximum demand	33.76%
Energy delivered (throughput)	8.58%
Total	**100%**
Transmission factor	**Weighting**
Customer numbers	7.6%
Circuit line length	52.8%
Ratcheted maximum demand	24.7%
Energy delivered (throughput)	14.9%
Total	**100%**

The factors in the AER's 2020 benchmarking reports are the same for both distribution and transmission networks, with differences in the weightings intending to capture the variation in the factors that drive opex for distribution networks relative to transmission networks.

Note that the annual benchmarking reports published by the AER serve only as benchmarking tools to inform the factors and weightings applied to output growth in the opex forecast of each individual NSP. The AER has historically tended to apply the benchmarking results in its distribution and transmission determinations. However, in its recent final determinations for several Victorian DNSPs that were published after the 2020 Annual Benchmarking Report, the AER chose not to use the multilateral partial factor productivity (MPFP) model to inform the weights placed on the output growth factors.

In explaining this shift, the AER noted the positions of CitiPower, Powercor, United Energy and Jemena (and their consultants NERA, CEPA and Frontier Economics) that MPFP output weights reflected drivers of *total* cost, not only opex. Section 3 of this report provides additional detail on the points of criticism raised regarding the Economic Insights methodology. In its final decisions for the Victorian DNSPs, the AER agreed that the MPFP output weights should not be used in determining growth factors, and it also stated that this was consistent with the view of its consultant, Economic Insights[16], which may point towards a shift in benchmarking methodology for both distribution and transmission as part of the forthcoming 2021 Annual Benchmarking Report (due in November 2021).

Of the five models set out in Economic Insights' methodology, the MPFP was the only model that included energy delivered as a growth factor. As such, under the AER's revised methodology for distribution, energy delivered was no longer used as a growth factor in determining output growth.

The AER also made some tweaks to the way in which output weights were determined using two of the other (translog) econometric models.

As set out in Table 7, the factors and weightings applied in the 2021 determinations for DNSPs in Victoria are significantly different from those estimated by Economic Insights in the 2020 Annual Distribution Network Service Provider Benchmarking Report (Table 7).

[16] United Energy Distribution Determination 2021 to 2026, Attachment 6 – Operating Expenditure, p. 6-26

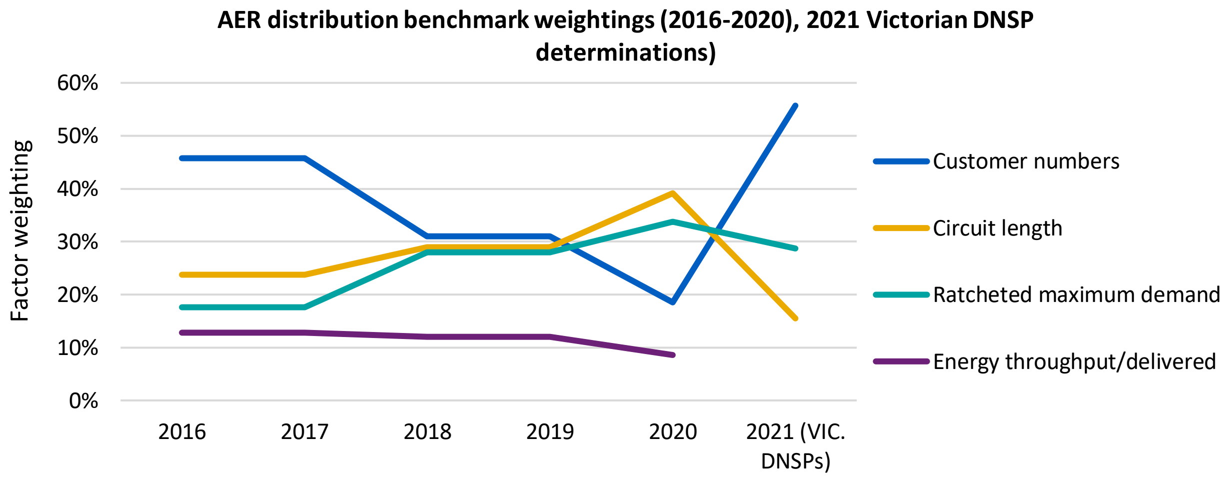
Table 7: Output growth factors and weightings – final determinations for Victorian DNSPs (United Energy, PowerCor, Jemena, CitiPower, AusNet Services) April 2021

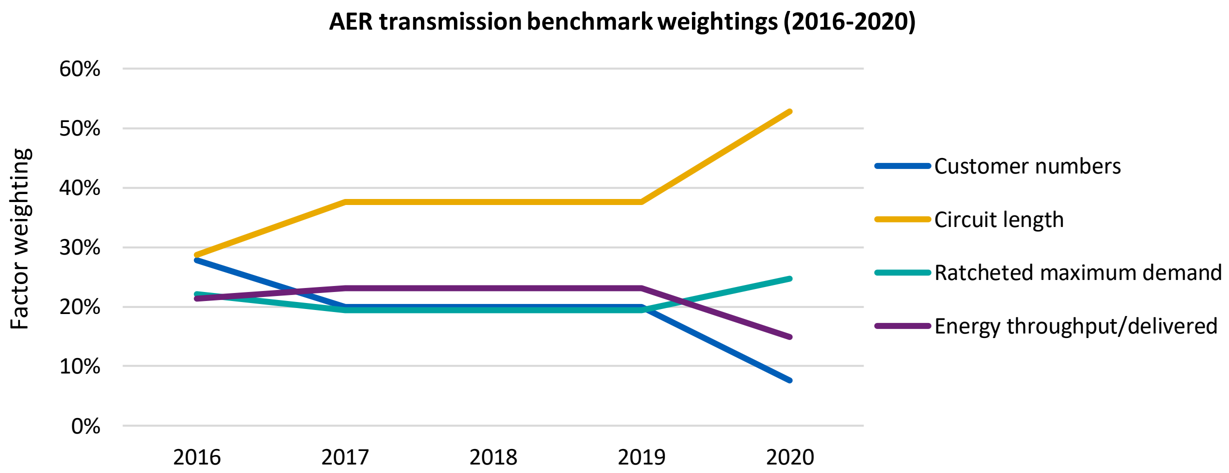
Growth factor	Weighting
Customer numbers	55.7%
Circuit length	15.5%
Ratcheted maximum demand	28.8%
Energy delivered (throughput)	–
Total	**100%**

Note: the weightings published by the AER in April 2021 have been adjusted slightly to account for rounding.

The AER's benchmark approach over the AA4 period

The factor weightings set out by the AER in annual benchmarking reports for DNSPs and TNSPs have varied significantly over the AA4 period, as shown below.





Three shifts in the benchmark weightings for DNSPs have occurred over the 2016 – 2021 period:

- **2018 Annual Benchmarking Report**: Output weights were updated in 2018, five years after Economic Insights and the AER originally determined the weightings in 2014. This was the first time output weights had been updated following the initial study. The update primarily aimed to reflect the most up-to-date data, expanding the number of years of observations for each of the DNSPs in the AER's sample to increase the pool of data used to determine output weights.

- **2020 Annual Benchmarking Report**: Output weights were updated in 2020, in response to an error identified by Frontier Economics, consultant to a number of Victorian DNSPs at the time. Economic Insights acknowledged there was an error in the method used to calculate output weights in previous benchmarking studies. The impact of correcting this error was an increased weight on circuit length and ratcheted maximum demand, and a decreased weight on customer numbers and energy delivered. Economic Insights considered that the revised weights were more reflective of the drivers of total cost for DNSPs, however noted that opex can be expected to be associated primarily with customer numbers, upon which a lower weight was placed under the corrected method.
- **2021 determinations for Victorian DNSPs**: As discussed above, the AER did not apply the MPFP model in determining output weights for Victorian DNSPs in 2021. This shift resulted in the energy delivered factor being removed, and a much higher weight being placed on customer numbers than is set out in the 2020 Benchmarking Report. The AER and Economic Insights acknowledged that this shift in output factors and weights was likely to better reflect the drivers of opex, as opposed to the drivers of total cost.

Two shifts in the benchmark weightings for TNSPs have occurred over the 2016 – 2021 period:

- **2017 Annual Benchmarking Report**: An update of the factor weightings was considered necessary in 2017 due to changes in the specifications and definitions of outputs. This update resulted in a higher weight on circuit length and lower weight on customer numbers.
- **2020 Annual Benchmarking Report**: As in the case of the 2020 Benchmarking Review for DNSPs, the AER found an error in the method used to determine output weights for TNSPs. The impact of correcting this error was an increased weight on circuit length and ratcheted maximum demand, and a decreased weight on customer numbers and energy throughput. The AER considered that this shift was in line with expectations regarding the main function of transmission networks, being the transport of bulk electricity.

The AER has noted there needs to be a balance between maintaining consistency of approach and updating the models with improved or additional data as it becomes available. As outlined above, the AER's approach in recent years has been to maintain consistency in the benchmark output factors and weights published in consecutive years, whilst also conducting periodic updates to reflect additional data, changes in output specifications or identified errors in the model.

2.2. The Economic Regulation Authority's approach to network growth escalation in Western Australia and comparison with the AER's approach

Western Power's approved AA4 submission for the 2017-22 period adopted the AER methodology and weightings at that time.

The trend component of the AA4 opex forecast captures a range of changes in output and cost input trends. Adjustments for forecast growth in the customer base and physical size of the transmission and distribution networks are captured through a network growth escalation applied to base opex. Network growth escalation applied by Western Power was aligned with the output growth trend component of the AER's methodology at the time.

As part of the AA4 proposal, Western Power adopted the factors set out in the AER's methodology at the time. However, these factors were proposed with different weightings than had been applied by the AER. The ERA's draft decision stated that "if the AER network growth escalation method is to be used, it should reflect the most recent data from the AER, including the current weightings used by the AER". Western Power subsequently adopted the weightings that had been applied by the AER at the time as part of their revised proposal.

The following table compares the network growth factor weighting adopted by the ERA for AA4, and the weightings from the AER's most recent benchmarking study and DNSP decisions.

Table 8: Comparison of growth factors and weightings applied by the AER and ERA

	Growth factors and weightings		
	Revised AER approach (Victorian DNSPs 2021)[b]	**2020 AER benchmarking results**	**ERA AA4 (2017 AER benchmarking results)**
Distribution growth factors and weightings			
Customer numbers	55.7%	18.52%	45.8%
Circuit length	15.5%	39.14%	23.8%
Ratcheted maximum demand	28.8%	33.76%	17.6%
Energy delivered (throughput)	–	8.58%	12.8%
Total	**100%**	**100%**	**100%**
Transmission growth factors and weightings			
Customer numbers[a]	–	7.6%	19.9%
Circuit length	–	52.8%	37.6%
Ratcheted maximum demand	–	24.7%	19.4%
Energy delivered (throughput)	–	14.9%	23.1%
Total	**–**	**100%**	**100%**

a. The AER's metric for customer numbers for transmission includes all end-use customers, which includes distribution customers. However, the ERA adopted transmission only customers as its metric for customer numbers for transmission. As noted elsewhere, the inconsistent metric adopted by the ERA would reduce the validity of the AER weightings.

b. Note: the weightings published by the AER in April 2021 have been adjusted slightly to account for rounding.

In relation to the customer numbers factor for transmission, the definition approved by the ERA for AA4 was different to that used by the AER. While the AER's definition was based on the number of *end-users* the TNSP is required to provide a service for, which includes end users on the distribution network, the definition approved by the ERA was the number of customers connected to Western Power's transmission network.

The AER's most recent 2020 Benchmarking Report continues to use end-user numbers as the measure for customer numbers for transmission. If Western Power bases its network growth factors and weightings for AA5 on the AER's methodology and weightings, the respective definitions of each of the network growth factors should also be adopted and applied in a manner consistent with the AER's application.

2.2.1. Treatment of corporate and indirect costs

Western Power proposed for AA4 that network growth escalation should be applied to corporate and indirect costs, consistent with the AER's approach. However, the ERA considered that these costs were "…not proportional to any growth in service outputs that may result from changes in customer demand. Consequently, no growth escalation should be applied to corporate costs". Table 9 compares the approaches adopted by the AER and ERA.

Table 9: Comparative approach to corporate and indirect costs for network growth escalation

Application of network growth factors to corporate and indirect costs	
The AER's approach	**The ERA's approach in AA4**
• The AER, informed by Economic Insights, applies the rate of change to the NSP's total operating and maintenance expenditure, including corporate related opex. • The AER may include category specific forecasts, however this is narrow in its use, and the AER generally seeks to include most expenditure categories in base opex to be consistent with the Economic Insights modelling.	• Western Power proposed to apply network growth to all opex, including corporate and indirect costs. • The ERA considered that corporate and indirect costs "are not proportional to any growth in service outputs that may result from changes in customer demand. Consequently, no growth escalation should be applied to corporate costs or indirect costs".

2.2.2. Interaction with Western Power's gain sharing mechanism

The ERA's approach to regulating allowed opex includes a gain sharing mechanism. The AA4 gain sharing mechanism states that Western Power will retain the benefit of any savings on actual opex relative to forecast opex for a five-year period, regardless of which year of the access arrangement period a saving is achieved. This ensures Western Power has a constant and continuous incentive to pursue efficiency gains, rather than an incentive that is reduced in later years of the access arrangement period.

Under the AA4 gain sharing mechanism, Western Power's efficiency savings may be classified as an above benchmark surplus that can be carried forward for a period of up to five years from the year when the efficiency is achieved, including into the next access arrangement period.

The AA4 gain sharing mechanism uses actual growth factors in an ex-post manner when calculating the above-benchmark surplus at the end of the period. This compares efficiencies that Western Power has achieved in terms of actual expenditure during the period against allowed operating expenditure forecast at the start of the period, with actual growth factors observed during the period. This is designed to ensure Western Power is not rewarded or penalised for variations from forecast opex that were attributable to differences in growth factors driving expenditure.

The ERA's approach in this regard is different to the AER's approach. Under the AER's Efficiency Benefit Sharing Mechanism (EBSS) – the AER's equivalent of the ERA's gain sharing mechanism – no ex-post adjustments are made to the forecast opex to account for outturn network growth. This reflects the AER's overall philosophy under the Base-Step-Trend approach to avoid adjustments to opex for uncontrollable costs, on the basis that under the right incentive framework (including service performance incentives), differences between actual and forecast costs will balance out over time. Importantly, this treatment of growth factors is supported by the symmetrical treatment of gains and losses under the AER's EBSS.–

We note that recent amendments to the Access Code changed the requirements of the gain sharing mechanism to treat efficiency gains and deficits symmetrically, similar to the AER's EBSS.[17] Depending on Western Power's preferred treatment of non-recurrent and uncontrollable costs, it may wish to propose a change to the gain sharing mechanism so that the Efficiency and Innovation Benchmarks are no longer adjusted to reflect outturn network growth, similar to the AER's EBSS.

2.2.3. Interaction with productivity measurement and adjustments

The AER uses the same metrics and benchmarking methods to determine network growth factors and productivity adjustments. However, under the ERA's approach, these are not linked. Productivity adjustments are proposed by Western Power independently of the proposed network growth factors and weightings. In AA4, Western Power and the ERA included a productivity adjustment, applied as a one per cent annual reduction in forecast opex.

Since the ERA's approach to productivity adjustment is not dependent on the approach to network growth factors, the ERA does not face the same constraint as the AER in relation to the choice of variables, data and benchmarking techniques for determining network growth factors and weights. This means Western Power and the AER could consider alternative options for determining network growth factors and weightings.

The table below compares the AER's approach to productivity measurement and adjustment to the ERA's approach in AA4.

[17] Electricity Network Access Code section 6.23A and section 6.25.

Table 10: Comparative approach to productivity in network growth escalation

Approach to productivity and efficiency in network escalation	
The AER's approach	**The ERA's approach in AA4**
• Adjustments for productivity are included in the rate of change, offsetting expected growth in input prices and outputs. • Expected productivity is forecast using a total factor productivity benchmarking technique.	• Adjustments for efficiency are applied under a separate mechanism to network growth escalation. • Western Power proposed a one per cent productivity improvement efficiency dividend, as a reduction in allowed opex. This was accepted by the ERA. • The ERA also included a negative step-change to take account of efficiency savings from the introduction of a depot optimisation program.

2.3. Approaches to network growth regulation adopted by international regulatory bodies

In the UK, the Office of Gas and Electricity Markets (Ofgem), does not make separate determinations of base opex and an allowed rate of change, however it does include allowed rates of change in productivity and input prices, and an adjustment for changes in costs due to changes in outputs to forecast total expenditure.

Ofgem has transitioned away from the use of energy throughput as a driver of operating costs, as outlined below

Under Distribution Price Control Review 4 that applied from 2005-2010, operating costs were measured by three drivers: network length (50%), customer numbers (25%), and energy throughput (25%). Subsequently, Ofgem did not use energy throughput as a driver of operating costs in Distribution Price Control 5, that applied from 2010-2015, due to concern that the composite variable used in Distribution Price Control Review 4 was an "inappropriate cost driver that did not adequately relate to the costs that were being assessed"[18].

In the current price control RIIO-ED1, that applies from April 2015 – March 2023, Ofgem again did not consider energy throughput a driver of opex. In benchmarking efficient total expenditure, energy throughput was not used as a driver of opex in any of three economic models.[19]

In the US, regulatory commissions determine an 'x-factor' based on long term trends in total factor productivity, which defines the productivity target included in the regulatory determination. Total factor productivity measurements are based on differences between the growth rates of outputs relative to inputs. Recent data collected from DNSPs in the US shows an increasing divergence in the relationship between opex and energy throughput. With respect to this trend, US state regulators have introduced alternative outputs to compensate distributors for the misalignment between opex and energy throughput, such as an Earnings Adjustment Mechanisms that reward distributors for contributing to peak reduction, system efficiency and improvements in the connection of distributed generation.[20]

[18] Ofgem, Electricity Distribution Price Control Review: Final Proposals – Allowed revenue – Cost assessment, December 2009, p 10
[19] NERA, *Review of the AER's Proposed output weightings*, p 20; and Ofgem, *RIIO-ED1: Final determinations for the slowtrack electricity distribution companies*
[20] NERA, *Review of the AER's Proposed output weightings*, pp 20-22.

3. Issues with existing measures of network growth

This section captures issues with existing measures of network growth in both the AER and ERA's recent approaches to opex forecasting. Issues can broadly be considered to fall under two categories:

- *Historical issues regarding the technical robustness of existing methodologies in their application to reflect the impact of network growth as a driver of opex; and*
- *Forward-looking issues driven by emerging changes to the composition of energy networks that mean existing factors are no longer fit for purpose for the upcoming AA5 period and beyond.*

The technical robustness of the economic benchmarking methodology set out by the AER's consultant Economic Insights has been questioned by a number of NSPs since its introduction in 2013. Most recently, these concerns have related to the appropriateness of the multilateral partial factor productivity model to accurately reflect the drivers of opex. Specifically, networks have questioned the validity of energy throughput as a network growth factor.[21]

As DER uptake increases and an increasing number of consumers generate and store energy behind the meter, the factors and weightings set out under existing measures of network growth may no longer be reflective of the drivers of opex. Specifically, the relationship between energy delivered and opex is increasingly likely to be negative, as DER uptake is reducing the amount of energy delivered to customers but also creating increasing opex requirements to address minimum demand and two-way flows. Furthermore, the ratcheted maximum demand factor is no longer likely to be the best reflection of how demand is driving opex, with minimum demand now also being a significant driver of network investment alongside peak demand.

The progression of alternative grid solutions such as standalone power systems and microgrids is also a key factor that is impacting the appropriateness of existing growth factors and weightings. As Western Power installs stand alone power systems (SPS) over the course of AA5, and de-energises and decommissions the associated lines, circuit length as it is currently measured and defined is unlikely to be an appropriate measure of the factors driving opex. Similarly, the way in which ratcheted maximum demand is measured and factored into network growth escalation may be impacted by the fact that Western Power's network will include an increasing number of alternative energy systems that are independent from the main grid, and are not captured by existing metrics, however will continue to impose material opex requirements for Western Power to serve the customers connected to them.

3.1. Recent reviews have questioned the technical robustness of Economic Insights' econometric methodology

Economic Insights developed the series of econometric models that inform the AER's approach to output growth in 2013, and continue to advise the AER through ongoing annual benchmarking reports.

Recently, a number of NSPs have challenged Economic Insights' methodology in their regulatory proposals, proposing an alternative set of econometric models to inform the factors and weights applied to determine output growth.

Economic consultant NERA was engaged by CitiPower, Powercor, United Energy and SA Power Networks in 2018 to conduct a 'Review of the AER's Proposed Output Weightings'.

NERA found a number of deficiencies related to the robustness of Economic Insights' approach, specifically the appropriateness of the multilateral partial factor productivity and translog models to reflect the drivers of opex and the use of energy throughput as a driver of opex.

[21] Australian Energy Regulator, *Annual Benchmarking Report – Electricity distribution network service providers*, November 2019, pp. 48-49

Most recently, United Energy and Powercor proposed to only use two of the five econometric models used by the AER to set the weights for each growth factor, stating that these two models provide a more efficient, prudent and realistic operating expenditure forecasts. In recent distribution determinations published in April 2021 for DNSPs in Victoria over the 2021-26 period, the AER recognised the issues raised by a number of DNSPs and their consultants and determined not to use the MPFP model to inform output growth factors and weightings. Therefore, energy throughput, a factor associated with the MPFP model, was not included as an output growth factor in forecasting opex.

3.2. Network growth escalation under AA4 does not apply to corporate costs

For AA4, Western Power proposed to apply network growth escalation to all operating expenditure, including corporate opex and indirect costs. This is aligned with Economic Insights' methodology for the AER which applies the rate of change to total operating and maintenance expenditure.

The ERA did not accept Western Power's proposed approach to escalating corporate opex, stating "business support activities such as information technology, levies, fees and insurance are not proportional to any growth in service outputs that may result from changes in customer demand."[22] Consequently, network growth factors were not applied to corporate costs.

Fundamentally, managing a larger network will require greater operational expenditure, including for business support activities. Hence, we would expect a clear positive correlation between network growth and corporate and indirect costs, even if network growth is not a direct driver of corporate and indirect costs. Further, while it is unlikely that corporate or overhead costs increase at the same rate as direct network opex, this is accounted for in the AER's and Economic Insights' methodology through deriving growth factors and weights based on total opex.

Therefore, if the AER methodology for output weightings are adopted for AA5, to ensure internal consistency network growth factors should be applied to all opex including corporate and indirect costs.

Alternatively, if network growth escalation is not to be applied to all opex, an adjustment should be made to correct for the exclusion of opex. Given the correlation between corporate opex and network growth is weaker than that for direct opex, excluding corporate opex from network growth escalation would derive a stronger correlation between the growth factors and direct opex growth (ie, greater weight attributed to faster rising growth factors). Such an adjustment was not reflected in the ERA's determination for AA4.

3.3. Impact of increasing deployment of stand-alone power systems

Western Power is pursuing stand-alone power systems (SPS) where it is the most prudent and efficient option to providing covered services in that area, particularly in remote locations where customers are connected at the end of long feeder lines on the distribution network. This network transformation is currently progressing through trials and early stage rollouts, and will progress significantly over the duration of AA5 and in subsequent access arrangement periods. Western Power forecasts approximately 1,800 customers will be transitioned to SPS between 2022 and 2027, increasing to approximately 4,000 in total by 2032.[23]

We outline below some of the potential issues associated with the existing approach to opex growth factors and weightings as a result of increasing deployment of SPS. We consider options for addressing these issues in section 6.

Issues with forecasting opex as stand-alone power systems are installed

Base opex will not reflect the impact of SPS installations

[22] Economic Regulation Authority, Draft Decision on Proposed Revisions to the Access Arrangement for the Western Power Network, May 2018, p. 50

[23] Western Power communication to KPMG on 5 August 2021

The opex required to serve a SPS customer may be materially different to that required to serve a grid-connected customer. As such, Western Power's total opex and opex per customer will change as more customers are transitioned off the grid and onto SPS.

Base opex is determined using actual opex from the most recently available year of the previous access arrangement period. Given the transitions occurring on Western Power's network related to SPS, and the implications for opex, it is unlikely that base opex in 2020/21 will capture the changes in opex from increasing roll-out of SPS over the AA5 period.

The installation of SPS will impact network growth metrics under existing factor definitions

Circuit length

Installing SPS involves decommissioning significant stretches of powerlines on Western Power's grid. Western Power estimates a reduction of 10,000 km of circuit length over the next 10 years due to the installation of SPS, relative to a current total network circuit length of 80,000 km.

This has a clear and direct impact on the circuit length network growth factor. As SPS are installed and lines are decommissioned, this metric would reduce the rate of change applied to base opex, which is not reflective of the ongoing opex associated with serving SPS customers.

The way in which this metric is defined and weighted needs to be reconsidered in order to align the way opex is forecasted with the changing composition of Western Power's network and the associated connecting infrastructure.

Ratcheted maximum demand

The installation of SPS will mean Western Power's network becomes increasingly decentralised with multiple energy systems serving different parts of the network. Although the installation of SPS is unlikely to have a material impact on total customer demand, customers will now be distributed across multiple systems and the number of grid-connected customers is likely to fall. This may impact maximum demand outcomes measured by Western Power, depending on how many customers are served by SPS and the nature and extent of their energy use.

Over time this may impact the ratcheted maximum demand metric depending on how it is calculated, resulting in a lower growth factor applied that does not reflect the opex required to meet demand across an increasing number of energy systems on Western Power's network.

3.4. Impact of increasing solar PV and DER uptake

The uptake of distributed energy resources (DER) by Western Power's customers is increasing. The WA Government's DER Roadmap indicates that one in three households in the SWIS currently have rooftop solar PV installed, with approximately 2,000 new systems installed each month.[24] Other forms of DER technology such as batteries and electric vehicles are less well progressed, however will have increasingly material implications for Western Power's opex as the AA5 period progresses and in subsequent Access Arrangements.

The key impact of solar PV and DER uptake on opex forecasting relates to its impact on output variables that measure network growth on the distribution network, primarily the energy delivered and ratcheted maximum demand variables.

We outline below some of the potential issues associated with the existing approach to opex growth factors and weightings as a result of increasing uptake of solar PV and DER. We consider options for addressing these issues in section 6.

The impact of DER uptake on energy delivered and energy throughput

[24] WA Government – Energy Transformation Taskforce, Distributed Energy Resource Roadmap, December 2019, p. 6

Under the approach set out by the AER's 2020 DNSP Benchmarking Report, the energy delivered factor captures the change in the amount of energy delivered to customers over the distribution network as measured at the customer meter. As such, it does not reflect the impact of energy resources behind the meter or energy exported upstream into the distribution network via DER.

Increasing uptake of rooftop solar PV has two impacts.

Firstly, it reduces the volume of energy delivered to customers via the distribution network as an increased portion of underlying demand is served by energy generated behind the meter. This will reduce the volume of energy captured by the energy delivered metric as it is currently defined.

Secondly, it increases the amount of energy exported upstream as DER are generating excess energy beyond the needs of the household or business it serves. A DNSP may incur higher opex to manage the safety and reliability of the network with respect to the increase in two-way flows of electricity, and address power quality issues relating to system low and minimum demand.

These factors mean that energy delivered is no longer a reflective measure of what is driving opex, and the relationship between energy throughput and opex is increasingly likely to be negative. Under the methodology adopted by the ERA for AA4 and the 2020 benchmarking methodology published by the AER in November 2020 and the, the allowed rate of change or escalation to base opex decreases with decreasing energy throughput. As uptake of solar PV further increases, distribution networks may incur materially higher opex while seeing a decrease (or smaller increase) in energy delivered as a network growth measure.

Although not yet formally reflected in the AER's published benchmarking methodology, distribution determinations for Victorian DNSPs published in 2021 recognised issues relating to the relationship between energy delivered (or throughput) and opex, and did not use this factor as a network growth measure. Through removing the energy delivered factor from the calculation of output growth, the potentially negative relationship between the change in energy delivered and the change in opex from increasing DER uptake would not negatively impact the rate of network growth escalation applied to base opex.

The impact of DER uptake on ratcheted maximum demand

As rooftop solar PV uptake increases, a greater proportion of energy consumption is being generated behind the meter. This reduces the level of energy demand that is served by the grid. Furthermore, the increasing uptake of rooftop solar PV increases the opex required to manage the safety and reliability of the grid in the context of increasing two-way flows of energy, as discussed above.

Although peak solar generating periods do not align with the evening period in which peak demand is typically observed, uptake of DER storage technology such as batteries means energy generated by rooftop solar PV during the day will increasingly be stored behind the meter for consumption during evening peak times. This will have a likely impact on peak demand as measured by demand served by the grid.

Peak demand is captured as a driver of opex through the ratcheted maximum demand growth factor. Ratcheted maximum demand recognises the highest maximum demand the DNSP has had to serve up to the point in time being examined. Hence, it relies on levels of peak demand that exceed the highest measurement of peak demand historically observed on the distribution network. As DER uptake progresses, it is less likely that peak demand will continue to increase beyond the historical level as an increasing proportion of underlying demand is served by resources behind the meter.

Although ratcheted maximum demand may not increase, Western Power will bear increasing costs to manage minimum demand challenges and two-way flows. Falling levels of minimum demand and the associated system strength and reliability issues will primarily require capital expenditure to improve the reliability of Western Power's network infrastructure. However, there may also be a flow on effect on operational and maintenance expenditure, for example to investigate and address power quality issues, particularly in the interim period where network upgrades have not been completed.

Hence, the ratcheted maximum demand factor will potentially both underestimate the level of peak demand on the network, and not reflect the extent to which minimum demand and two-way flows associated with DER is driving increases in opex.

Current commentary and approaches on managing the impact of DER uptake

The AER has acknowledged the impact of DER on accurately forecasting opex, stating that more work will need to be done to properly assess the impacts. The AER noted in its November 2020 Benchmarking Report it will begin to scope the issues relating to how benchmarking models account for the impact of DER. To the extent that these impacts are found to be material, the AER flagged that a review will consider both removing certain outputs and adding new output factors.

As noted previously, in the most recent VIC DNSP determinations over 2021-26, the AER did not apply the energy delivered factor in calculating output growth, and it appears likely that this shift will persist into the future.

The AER's consultant Economic Insights has similarly acknowledged the increasingly material impact of DER and has noted an intention to conduct a detailed review of the relationship between DER and benchmarking in the future. In the interim, they suggest that increased opex requirements attributable to the emergence of DER would be best handled by including a relevant step change in the opex forecast.

A step change of this nature has recently been included in the AER's distribution determination for South Australia Power Networks 2020-25. The AER acknowledged that SA Power Networks was facing increasing challenges to manage its network, including voltage non-compliance issues related to increasing uptake of DER, and that as a result there was a likelihood that the output growth forecast may not fully compensate for the higher opex required to address DER management. A step-change of $3.7 million for low voltage management of future networks was allowed in the opex forecast.

4. Assessment of existing growth factors used for AA4

This section provides an assessment of the existing growth factors used for both distribution and transmission opex trends against three criteria: (a) there is a clear and verifiable relationship between the growth factor and changes in opex; (b) the data required is available and robust; and (c) the use of the growth factor is transparent and can be easily understood by stakeholders. Our assessment identifies concerns in particular with the use of energy throughput as a growth factor for both distribution and transmission.

4.1. Criteria for assessing network growth factors

We have adopted the following criteria for assessing the network growth factors for AA5:

1) **Verifiable relationship**: The factors and weightings have a clear, material and verifiable relationship with operating expenditure and the services provided to customers both in the current context and forward-looking context. This means that the factors adopted are conceptually consistent with known opex growth factors, and that the strength of the relationship between the growth factors and opex growth can be verified through quantitative analysis.
2) **Data availability and quality**: The data required to determine the factors and weights is credible, robust, consistent and available without undue cost and effort.
3) **Transparency**: The factors are easy to apply and are transparent to the ERA and other stakeholders.

4.2. Assessment of existing growth factors for distribution

We consider each of the opex growth factors for DNSPs in the AER's current benchmarking analysis and as adopted by the ERA for AA4. These factors are:

1) Circuit length
2) Ratcheted maximum demand
3) Customer numbers
4) Energy delivered

Table 11 Distribution network growth factor – Circuit length

Criteria	Assessment	Rating
Verifiable relationship	Circuit length represents a strong indicator of network growth as the network is extended to serve customer in greenfield areas. With the additional assets comes increased opex associated with operations and maintenance, and thus circuit length is also a strongly linked to opex growth. However, as noted in above, increasing deployments of SPS will result in significant reductions in circuit length, while at the same time resulting in increased opex. Without appropriately addressing the impacts of SPS on circuit length and opex, there is a weakening relationship between circuit length and opex. In the AER's most recent DNSP decisions, 15.5% of opex growth was attributed to circuit length, down from 23.8% applied by the ERA for AA4.	

Data availability and quality	Western Power can relatively easily produce accurate records of current and historical circuit length. However, as growth in circuit length is largely a result of customer driven projects, there is uncertainty around the forecast growth rate. Setting aside the impact of SPS, using historical growth rates would serve as a reasonable starting point for the forecast. We note for the purpose of the gain sharing mechanism, under the AA4 approach circuit length will be trued up to actuals over time. It is not clear whether such an adjustment will be applied for AA5. Given Western Power's plans for rolling out a large number of SPS, Western Power will need to address the resulting impact on opex and/or the gain sharing mechanism, particularly as circuit line length will reduce as a result. We consider potential options for Western Power to address SPS in section 6.	
Transparency	The use of physical circuit length as a network growth factor for opex is well established and is easy for stakeholders to understand. However, the added complexity of addressing the impacts of SPS may be less transparent – see section 6.	

Table 12 Distribution network growth factor – Ratcheted maximum demand

Criteria	Assessment	Rating
Verifiable relationship	As maximum demand in parts of the network increases, additional capacity is needed through additional or upgraded assets (eg, additional lines and larger transformer capacity). These new assets result in increased operations and maintenance costs, and there is therefore a clear relationship between maximum demand and opex. Using *ratcheted* maximum demand as a growth factor recognises capacity that has actually been used to satisfy demand and gives the DNSP credit for this capacity in subsequent years, even though annual peak demand may be lower in subsequent years. Ensuring the network can continue to meet maximum demand in the future will continue to drive costs. However, the materiality of this factor in driving opex growth is likely diminishing with increased adoption of Solar PV and DER. Instead, minimum demand, rather than maximum, along with two-way flows, is now increasingly driving the need for asset upgrades. We consider options for addressing the impact of solar PV and DER in section 6. The AER's most recent DNSP decisions attributed 28.7% of opex growth to ratcheted maximum demand, compared with 17.6% adopted by the ERA in AA4.	
Data availability and quality	Western Power can relatively easily produce accurate records of current and historical maximum demand across its distribution network. Increases in ratcheted maximum demand would generally be expected to be minimal, in particular given the growth in solar PV and DER. We therefore consider Western Power would also be able to provide a reliable forecast of ratcheted maximum demand.	
Transparency	Once the appropriate weightings have been determined, the application of ratcheted maximum demand as a network growth factor for opex	

	escalation is straight forward, and easy for informed stakeholders to understand.	

Table 13 Distribution network growth factor – Customer numbers

Criteria	Assessment	Rating
Verifiable relationship	Customer numbers can explain considerable variation of opex, for example in relation to customer services including billing, collections, and inquiries, and connection-side repairs. However, costs will also vary depending on the type of customer (eg, residential house, residential tower, large business customer) and by location (eg, brownfield/urban or greenfield/rural). Despite the varied nature of costs associated with customer connections, Economic Insights' analysis suggests that a simple aggregate measure of customer numbers is a meaningful explanatory variable for DNSP opex variations.[25] The AER's most recent DNSP decisions attributed 55.7% of opex growth to growth in customer numbers, compared with 45.8% adopted by the ERA for AA4.	
Data availability and quality	Western Power can easily produce accurate records of current and historical customer numbers. We note however that as a result of the COVID-19 pandemic, producing accurate forecasts can be challenging.	
Transparency	Once the appropriate weightings have been determined, the application of customer numbers as a network growth factor for opex escalation is straight forward and easy for stakeholders to understand.	

Table 14 Distribution network growth factor – Energy delivered

Criteria	Assessment	Rating
Verifiable relationship	While energy delivered is clearly correlated with network growth and the service delivered to customers, the relationship between energy delivered and network opex is ambiguous at best. Electricity networks are designed to meet certain levels of peak demand. So long as energy throughput remains within the design limits of the network, the impact of overall energy delivered on opex would be expected to be minimal. As noted previously, with increasing adoption of solar PV and DER, we are in fact seeing increasing opex while energy delivered is decreasing. This raises further doubt about the appropriateness of using energy delivered as a network growth factor for opex escalation. This issue has also been recognised by the AER.[26] In the most recent DNSP decisions by the AER, energy delivered was removed as a growth factor due to issues identified with the modelling to determine the weighting for this factor. It was also recognised that this was sensible from a conceptual stand point.	

[25] Economic Insights, *Economic Benchmarking Results for the Australian Energy Regulator's 2020 DNSP Annual Benchmarking Report*, October 2020.

[26] Australian Energy Regulator, *Annual Benchmarking Report – Electricity distribution network service providers*, November 2019, pp. 48-49; and Australian Energy Regulator, *Annual Benchmarking Report – Electricity distribution network service providers*, November 2020, pp. 55-56.

	All of the above suggests that energy delivered is not a suitable growth factor for distribution opex. We note for AA4, the ERA adopted a weighting of 12.8% to energy throughput.	
Data availability and quality	Western Power can easily produce accurate records of current and historical energy delivered. However, forecasts are becoming increasingly challenging both due to COVID-19 and the increasing uptake of Solar PV and DER.	
Transparency	Once the appropriate weightings have been determined, the application of energy delivered as a network growth factor for opex escalation would be straight forward. However, informed stakeholders may question the validity of energy demand as an opex cost driver.	

4.3. Assessment of existing growth factors for transmission

We consider each of the opex growth factors for TNSPs in the AER's current benchmarking analysis and as adopted by the ERA for AA4. These factors are:

1) Circuit length
2) Ratcheted maximum demand
3) Energy delivered
4) Customer numbers

Table 15 Transmission network growth factor – Circuit length

Criteria	Assessment	Rating
Verifiable relationship	As for distribution, circuit length is a meaningful indicator of the size of a transmission network. And as additional assets are required to increase the circuit length, this factor has a clear direct relationship with operations and maintenance costs. This suggests circuit length will remain a suitable indicator of network growth for transmission. We note the most recent AER benchmarking report attributes a weighting of 52.8% to circuit length as a growth factor for opex escalation, compared with 37.6% in the AER's 2020 benchmarking report.	
Data availability and quality	Western Power can relatively easily produce accurate records of current and historical circuit length. However, as growth in circuit length is largely a result of customer driven projects, there is uncertainty around the forecast growth rate. Historical growth rates would be reasonable starting point for the forecast. We note for the purpose of the gain sharing mechanism, under AA4 approach, circuit length would be trued up to actuals over time. It is unclear whether such an adjustment would apply for AA5.	
Transparency	Once the appropriate weightings have been determined, the use of circuit length as a network growth factor for opex escalation is straight forward and easy for stakeholders to understand.	

Table 16 Transmission network growth factor – Ratcheted maximum demand

Criteria	Assessment	Rating
Verifiable relationship	As for distribution, maximum demand served has a clear relationship with investment in system capacity and opex associated with the operations and maintenance of the relevant assets. Using *ratcheted* maximum demand as a growth factor recognises capacity that has actually been used to satisfy demand and gives the TNSP credit for this capacity in subsequent years, even though annual peak demand may be lower in subsequent years. This relationship may decline over time as more DER enters the system. However, to the extent capacity upgrades are required, ratcheted maximum demand would be expected to remain a material explanatory factor for opex growth. The AER's 2020 benchmarking analysis attributed 24.7% of opex growth to ratcheted maximum demand. This compares with a weighting of 19.4% adopted by the Era for AA4.	
Data availability and quality	Western Power can easily produce accurate records of current and historical maximum demand across its transmission network. Increases in ratcheted maximum demand would are typically driven by large well-defined projects or by general growth on the distribution network. Given the significant lead time and well-defined nature of most major transmission customer connections, we consider should have reasonable ability to forecast the impact on maximum ratcheted demand over the regulatory period. When it comes to growth in peak demand on the distribution network, the impact on ratcheted peak demand for transmission would generally be expected to be minimal, in particular given the growth in solar PV and DER. We therefore consider Western Power would be able to provide a reliable forecast of ratcheted maximum demand.	
Transparency	Once the appropriate weightings have been determined, the application of ratcheted maximum demand as a network growth factor for opex escalation is straight forward, and easy for informed stakeholders to understand.	

Table 17 Transmission network growth factor – Energy throughput

Criteria	Assessment	Rating
Verifiable relationship	Energy throughput reflects a key service delivered to customers. However, as for distribution, so long as energy throughput remains within the design limits of the network, we would expect the impact on opex to be relatively small. This is recognised both by the AER[27] and Economic Insights[28]. The AER's most recent benchmarking report retains energy throughput as a network growth factor, and attributes it a relatively significant weighting of 14.9%. Further, the AER did not exclude energy throughput in its recent draft decision for Powerlink. We understand one of the reasons for this is that the AER does not currently have benchmark models that exclude this factor. However, as with the AER's recent determinations for VIC DNSPs, we may see a move away from energy throughput as a factor in future benchmarking reports. This would follow the same logic as for DNSPs, and would reflect similar modelling issues. We note that given the relative infancy of TNSP benchmarking and the smaller dataset used by the AER, the benchmarking results could be expected to be less robust than for DNSPs. This makes it even more important to get the model specification right, and variables that do not have a clear verifiable relationship with opex should be excluded.	
Data availability and quality	Western Power can easily produce accurate records of current and historical energy throughput. However, forecasts are becoming increasingly challenging both due to COVID-19 and the increasing uptake of Solar PV and DER.	
Transparency	Once the appropriate weightings have been determined, the application of energy throughput as a network growth factor for opex escalation would be straight forward. However, informed stakeholders may question the validity of energy throughput as an opex cost driver.	

Table 18 Transmission network growth factor – Customer numbers

Criteria	Assessment	Rating
Verifiable relationship	As noted earlier, immediately prior to the AA4 decision, the AER updated its benchmarking methodology to include end-use customers as a growth factor for transmission, rather than voltage-weighted entry and exit connection points used previously. However, the AA4 decision adopted the number of transmission customers as the customer metric, rather than end-use customers. The use of an inconsistent definition of customer numbers would reduce the validity of the weightings from the AER benchmarking results. If Western Power is to adopt the AER's methodology and weightings for AA5, the respective definitions of each of the network growth factors should also be adopted and applied in a manner consistent with the AER's application. The AER's adoption of end-use customers as a growth factor for Transmission networks was based on the view that it provides a direct	

[27] Australian Energy Regulator, *Annual Benchmarking Report, Electricity transmission network service providers*, November 2020, p 36.
[28] Economic Insights, *Outputs and Operating Environment Factors to be Used in the Economic Benchmarking of Electricity Transmission Network Service Providers*, February 2013, pp 7-8.

	measure of the scale of the transmission task, is a proxy for the complexity of the task faced by the TNSP, and is similar to the factor used in the benchmarking for DNSPs. In simple terms, the greater the number of end users, the more assets are required to service demand. There is clearly a correlation between the number of end-use customers and the magnitude of the transmission task and costs. However, as transmissions networks are not directly involved in delivering the service to end use customers, this link is considerably weaker than for distribution. We consider the complexity of the transmission task relates more strongly to the particular characteristics of the various connections on the transmission network, which would generally be more heterogenous both across transmission networks and when compared with connections on the distribution network. We further note that Economic Insights in late 2020 discovered an error in its earlier modelling, which resulted in the benchmark weighting for end use customer numbers to reduce from 19.9% to 7.6% – a significant reduction in materiality. Economic Insights commented that the change in weightings were more consistent with what would be expected conceptually.[29]	
Data availability and quality	Western Power can easily produce accurate records of current and historical customer numbers. We note however that as a result of the COVID-19 pandemic, producing accurate forecasts is more challenging.	
Transparency	Once the appropriate weightings have been determined, the application of customer numbers as a network growth factor for opex escalation is straight forward. However, informed stakeholders may question the validity of energy demand as an opex cost driver, when coupled with the other existing growth factors.	

[29] Economic Insights, *Economic Benchmarking Results for the Australian Energy Regulator's 2020 TNSP Annual Benchmarking Report*, October 2020.

5. Options for network growth factors and weightings for AA5

This section provides an assessment of the options for growth factors and weights for AA5. Four options are assessed against the assessment criteria. The recommended option for AA5 for distribution is to update network growth factors and weightings to align with the AER's recently applied approach for DNSPs, which excludes energy delivered. We also recommend an adjustment to the AER's approach for transmission, again to exclude energy throughput.

5.1. Criteria for approach to network growth factors in AA5

We have adopted the following criteria for assessing options for determining network growth factors and weightings for AA5:

1) **Evidence-base**: The approach would be expected to produce network growth factors and weights that are conceptually consistent with known drivers of opex growth, and be supported by data that is credible, robust, consistent and available without undue cost and effort.
2) **Implementability for AA5**: The approach could be sufficiently well established to be implementable for AA5.
3) **Transparency**: The approach is easy to apply and is transparent to the ERA and other stakeholders.
4) **Risk allocation**: The approach ensures a reasonable sharing of risk between customers and Western Power.

5.2. Options considered

In the assessment below we consider the following 4 options:

5(A) Retain current (AA4) network growth factors and weights

5(B) Adopt factors and weights used by AER in 2021, which excludes energy throughput for distribution but retains it for transmission

5(C) Adopt factors and weights used by AER in 2021 for distribution (same as 5(B)), but adjust factors and weights for transmission to exclude energy throughput

5(D) Adapt AER's methodology to incorporate Western Power data in the analysis

5(E) Develop an alternative methodology for network growth factors and weights that is not based on the AER methodology

For the purpose of these assessments, we have assumed the network growth factors would be applied to all opex, as per the AER's current methodology.

5.3. Option 5(A): Retain current (AA4) network growth factors and weights

This option involves retaining the growth factors and weighting adopted by the ERA for AA4, which were as follows:

Table 19: Network growth factors and weightings applied under the ERA's final AA4 decision

Distribution factor	Weighting
Customer numbers	45.8%
Circuit length	23.8%
Ratcheted maximum demand	17.6%
Energy delivered (throughput)	12.8%
Total	**100%**
Transmission factor	**Weighting**
Customer numbers	19.9%
Circuit length	37.6%
Ratcheted maximum demand	19.4%
Energy delivered (throughput)	23.1%
Total	**100%**

Table 20 Assessment of Option 5(A) for both distribution and transmission

Criteria	Assessment	Rating
Evidence-based	The AER's most recent benchmarking analysis was published in October 2020. In addition to updated data and minor revisions to the methodology, an error was identified in previous analysis that had a significant impact on the benchmarking results. On this basis alone, it would be inappropriate to retain the current AA4 factors and weights. Further, as noted in section 5, the AER has since decided that 'energy delivered' was not appropriate to include as a growth factor for DNSPs. This was based on both weak theoretical support for the factor, and issues with the underlying modelling. While the AER has not yet made a similar assessment for the 'energy throughput' factor for TNSPs, there are similar issues. In conclusion, the AA4 factors and weights can be shown to no longer be in-line with current evidence and should not be retained for AA5.	
Implementable for AA5	As this approach would mean applying the same factors and weights as for AA4, it is easily implementable for AA5.	
Transparency	The AER methodology for determining the factor weightings is highly complex and is neither easy to apply nor to understand. However, this would be true for most (if not all) quantitative methods used to determine factor weights. The application of the factors and weightings is relatively easy to understand.	
Risk allocation	The issues found with the modelling that underpinned the AA4 weightings have been shown to produce weightings that do not align with conceptual expectations of opex drivers. This means the AA4 weightings are likely to either systematically under- or over-represent the growth in opex resulting from network growth. This means either Western power would recover insufficient funding for opex, or customers would pay too much, and therefore does not lead to an appropriate allocation of risk.	

5.4. Option 5(B): Adopt factors and weights used by AER in 2021, which excludes energy throughput for distribution but retains it for transmission

This option involves adopting the growth factors and weightings for distribution that will be published by the AER in its November 2021 benchmarking reports. These would be expected to reflect recent methodological improvements and up-to-date data, as outlined earlier. For distribution, energy delivered would be expected to no longer be included as a growth factor. It is possible that energy throughput will also be excluded from the transmission growth factors for the same reasons as for distribution. However, in lieu of a decision from the AER, this is not certain. Our assessment for transmission below considers the most recent benchmarking results published by the AER in November 2020.

5.4.1. Distribution – *without* energy delivered growth factor

The growth factors and weightings used by the AER in its 2021 decisions for VIC DNSPs are shown below. These reflect the AER's revised methodology and the exclusion of energy delivered as a growth factor.

Table 21: VIC DNSP network growth factors and weightings applied in AER's 2021 decisions

Distribution factor	Weighting
Customer numbers	55.7%
Circuit length	15.5%
Ratcheted maximum demand	28.8%
Energy delivered (throughput)	0%
Total	**100%**

Note: the weightings published by the AER in April 2021 have been adjusted slightly to account for rounding.

Table 22 Assessment of Option 5(B) for Distribution

Criteria	Assessment	Rating
Evidence-based	The AER's model has been refined through several iterations in close collaboration with DNSPs. The most recent iteration addressed several concerns with previous modelling, including errors, the use of the MPFP model based on total cost, and the inclusion of energy delivered as a growth factor. In Western Power's context, one key shortcoming is that Western Power's own data does not form part of the underlying benchmarking analysis. However, the drivers of opex growth for Western Power would be expected to be reasonably similar to those on the East Coast. Further, including Western Power's own data would likely not change the estimates by much, given Western Power would be one of 16 DNSPs in the analysis (including NZ and Ontario). As discussed previously, other limitations include deficiencies in the model's ability to appropriately account for key changes to the network that are impacting costs, such as the deployment of SPS and rapidly increasing adoption of Solar PV and DER. We consider options for addressing these issues in Chapter 6. Despite some clear shortcomings, the AER's revised model has a reasonably sound theoretical underpinning and represents a clear improvement on the AA4 approach.	
Implementable for AA5	In terms of implementation, the only difference with this approach compared with the approach used for AA4 is the application of one less growth factor and revised weights for the remaining 3 factors. It is therefore easily implementable for AA5.	
Transparency	As for Option 5(A).	

Risk allocation	This option is a significant improvement on the AA4 approach, due to the use of a larger and more up to date dataset, a more theoretically sound model specification and correction of errors. Overall, this would be expected to reduce any systemic bias in the application of growth factors, leading to more appropriate sharing of risk between Western Power and its customers.	

5.4.2. Transmission – *with* energy throughput growth factor

The growth factors and weightings derived from the AER's most recent benchmarking results for TNSPs in November 2020 are shown below. This includes energy throughput as a growth factor, although it is possible the AER will look to remove this factor for the same reasons as for distribution. Option 5(C) considers an alternative option that adjusts the 2020 AER factors and weights to exclude energy throughput.

Table 23: AER's 2020 benchmarking results for TNSP network growth factors and weightings

Transmission factor	Weighting
Customer numbers	7.6%
Circuit length	52.8%
Ratcheted maximum demand	24.7%
Energy delivered (throughput)	14.9%
Total	**100%**

Table 24 Assessment of Option 5(B) for Transmission with energy throughput growth factor

Criteria	Assessment	Rating
Evidence-based	While AER's model for transmission is similar to that for distribution, there is less data (due to fewer TNSPs) which makes the model less robust. Further, there is long-standing concern about the inclusion of energy throughput as a growth factor. In its September 2021 draft decision for Powerlink, the AER did not exclude energy throughput from the growth factors. We understand that a key reason for this is that the AER does not currently have alternative econometric cost models to the MTFP for transmission. While it is possible that the AER will reconsider the use of energy throughput in its transmission benchmarking model in November 2021 benchmarking report, the AER may require more time to develop alternative models. Nevertheless, we consider a move away from energy throughput as a growth factor will be inevitable eventually.	
Implementable for AA5	In terms of implementation, the only difference with this approach compared with the approach used for AA4 is the use of updated weights for same growth factors. It is therefore easily implementable for AA5.	
Transparency	As for Option 5(A).	
Risk allocation	Given the issues associated with the AER's use of an MPFP model on total cost and inclusion of energy throughput as a growth factor, this approach is likely to be biased either to the detriment of Western Power or to its customers. It is unclear the direction and extent of this bias.	

5.5. Option 5(C): Adopt factors and weights used by AER in 2021 for distribution (as for 5(B)), but adjust factors and weights for transmission to exclude energy throughput

This option involves adopting the same approach to distribution growth factors and weightings as option 5(B), with energy delivered no longer included as a growth factor. For transmission, this option applies an adjustment to the AER's previous benchmarking results to remove energy throughput as a growth factor.

5.5.1. Distribution – *without* energy delivered growth factor

This option involves same as the approach to distribution growth factors and weightings as under option 5(B). Please refer to section 5.4.1 for our assessment of this approach.

5.5.2. Transmission – *without* energy throughput growth factor

While the AER's most recent application of growth factors and weightings has retained energy throughput as a growth factor, we consider this is inappropriate as energy throughput has little impact on network opex from an engineering standpoint. This is recognised by the AER, and we suspect the AER will investigate modifications to its benchmarking models to remove this factor in the future. In the meantime, we propose an adjustment to the AER's current benchmarking results to remove energy throughput. Our recommended growth factors and weightings are as follows, based on the AER's 2020 benchmarking results.

Table 25: KPMG recommended transmission growth factors and weightings

Transmission factor	Weighting
Customer numbers	24.1%
Circuit length	49.3%
Ratcheted maximum demand	26.6%
Energy delivered (throughput)	0%
Total	**100%**

We explored three options:

- Remove ET from 2020 Tx benchmarking study.
- Remove ET from AA4 measures
- Remove ET from the weighted average of Tx weightings from the previous AER benchmarking report between the AA4 (2016 to 2020) period

We do not consider it would be appropriate to assign all of the ET weighting to only one factor – this would involve a high degree of subjectivity. Instead, our view is that it would be more appropriate to spread the ET weighting equally across all 3 remaining factors in the absence of any more information.

Our advice is to use weighted average of the previous 5 AER reports, which provides a level of stability to the weightings. We consider the resulting weightings are more defensible based on our conceptual understanding of the drivers of opex for a transmission business.

We emphasise that this is a pragmatic approach adopted in lieu of sophisticated and costly benchmarking analysis. It takes account of the large swings in the weights between the AER's benchmarking studies and the approach taken by the AER in its recent determinations for the Victorian DNSPs.

Table 26 Assessment of Option 5(C) for Transmission without energy throughput growth factor

Criteria	Assessment	Rating
Evidence-based	While the proposed transformation is relatively unscientific, it is based on previous benchmarking results from the AER and takes into account our understanding from an engineering point of view that energy throughput is not a material driver of costs for a transmission network, so long as energy throughput remains within the design limitations of the network.	

	The latter point is broadly confirmed by the observation that energy throughput continues to decline.	
Implementable for AA5	The only difference with this approach compared with the approach used for AA4 is the use of updates weightings, with the weighting for the energy throughput set to zero. It is therefore easily implementable for AA5.	
Transparency	Our proposed transformation applies a simple weighted average of the weightings for the non-energy throughput factors from the AER's 2015-2020 benchmarking results. We consider this simple adjustment approach does not impact transparency relative to the AA4 approach.	
Risk allocation	By excluding the energy throughput as a growth factor which results in weightings better aligned to a-priori expectations around the drivers of network opex, we consider this approach delivers an improvement on the allocation of risk between Western Power and its customers.	

5.6. Option 5(D): Adapt the AER's revised methodology to incorporate Western Power data in analysis

This option involves applying the AER's revised methodology but including Western Power's data in the analysis, to account for Western Power's own costs, outputs and operating environment factors.

Table 27 Assessment of Option 3 for both distribution and transmission

Criteria	Assessment	Rating
Evidence-based	As noted previously, the AER model has been refined over a long period of time, in close collaboration with NSPs. It has a reasonably sound theoretical underpinning, despite some limitations and concerns. Including Western Power data in the analysis would have the potential to improve the robustness of the benchmarking and the ability to account for factors specific to Western Power's operating environment. However, this would assume that Western Power could replicate the methodology and that the Western Power's data would be accurate and consistent for the full period included in the benchmarking analysis, that is, from 2006 onward. We also note that, as it stands, one of the main criticisms of the AER's transmission benchmarking analysis is the inclusion of energy throughput as a growth factor. While the AER may choose to exclude this going forward, this is not yet certain. Either way, there will remain issues with the robustness of the AER's transmission benchmarking approach.	
Implementable for AA5	Although Western Power would not need to develop the methodology from scratch, replicating the AER approach would still involve numerous challenges. As noted above, Western Power would need to be able to produce accurate and consistent data over the full period required for the benchmarking analysis (from 2006 onward). This would likely be challenging and require significant time and effort. Further, while the relevant data for the East Coast NSPs is published along with the annual benchmarking analysis, Western Power would also need to obtain the relevant data for the Ontario and NZ NSPs. We therefore do not consider this approach would be implementable in the timeframe available for AA5.	

Transparency	As for Option 5(A).	
Risk allocation	Given challenges around obtaining accurate and consistent data and the extremely limited time available to test and refine the methodology, this option would carry significant uncertainty around the allocation of risk between Western Power and its customers.	

5.7. Option 5(E): Develop alternative methodology for factors and/or weightings

This option involves Western Power developing an alternative approach to the AER's benchmarking methodology. This would allow for the inclusion of Western Power's own data plus alternative variables that may have better explanatory power, including accounting for the impacts of DER and SPS.

Table 28 Assessment of Option 4 for both distribution and transmission

Criteria	Assessment	Rating
Evidence-based	We're unable to provide an assessment of whether an alternative unspecified approach would be 'evidence-based'. However, we note that developing an alternative methodology would: • allow for the inclusion of Western Power data • testing of variables that may have better explanatory power, including variables that would address DER and SPS issues • provide an opportunity to address some of the methodological limitations of the AER's current methodology Nevertheless, it would without doubt be a challenging task to develop a new approach that was able to produce network growth factors and weights that are conceptually consistent with known drivers of opex growth, is supported by data that is credible, robust, consistent and available without undue cost and effort.	**N/A**
Implementable for AA5	Developing, testing and refining a new approach to determining growth factors and weights is a significant undertaking. It could also be challenging to source the necessary data of sufficient quality to develop a credible and robust method. Further, to be successful with the ERA, the development of a new approach would require significant involvement and buy in from the ERA and other key stakeholders. This option is therefore not achievable for AA5.	
Transparency	While we're unable to provide an assessment of 'transparency' without a specific approach in mind, as noted previously, most methods for determining output weights would involve a degree of complexity which makes them less transparent and difficult for stakeholders to understand.	**N/A**
Risk allocation	Given challenges around obtaining accurate and consistent data and the extremely limited time available to develop, test and refine the methodology, this option would carry significant uncertainty around the allocation of risk between Western Power and its customers.	

5.8. Assessment summary and recommendations

Based on the above assessment of options, we recommend Option 5(C) for AA5, being:

1) the adoption factors and weights used by AER in 2021 for distribution, which involves the removal of energy delivered as a network growth factor, and the shifting of increased weights towards customer numbers
2) an adjustment to the AER's factors and weightings for transmission to exclude energy throughput.

The AER's revised methodology for distribution will better accommodate the increased penetration of DER on Western Power's network. However, the current amendments to the AER methodology may not be sufficient in the longer term if DER penetration continues as expected. The AER is considering how to update its methodology to take better account of DER impacts on operating costs. However, it may be more appropriate for Western Power and the ERA to agree on a separate methodology more specific to the conditions on the SWIS and this could be investigated further during the AA5 period.

For transmission there is some uncertainty at this stage regarding the AER's future choice of network growth factors and weightings. However, we would expect that the AER would look to develop benchmarking models for transmission that also excludes energy throughput as a growth factor. This will become clearer once the AER releases its 2021 benchmarking reports in November 2021.

Table 29 provides a summary of the above assessments with the recommended option highlighted.

Table 29 Summary of assessments of options for AA5 network growth factors and weightings

		Ratings by criteria				
Option		**Evidence-based**	**Implementable for AA5**	**Transparency**	**Risk allocation**	**Recommended option**
5(A) Retain current (AA4) network growth factors and weights						
5(B) Adopt factors and weights used by AER in 2021, which excludes energy throughput for distribution but retains it for transmission	**Dx**					
	Tx					
5(C) Adopt factors and weights used by AER in 2021 for distribution, but adjust factors and weights for transmission to exclude energy throughput	**Dx**					✓
	Tx					
5(D) Adapt AER's methodology to incorporate Western Power data in the analysis						
5(E) Develop an alternative methodology for network growth factors and weights that is not based on the AER methodology		**N/A**		**N/A**		

6. Options for addressing energy transition issues in AA5

This section provides an assessment of a range of options for addressing the impact of solar PV, DER and SPS for AA5. Each option is assessed against 4 assessment criteria. Our assessment finds that including step changes is the preferred short-term option to address issues around solar PV, DER and SPS in Western Powers AA5 proposal.

6.1. Criteria for addressing energy transition issues in AA5

We have adopted the following criteria for assessing options for addressing energy transition issues:

1) **Evidence base**: The approach is conceptually consistent with known impacts on opex growth, and is supported by data that is credible, robust, consistent and available without undue cost and effort.
2) **Transparency**: The approach is easy to apply and is transparent to the ERA and other stakeholders.
3) **Risk allocation**: The approach ensures a reasonable sharing of risk between customers and Western Power.
4) **Implementability for AA5**: The approach could be sufficiently well established to be implementable for AA5.

These criteria will ensure that the selection of the output factors and weightings meet the requirements of the Access Code for operating expenditure as summarised in section 1.

6.2. Options for addressing solar PV and DER uptake

In section 3 we explain that the increasing uptake of solar PV and DER are impacting on opex in ways that are not captured by the ERA's approach to growth factors and weights in AA4, and has not yet been addressed in the AER's benchmarking methodology for DNSPs. We consider below some options for Western Power to address solar PV and DER issues in AA5.

6.2.1. Options considered for addressing solar PV and DER uptake

We have considered the following options for addressing Solar PV and DER uptake:

6.2(A) No further change beyond Option 5(C) (the recommended approach to growth factors and weightings identified in section 5)

6.2(B) Develop an alternative methodology that includes a DER growth factor

6.2(C) Include a step change for DER opex impacts

6.2.2. Option 6.2(A) – no further changes beyond Option 5(C)

Option 5(C) for distribution involves retaining the current growth factors except energy delivered. The weights for the remaining 3 growth factors would be updated to reflect AER's latest benchmarking results (with a further update expected in November 2021). Option 6.2(A) considered here involves no further adjustment to account for impacts of solar PV and DER uptake.

Table 30 Assessment of Option 6.2(A) – no further changes beyond Option 5(B)

Criteria	Assessment	Rating
Evidence based	As noted in section 5, the AER modelling has a reasonably sound theoretical underpinning, despite some limitations and concerns. The removal of the energy delivered growth factor eliminates one of the primary criticisms, in particular in the context of increasing adoption of solar PV and DER. However, this approach still does not account for the potentially increasing opex associated with solar PV and DER, for example associated with managing lower minimum demands and greater exports to the grid. While most of the immediate expenditures relate to capex, additional assets and system complexity could be expected to also impact on operational and maintenance costs. We also note that there may be existing or expected impacts on Western Power's efficient baseline opex that would not be accounted for without further adjustments to the opex forecast, for example through a step change. Option 6.2(C) considers a step change adjustment to account for such opex impacts. That being said, we understand from Western Power that the expected opex impact over AA5 would be relatively small, and that this will be more of an issue in subsequent determination periods. We note that the AER is actively considering how to address solar PV and DER growth in its benchmarking modelling.	
Transparency	As this approach involves no further adjustments to address the impact of solar PV and DER on opex, there are no additional transparency issues beyond those associated with Option 5(C).	
Risk allocation	With the removal of energy delivered, the opex risk to Western Power associated with lower energy consumption due to Solar PV and DER has been removed. However, as noted above, risk associated with opex growth from solar PV and DER would remain without further adjustments to growth factors or to the efficient baseline. While Western Power expects the opex impact to be small in AA5, faster than expected growth in solar PV and DER could see greater impact on Western Power's opex.	
Implementable for AA5	In section 5 we found that Option 5(C) could easily be implemented for AA5. As this approach involves no further adjustments to address the impact of solar PV and DER on opex, this option remains easily implemented for AA5.	

6.2.3. Option 6.2(B) – alternative methodology with DER growth factor

This option would involve Western Power developing an alternative methodology for establishing opex growth factors and weights, which would include a growth factor to capture solar PV and DER uptake. We note that the AER's consultant Economic Insights has acknowledged the increasingly material impact of DER and has stated its intention to conduct a detailed review of the relationship between DER and benchmarking in the future. Option 6.2(B) is effectively a variation of Option 5(E).

Table 31 Assessment of Option 6.2(B) – alternative methodology with DER growth factor

Criteria	Assessment	Rating
Evidence-based	We're unable to provide an assessment of whether an alternative unspecified approach would be 'evidence-based'. Please refer to our assessment of Option 5(E) for further detail.	**N/A**
Transparency	As for Option 5(E), we're unable to provide an assessment of 'transparency' for an alternative unspecified approach. Please refer to our assessment of Option 5(E) for further detail.	**N/A**
Risk-allocation	While developing a new methodology that specifically addresses solar PV and DER could help Western Power share some of the opex risk with customers, there could be considerable risk involved with a new methodology. It would not necessarily lead to a better overall outcome for Western Power.	
Implementable for AA5	As noted in the assessment of Option 5(E), developing, testing and refining a completely new approach to determining growth factors and weights is a significant undertaking, and would be unlikely to be implementable for AA5. Please refer to our assessment of Option 5(E) for further detail.	

6.2.4. Option 6.2(C) – include a step change for DER opex impacts

This option involves Western Power proposing a step-change to their baseline opex allowance to reflect an estimate of the current impact on opex associated with solar PV and DER. We note that the AER's consultant, Economic Insights, have suggested that DNSPs include such a step change to capture DER impacts until the AER's benchmarking methodology can robustly capture these impacts.

A step change of this nature was recently accepted by the AER's in its decision for South Australia Power Networks 2020-25. The AER acknowledged that SA Power Networks was facing increasing challenges to manage its network, including voltage non-compliance issues related to increasing uptake of DER, and that it was likely that the output growth forecast would not fully compensate for the higher opex required to address DER management. A step-change of $3.7 million for low voltage management of future networks was allowed in the opex forecast. (See further detail in Box 1 below)

Table 32 Assessment of Option 6.2(C) – include a step change for DER opex impacts

Criteria	Assessment	Rating
Evidence-based	It is well established that solar PV and DER has increasingly material impact on network costs. However, there is still great uncertainty around the precise magnitude of the impacts, particularly in relation to opex. We understand from Western Power that the opex impact is expected to be relatively small in the near term. Western Power has indicated it would be able to produce indicative estimates of these opex impacts. We therefore expect Western Power	

	could present a reasonably robust conservative estimate of a step change reflecting the current impact on the opex baseline.	
Transparency	We understand that estimating opex impacts of DER can be challenging and is therefore also unlikely to be easy for stakeholders to understand. However, the general approach to step-changes is well established, and both easy to apply and understand.	
Risk-allocation	A step change related to DER would involve an increment added to Western Power's baseline opex. Any additional opex impacts due to growth in solar PV and DER over the AA5 period would not be accounted for. Further, given the nascent state of DER and the challenges involved in estimating opex impacts, the ERA may only be willing to accept a conservative estimate of opex impacts.	
Implementable for AA5	As noted above, Western Power has indicated it would be able to produce indicative estimates of current opex impacts from solar PV and DER. We therefore consider it should be able to seek a conservative step change for AA5.	

Box 1 below provides a recent example from the AER approving a step change to recover costs associated with the integration of DER.

Box 1 – Example of AER approved step change for DER

The AER recently approved a $3.8 million step change for DER for SA Power Networks' 2020-25 Determination.

The proposed step change is part of SAPN's overall DER management program to develop new operational systems and business processes to manage the integration of solar, battery storage and virtual power plants into its distribution network.

AER decision and reasons

The AER accepted this step change on the basis that:

- there is a likelihood that, at least in the short term, the output growth forecast may not fully compensate for the higher opex required to address DER;
- based on the information available, the capex component of the LV Management program is considered to be the least-cost solution; and
- analysis of the proposed opex suggests it is the least-cost option.

The AER noted that it would typically not provide a step change in opex to operate and maintain a new asset. The standard approach of allowing opex increases in line with the output growth forecast would normally compensate a prudent operator for operating and maintaining a network not faced with an unusual operating environment. However with DER, SA Power Networks appears to be facing significant demands to manage its network and address its customers' needs that, if not addressed properly, might lead to voltage noncompliance issues. It is arguable that the opex output growth forecast may not allow adequate opex for this purpose.

6.2.5. Assessment summary and recommendations

Based on the above assessment of options, we recommend Option 6.2(C) for AA5, being addition of a step change to account for DER opex impacts on base opex. This option recognises that while the removal of energy delivered as a network growth factor for DNSPs goes some way in addressing the issues associated with DER, it will not account for existing known impacts on Western Power's opex due to increasing DER penetration. Adding a step change will further assist in managing this impact, and has been a successful approach under the AER framework.

Table 33 provides a summary of the above assessments with the recommended option highlighted.

Table 33 Summary of assessments of options for addressing opex impacts of DER over AA5

	Ratings by criteria				
Option	**Evidence based**	**Transparency**	**Risk allocation**	**Implementable for AA5**	**Recommended option**
6.2(A) No further change beyond Option 5(C)					
6.2(B) Develop an alternative methodology that includes a DER growth factor	**N/A**	**N/A**			
6.2(C) Include a step change for DER opex impacts					✓

6.3. Options for addressing Stand-alone Power Systems

In section 3 we explain that the increasing deployment of Stand-Alone Power Systems (SPS) is impacting on distribution opex in ways that are not captured by the ERA's approach to growth factors and weights in AA4, and has not yet been addressed in the AER's benchmarking methodology for DNSPs. We consider below some options for Western Power to address the opex impacts of SPS in AA5.

6.3.1. Options considered for addressing Stand-alone Power Systems

We have considered the following options for addressing Stand-alone Power Systems:

6.3(A) No further change beyond Option 5(C) (the preferred approach to growth factors and weightings identified in section 5)

6.3(B) Develop an alternative methodology that includes a SPS growth factor

6.3(C) Include a step change for SPS

6.3(D) Include proxy circuit-lengths for SPS

6.3(E) Include a separate opex category for SPS

6.3.2. Option 6.3(A) – no further changes beyond Option 5(C)

Option 5(C) for distribution involves retaining the current growth factors except energy delivered. The weights for the remaining 3 growth factors would be updated to reflect AER's latest benchmarking results (with a further update expected in November 2021). Option 6.3(A) involves no further adjustment to account for opex impacts of SPS.

Table 34 Assessment of Option 6.3(A) – no further changes beyond Option 5(C)

Criteria	Assessment	Rating
Evidence based	As noted in section 5, the AER modelling has a reasonably sound theoretical underpinning, despite some limitations and concerns. With the deployment of SPS, circuit length would decrease. Circuit length is one of the 3 growth factors for DNSPs, which has been attributed a weighting of 15.5% in the AER's most recent decision. While the use of SPS will reduce the need for expensive capex, it increases opex. Therefore, in the case of SPS, there is an inverse relationship between circuit length and opex, contradicting the link between circuit length and opex growth under AER's methodology.	
Transparency	As this approach involves no further adjustments to address the impact of SPS on opex, there are no additional transparency issues beyond those associated with Option 5(C).	
Risk allocation	Without further adjustment, the risk to Western Power associated with opex growth from the deployment of SPS would remain.	
Implementable for AA5	In section 5 we found that Option 5(C) could easily be implemented for AA5. As this approach involves no further adjustments to address the impact of solar PV and DER on opex, this option remains easily implemented for AA5.	

6.3.3. Option 6.3(B) – alternative methodology with an SPS growth factor

This option would involve Western Power developing an alternative methodology for establishing opex growth factors and weights, which would include a growth factor to capture the impact of SPS. This option is effectively a variation of Option 5(E).

Table 35 Assessment of Option 6.3(B) – alternative methodology with an SPS growth factor

Criteria	Assessment	Rating
Evidence based	We're unable to provide an assessment of whether an alternative unspecified approach would be 'evidence-based'. However, we note that the nascent status of SPS means there is limited historical data on SPS across and their impact on opex across NSPs. This would severely constrain the ability to conduct robust regression analysis to determine an appropriate weighting for a SPS-related growth factor. Please refer to our assessment of Option 5(E) for a more detail discussion of the challenges of establishing sufficient evidence for an alternative methodology.	**N/A**
Transparency	As for Option 5(E), we're unable to provide an assessment of 'transparency' for an alternative unspecified approach. Please refer to our assessment of Option 5(E) for further detail.	**N/A**

Risk allocation	While developing a new methodology that specifically addresses the opex impact of SPS could help Western Power share the opex risk with customers, there could be considerable risk involved with a new methodology. It would not necessarily lead to a better overall outcome for Western Power.	
Implementable for AA5	As noted in the assessment of Option 5(E), developing, testing and refining a completely new approach to determining growth factors and weights is a significant undertaking, and would be unlikely to be implementable for AA5. Please refer to our assessment of Option 5(E) for further detail.	

6.3.4. Option 6.3(C) – include a step change for SPS

This option involves Western Power proposing a step-change to their baseline opex allowance to reflect a known (or expected) recurring increase in opex associated with SPS, compared with the traditional solution it replaces.

Table 36 Assessment of Option 6.3(C) – include a step change for SPS

Criteria	Assessment	Rating
Evidence based	We understand Western Power has a good understanding of the opex impacts of SPS and could provide evidence of this to the ERA. However, we note the nascent state of SPS and the relatively limited information available at this stage. Nevertheless, we expect Western Power could present a reasonably strong evidence base for a proposed step change.	
Transparency	Based on Western Power's historical data on the opex associated with SPS, determining the step change should be reasonably straight forward and easy for the ERA and other stakeholders to understand.	
Risk allocation	A step change to account for a known increase in the baseline opex due to SPS would help offset the reductions in the opex allowance that would result from the decreased circuit length. However, as a step change would be one-off increment to the baseline opex, any additional opex impacts due to growth in SPS would not be accounted for. Further, given the nascent state of SPS and relatively limited data available to date, the ERA may only accept a conservative estimate of the impact of SPS on the baseline opex.	
Implementable for AA5	As noted above, we understand Western Power has a good understanding of opex associated with SPS based on recent SPS deployments. It should therefore be straight forward to estimate the required step change which would be proposed for AA5.	

6.3.5. Option 6.3(D) – include proxy circuit-lengths for SPS

Deployment of SPS is generally followed by the decommissioning of existing lines that are no longer required. This reduces the circuit length, which under the AER approach (as adopted by the ERA) would lead to a reduction in allowed opex. Option 6.3(D) involves the inclusion of a circuit-length proxy for SPS. We contemplate 2 approaches to this:

1) Retain as a proxy the circuit length of the lines no longer required after they have been decommissioned

2) Establish as a proxy a 'virtual circuit length' measure which captures not only the length of the decommissioned lines, but also an estimate of the incremental opex associated with SPS compared with traditional distribution solutions.

We note that these approaches would likely only represent a temporary measure in lieu of more robust approaches. We would expect more robust approaches to be developed as more data on SPS becomes available and the relationship between SPS on opex growth is better understood among industry stakeholders. However, these approaches would align well with the use of historical growth rates to forecast circuit length.

Table 37 Assessment of Option 6.3(D) – include proxy circuit-lengths for SPS

Criteria	Assessment	Rating
Evidence based	We understand Western Power has reasonably good appreciation for the opex impacts of SPS. It has stated that the opex associated with SPS is typically higher than the opex associated with the traditional solution they are replacing. This suggests that using the circuit length of the decommissioned lines would result in a conservative growth factor for opex. On the other hand, the use of a 'virtual circuit length', for example as a factor of the decommissioned circuit length, would be highly sensitive to the underlying data, and would likely vary considerably from one case to another and over time. Either option therefore has its limitations when it comes to the evidence base supporting it.	
Transparency	Adopting proxy line lengths for SPS requires resolving a number of questions, such as how long these proxy lengths should be retained, and how to address the resulting decrease in repairs and maintenance opex. While retaining decommissioned line length would involve the use of known data on exiting lines, using 'virtual line length' would be less so due to the variability in relative opex between cases. Overall, this approach would add new complexities which would impact transparency.	
Risk allocation	Based on information provided by Western Power, the use of decommissioned line length would underestimate the opex impact. On the other hand, we would expect there to be material uncertainty with the use of the 'virtual line length' option. Either option therefore entails a degree of risk to Western Power, and to customers in relation to the use of 'virtual line length'. Western Power has stated that it expects the impact of SPS to be limited over AA5. On this basis, the smaller uncertainty associated with using decommissioned circuit length might be more acceptable to the ERA and other stakeholders.	
Implementable for AA5	We consider either option is likely to be achievable for AA5, notwithstanding the complexities noted above.	

6.3.6. Option 6.3(E) – include a separate opex category for SPS

This option entails excluding SPS-related opex from the Base-Step-Trend (BST) approach, and instead forecast SPS related opex separately.

Table 38 Assessment of Option 6.3(E) – include a separate opex category for SPS

Criteria	Assessment	Rating
Evidence based	This approach would allow for a direct forecast of the opex impacts of SPS without the need for developing a robust methodology that would work within the constraints of the BST approach. As noted above, despite the nascent state of SPS and the relatively limited information available so far, Western Power has a good understanding of the opex impacts of SPS. This approach would provide more flexibility than the BST approach and would better reflect the true opex impacts that Western Power has seen to date.	
Transparency	Given Western Power already has a good grasp of the opex associated with SPS, we would expect it could provide a reasonably robust and transparent forecast for AA5, based on historical information.	
Risk allocation	As above, given Western Power's confidence in its understanding of opex associated with SPS, we would expect it to be able to provide a reasonably robust forecast. However, given the nascent state of SPS and limited information available, the ERA may prefer a conservative forecast for AA5.	
Implementable for AA5	Given Western Power's established understanding of SPS related opex, and given plans and investment cases for SPS would already be required for AA5, this approach would be easily implementable for AA5. However, it is uncertain whether the ERA would accept a category specific forecast for SPS.	

6.3.7. Assessment summary and recommendations

Based on the above assessment of options, to address impacts of SPS on Western Power's opex for AA5 we recommend Option 6.3(C), which is the inclusion of a step change. A step change to the base opex would account for the additional opex of serving SPS customers compared to grid connected customers. This will help address know impacts on base opex, however we note it will not account for changes over AA5 period due to further deployment of SPS.

We note that SPS impacts on opex may not be a material issue for AA5 but will be for subsequent periods.

Table 39 provides a summary of the above assessments with the recommended option highlighted.

Table 39 Summary of assessments of options for addressing opex impacts of SPS over AA5

	Ratings by criteria				
Option	**Evidence based**	**Transparency**	**Risk allocation**	**Implementable for AA5**	**Recommended option**
6.3(A) No further change beyond Option 5(B)					
6.3(B) Develop an alternative methodology that includes a SPS growth factor	**N/A**	**N/A**			
6.3(C) Include a step change for SPS					✓
6.3(D) Include proxy circuit-lengths for SPS					
6.3(E) Include a separate opex category for SPS					