DRAFT DECISION
Essential Energy
Distribution Determination

2019–24

Attachment 5
Capital expenditure

November 2018

AUSTRALIAN ENERGY REGULATOR

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Note

This overview forms part of our draft decision on the distribution determination at will apply to Essential Energy for the 2019–24 regulatory control period. It should be read with all other parts of the draft decision.

The draft decision includes the following attachments:

Overview

Attachment 1 – Annual revenue requirement

Attachment 2 – Regulatory asset base

Attachment 3 – Rate of return

Attachment 4 – Regulatory depreciation

Attachment 5 – Capital expenditure

Attachment 6 – Operating expenditure

Attachment 7 – Corporate income tax

Attachment 8 – Efficiency benefit sharing scheme

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Attachment 10 – Service target performance incentive scheme

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Contents

Shortened forms

Shortened form	Extended form
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
Arup	Arup Pty Ltd
augex	augmentation expenditure
capex	capital expenditure
CCP10	Consumer Challenge Panel
CPI	consumer price index
distributor	distribution network service provider
ECA	Energy Consumers Australia
Expenditure Assessment Guideline	Expenditure Forecast Assessment Guideline for Electricity Distribution
EUAA	Energy Users Association of Australia
ICT	information and communications technology
LiDAR	light detection and ranging
NEL	national electricity law
NEM	national electricity market
NEO	national electricity objective
NER	national electricity rules
NIEIR	National Institute of Economic and Industry Research
NSP	network service provider
opex	operating expenditure
PIAC	Public Interest Advocacy Centre
PQ	power quality
RAB	regulatory asset base
repex	replacement expenditure

Shortened form	Extended form
RIN	regulatory information notice
RMS	NSW Roads and Maritime Services
SAIDI	system average interruption duration index
SAIFI	system average interruption frequency index
SCS	standard control services
STPIS	service target performance incentive scheme
VCR	value of customer reliability

5 Capital expenditure

Capital expenditure (capex) refers to the investment made in the network to provide standard control services. This investment mostly relates to assets with long lives (30–50 years is typical) and these costs are recovered over several regulatory control periods.

On an annual basis, the financing and depreciation costs associated with these assets are recovered (return of and on capital) as part of the building blocks that form Essential Energy's (Essential) total revenue requirement.[1]

This attachment sets out our draft decision on Essential's total capex forecast. Further detailed analysis is provided in the following appendices:

Appendix A – Assessment techniques

Appendix B – Assessment of capex drivers

Appendix C – Engagement and information-gathering process

Appendix D – Repex modelling approach

Appendix E – Demand

Appendix F – Ex-post statement of efficiency and prudency

Our draft decision is based on our analysis of the information we have received to date. We will be informed by Essential's revised proposal, submissions and further analysis in arriving at our final decision in April 2019.

5.1 Draft decision

We do not accept Essential's forecast capital expenditure (capex) of $2099.6 million ($2018–19) for the 2019–24 regulatory control period. While we are generally satisfied that Essential's forecast reasonably reflects the capex criteria, we have identified a CPI escalation error in Essential's capex model which has slightly overstated Essential's forecast for net direct capex and LiDAR in real 2018–19 dollars. We have rectified this error in consultation with Essential, resulting in a small adjustment to its forecast capex.

After the CPI escalation adjustment Essential's forecast capex is $2081.2 million ($2018–19). We are satisfied that this forecast capex is consistent with the drivers of investment need, the efficient costs that a prudent operator would incur in the 2019–24 regulatory control period and reasonably reflects the capex criteria.

In assessing forecast capital expenditure, we are guided by the National Electricity Objective (NEO) and underpinning capex criteria and objectives set out in the National

[1] NER, cl. 6.5.2 and 6.5.5.

Electricity Rules (NER). We must accept a distributor's capex forecast if we are satisfied that the total forecast capital expenditure for the regulatory control period reasonably reflects the capex criteria.

These criteria outline that a distributor's capex forecast must reasonably reflect the efficient costs of achieving the capex objectives, the costs that a prudent operator would require to achieve the capex objectives, and a realistic expectation of the demand forecast and cost inputs required to achieve the capex objectives.[2]

The capex objectives relate to a distributor's ability to comply with regulatory obligations and maintain the quality, reliability and security of supply of standard control services.[3]

Where a distributor is unable to demonstrate that its proposal complies with the capex criteria and objectives, the NER require us to set out a substitute estimate of total capex that we are satisfied reasonably reflects the capex criteria, taking into account the capex factors.[4]

Essential's forecast reflects the ongoing transition to more risk-based decision-making where proposed investments are weighed up against value to consumers.

Essential has proposed a decrease in capex for the 2019–24 regulatory control period of 6 per cent compared with estimated capex in the current regulatory control period.[5] This is largely driven by reductions in forecast augex and capitalised overheads. Forecast repex and connections capex are also lower than for the current regulatory control period. The capex proposal includes investments in its strategic initiatives program, which Essential has forecast will lead to ongoing capex and operating expenditure (opex) savings.

In making our draft decision we have considered the information we have received from Essential and input from stakeholders, including the Consumer Challenge Panel (CCP10). We have also taken into account the early and extensive process of consumer engagement undertaken by Essential to ensure its revenue proposal adequately reflects the preferences of its customers. Table 5.1 outlines our draft decision, compared with Essential's initial regulatory proposal. Our draft decision reflects the CPI escalation adjustment we made in Essential's capex model.

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2 NER, cl. 6.5.7(c)(1).

3 NER, cl. 6.5.7(a).

4 NER, cl. 6.12.1(3)(ii).

5 Essential Energy *RIN responses*, AER analysis.

Table 5.1 – Draft decision on Essential's total forecast capex ($2018–19, million)

	2019–20	2020–21	2021–22	2022–23	2023–24	Total
Essential's initial regulatory proposal	498.5	411.4	409.2	395.9	384.5	2099.6
Draft decision	494.5	407.6	405.6	392.4	381.0	2081.2
Difference	-4.0	-3.7	-3.7	-3.5	-3.5	-18.4
Percentage difference (%)	-0.8%	-0.9%	-0.9%	-0.9%	-0.9%	-0.9%

Source: Essential Energy, *Regulatory Proposal* and AER analysis.

Notes: Numbers may not add up due to rounding.

The figures above do not include equity raising costs. For our assessment of equity raising costs, see attachment 3 – rate of return.

Table 5.2 summarises our findings and the reasons for our draft decision by 'capex driver' (e.g. augmentation, replacement and connections). This reflects the way we have assessed Essential's total capex forecast. The capex set out in the table is after we have made the CPI escalation adjustment in Essential's capex model.

Our findings on the capex drivers are part of our broader analysis and should not be considered in isolation. We do not approve an amount of forecast expenditure for each capex driver. However, we use our findings on the different capex drivers to arrive at our decision to accept or to provide a substitute estimate for total capex.

Our assessment highlights that, after we make the CPI escalation adjustment, Essential has justified most aspects of its regulatory proposal. We raise concerns with some elements of the proposal but do not consider that these have a material effect on Essential's capex proposal overall. As such, we are satisfied that Essential's capex proposal (after CPI escalation adjustment) reasonably reflects the capex criteria, taking into account the revenue and pricing principles.[6]

Overall, the capex forecast addresses the capital expenditure objectives.[7] In making our draft decision we specifically considered the impact our decision will have on the safety and reliability of Essential's network. This capex forecast should be sufficient for a prudent and efficient service provider in Essential's circumstances to be able to maintain the safety, service quality, security and reliability of its network, consistent with its current obligations.

We test this total estimate of capex against the capex criteria (see section 5.3 for a detailed discussion). As set out in appendix B, Essential has demonstrated that its

6 NER, cl. 6.5.7(c) and (d).

7 NER, cl. 6.5.7(a).

overall capex forecast forms part of an overall distribution determination that will or is likely to contribute to the achievement of the NEO to the greatest degree.

Table 5.2 – Summary of our reasons and findings

Issue	Reasons and findings
Total capex forecast	We do not accept Essential's total net capex forecast of $2099.6 million ($2018–19). While we are generally satisfied with Essential's forecast, we have identified a CPI escalation error in its capex model which has slightly overstated Essential's forecast net direct capex and LiDAR in real 2018–19 dollars. Our substitute decision for Essential's total net capex forecast is $2081.2 million ($2018–19). We are satisfied that this substitute estimate reasonably reflects the capex criteria. The substitute estimate is $18.4 million lower than Essential's initial regulatory proposal. The reasons for our decision are summarised in this table and detailed in the remainder of this attachment. Note that for each capex category below we have adjusted Essential's forecast by rectifying the CPI escalation error in Essential's capex model.
Forecasting methodology, key assumptions and past capex performance	Essential's key assumptions and forecasting methodology are generally reasonable. Essential's approach results in an overall capex forecast that reasonably reflects the capex criteria.
Augmentation capex	Essential has established that its proposed augmentation capex of $163.3 million ($2018–19) forms part of a total forecast capex that reasonably reflects the capex criteria. The forecast is lower than current period expenditure and it incorporates the expected savings achieved through Essential's strategic initiatives. In coming to our position we find that Essential's proposal for traffic Black Spot Program is not justified; however, this does not change our position on Essential's forecast capex overall.
Customer connections capex	Essential has demonstrated its proposed gross connections capex of $466.5 million ($2018–19) forms part of a total forecast capex that reasonably reflects the capex criteria. The forecast includes net connections capex of $24.7 million and capital contributions of $441.8 million (or $447.2 million including overheads). Essential's forecast is 23 per cent lower than current period expenditure.
Replacement capex (repex)	Essential has justified its proposed repex of $805.6 million, which forms part of a total forecast capex that reasonably reflects the capex criteria. The forecast is lower than current period expenditure and it incorporates the expected savings achieved through Essential's strategic initiatives.
Non-network capex	Essential has justified its proposed non-network capex of $494.2 million ($2018–19), which forms part of a total forecast capex that reasonably reflects the capex criteria. In coming to our position we have identified some elements of Essential's buildings and property capex where Essential has not sufficiently demonstrated as reflecting the capex criteria; however, this does not change our position on Essential's forecast capex overall.
Capitalised overheads	Essential has demonstrated its proposed capitalised overheads forecast of $593.4 million ($2018–19), or $598.8 million including overheads related to capital contributions, forms part of a total forecast capex that reasonably reflects the capex criteria. The forecast is lower than current period expenditure and incorporates the expected cost savings achieved through Essential's strategic initiative program.

Issue	Reasons and findings
Real cost escalators	Essential's proposed real cost escalators are reasonable. Essential submitted that it has applied zero percent escalation, as it intends to offset any increases arising in labour and materials costs over the 2019–24 through its strategic initiatives, which will improve productivity and efficiency within its business.[8]

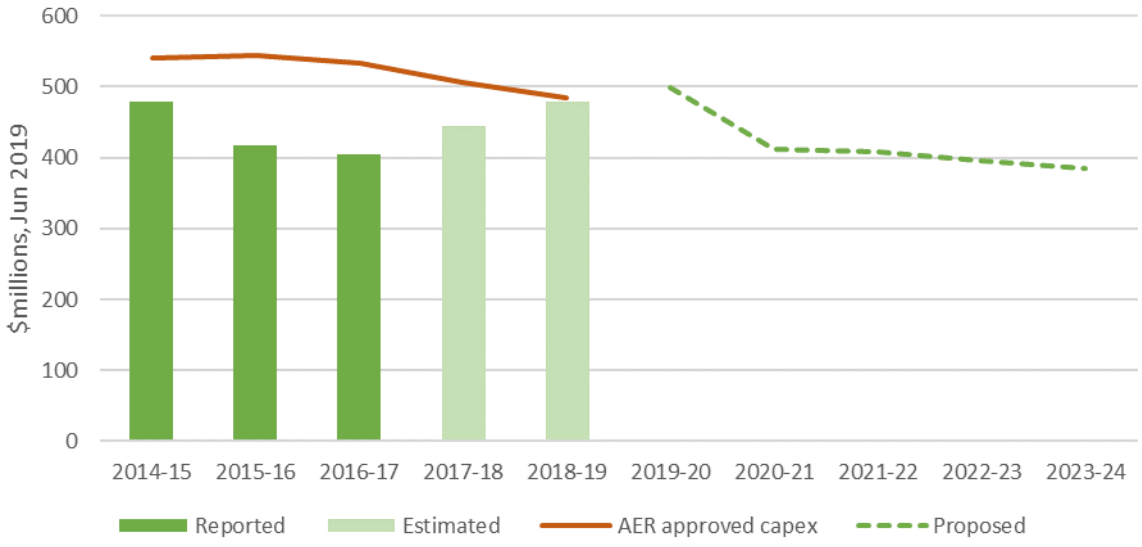
Source: AER analysis.

Note: The capex set out in this table is after we have made the CPI escalation adjustment in Essential's capex model.

5.2 Essential's proposal

For the 2019–24 regulatory control period, Essential proposed total forecast net capex of $2099.6 million ($2018–19). Essential's 2019–24 capex forecast is $126.9 million (6 per cent) lower than its actual/estimated capital expenditure of $2226.5 million over the 2014–19 regulatory control period. Figure 5.1 outlines Essential's historical capex trend compared with its forecast for the 2019–24 regulatory control period.

Figure 5.1 – Essential's historical vs forecast capex, and our 2014–19 final determination allowance ($2018–19, million)



Source: *Essential Energy RIN responses*, AER analysis.

5.2.1 Background

The key drivers of Essential's initial capex proposal of $2099.6 million are:

1. Augmentation[9] – $166.1 million (8 per cent)

[8] Essential Energy, *response to information request 026 - ROMO, VCR and Repex - 30 July 2018, Public*, p.1.

[9] Includes reliability and quality improvements.

2. Connections – $25.1 million (1 per cent)
3. Replacement – $819.7 million (39 per cent)
4. Non-network – $495.2 million (24 per cent)
5. Capitalised overheads – $593.4 million (29 per cent)

This attachment discusses our reasons for accepting Essential's proposed capex—after the CPI escalation adjustment—and highlights some concerns we have with a small number of areas of the proposal. We recognise Essential's efforts to engage more thoroughly with its stakeholders during the regulatory proposal process and encourage this level of engagement on an ongoing basis.

The reasons for our draft decision, including a summary of these capex drivers, are outlined in section 5.4. More detailed analysis of each of these drivers is outlined in appendix B.

5.3 Our assessment approach

We must determine whether Essential's proposal reasonably reflects the capex criteria set out in the NER.[10] We use various qualitative and quantitative assessment techniques to assess the different elements of Essential's proposal.

We must accept a distributor's proposal if we are satisfied that it reasonably reflects the capex criteria.[11] If we do not accept the business' proposed total forecast capex, the NER requires us to substitute an alternative estimate that we are satisfied reasonably reflects the capex criteria.[12]

In deciding whether Essential's proposed total capex forecast reasonably reflects the capex criteria, we must have regard to the capex factors.[13] The weight we placed on some capex factors relative to others is discussed in Appendix B, where we discuss how we came to our position.

More broadly, we also take into account the revenue and pricing principles set out in the NEL.[14] In particular, we take into account whether our overall capex forecast provides Essential with a reasonable opportunity to recover at least the efficient costs it incurs in:[15]

- providing direct control network services; and
- complying with its regulatory obligations and requirements.

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10 NER, cl. 6.5.7(c).
11 NER, cl. 6.5.7(c).
12 NER, cl. 6.12.1(3)(ii).
13 NER, cl. 6.5.7(e).
14 NEL, ss. 7A and 16(2).
15 NEL, s. 7A.

When assessing capex forecasts, we also consider that:

- the capex criteria relating to a prudent operator and efficient costs are complementary. Prudent and efficient expenditure reflects the lowest long-term cost to consumers for the most appropriate investment or activity required to achieve the expenditure objectives[16]
- past expenditure was sufficient for the distributor to manage and operate its network in previous periods, in a manner that achieved the capex objectives.[17]

5.3.1 Considerations in applying our assessment techniques

Appendix A outlines our assessment approach and appendix B details how we came to our position on Essential's capex forecast. In summary, some of these assessment techniques focus on total capex, while others focus on high-level, standardised sub-categories of capex. Importantly, while we may consider certain programs and projects in forming a view on the total capex forecast, we do not determine which programs or projects a distributor should or should not undertake.

This is consistent with our ex-ante incentive based regulatory framework. Our approach is based on approving an overall ex-ante revenue requirement that includes an assessment of what we find to be a prudent and efficient total capex forecast.[18] Once the ex-ante allowance is established, distributors are incentivised to provide services at the lowest possible cost because their returns are determined by the actual costs of providing services. If distributors reduce their costs to below the estimate of efficient costs, the savings are shared with consumers in future regulatory control periods.

This ex-ante incentive-based regulatory framework recognises that the distributor should have the flexibility to prioritise its capex program given its circumstances over the course of the regulatory control period. The distributor may need to undertake programs or projects that it did not anticipate during the distribution determination process. The distributor may also not need to complete some of the programs or projects it proposed during the forecast regulatory control period if circumstances change. We consider a prudent and efficient distributor would consider the changing environment throughout the regulatory control period and make decisions accordingly.

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16 AER, *Expenditure forecast assessment guideline for electricity distribution*, November 2013, pp. 8–9. The Australian Competition Tribunal has previously endorsed this approach: see : Application by Ergon Energy Corporation Limited (Non-system property capital expenditure) (No 4) [2010] ACompT 12; Application by Energy Australia and Others [2009] ACompT 8; Application by Ergon Energy Corporation Limited (Labour Cost Escalators) (No 3) [2010] ACompT 11; Application by DBNGP (WA) Transmission Pty Ltd (No 3) [2012] ACompT 14; Application by United Energy Distribution Pty Limited [2012] ACompT 1; Re: Application by ElectraNet Pty Limited (No 3) [2008] ACompT 3 ; Application by DBNGP (WA).

17 AER, *Expenditure forecast assessment guideline for electricity distribution*, November 2013, p. 9.

18 AEMC, *Economic Regulation of Network Service Providers, and Price and Revenue Regulation of Gas Services, Final Position Paper*, 29 November 2012, p. vii.

Therefore, recognising the interplay between the broader incentive framework and program and project investment considerations, when reviewing a capex forecast we use a combination of bottom-up and top-down assessment techniques. Assessment of the bottom-up build of forecasts including underlying assumptions is an informative way to establish whether the forecast capex at the program or project level is prudent and efficient. Many of the techniques we apply at this level encompass the capex factors that we are required to consider. However, we are also mindful that a narrow focus on only a bottom-up assessment may not itself provide sufficient evidence that the forecast is prudent and efficient. Bottom-up approaches tend to overstate required allowances, as they do not adequately account for interrelationships and synergies between programs, projects or areas of work.

Thus, we also review the prudency and efficiency of aggregate expenditure areas or the total capex forecast. Top-down analysis provides us with assurance that the entire expenditure program is prudent and efficient, and allows us to consider a distributor's total capex forecast. We use holistic assessment approaches that include a suite of techniques such as trend analysis, predictive modelling and detailed technical reviews. Consistent with our holistic approach, we take into account the various interrelationships between the total capex forecast and other components of a distributor's distribution determination, such as forecast opex and service target performance incentive scheme (STPIS) interactions.[19]

In the event a distributor does not justify that the proposed capex forecast reasonably reflects the capex criteria, we are required to determine a substitute estimate. We do so by applying our various assessment techniques. We then use our judgement to weigh the results of these techniques case-by-case, in light of all the relevant information available to us.

Broadly, we give greater weight to techniques that we consider are more robust in the particular circumstances of the assessment. By relying on several techniques, we ensure we consider a wide variety of information and take a holistic approach to assessing the distributor's capex forecast. Where our techniques involve the use of a consultant, its reports are considered when we form our draft decision position on total forecast capex.

Importantly, our decision on the total capex forecast does not limit a distributor's actual spending. We set the forecast at the level where the distributor has a reasonable opportunity to recover its efficient costs. As noted previously, a distributor may spend more or less on capex than the total forecast amount specified in our decision in response to unanticipated expenditure needs or changes.

The regulatory framework has a number of mechanisms to deal with these circumstances. Importantly, a distributor does not bear the full cost where unexpected events lead to overspending of the approved capex forecast. Rather, the distributor

[19] NEL, s. 16(1)(c).

bears 30 per cent of this cost if the expenditure is subsequently assessed to be prudent and efficient. Further, the pass through provisions provide a means for a distributor to pass on significant, unexpected capex to customers, where appropriate.[20]

Similarly, a distributor may spend less than the capex forecast because it has operated at a more efficient level than expected. In this case, the distributor will keep on average 30 per cent of this reduction over time, with the remaining benefits shared with its customers.

5.3.2 Safety and reliability considerations

Our position in this draft decision is that our approved capex forecast will provide for a prudent and efficient service provider in Essential's circumstances to maintain performance at the targets set out in the STPIS. Therefore, it is appropriate to apply the STPIS, as set out in attachment 10 – service target performance incentive scheme.

In particular, a capex allowance should not be set at a level such that Essential systematically under or over performs against its STPIS targets. More broadly, our analysis in appendix B outlines how our assessment techniques factor in network safety and reliability. Our draft decision on capex will allow Essential to maintain the safety, service quality and reliability of its network, consistent with its legislative obligations.

5.3.3 Interrelationships

In coming to a position on Essential's capex proposal, we have taken into account the various interrelationships between the total capex forecast and other constituent components of the determination, such as forecast opex and STPIS interactions.[21]

For some elements, such as capitalised overheads, we have considered the proposed capital expenditure in the context of total expenditure. For other elements, such as capability growth, we considered any opex-capex trade-offs to determine whether the capital expenditure will result in a net benefit to electricity customers. In particular, when assessing Essential's proposed ICT capex, and more broadly its strategic initiatives program, we have had regard to cost reductions identified by Essential across its opex and capex forecasts.

Essential has included within its opex forecast a negative opex step-change relating to the benefits of its capital expenditure on strategic initiatives investments. This step-change peaks in the final year, with a forecast opex reduction of $45 million. When compared with the most recent actual expenditure available (2016–17), by the end of the forthcoming regulatory control period Essential has forecast a 10 per cent reduction to operating expenditure because of its capital expenditure on strategic initiatives.[22]

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20 NER, cl. 6.6.1.

21 NEL, s. 16(1)(c).

22 Essential Energy, *Response to AER information request 007 - 007.1 Strategic Initiative 2*, 04 June 2018.

When assessing Essential's proposed LiDAR capex, we have considered the opex savings demonstrated by Essential through the reduced frequency of ground line levels inspections.[23]

5.4 Reasons for draft decision

We applied the assessment approach set out in section 5.3 to Essential. Our substitute estimate for Essential's capex for the 2019–24 regulatory control period, by capex driver, is set out in Table 5.3.

Table 5.3 – Draft decision by capex driver 2019–24 ($2018–19, million)

Category	2019–20	2020–21	2021–22	2022–23	2023–24	Total
Augmentation	39.9	34.1	29.1	30.6	29.5	163.3
Connections	93.4	93.3	93.2	93.3	93.3	466.5
Replacement	167.5	164.0	162.4	158.0	153.7	805.6
Non-network*	151.0	88.6	100.9	96.4	89.0	525.8
Capitalised overheads	137.5	122.5	115.6	111.5	111.7	598.8
Gross capex	**589.4**	**502.5**	**501.2**	**489.8**	**477.1**	**2559.9**
Less capital contributions^	(89.7)	(89.5)	(89.4)	(89.3)	(89.3)	(447.2)
Less disposals	(5.1)	(5.3)	(6.3)	(8.0)	(6.8)	(31.6)
Net capex	**494.5**	**407.7**	**405.5**	**392.4**	**381.0**	**2081.2**

Source: AER analysis.

Notes: * gross of disposals.

^ includes overheads. Forecast capital contributions for 2019–24 are $441.8 million excluding overheads.

Numbers may not add up due to rounding.

The reasons for our substitute estimate of $2081.2 million—which reflects Essential's initial capex proposal adjusted to amend the CPI escalation modelling error—are summarised below:

Augmentation:

- Essential has justified that its proposed augex forecast of $163.3 million ($2018–19), after the CPI escalation adjustment, forms part of a capex forecast that reasonably reflects the capex criteria.
- In coming to this view, we have utilised a number of assessment approaches including trend analysis, forecast peak load, asset utilisation rates and project business cases, and have received advice from engineering and technical experts.

[23] Essential Energy, *Response to AER Information Request 004 - 004.24 Est Aerial Inspect Value*, 28 May 2018.

Connections and capital contributions:

- Essential has demonstrated that its proposed net connections capex forecast of $24.7 million ($2018–19), after the CPI escalation adjustment, forms part of a capex forecast that reasonably reflects the capex criteria.
- Essential's forecast is substantially lower than the expected expenditure for the current regulatory control period, reflecting planned capital efficiency and an expected decrease in new connections volumes.

Replacement:

- Essential has established that its proposed repex forecast of $805.6 million ($2018–19), after the CPI escalation adjustment, forms part of a capex forecast that reasonably reflects the capex criteria.
- Our trend analysis shows that Essential's repex forecast is below its actual spend in the current period of $862 million ($2018–19). In addition, Essential has incorporated savings into its repex forecast due to its strategic initiative investments.
- Our bottom-up analysis raises some concerns with forecast repex for pole top structures; however, this does not change our position on Essential's forecast capex overall.

Non-network:

- Essential has justified that its proposed non-network capex forecast of $494.2 million ($2018–19), after the CPI escalation adjustment, forms part of a total capex forecast that reasonably reflects the capex criteria.
- Essential has incorporated savings through its strategic initiative investments into its regulatory proposal.
- Essential has not demonstrated that some elements of its buildings and property capex forms part of a total capex forecast that reasonably reflects the capex criteria; however, this does not change our position on Essential's forecast capex overall.

Capitalised overheads:

- Essential's proposed capitalised overheads forecast of $593.4 million ($2018–19), or $598.8 million including overheads relating to capital contributions, forms part of a capex forecast that reasonably reflects the capex criteria.
- Essential’s forecasting methodology is well set out and is in line with its cost allocation method. It has identified and explained expected cost drivers and has incorporated expected cost savings achieved through Essential’s strategic initiative investments.

A Assessment techniques

This appendix describes the approaches we applied in assessing whether Essential's total capex forecast reasonably reflects the capex criteria. Appendix B sets out in greater detail the extent to which we relied on each of these techniques.

The techniques that we apply in capex are necessarily different from those we apply when assessing opex. This is reflective of differences in the nature of the expenditures that distributors propose. We outline this in the Expenditure Assessment Guideline.[24]

A.1 Trend analysis

We consider past trends in actual and forecast capex as this is one of the capex factors.[25] We also consider trends at the asset category level to inform our view on the prudency and efficiency of a distributor's capex forecast.

Trend analysis involves comparing a distributor's forecast capex and volumes against historical levels. Where forecast capex and volumes are materially different to historical levels, we seek to understand the reasons. In doing so, we consider the reasons the distributor provides in its initial proposal, as well as any potential changing circumstances.

In considering whether the total capex forecast reasonably reflects the capex criteria, we need to consider whether the forecast will allow the distributor to meet expected demand and comply with relevant regulatory obligations.[26] Demand and regulatory obligations (specifically service standards) are key capex drivers. More onerous standards or growth in maximum demand will increase capex. Conversely, reduced service obligations or a decline in demand will likely cause a reduction in the capex the distributor requires.

Maximum demand is a key driver of augmentation or demand-driven expenditure. Augmentation (augex) often needs to occur prior to demand growth being realised. Forecast demand, rather than actual demand, is therefore most relevant when a distributor is deciding the augmentation projects it will require in the forecast regulatory control period. However, a distributor should continually reassess project needs over time as new information about population growth and energy usage becomes available. Growth in a distributor's network will also drive connections-related capex. For these reasons, it is important to consider how capex trends, particularly for augex and connections, compare with demand and customer number trends.

There is generally a lag between when capex is undertaken or not and when a distributor's service improves or declines. This is important when considering the

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24 AER, *Better regulation: Expenditure forecasting assessment guideline*, November 2013, p. 8.

25 NER, cl. 6.5.7(e)(5).

26 NER, cl. 6.5.7(a)(3).

expected change in service levels following an increase or decrease in capex. It is also relevant to consider when service standards have changed and how this has affected the distributor's capex requirements.

For the three distributors in NSW, an amendment to the licence conditions came into effect on 1 July 2014.[27] This amendment removed the design planning requirements that imposed a particular standard on the design and planning of the network. Without these requirements, distributors should only undertake capex where the benefits outweigh the costs. We have had regard to this change when undertaking our trend analysis.

We analysed capex trends across a range of levels including at the total capex level and the category level (e.g. augex, connections and repex). We also compared these with demand trends and any relevant changes in service standards.

A.2 Category analysis

Expenditure category analysis allows us to compare expenditure across distributors, and over time, for various levels of capex. The comparisons we analyse include:

- overall costs within each category of capex;
- unit costs across a range of activities;
- volumes across a range of activities; and
- expected asset lives across a range of repex asset categories.

Using standardised reporting templates, we collect data on augex, repex, connections, non-network capex, overheads and demand for all distributors in the NEM. Using standardised category data allows us to make direct comparisons across distributors. Standardised category data also allows us to identify and scrutinise different operating and environmental factors that affect the amount and cost of works that distributors incur and how these factors may change over time.

A.3 Predictive modelling

Background

Our repex model is a statistical based model that forecasts asset replacement capex (repex) for various asset categories based on their condition (using age as a proxy), unit costs and expected asset replacement lives. We only use the repex model to assess forecast repex that can be modelled. This typically includes high-volume, low-value asset categories and generally represents a significant component of total forecast repex.

[27] For more information, refer to https://www.ipart.nsw.gov.au/files/sharedassets/website/trimholdingbay/electricity_-_regulatory_instruments_-_dnsp_conditions_14_-_19_-_july_2014.pdf.

The repex model forecasts the volume of assets in each category that a distributor would expect to replace over a 20-year period. The model analyses the age of assets already in commission and the time at which, on average, these assets would be expected to be replaced, based on historical replacement practices. We refer to this as the calibrated expected asset replacement life. We derive a total replacement expenditure forecast by multiplying the forecast replacement volumes for each asset category by an indicative unit cost.

We can use the repex model to advise and inform us where to target a more detailed bottom-up review and assist us to define a substitute estimate if necessary. We can also use the model to compare a distributor against other distributors in the National Electricity Market (NEM)[28]. We have also had regard to feedback from distributors on some of the underlying assumptions and modelling techniques throughout our ongoing engagement during both the pre-proposal and proposal stages.

Scenario analysis

Our repex modelling approach analyses four scenarios that consider both a distributor's historical replacement practices and the replacement practices of other distributors in the NEM. The current approach builds on our assessment in previous determinations by considering intra-industry comparative analysis for unit costs and expected asset replacement lives. The four scenarios analysed are:

1. historical unit costs and calibrated expected replacement lives (**Historical Performance Scenario**)
2. comparative unit costs and calibrated expected replacement lives (**Cost Scenario**)
3. historical unit costs and comparative expected replacement lives (**Expected Lives Scenario**)
4. comparative unit costs and comparative expected replacement lives. (**Combined Scenario)**.

Comparative unit costs are the minimum of a distributor's historical unit costs, its forecast unit costs and the median unit costs across the NEM. Comparative replacement lives are the maximum of a distributor's calibrated expected replacement life and the median expected replacement life across the NEM.

The 'cost, lives and combined' scenarios rely on a comparative analysis technique that compares the performance of all distributors in the NEM. The technique analyses the two variable repex model inputs – unit costs and expected replacement lives.

The 'cost scenario' analyses the level of repex a distributor could achieve if its historical unit costs were improved to comparative unit costs. The 'lives scenario' analyses the level of repex a distributor could achieve if its calibrated expected replacement lives were improved to comparative expected replacement lives.

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[28] This includes Power and Water Corporation.

Previous distribution determinations where we have used the repex model have primarily focused on the 'historical scenario'. This scenario forecasts a distributor's expected repex and replacement volumes based on its historical unit costs and asset replacement practices (which are used to derive expected replacement lives).

Repex model threshold

Our 'repex model threshold' is defined taking these results and other relevant factors into consideration. For the 2019–24 determinations, our approach is to set the repex model threshold equal to the highest result out of the 'cost scenario' and the 'lives scenario'.[29]

This approach considers the inherent interrelationship between the unit cost and expected replacement life of network assets. For example, a distributor may have higher unit costs than other distributors for particular assets, but these assets may in turn have longer expected replacement lives. In contrast, a distributor may have lower unit costs than other distributors for particular assets, but these assets may have shorter expected replacement lives. Further details about our repex model are outlined in appendix D.

A.4 Assessment of bottom-up and top-down methodologies

In assessing whether Essential's capex forecast is prudent and efficient, we examined the forecasting methodology and underlying assumptions used to derive its forecast. In particular, some of the evidence that we can use to evaluate the prudency and efficiency of a bottom-up forecast at the program or project level is:

- identifying and quantifying all reasonable options in a cost-benefit analysis, including deferral or 'do nothing' scenarios;
- cost-benefit analysis that incorporates a proper quantified risk assessment, where the most beneficial program or project is selected, or clear and justified reasoning as to why another option was chosen; and
- reasons to support the expenditure timing for the forecast regulatory control period, particularly if the expenditure may have been deferred in previous regulatory control periods.
- Our industry practice application note[30], which relates to asset replacement planning, aims to assist network businesses with this bottom-up forecast. The final industry practice application note will be published in late November 2018. We

[29] Our modelling approach means the 'historical scenario' will always be higher than the 'cost scenario' and the 'lives scenario', and the 'combined scenario' will always be lower than the 'cost scenario' and the 'lives scenario'.

[30] For more information, refer to https://www.aer.gov.au/networks-pipelines/guidelines-schemes-models-reviews/industry-practice-application-note-for-asset-replacement-planning.

therefore encourage Essential to have regard to the final application note and the consultation process in its revised proposal.

The industry practice application note does not replace published guidelines. Rather, it supplements the guidelines by outlining principles and approaches that accord with good industry practice, asset management strategies and risk management practices. Good asset management and risk management practices are often aligned with international standards of practice, such as ISO 55000 for asset management and ISO 31000 for risk management. These practices and approaches are consistent with what we have considered in previous decisions, and the industry practice application note helps to articulate these practices and approaches.

In addition to a bottom-up build, a holistic and strategic consideration or assessment of the entire forecast capex portfolio would be evidence that some discipline has been applied at the top-down level. In particular, a top-down assessment would give us confidence that:

- the bottom-up builds have been subject to overall checks against business governance and risk management arrangements;
- synergies between programs or projects have been identified, which may reduce the need for, scope or cost of some programs or projects over the forecast regulatory control period;
- subjectivity from the bottom-up forecasts has been addressed; and
- the timing and prioritisation of capital programs and projects have been determined over both the short and long term, such that delivery strategy has been considered.

A.5 Economic benchmarking

Economic benchmarking is one of the key outputs of our annual benchmarking report.[31] The NER require us to have regard to the annual benchmarking report, as it is one of the capex factors.[32] Economic benchmarking applies economic theory to measure the efficiency of a distributor's use of inputs to produce outputs, having regard to the operating environment and network characteristics.[33]

Economic benchmarking allows us to compare the performance of a distributor against its own past performance and the performance of other distributors. It also helps to assess whether a distributor's capex forecast represents efficient costs.[34] The AEMC stated:

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31 AER, *Annual benchmarking report: Electricity distribution network service providers*, December 2017.

32 NER, cl. 6.5.7(e)(4).

33 AER, *Better regulation: Expenditure forecasting assessment guideline*, November 2013, p. 78.

34 NER, cl. 6.5.7(c).

> "Benchmarking is a critical exercise in assessing the efficiency of a distributor".[35]

Several economic benchmarks from the annual benchmarking report are relevant to our capex assessment. These include measures of total cost efficiency and overall capex efficiency. In general, these measures calculate a distributor's efficiency with consideration given to its inputs, outputs and its operating environment.

We consider each distributor's operating environment in so far as there are factors outside of a distributor's control that affect its ability to convert inputs into outputs.[36] Once we consider these exogenous factors, we expect distributors to operate at similar efficiency levels. One example of an exogenous factor we consider is customer density.

A.6 Other assessment factors

We considered several other factors when assessing Essential's total capex forecast. These factors included:

- safety and reliability statistics (SAIDI and SAIFI[37]);
- internal technical and engineering review;
- external consultant review;
- submissions made by various stakeholders; and
- other information provided by Essential.

[35] AEMC, *Final rule determination: National electricity amendment (Economic regulation of network service providers) Rule 2012*, November 2012, p. 25.

[36] AEMC, *Final rule determination: National electricity amendment (Economic regulation of network service providers) Rule 2012*, November 2012, p. 113. Exogenous factors could include geographic, customer, network and jurisdictional factors.

[37] System average interruption duration index and system average interruption frequency index.

B Assessment of capex drivers

This appendix outlines our detailed analysis of the categories of Essential's capex forecast for the 2019–24 regulatory control period. These categories are augmentation capex (augex), customer connections capex, replacement capex (repex), capitalised overheads and non-network capex.

As we discuss in the capex attachment, Essential has justified that its proposed total capex forecast (after we make the CPI escalation adjustment) reasonably reflects the capex criteria. In this appendix, we set out further analysis in support of this view. In coming to our position, we applied the assessment techniques outlined in appendix A.

This appendix sets out our findings and views on each capex category. The structure of this appendix is:

- Section B.1: forecast augex
- Section B.2: forecast customer connections capex, including capital contributions
- Section B.3: forecast repex
- Section B.4: forecast non-network capex
- Section B.5: forecast capitalised overheads.

In each of these sections, we explain why the forecast amount of capex contributes to an overall capex proposal that reasonably reflects the capex criteria.

B.1 Forecast augex

Network augmentation capex (augex) is directed at increasing the capacity of the existing network to meet the demand of existing and future customers. It can also be triggered by the need to upgrade the network to comply with quality, safety, reliability and security of supply requirements.

B.1.1 Essential's proposal

Essential has proposed forecast augex of $166.1 million ($2018–19). The proposal includes:

- $92.2 million for distribution level augmentation, driven by growth in customer numbers and the need to manage risks associated with pre-existing network voltage and thermal constraints.[38]

[38] Essential Energy, *Supporting document 12.1.8 - Distribution network growth strategy*, April 2018, pp. 51–52. Note that $92.2 million is calculated from the $113.6 million reported in Table 15 less the $24.2 million for new customer connections.

- $18.8 million for power quality augmentation, to supplement existing reactive measures with an increase in the proactive identification of power quality issues.[39]
- $6.5 million for the proposed traffic Blackspot Program, targeting the movement of those power poles that are at a high risk of being involved in a vehicle accident.[40]
- $48.6 million for other augmentation projects.

CPI escalation adjustment

As discussed in section 5.1 we have identified a CPI escalation error in Essential's capex model which has slightly overstated Essential's forecast in real 2018–19 dollars. We have rectified this error in consultation with Essential.

The adjustment has the effect of reducing the forecast for augex by $2.8 million ($2018–19), or 2 per cent, to $163.3 million.

B.1.2 Position

We are satisfied that Essential's forecast augex of $163.3 million ($2018–19), after CPI escalation adjustment, forms part of a total capex forecast that reasonably reflects the capex criteria. In coming to this view, we have assessed:

- trend analysis comparing recent actual and forecast expenditure
- the forecast peak load on Essential's network
- the utilisation rates of Essential's assets
- the project documentation accompanying Essential's proposal and any further information provided by Essential
- advice from engineering/technical experts.

Table 5.4 summaries Essential's proposal and our alternative amounts for augex.

[39] Essential Energy, *Supporting document 12.1.6 - Network power quality strategy*, April 2018, p. 5.

[40] Essential Energy, *2019–24 Regulatory Proposal*, April 2018, p. 68.

Table 5.4 – Draft decision on Essential's total forecast augex ($2018–19, million)

	2019–20	2020–21	2021–22	2022–23	2023–24	Total
Initial regulatory proposal	40.6	34.7	29.6	31.2	30.0	166.1
Draft decision	39.9	34.1	29.1	30.6	29.5	163.3
Total difference b/w our draft decision and initial regulatory proposal	-0.7	-0.6	-0.5	-0.6	-0.5	-2.8
Percentage difference b/w our draft decision and initial regulatory proposal (%)	-1.7%	-1.8%	-1.6%	-1.8%	1.7%-	-1.7%

Source: Essential Energy, *Reset RIN*, April 2018; AER analysis.

Note: Numbers may not add up due to rounding.

Our findings are:

- Essential has established that its proposed augex forms part of a capex forecast that reasonably reflects the capex criteria.
- Essential's adjusted forecast augex of $163.3 million is significantly lower than actual/estimated expenditure of $405.8 million over the 2014–19 regulatory control period. Further, the proposed augex is lower on an annualised basis than for any year which we have data available, going back to 2001–02.
- Essential has justified its proposal and supporting evidence for proposed expenditure on distribution level augmentation, power quality augmentation, and for specific augmentation projects. Essential has forecast a decrease in expenditure relative to 2014–19 levels across each of these categories. Further, Essential has justified the sub-programs within these categories where expenditure is forecast to increase.
- Essential has not shown that its proposed traffic Black Spot program is required to achieve the capex objectives. Specifically, Essential has not identified the legislative requirements that compel it to undertake the program. However, this does not change our position on Essential's capex forecast overall.

B.1.3 Reasons for our position

In coming to our position, we have considered the trend of historical and forecast expenditure, the accompanying demand forecast and asset utilisation.

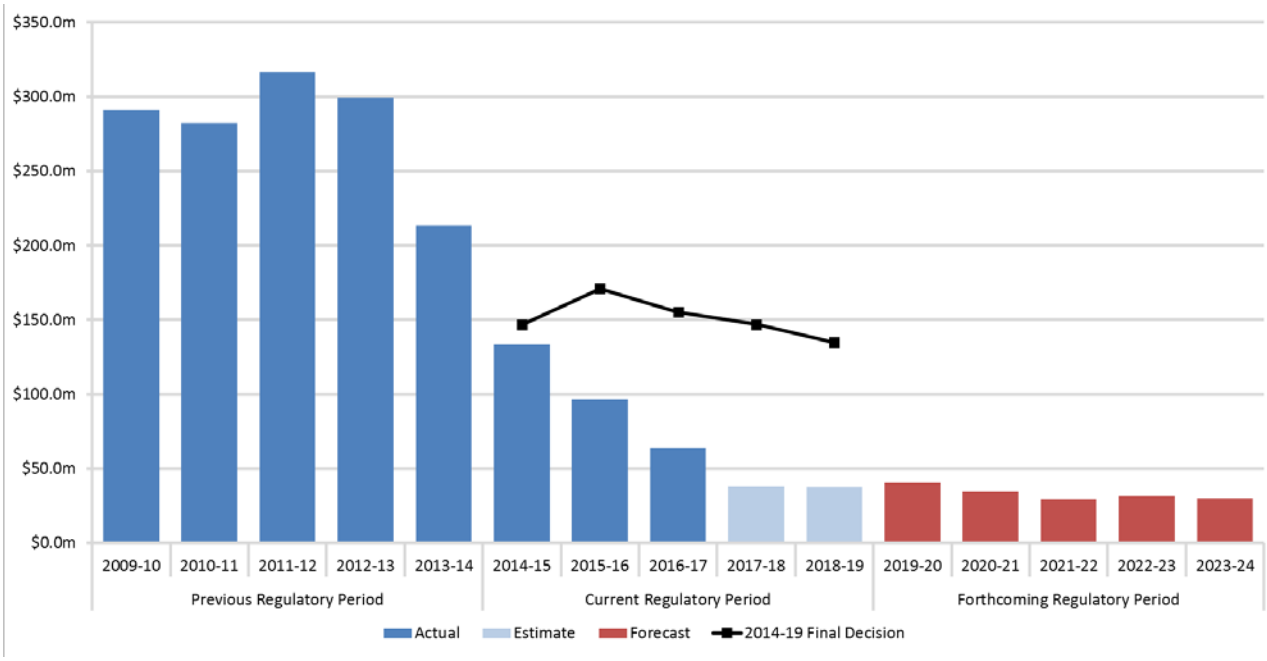
We then focused on the project documentation accompanying Essential's proposal and any further information Essential provided on its network and secondary systems projects.

Trend analysis

The NER require that we consider the actual and expected capital expenditure during any preceding regulatory control period.[41] We use trend analysis to gauge how Essential's historical actual augex compares with its expected augex for the 2019–24 regulatory control period.

Figure 5.2 shows Essential's actual/estimated augex from 2009–10 to 2018–19 and its forecast augex for the 2019–24 regulatory control period, and the final decision allowance for the 2014–19 regulatory control period. Essential has forecast a decrease in augex in the 2019–24 regulatory control period. Average annual augex is forecast to decrease from $73.9 million per annum in the 2014–19 regulatory control period to $33.2 million in the 2019–24 regulatory control period. Over the 2014–19 period, Essential expects to underspend the allowance of $754.8 million by $385.2 million, or 51 per cent.

Figure 5.2 – Essential's historical and forecast augex ($2018–19, million)



Source: Essential Energy, *RIN responses* and AER, *Essential 2014–19 Final Decision capex model*.

The evidence also shows that Essential's proposed annual average growth capex (augmentation plus net connections)[42] is lower than for any year which we have data available, going back to 2001–02.[43]

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41 NER, cl.6.5.7(e)(5)

42 Augmentation is a significantly larger proportion of Essential's growth capex than net expenditure on connections.

43 AER analysis, sourcing 2001–02 to 2002–03 growth capex figures from Country Energy, *Country Energy's regulatory proposal 2009–2014*, June 2008, p. 69.

We recognise that the reduction in forecast augex reflects in part the impact of Essential's proposed strategic initiatives investments, as outlined in its Delivering Value chapter of the regulatory proposal.[44] Essential has indicated that $22 million of the decrease in augex is due to forecast savings through its strategic initiatives investments.[45] We consider the IT costs associated with the strategic initiatives in section B.4.7.1.

Essential has proposed a significant decrease in average annual augex in 2019–24 compared with the current regulatory control period. While this relative decrease by itself is not enough for us to determine whether a distributor's proposed augex is prudent and efficient, the trend analysis supports our view that Essential's forecast augex forms part of a total capex forecast that reasonably reflects the capex criteria.

Demand forecast

Peak demand is a fundamental driver of a distributor's forecast augex. Essential must deliver electricity to its customers and build, operate and maintain its network to manage expected changes in demand for electricity. We have considered Essential's peak demand forecast relative to the Australian Energy Market Operator's (AEMO) independent forecast of peak demand on Essential's network.

In summary, Essential's system peak demand forecasts are reasonable. It forecasts annual peak demand growth to be positive in both the summer and winter periods between 2015–16 and 2023–24, at 0.1 and 0.6 per cent, respectively. AEMO forecasts a higher rate of peak demand growth in winter, but in contrast, forecasts summer peak demand to be negative. Essential's forecast of marginal system peak demand growth indicates that forecast demand-driven augmentation should be significantly lower than historical levels, addressing only localised peak demand pressures that are forecast to arise.

Our review of the peak demand forecasts is outlined in Appendix E.

Asset utilisation

To examine the impact of a maximum demand forecast on the need for network augmentation, we have looked at network utilisation. Network utilisation is a measure of the installed network capacity that is, or is forecast to be, in use. Where utilisation rates decline over time (such as from a decline in maximum demand), it is expected that total augex requirements would similarly fall.

Figure 5.3 shows Essential's zone substation utilisation between 2013–14 and 2017–18, and forecast utilisation in 2023–24 (at the end of the regulatory control period). Over the three separate years, there is no significant shift in the average utilisation rate of the asset population, and the number of zone substations above 60 per cent

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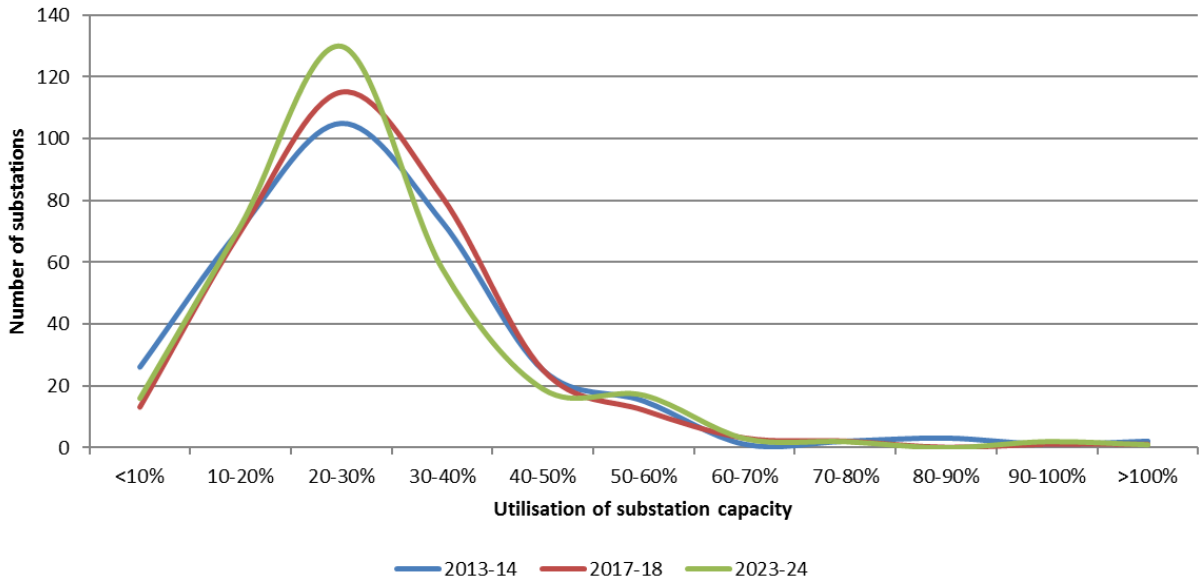
44 Essential Energy, *2019–24 Regulatory Proposal*, April 2018, pp. 31–34.

45 Essential Energy, *Response to AER information request 007 - 007.1 Strategic Initiative 2*, 04 June 2018.

utilisation remains roughly constant. The forecast indicates that demand-driven augmentation should not be expected for assets at the zone substation level.

Figure 5.3 – Essential's zone substation utilisation 2013–14 and 2017–18 actual, and 2023–24 forecast



Source: AER analysis and Essential Energy, *Reset RIN*.

Note: Utilisation rates are based on 'substation normal cyclic' zone substation capacities.

Taken together with Essential's forecast of marginal demand growth, this suggests there is sufficient capacity in most areas of its network, such that significant investment should not be required.

Review of augmentation components

We reviewed the components of Essential's proposed augmentation program, in the context of the 2019–24 proposal being significantly lower than actual/estimated levels for the 2014–19 period. As such, the focus for our review was to understand the trend in the components of the overall proposal, and to understand reasons for expenditure increases (if any).

Distribution level augex

Essential has proposed distribution level augex of $92.2 million ($2018–19), which is the largest individual component of its augmentation proposal. The proposed augex is 17 per cent lower than the expected capex over the current period ($99.2 million compared with $119 million, including overheads). We asked Essential about the

drivers of distribution level augmentation and how these were expected to change for the 2019–24 period. It explained:[46]

> Essential Energy is implementing large reductions in augmentation expenditure across the board, from close to $40 million in 14–15 down to approximately $20 million in 19–20. Within the augmentation programs material decreases exist in voltage and thermal constraint augmentation. Comparatively minor uplifts in network monitoring expenditure will provide much more information on network voltages and currents which will allow Essential to run the network harder, enabling the reductions to augmentation capital outlined and committed within our strategic initiatives.

We further questioned Essential regarding how the expected benefits of the network monitoring expenditure were accounted for in its regulatory proposal. It explained that the monitors are an enabler of a number of process improvements.[47] It is not clear which of the proposed investments of its strategic initiatives specifically includes an allowance for network monitoring; however, we accept Essential's position that the monitors enable other process improvements. Essential's forecast strategic initiatives benefits still considerably outweigh the expected costs, even if the costs for network monitoring are included.

Power quality augex

Essential has proposed power quality (PQ) augex of $18.8 million ($2018–19). The proposed augex is 3 per cent lower than the corresponding amount over the current period of $19.3 million. We asked Essential about the drivers of PQ augmentation and how these were expected to change in the 2019–24 period. It explained:[48]

> Within the overall power quality network strategy there has been a reprioritisation of expenditure due to the large growth in investment required to remediate areas of existing sub transmission network to a level of harmonic emissions within the planning standards required to manage our compliance obligations and facilitate network connections. This new investment in PQ Mitigation Equipment Installation is linked to the program of zone substation power quality monitoring which commenced in 2015/16 to ensure existing background levels, of harmonic emissions particularly, are in line with our compliance obligations.

Essential's historical expenditure on PQ augmentation is a reasonable indicator of likely expenditure in the 2019–24 period. Further, we recognise the reprioritisation of expenditure, with the increase in expenditure in PQ mitigation equipment being offset by lower expenditure on substation PQ augmentation.

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46 Essential Energy, *Response to information request 004*, 28 May 2018, p. 11.

47 Essential Energy, *Response to information request 022*, 18 July 2018, p. 1.

48 Essential Energy, *Response to information request 001*, 17 May 2018, p. 2.

Traffic Black Spot Program

Essential has not demonstrated that its proposed augex for its traffic Black Spot Program forms part of a capex forecast that reasonably reflects the capex criteria. It proposed $6.5 million ($2018–19) to move poles in specific areas to reduce traffic accidents, and cited its customers' support for the program.[49] In the Essential decision for the 2014–19 regulatory control period, we did not include this program in our alternative forecast. We considered the program was focused on improving road safety rather than maintaining network safety or complying with network reliability requirements, and was therefore not required to achieve the capex objectives.[50] We continue to hold the view that the traffic Black Spot program does not reasonably reflect the costs that a prudent operator, acting efficiently, would require to achieve the capex objectives.

For this review, we asked Essential about the compliance drivers for the program. Essential explained that it has duty under the Workplace Health and Safety (WHS) Act to eliminate risks to health and safety.[51] However, it did not specify which sections of the WHS Act were relevant. Therefore, Essential has not justified that it has an obligation to undertake the program to reduce traffic accidents.

While road safety is important for the community, it is not the sole responsibility of the electricity distributor and electricity customers to fund programs to increase road safety. Essential explained that if risk arose through actions taken by other parties (e.g. NSW Roads and Maritime Services (RMS)) it would seek to ensure the costs are passed on, however:[52]

> The reactive nature of this program targeting existing roads and poles identified as blackspot locations does not allow for costs associated with these particular projects to be passed on to councils or RMS. This program is only dealing with poles where there is no way to pass on the costs, yet there is still an obligation on Essential to address the identified safety risk.

Essential has not justified why electricity customers should have to bear these costs and how it is required to achieve the capex objectives.

Other augmentation

The remaining $48.6 million of proposed augex covers specific augmentation projects and smaller augmentation programs. We reviewed Essential's application of risk assessments in its planning and investment decision process, due to concerns we

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49 Essential Energy, *2019–24 Regulatory Proposal*, April 2018, p. 68.

50 AER, *2014–19 Final decision Essential Energy distribution determination - Attachment 6 – Capital Expenditure*, April 2015, p. 79.

51 Essential Energy, *Response to information request 004*, 28 May 2018, p. 14.

52 Essential Energy, *Response to information request 004*, 28 May 2018, p. 14.

raised about the practices in the decision for the 2014–19 regulatory control period.[53] In particular, risk assessments had not been common practice in Essential's planning processes and were overly conservative when applied, overstating the amount of work required.

Essential's current approach to risk assessment is reasonable. Essential applies an appropriate methodology to value the risk of energy unserved, and considers a range of options to address the risk. This view is supported by our consultant Arup, which considers that Essential has followed a reasonable methodology in its options development.[54] Essential does not appear to formally consider non-network options for all augmentation projects, suggesting there is room for improvement to its augmentation program.[55]

B.2 Forecast customer connections capex

Connections capex is expenditure incurred to connect new customers to the network and, where necessary, augment the shared network to ensure there is sufficient capacity to meet the new customer demand.

The contestability framework in New South Wales (NSW) allows customers to choose their own accredited service provider and negotiate efficient prices for connection services. Given the competition between service providers, we do not regulate the majority of connection services in NSW. However, some connection works that involve augmenting and extending the shared network to connect new customers are regulated and funded by all customers. These works are referred to as net connections capex.

In NSW, the majority of capital contributions are made up of the value of assets constructed by third parties, which are then gifted to Essential to be operated and maintained. In some cases, Essential requires payments for connection works that are not contestable. These contributions are subtracted from total gross capex and, as such, decrease the revenue that is recovered from all customers.

B.2.1 Essential's proposal

Essential proposed $466.9 million ($2018–19) for connections capex for the 2019–24 regulatory control period. The forecast is $138.4 million—or 23 percent—lower than its actual/estimated connections expenditure of $605.3 million in 2014–19.[56]

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53 AER, *Final decision Essential Energy distribution determination 2015–16 to 2018–19: Attachment 6 – Capital Expenditure*, April 2015, pp. 55–56.

54 Arup, Review of Essential Energy's past and forecast capital expenditure for the 2019/24 regulatory control period, October 2018, pp. 68–75.

55 For example, the options report for Googong Town zone substation - second transformer (Supporting Document 12.1.15e), does not indicate any consideration of potential non-network solutions.

56 Essential Energy, *Reset RIN* (2019–24) and *response to information request 031* (2014–19), 15 August 2018. Expenditure for 2014–19 is derived from historic project information. This provides a more complete account of connections works compared with the information provided in the category analysis RINs.

Essential's forecast connections capex includes:

- net expenditure (costs incurred by Essential) of $25.1 million
- capital contributions of $441.8 million.

Net connections capex for the 2019–24 regulatory control period is 42 per cent lower than actual/estimated expenditure of $43.2 million in 2014–19. Only net connections capex is rolled into the regulatory asset base.

CPI escalation adjustment

As discussed in section 5.1 we have identified a CPI escalation error in Essential's capex model which has slightly overstated Essential's forecast in real 2018–19 dollars. We have rectified this error in consultation with Essential.

The adjustment has the effect of reducing the forecast for net connections capex by $0.4 million to $466.5 million ($2018–19).[57]

B.2.2 Position

Essential has justified its proposed connections capex of $466.5 million ($2018–19, excluding overheads), after CPI escalation adjustment. This forecast forms part of a total capex forecast that reasonably reflects the capex criteria. Table 5.5 summarises Essential's proposed connections capex for 2019–24.

[57] Forecast capital contributions were not affected by the CPI escalation adjustment. The CPI error in Essential's model only affected Essential's forecast for net direct capex and LiDAR.

Table 5.5 – Essential's proposed connections capex for 2019–24 ($2018–19, million)

	2019–20	2020–21	2021–22	2022–23	2023–24	Total
Essential gross connections capex (initial regulatory proposal)	93.4	93.4	93.4	93.4	93.4	466.9
Net connections capex	*5.0*	*5.0*	*5.0*	*5.0*	*5.1*	*25.1*
Capital contributions	*88.5*	*88.4*	*88.3*	*88.3*	*88.3*	*441.8*
Draft decision gross connections capex	93.4	93.3	93.2	93.3	93.3	466.5
Net connections capex	*4.9*	*4.9*	*4.9*	*5.0*	*5.0*	*24.7*
Capital contributions	*88.5*	*88.4*	*88.3*	*88.3*	*88.3*	*441.8*
Difference—gross connections capex	-0.0	-0.1	-0.2	-0.1	-0.1	-0.4
Percentage difference—gross connections capex	-0.0%	-0.1%	-0.2%	-0.1%	-0.1%	-0.1%

Source: AER analysis and Essential Energy, *Reset RIN*.

B.2.3 Reasons for our position

In coming to our position, we have looked at Essential's methodology, historical costs, trends and expected customer growth. We have also looked at Essential's forecast capital contributions and its proposed connection policy.[58]

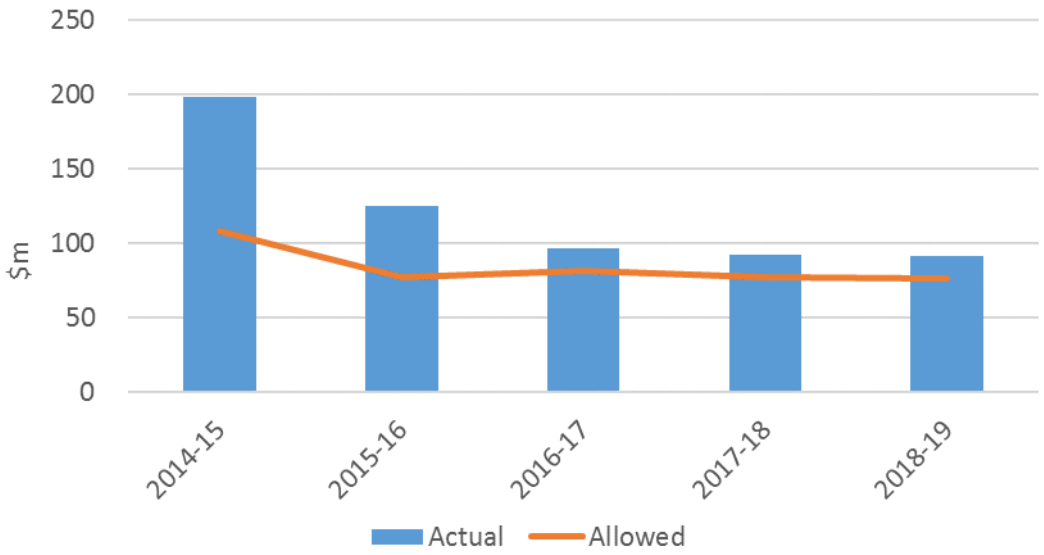
Connections capex in 2014–19

Figure 5.4 compares Essential's 2014–19 actual/estimated gross connections capex with our final determination allowance. Essential estimates connections capex of $605.3 million in 2014–19. This is 44 per cent higher than our final determination allowance of $421.7 million.

Compared with our final determination allowance, Essential's actual/estimated net connections capex are 35 per cent higher, and capital contributions 44 per cent higher, in the 2014–19 regulatory control period.

[58] Please refer to Attachment 17 of our draft decision for our assessment of Essential's proposed connection policy.

Figure 5.4 – Annual gross connections capex, actual/estimated expenditure compared with our final determination allowance, 2014–19 ($2018–19, million)

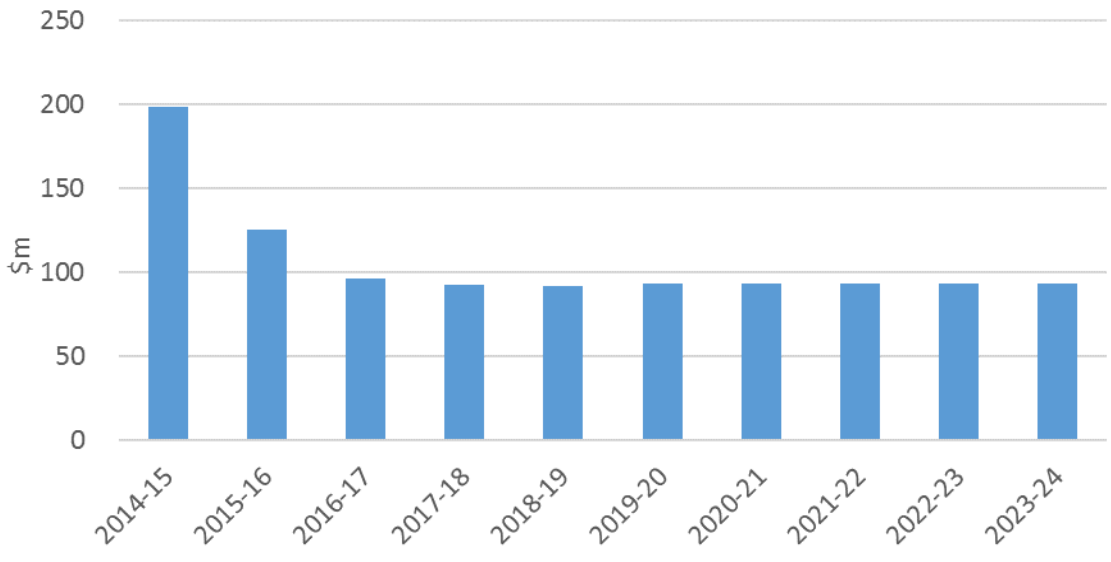


Source: Essential Energy and AER, *Essential Energy - Final Determination 2014–19*.

Forecast connection capex compared with current period

Figure 5.5 compares Essential's 2019–24 forecast gross connections capex (including capital contributions) with actual/estimated expenditure in 2014–19. Gross connections capex decreased from $199 million in 2014–15 to less than $100 million in 2016–17, and is expected to remain around this level through to 2023–24.

Figure 5.5 – Annual gross connections capex, 2014–15 to 2023–24 ($2018–19, million)

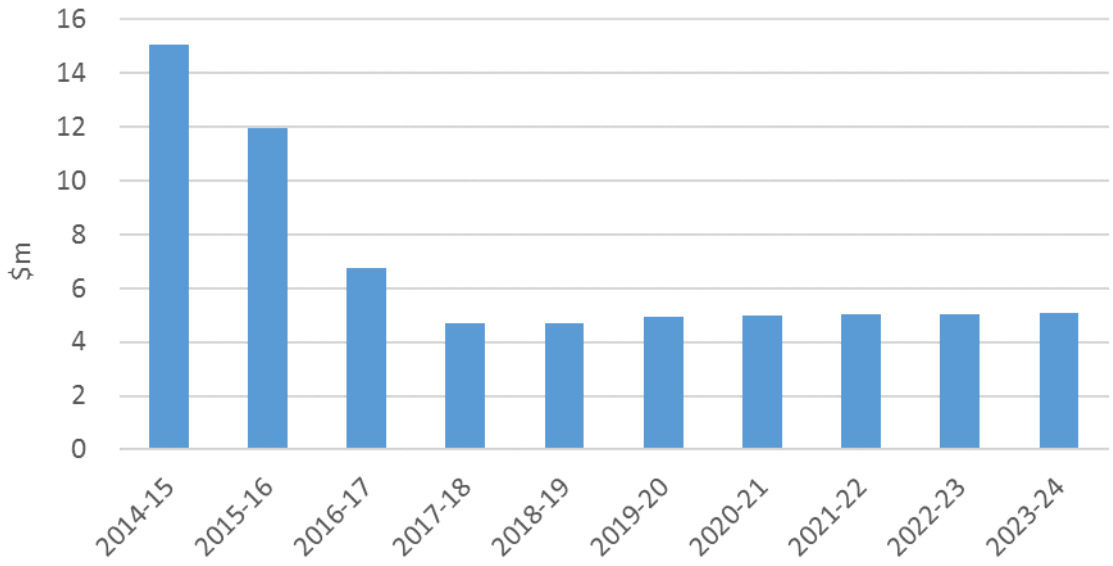


Source: Essential Energy, *Reset RIN* and *Response to information request 031*, 14 August 2018.

Net connections capex is expenditure incurred by Essential and is rolled into the regulatory asset base. Essential's 2019–24 forecast net connections capex (excluding capital contributions) compared with actual/estimated expenditure in 2014–19 is shown in Figure 5.6. The relatively high expenditure in the first two years of the current regulatory control period reflect, in part, the transition from the previous to the current connection policy which came into effect from July 2014.

Net connections capex decreased substantially between 2014–15 and 2016–17 and is expected to remain around these low levels through to 2023–24.

Figure 5.6 – Annual net connections capex, 2014–15 to 2023–24 ($2018–19, million)



Source: Essential Energy, *Reset RIN* and *Response to information request 031*, 14 August 2018.

In the 2019–24 regulatory control period net connections capex is expected to make up only 5 per cent of gross connections capex. Essential's proposed net connections capex is the lowest among the NSW distributors. This is because, in accordance with its connections policy, it requires customers to pay for connections works in most circumstances.

Our assessment of forecast connections capex

Essential forecasts net connections capex by taking the historic actual expenditure over the three years to 2016–17 as a starting point. Essential's forecast is primarily based on expenditure under its internal project code for growth—connections, which makes up the overwhelming majority of its forecast connections capex in 2019–24.

The historical average used as a starting point by Essential is around $9.5 million per year. As is the case for all of the capex program, this “historic average value was tempered based on planned businesses capital efficiency improvements and adjustments throughout [Essential’s] optimisation process.”[59]

Essential makes further revisions to the forecast. The historical average is further revised down to reflect the expected decrease in new connections volumes and to remove the effect of the previous connection policy on the historical expenditure.

Essential also notes that in arriving at its forecast expenditure it has had regard to voltage constraints, which puts upward pressure on costs per connection:

> "…there is substantial change from the historic norm in how much network capacity is required for new connections. Per connection, Essential now sees greater differences between high and low loads or positive and negative demand. This increased absolute spread of demand results in greater voltage variation and higher capacity requirements and expenditure per connection." [60]

Essential also includes expenditure for load control relays for new customers in its connections capex forecast. This is forecast based on historic actual expenditure over the three years to 2016–17, with a decreasing trend applied to reflect lower expected demand.[61] Forecast expenditure for load control relays is $0.9 million for 2019–24.

Essential’s forecast for net connections capex in 2019–24 is 42 per cent lower than actual/estimated net connections capex in the current 2014–19 regulatory control period. Average unit rates are lower than for the current regulatory control period and Essential's lower forecast reflects the expected decrease in demand in 2019–24. Overall, Essential’s approach produces a forecast for connections capex that is prudent and efficient and forms part of a total capex forecast that reasonably reflects the capex criteria.

New connection volumes

Figure 5.7 compares forecast number of new connections in the 2019–24 regulatory control period with actual/estimated connection numbers in 2014–19. Essential forecasts a decreasing number of new connections over the 2019–24. It forecasts an average of around 9300 new connections per year, which is 19 per cent lower than expected connection volumes for the current regulatory control period.

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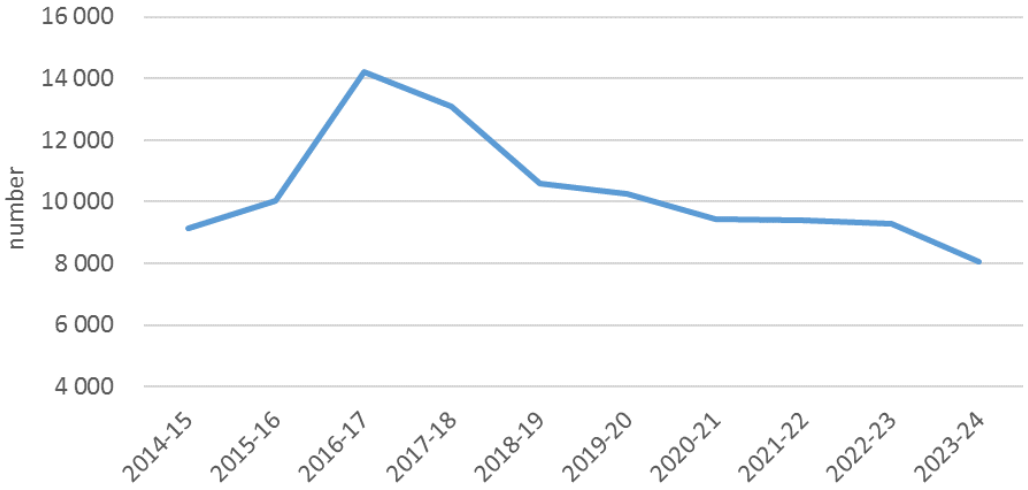
59 Essential Energy, *Response to information request 001*, 17 May 2018, p.4.

60 Essential Energy, *Response to information request 001*, 17 May 2018, p. 3.

61 Essential Energy, *Response to information request 014*, 22 June 2018, p.4.

Figure 5.7 – New connection numbers, 2014–15 to 2023–24



Source: Essential Energy, *RIN responses*.

Essential forecasts on average around 8160 residential connections and around 1140 commercial and industrial connections per year over 2019–24. Essential notes that the high number of connections in 2016–17 and 2017–18 reflect strong population growth in NSW from 2011–12 onwards.[62]

The forecast for new connections is based on Essential's customer number projections, which have been forecast by National Institute of Economic and Industry Research (NIEIR). Residential connection numbers are based on forecast dwelling commencements and completions. Business customer numbers are projected forward on a trend basis from average usage data for each tariff type.[63]

We consider that Essential's forecast for new customer connections in 2019–24 is reasonable and reflects the expected slow-down of population growth in regional NSW in the medium term.

Specific issues we raised with Essential

Increasing unit rates

We asked Essential to explain why implied unit rates (net connections capex divided by new connection numbers) were forecast to increase each year between 2019–20 and 2023–24. Essential responded that the connections expenditure forecasts are estimated separately to the annual volume forecasts, so it is not appropriate to make year-on-year comparisons.[64] We have examined Essential's approach of estimating

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62 Essential Energy, *Response to information request 001*, 17 May 2018, p. 5.

63 Essential Energy, *14.1 Electrical energy and customer number projections for Essential in New South Wales to 2029–30 - NIEIR - 20180430 – Public,* p. 32.

64 Essential Energy, *Response to information request 014*, 22 June 2018, p. 5.

these separately, and found that it has no material effect in Essential's proposed net connections expenditure or revenue requirements for the 2019–24 regulatory control period or any subsequent period.

Essential also noted that "it is reasonable to assume that unit rates will increase as connections are made with an increased absolute spread of demand and therefore greater voltage variation…network requirements and therefore capital expenditure are directly related to the total difference between minimum load and maximum load."[65]

Although implied unit rates are forecast to increase *within* the 2019–24 regulatory control period, overall the forecast average unit rates for 2019–24 are 34 per cent lower when compared with the current regulatory control period. This fact, together with the explanation that Essential has provided, justifies the increasing unit rates within the 2019–24 regulatory control period.

Reclassification of services

Essential notes that it proposes to reclassify some services that are non-contestable due to safety and reliability factors.[66] We asked for more information about these services and what effect these changes make to its net connections capex forecast.

Essential confirmed that its forecast net connections capex did not include any costs relating to these changes. It stated that the new service classification Connections under Chapter 5 of the NER will “allow for customers to be charged where work is deemed non-contestable and undertaken by the [distributor]. Essential does not believe that all customers should pay for these costs.”[67]

Essential explained that the majority of services to be reclassified are augmentation works to zone substations to connect large-load customers. The ability to charge applicants for this work is restricted following the introduction of Ring Fencing. Essential stated that under the current Classification of Services these costs would need to be included as standard control services. The changes are therefore necessary for Essential to continue charging applicants for these works.[68]

These changes are reasonable and in line with the causer-pays principles outlined in the NER.[69]

B.2.4 Capital contributions

Capital contributions include the value of assets constructed by third parties that are operated by Essential, and payments from customers who directly benefit from

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65 Essential Energy, *Response to information request 014*, 22 June 2018, p. 5.

66 Essential Energy, *2019–24 Regulatory Proposal*, April 2018, p. 41.

67 Essential Energy, *Response to information request 014*, 22 June 2018, p. 7

68 Essential Energy, *Attachment 8.1: Classification of Services Proposal*, April 2018, pp. 5–6.

69 NER, cl. 5A.E.3.

customer-initiated services. These contributions reduce the amount of capex that is recovered from all other customers.

Essential forecasts capital contributions to be $441.8 million[70] for the 2019–24 regulatory control period. The forecast is 21 per cent lower than expected capital contributions for the 2014–19 period.

The value of gifted assets is forecast to be $432.1 million over the regulatory control period. Essential has forecast gifted assets based on historical actual expenditure in 2016–17 and 2017–18 year-to-date. Payments from customers for connections works are forecast to be $9.7 million for 2019–24, decreasing over the period as benefits of Essential's strategic initiatives are realised.

Essential's forecast is in line with the expected decrease in new connections volumes in 2019–24 compared with the current regulatory control period.

B.3 Forecast replacement expenditure

Replacement capital expenditure (repex) must be set at a level that allows a distributor to meet the capex objectives. Replacement can occur for a variety of reasons, including when:

- an asset fails while in service or presents a real risk of imminent failure
- a condition assessment of the asset determines that it is likely to fail soon (or degrade in performance, such that it does not meet its service requirement) and replacement is the most economic option[71]
- the asset does not meet the relevant jurisdictional safety regulations, and can no longer be safely operated on the network
- the risk of using the asset exceeds the benefit of continuing to operate it on the network.

The majority of network assets will remain in efficient use for far longer than a single regulatory control period (many network assets have economic lives of 50 years or more). As a result, a distributor will only need to replace a portion of its network assets in each regulatory control period. Our assessment of repex seeks to establish the proportion of Essential's assets that will likely require replacement over the 2019–24 regulatory control period and the associated capital expenditure.

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[70] Note that capital contributions in Table 5.3 include an overheads component of $5.4 million.

[71] A condition assessment may relate to assessment of a single asset or a population of similar assets. High value/low volume assets are more likely to be monitored on an individual basis, while low value/high volume assets are more likely to be considered from an asset category wide perspective.

B.3.1 Essential's proposal

Essential proposed $819.7 million ($2018–19) for repex for the 2019–24 regulatory control period. The forecast is $42.3 million—or 5 per cent—lower than its actual/estimated connections expenditure of $862 million in 2014–19.

The breakdown of Essential's forecast repex is broken down as shown in Table 5.6.

Table 5.6 – Essential's forecast repex and breakdown into asset groups, 2019–24

Asset group	Forecast ($2018–19, million)	Percentage of total repex
Poles	201	25%
OH conductors	94	11%
UG cables	16	2%
Services lines	28	3%
Transformers	62	8%
Switchgear	117	14%
Pole top Structures	230	28%
Other	44	5%
SCADA	19	2%
Total Repex	820	

Source: AER Analysis and Essential Energy, *Reset RIN*.

Notes: Numbers may not add up due to rounding.

CPI escalation adjustment

As discussed in section 5.1 we have identified a CPI escalation error in Essential's capex model which has slightly overstated Essential's forecast in real 2018–19 dollars. We have rectified this error in consultation with Essential.

The adjustment has the effect of reducing the forecast for repex by $14.1 million ($2018–19), or 2 per cent, to $805.6 million ($2018–19).

B.3.2 Position

Essential has justified its forecast of $805.6 million ($2018–19), after CPI escalation adjustment. We are satisfied that this forecast repex forms part of a total capex forecast that reasonably reflects the capex criteria. In coming to our position we have identified some elements of Essential's pole top structures repex which we consider Essential has not demonstrated against the capex criteria; however, this does not change our position on Essential's forecast capex overall.

Table 5.7 summarises Essential's proposal and our draft decision.

Table 5.7 – Draft decision on Essential's total forecast repex ($2018–19, million)

	2019–20	2020–21	2021–22	2022–23	2023–24	Total
Initial regulatory proposal	170.5	166.8	165.3	160.7	156.4	819.7
Draft decision	167.5	164.0	162.4	158.0	153.7	805.6
Difference	-3	-2.8	-2.9	-2.7	-2.7	-14.1

Source: AER Analysis and Essential Energy, *Reset RIN*.

B.3.3 Reasons for our position

In this section, we set out our review of Essential's initial repex forecast of $819.7 million, which was submitted as part of the initial regulatory proposal. We have applied several assessment techniques to assess Essential's forecast of repex against the capex criteria. These techniques include:

- trend analysis of Essential's past expenditure;
- predictive repex modelling based on Essential's assets currently in commission when compared with its industry peers;
- Essential's performance against several network health indicators;
- consideration of bottom-up and top-down methodologies, such as business cases and top-down challenges or constraints;
- advice from Arup, our independent consultant, and;
- stakeholder submissions.

When weighing up all the above techniques, Essential's forecast repex of $819.7 million forms part of a forecast for total capex that reasonably reflects the capex criteria. As an example and discussed later, we have found that Essential's average asset age is higher than the industry average. We also estimated its expected replacement age, as part of our repex modelling, and have found these to be generally longer than its peers.

In addition, Essential has submitted that its strategic initiatives investments will reduce its repex forecast by $110 million.[72] CCP10 and Energy Users Association of Australia (EUAA) have expressed their support of the aggressive approach that Essential is taking to reducing its capital expenditure, through its investment in information

[72] Essential Energy, *Response to AER information request 007 - 007.1 Strategic Initiative 2*, 04 June 2018.

technology and data analytics.[73] In addition, public submissions have acknowledged Essential's efforts in its engagement with consumer groups and interested stakeholders.[74] Similarly, Essential has engaged with us constructively, during the preproposal stage, the on-site discussions and through its responses to our information requests. More details regarding our engagement with Essential are in Appendix C of this attachment.

In coming to our position, we have been informed by the results of our predictive modelling where our modelled repex for Essential is $574 million, which is approximately 70 per cent of its total proposed repex. For the remainder of Essential's repex where we have not used predictive modelling, we have relied on several factors, including expenditure trends, asset health indicators and other material including a sample of Essential's bottom-up build in support of its repex forecast. In assessing both the modelled and unmodelled repex, we have also had regard to independent advice from Arup on Essential's repex forecast.

Trend analysis

Trend analysis of a distributor's past expenditure allows us to draw general observations about how a business is performing, as well as to provide a sanity check against our predictive modelling results. In addition, one capex factor that we must have regard to is the actual and expected capital expenditure during any preceding regulatory control period.[75]

For some aspects of our assessment where we have not relied on predictive modelling, we have considered historical levels of expenditure to forecast repex or to determine our substitute estimate. In particular, where past expenditure was sufficient to achieve the capex objectives, this can be a reasonable indicator of whether an amount of forecast repex is prudent and efficient, and whether the forecast repex forms part of a forecast capex that reasonably reflects the capex criteria.[76]

In coming to our position, we had regard to the following trends:

- Essential’s proposed repex forecast for the 2019–24 regulatory control period relative to its actual/estimated spend in the current regulatory control period; and
- Historical vs forecast repex and replacement volume trends at both the asset group and asset category level.

Figure 5.8 indicates that Essential forecast a step down in repex in the 2019–24 regulatory control period, by approximately 4 per cent or $31.7 million.

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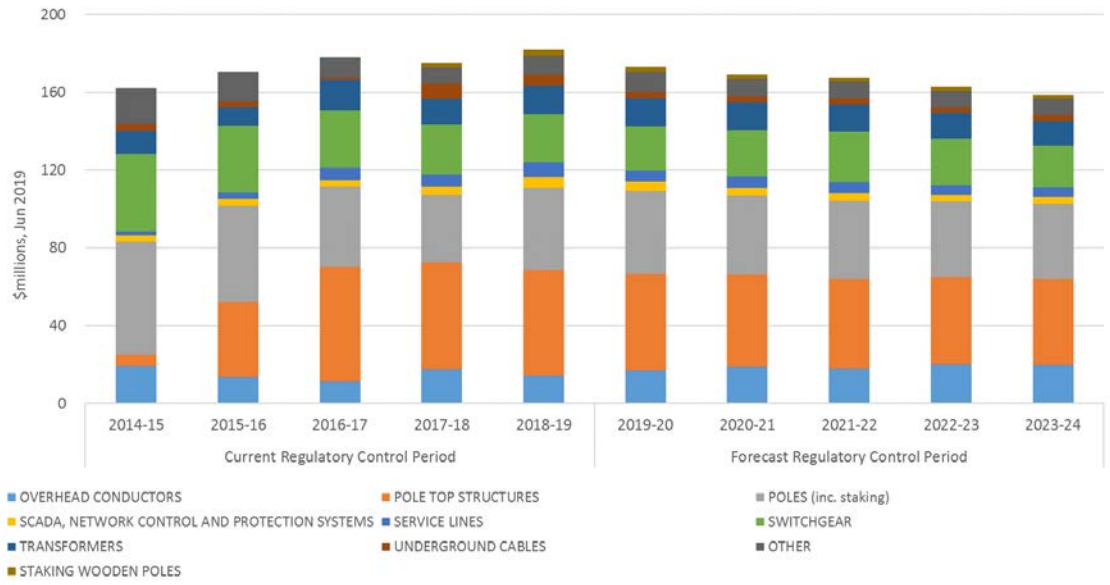
[73] CCP10, *Response to AER Issues paper and revenue proposals for NSW Electricity Distribution Businesses 2019–24, August 2018*, p.6 and EUAA, *NSW Electricity Distribution determinations: Ausgrid, Endeavour, Essential Energy 2019–24*, Public, p.6.

[74] Origin Energy, *Regulatory Proposals for NSW Electricity distributors 2019–24*, public, 8 August 2018, p.1.

[75] NER, cl. 6.5.7(e)(5).

[76] AER, *Expenditure Forecast Assessment Guideline for Electricity Distribution*, November 2013, pp. 7–9.

Figure 5.8 – Comparison of Essential's historical and forecast replacement expenditure ($2018–19, million)



Source: AER analysis and Essential Energy, *RIN responses.*

Figure 5.8 shows there was a significant step-up in expenditure in pole top structures from 2015–16, with the expenditure level proposed to be maintained over the forecast period. Essential has allocated approximately $230 million, or 28 per cent, on pole top structures in its repex forecast. PIAC flagged the significant magnitude of unmodelled repex, particularly pole top structures and raised its concern regarding the justification of this asset group.[77]

Repex modelling: a top-down assessment of modelled repex

The repex model can be used to advise and inform us where to target a more detailed bottom-up review and define a substitute estimate, if necessary. The model can also be used to compare a distributor against other distributors in the NEM. [78]

We recognise that it is difficult to model some categories of repex. Sometimes expenditure cannot be forecast by the repex model due to a non-age related reason for the asset replacement (such as a change in jurisdictional safety or environmental legislation) or there may not be sufficient data on particular repex categories. We rely on other evidence to assess the prudency and efficiency of this unmodelled repex.

The results of our repex model show that Essential's forecast modelled repex, which makes up 70 per cent of its total forecast repex, is 10 per cent below the threshold

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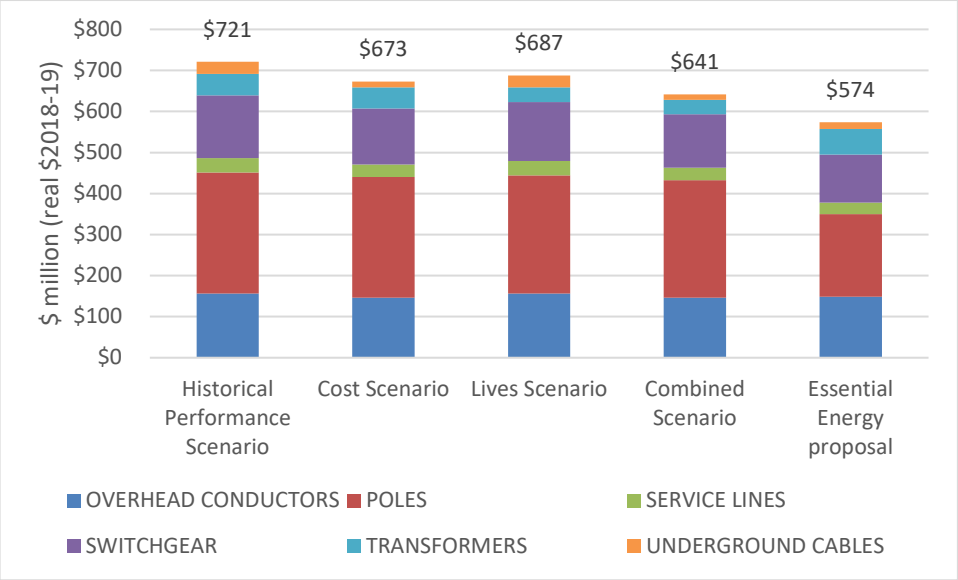
77 Public Interest Advocacy Centre, *PIAC's submission on Essential Energy's 2019–24 Capex proposal - Attachment D,* 17 August 2019, p.4.

78 This includes Power and Water Corporation.

level of repex of $673 million. The outcomes from the scenario analysis are set out in Figure 5.9 below.

Figure 5.9 – Output of the repex modelling scenario comparison ($2018–19, million)



Source: AER Analysis.

Notes: Historical Scenario uses historical unit costs and calibrated expected replacement lives.
Cost Scenario uses comparative unit costs[79] and calibrated expected replacement lives.
Lives Scenario uses historical unit costs and comparative expected replacement lives.[80]
Combined Scenario uses comparative unit costs and comparative expected replacement lives.

As Figure 5.9 shows, Essential performs well against the NEM median on both expected replacement lives and unit rates for most asset groups. Essential's result is driven by its forecast unit rates being lower compared with the industry median. Similarly, the expected replacement lives are generally longer than the industry median for all the modelled asset groups.

Assessment of top-down and bottom-up methodologies

We reviewed Essential's bottom-up and top-down methodologies, which were used to forecast repex for the 2019–24 regulatory control period.

Essential used a number of approaches to forecast its repex. These include:

- Condition: use of reliability or asset failure information to forecast repex, which is constructed from a bottom-up engineering build of individual business cases. Each business case is considered in isolation from the rest of the portfolio. Essential noted that the criteria used was premised on maintaining failure rates for a particular asset class.

[79] Minimum of a distributor's historical unit costs, its forecast unit costs and the median unit costs across the NEM.

[80] Maximum of a distributor's calibrated replacement life and the median replacement life across the NEM.

- Top-down challenge: Essential engaged Cutler Merz to assess network risk under varying network investment scenarios. The outcomes of the model informed the capital expenditure constraint placed on the portfolio.[81]
- Optimising the portfolio: Essential utilised the Copperleaf C55 Asset Investment Planning System (C55), a proprietary algorithm, to optimise the value of the investment portfolio. It used mixed-integer linear programming to apply a financial constraint to the bottom-up portfolio. The C55 applied a systematic assessment of multiple benefits simultaneously, which is consistent with Essential's appraisal value framework. The benefits included, but is not limited to, mitigating safety risk, mitigating network reliability risk and mitigating financial risk[82].

On the last point, we acknowledge that the portfolio optimisation, through the use of C55, is a significant step forward from legacy procedures in the previous 2014–19 review (for example, the Capital Allocation Selection Hierarchy tool).[83] Arup noted that the tool is an advanced technique and its use in conjunction with an independent top-down challenge renders the likelihood of materially inefficient investment to be low.[84] However, Arup has raised some concerns regarding the application of C55. For example, Arup noted that C55 appears to optimise benefits rather than costs. In doing so, it may seek to reduce the level of the risk in a network beyond the level that customers are willing to accept. Despite the concerns raised, consistent with Arup, the issues are not expected to have a material impact on the overall capex portfolio.[85]

Top-down challenge

Our top-down considerations of Essential's repex forecast include our repex modelling assessment and Cutler Merz's consideration of risk and expenditure.

As outlined in the repex modelling section, Essential's modelled repex forecast lies below our modelled repex threshold and compares favourably with other distributors on both unit costs and expected replacement lives.

In addition, Essential engaged Cutler Merz to execute a top-down challenge to Essential's bottom-up build of forecast repex[86]. The top-down modelling undertaken revealed that, for some asset groups poles and pole top structures, forecast capex could be reduced while still maintaining the same level of overall network risk. However, overall Essential's total forecast repex is below the top-down challenge level,

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81 Essential Energy, *Risk informed optimisation, public, 20180430*, p.4

82 Essential Energy, *Risk informed optimisation, public, 20180430*, p.4-7

83 AER, *Final Decision Essential Energy distribution Determination - Attachment 6 - Capital Expenditure*, April 2015, p.23.

84 Arup, *Review of Essential Energy's past and forecast capital expenditure for the 2019–24 regulatory control period, Final draft report*, 24 August 2018, p.25.

85 Arup, *Review of Essential Energy's past and forecast capital expenditure for the 2019–24 regulatory control period, Final draft report*, 24 August 2018, p.26.

86 Essential Energy, *Risk informed optimisation, public, 20180430*, p.5

and incorporates synergies at the portfolio level.[87] This supports our overall view that the Essential's repex forecast is prudent and efficient.

Bottom-up considerations

Bottom-up considerations – poles replacement and reinforcement

We reviewed the supporting information for several of Essential's key repex programs and projects. Most notably, we analysed Essential's proposed distribution pole replacement program, which is forecast at $121 million or 14 per cent of the total repex portfolio.

Essential identified that the preferred option for this program is to replace the three top categories of defects.[88] Like Arup, we have some concerns regarding the C55 optimisation tool and its application.[89] However, on balance, the pole replacement program is consistent with the historical expenditure on this category. In addition, Essential is proposing to replace defects that represent emergency, urgent situations or those assessed to be moderate risk to the safe or reliable operation of the network. We agree with Essential's assessment that the selected option forms part of a total capex forecast that reasonably reflects the capex criteria.

Bottom-up considerations – pole top structures

Consistent with Arup, we identified a significant increase in Essential's pole top structures repex. This step-up started in 2015–16 and is forecast to continue into the 2019–24 regulatory control period.[90] Essential advised that the observed increase is attributable to accounting treatment changes, from opex to capex and a better delineation between poles and pole top structures expenditure. From a trend analysis perspective, Essential has shown that the volumes of pole top structure replacement have not increased, but have been consistent over time.[91]

In our bottom-up review, we observed that Essential allocated 50 per cent of its low clearance program to pole top structures over the forecast regulatory control period[92], which is substantially higher than its historical allocation (3 per cent).[93] This meant that total forecast modelled repex may be understated when comparing with historical modelled repex. Therefore, we have made a reallocation of the 50 per cent of the low clearance program from pole top structures asset group to the overheads asset group

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87 Arup, *Review of Essential Energy's past and forecast capital expenditure for the 2019–24 regulatory control period, Final draft report*, 24 August 2018, p.26.

88 Essential Energy, *ESS_15, ESS_17 and ESS_46 Poles and Towers - Investment Case, Public*, April 2018, p.30

89 Arup, *Review of Essential Energy's past and forecast capital expenditure for the 2019–24 regulatory control period, Final draft report*, 24 August 2018, p.48.

90 Arup, *Review of Essential Energy's past and forecast capital expenditure for the 2019–24 regulatory control period, Final draft report*, 24 August 2018, p.49.

91 Essential Energy, *Response to Information request 008 - AER Information Request Response, 20180608, Public*, 8 June 2018, p.13 - Question 3.

92 Essential Energy, *Response to AER information request 003 - Repex projects to RIN Mapping*, *20180523, Public*.

93 Essential Energy, *Rectification of Low Clearance on Overhead Feeders*, April 2018, Public, p.13.

to ensure that forecast modelled repex is consistent with historical data.[94] Despite our reallocation, Essential performed well in our repex modelling as shown in Figure 5.9 above.

We also reviewed the supporting information for Essential's pole top structures program. Most notably, we analysed the distribution pole top refurbishment program, which is $113 million or 14 per cent of the total repex forecast. For the pole top refurbishment program, Essential's preferred replacement option is the planned replacement of defective steel and timber cross arms with a composite fiberglass cross arm.[95] We inquired about the underlying cost-benefit analysis that support the preferred option. Essential provided an analysis that demonstrates that composite fiberglass cross arms is its most preferable option.[96]

Arup's review of Essential's cost-benefit analysis has revealed a number of concerns. Firstly, Arup observed that Essential assumed a zero probability of failure for its composite cross arms over its life, while giving consideration to steel and timber probabilities of failure.[97] Secondly, the preferred option is optimised in the C55 model based on value, but did not regard the optimisation of least-cost.[98] Thirdly, Arup concluded that Essential has the opportunity to utilise LiDAR technology in a way that would enable it to target the highest risk assets rather than replacing all identified defects.[99]

Network Health Indicators

Network health measures provide useful information about the overall condition of a regulated business' assets currently in commission. When assessing a distributor's proposed repex over the regulatory control period, we will have regard to various network health measures to determine for instance whether a step-up in forecast repex is required when a distributor has performed consistently well over time on these health measures.

In assessing Essential's network health, we have reviewed:

- measures of reliability for Essential's network
- the age profile of assets in Essential's network, and where possible, relative to comparable networks. Asset age is a reasonable proxy for asset condition which affects the repex requirements of the network

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94 Essential Energy, *Rectification of Low Clearance on Overhead Feeders*, April 2018, Public, p.13.

95 This includes all four defect severities. See Essential Energy, ESS_4005 Distribution Pole Tops, Public, April 2018, pp.29–30.

96 Essential Energy*, Response to AER Information Request 008 - Review of composite crossarms*,

97 Essential Energy, *Response to AER Information Request 026 - NPV Crossarms options model, confidential*, July 2018.

98 Arup, *Review of Essential Energy's past and forecast capital expenditure for the 2019–24 regulatory control period, Final draft report*, 24 August 2018, p.60.

99 Arup, *Review of Essential Energy's past and forecast capital expenditure for the 2019–24 regulatory control period, Final draft report*, 24 August 2018, p.67.

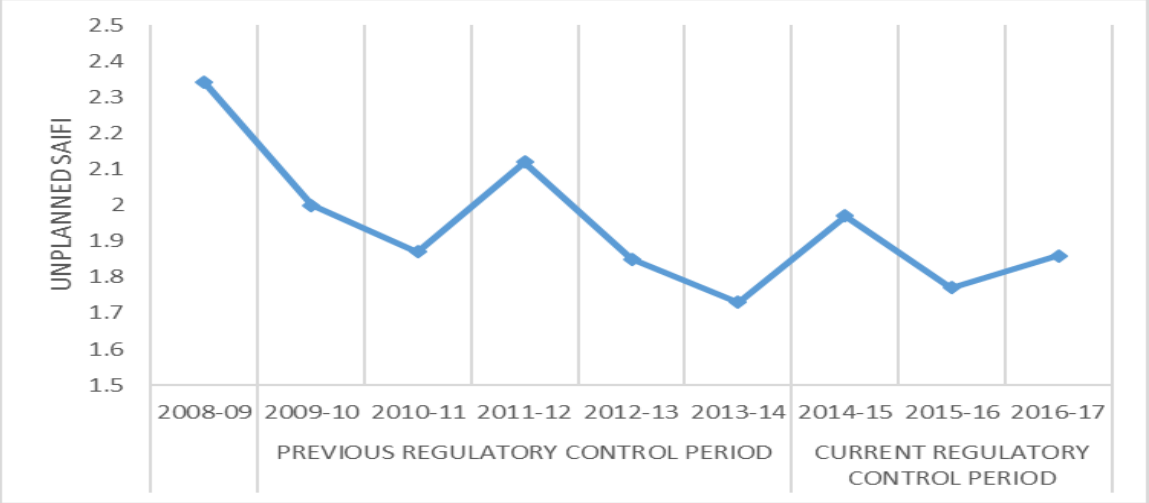
- utilisation of Essential's network (where spare capacity should be correlated to asset condition). This is to provide an indication as to whether Essential's assets are likely to deteriorate more or less than would be expected given the age of its assets.

Overall, we observe a consistent improvement in Essential's SAIFI over time indicating that Essential's current replacement practices are providing a consistent level of reliability in its network. We also observed that when compared with other distributors, Essential's network assets' average age is above the distributor wide average. Despite this, its zone substation utilisation has been relatively stable between 2013–14 and 2017–18 suggesting the network should not be degrading from high use.

Trends in Reliability (SAIFI)

Figure 5.10 shows Essential's SAIFI over time. SAIFI is a measure of the frequency of interruptions. The trend is a decline across the period, which indicates an improvement in reliability over time. This overall level of SAIFI and the consistent improvement over time support Essential's repex program, which is consistent with the current level of expenditure.

Figure 5.10 – Essential whole of network unplanned SAIFI[100]



Source: AER Analysis. See Essential, *Economic Benchmarking Regulatory Information Notice* – 3.6 Quality of service.

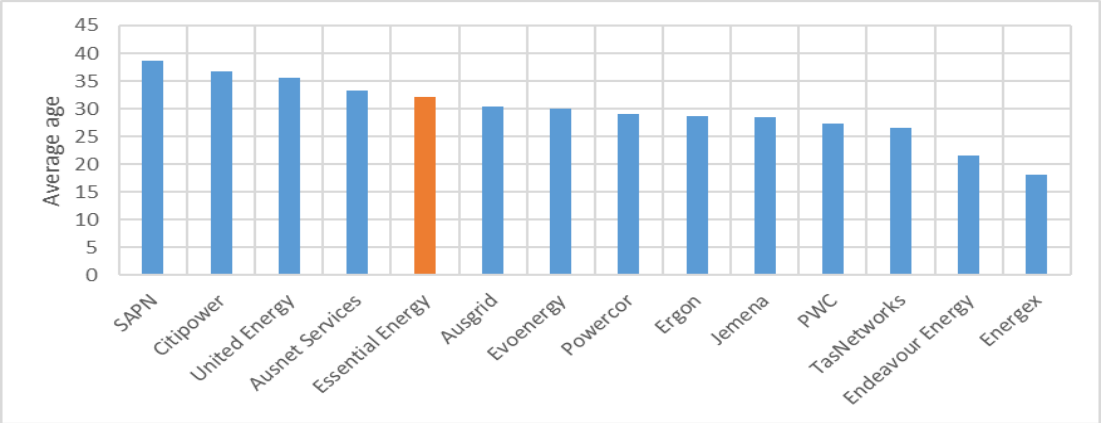
Average Asset Age

We considered the average age of all of Essential's assets compared with other NEM businesses.

[100] System-wide SAIFI excluding MEDs and excluded outages.

Figure 5.11 shows that compared with other distributors in the NEM, Essential has a network that is older than the average across the NEM.

Figure 5.11 – Electricity distributor network average asset age



Source: AER analysis and Essential Energy, *Category Analysis RIN Workbooks – 5.2 Asset Age Profile, December 2017.*

Asset Utilisation

We consider that the degree of asset utilisation can have an impact on the condition of certain network assets. The relationship between asset utilisation and condition can vary across the asset types. The relationship between asset utilisation and condition is not necessarily a linear one and the condition of an asset may be difficult to determine. As such, early-life asset failures may be due to utilisation, or a combination of factors.

As can be seen from Figure 5.3 and highlighted in section B.1.3 Essential has not experienced a significant change in its utilisation profile from 2013–14 to 2017–18. The number of substations utilising 60 per cent of capacity or greater has remained roughly constant and is forecast to remain at this level. Overall, we expect a positive correlation between higher levels of asset utilisation and asset degradation. Given Essential's substation utilisation profile, we would not expect that its network would have experienced additional degradation due to higher use. This would support Essential's past asset management planning practices.

B.4 Forecast non-network capex

The proposed non-network capex for Essential includes expenditure on information and communications technology (ICT), buildings and property, motor vehicles, tools and equipment.

B.4.1 Essential's proposal

Essential has proposed $495.2 million ($2018–19) for non-network capex for the 2019–24 regulatory control period. This is $168.1 million, or 51 per cent higher than total forecast non-network capex of $327.1 million of the current regulatory control

period. The largest components of Essential's forecast are fleet and plant ($168 million, or 34 per cent) and ICT ($164 million, or 33 per cent).[101]

CPI escalation adjustment

As discussed in section 5.1 we have identified a CPI escalation error in Essential's capex model which has slightly overstated Essential's forecast in real 2018–19 dollars. We have rectified this error in consultation with Essential.

The adjustment has the effect of reducing the forecast for non-network capex by $1.0 million to $494.2 million ($2018–19).[102]

B.4.2 Position

Essential has justified its proposed non-network capex of $494.2 million ($2018–19), after CPI escalation adjustment. This forecast forms part of a total capex forecast that reasonably reflects the capex criteria. In coming to our position we have identified some elements of Essential's buildings and property capex which Essential has not established against the capex criteria; however, this does not change our position on Essential's forecast capex overall.

Table 5.8 summarises Essential's proposal for non-network capex.

Table 5.8 – Draft decision on Essential's total forecast non-network capex ($2018–19, million)

	2020	2021	2022	2023	2024	Total
Initial regulatory proposal	146.1	83.5	94.8	88.5	82.4	495.2
Draft decision	145.9	83.3	94.6	88.4	82.1	494.2
Difference	-0.2	-0.2	-0.2	-0.1	-0.3	-1.0

Source: Essential Energy, *Reset RIN*; AER analysis.
Note: Numbers may not add up due to rounding.

B.4.3 Reasons for our position

We have had regard to the following information and applied several assessment techniques to assess Essential's proposed non-network capex forecast. This included:

- trend analysis comparing forecast expenditure to recent actual expenditure

[101] Essential Energy, *Regulatory Proposal - Executive Summary (Overview paper)*, April 2018, p. 23

[102] We did not adjust the majority of Essential's forecast for non-network capex. The CPI error in Essential's model only affected Essential's forecast for net direct capex and LiDAR.

- consideration of stakeholder submissions[103]
- category specific analysis of individual components of non-network expenditure
- review of the project documentation accompanying Essential's proposal
- assessment of Essential's overall expenditure forecast to assess the extent to which capital investments are offset by reductions to Essential's overall expenditure proposal
- technical review of Essential's proposal by Arup.

When weighing up all the above techniques, Essential has justified its non-network capex forecast. Trend analysis has found that Essential's forecast represents an increase to recent historical levels of expenditure. Given that Essential's forecast is higher than historical expenditure for this category of capex, we undertook a review of the information Essential provided in support of its forecast. We have assessed the need for, and timing of, the proposed expenditure, to inform our view as to whether the increase relative to past expenditure is justified.[104]

Our category based assessment of non-network capex has found that Essential has supported each category of its non-network capex forecast. When requested, Essential provided cost forecasting models and cost-benefit assessment for each category of non-network capex. We have also found that Essential has incorporated ex-ante benefits of non-network expenditure into its overall expenditure proposal. This gives us a level of confidence that Essential's total expenditure forecast reflects the costs that a prudent and efficient operator would incur.

We have identified elements of Essential's buildings and property capex that Essential has not demonstrated reasonably reflects the capex criteria. Our finding is that Essential has not undertaken a full risk and benefit assessment for its buildings and property forecast. However, these elements are not material to Essential's total forecast capex.

We have also had regard to Arup's advice in forming our position on non-network capex. Arup's view overall was:[105]

> Essential Energy's approach to capex appears to be generally robust, with proposed expenditure approximately in line with historical levels. Essential Energy appears to have a well-structured approach to identifying key project drivers, and the development and prioritisation of options which allows a consideration of lowest cost delivery of outcomes. Updating legacy ICT systems and increasing the capability of project selection and prioritisation tools will be important in Essential Energy maintaining a reliable and affordable network for its customers.

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[103] We received submissions from CCP10, PIAC and ECA that made reference to Essential's non-network capex forecast.

[104] NER, cl. 6.5.7(e)(5).

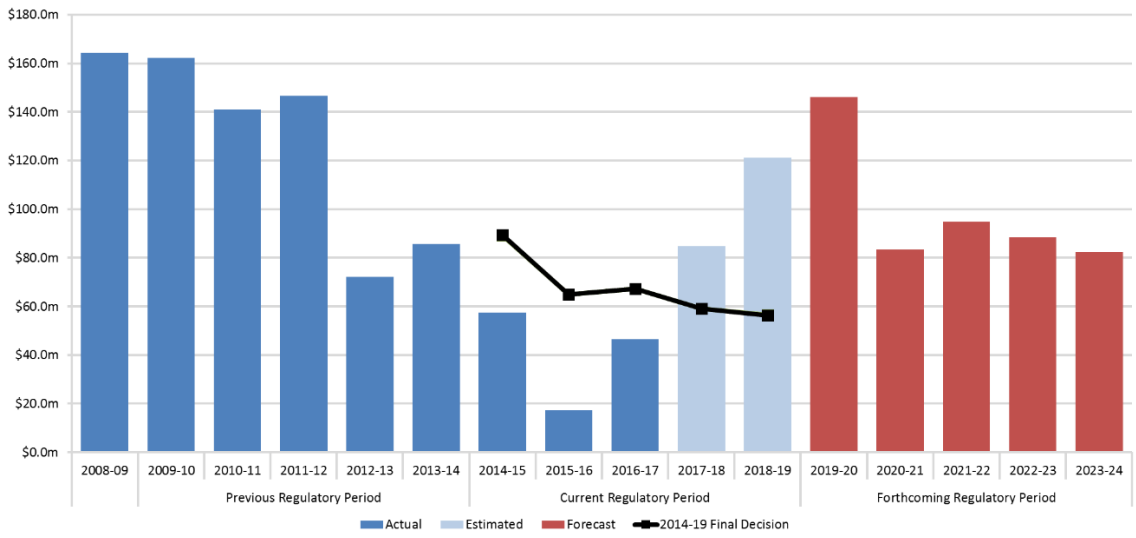
[105] Arup, *Review of Essential Energy's past and forecast capital expenditure for the 2019/24 regulatory control period*, 24 August 2018, p. 3.

B.4.4 Trend Analysis

Trend analysis allows us to draw general observations about how a business is performing. In addition, one capex factor that we must have regard to is the actual and expected capital expenditure during any preceding regulatory control period.[106]

Figure 5.12 shows Essential's actual non-network capex for each year from 2008–09 to 2016–17, estimated non-network capex for 2017–18 and 2018–19 and proposed forecast capex for the 2019–24 regulatory control period. It also shows our final decision for allowed capex relating to non-network capex for the current regulatory control period.

Figure 5.12 – Essential's non-network capex ($2018–19, million)



Source: Essential Energy, *RIN responses*; AER, *Draft decision Essential distribution determination – Essential 2014 – Consolidated Capex Forecast*, November 2014; AER, *Final decision Essential distribution determination – Essential 2015 – Capex model*, April 2015.

As shown, Essential has reduced non-network capex over the first three years of the current regulatory control period. Essential has submitted that this reflects under-investment due to uncertainty during the time of the state government venture between NSW's three electricity distribution entities.[107] Essential has submitted that these years of cost containment have led to latency issues resulting in increased capital expenditure.

We also note a reason for the forecast increase in non-network capex (particularly in 2019–20) is a one-off increase in capex reflecting capitalisation of rental expenses (previously as opex). We discuss this in further detail in section B.4.8.1. This 'step-change' accounts for $32 million of Essential's non-network capex forecast.

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106 NER, cl. 6.5.7(e)(5).

107 Essential Energy, *Response to AER Information Request 004*, 28 May 2018, p. 1

Excluding this step-change cost, our analysis of longer-term trends in non-network capex has identified that Essential's proposal, as well as being higher than expected current period expenditure, is:

- 2 per cent higher than annual average non-network capex of the previous two regulatory control periods (2009–10 to 2016–17)
- 63 per cent higher than annual average non-network capex of the previous five years of actual data (2012–13 to 2016–17).

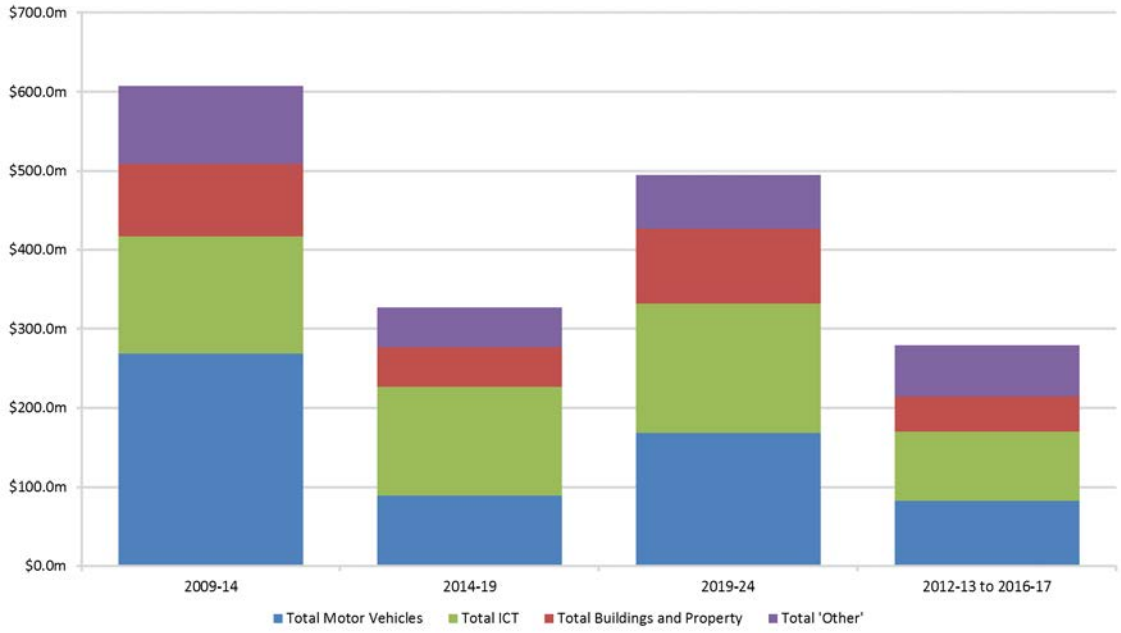
Therefore, Essential's non-network capex proposal is not supported by trend analysis. Given the forecast increase in total non-network capex, we have undertaken a review of the information provided in support of the proposal. We have assessed the need for and timing of the proposed expenditure, with a particular focus on the higher forecast in the first year of the period to inform our view as to whether the increase relative to past expenditure is justified.

B.4.5 Category analysis

We have also undertaken trend analysis across each category of non-network capex. This category analysis has been used to inform our view of whether forecast non-network capex is reasonable relative to historical rates of expenditure in each category, and to identify trends in the different category forecasts which may warrant further review.

Figure 5.13 shows Essential's actual/estimated and forecast non-network capex by category for the previous, current and forecast regulatory control periods. It also shows total non-network capex for the most recent five years that actual data are available (2012–13 to 2016–17). Essential's total non-network capex forecast is approximately in between 2009–14 and 2014–19 period expenditure, and is significantly higher than expenditure over the five years to 2016–17.

Figure 5.13 – Essential non-network capex by category ($2018–19, million)



Source: Essential Energy, *RIN responses*.

Essential has forecast increases across all categories of non-network expenditure compared with current period expenditure. The largest forecast increases are in buildings and property (90 per cent) and fleet and plant (89 per cent). Essential has also forecast smaller increases in non-network ICT (19 per cent) and non-network 'other' (36 per cent). Given our top-down assessment of historical trends, we have conducted a review on all categories of non-network capex. Our conclusions for each category of non-network capex are summarised below.

B.4.6 Fleet and Plant capex

Essential has proposed capex of $168 million ($2018–19) for fleet and plant for the 2019–24 regulatory control period. Essential's proposal is $79 million, or 89 per cent higher than total forecast fleet and plant capex of the current regulatory control period.

Non-network fleet capex reduced substantially over the 2014–19 regulatory control period because of fleet cost rationalisation and efficiency initiatives.[108] From 2012–13 to 2016–17, Essential reduced fleet numbers by 28 per cent, which aligned with a reduction in employee numbers.[109] Essential's forecast opex reflects this reduced total fleet size (a reduction of $86.5 million). While Essential is forecasting a large increase in fleet and plant capex, overall it has forecast a 4 per cent increase in total motor vehicle expenditure in the 2019–24 period compared with the current period.

[108] Essential Energy, Annual Reports 2014–15, 2015–16, 2016–17.

[109] Essential Energy, *Response to AER Information Request 011*, 20 June 2018, p. 4

We asked Essential to provide its fleet and plant capex model to outline the methodology and input assumptions Essential undertook in forecasting its fleet and plant capex requirements for the forthcoming period. This was provided on 29 May 2018.

B.4.6.1 Findings on fleet and plant capex

We have reviewed the information provided by Essential in support of its motor vehicle capex forecast including the business case provided[110] and fleet forecast model.[111] Where required, we have sought further information from Essential regarding the assumptions adopted in its forecast. We have assessed the unit costs and replacement ages assumed in the model by comparing this to historical practices and industry benchmarks, to determine if the forecast is prudent and efficient.

Our review has found that Essential has justified its motor vehicle capex forecast:

- Most of the forecast increase in total motor vehicle capex ($62 million) is in heavy commercial vehicle and elevated work platform replacement. Replacement of these categories of vehicle are driven by a requirement to comply with Australian Standards and WHS regulation.[112] We have reviewed the unit costs and replacement assumptions in detail. The approach to elevated work platform and heavy commercial vehicle replacement has been demonstrated as prudent and efficient.
- The remaining forecast increase in motor vehicle capex ($34 million) relates to renewal of the light commercial vehicle fleet to align it with a target optimal age/usage profile. This age/usage profile is commonly applied across distributors when considering the most efficient age/usage characteristics of light commercial vehicle fleets. Essential's forecast replacement cycle aligns with efficient benchmarks.
- We have also had regard to the view of our consultant Arup, who considered that Essential's fleet capex forecast appeared reasonable in light of the fleet optimisation undertaken between 2012–13 and 2017–18.[113]

B.4.7 Information and communications technology capex

Essential has proposed $164 million ($2018–19) for ICT non-network capex for the 2019–24 regulatory control period. Essential's proposal is $26 million, or 19 per cent higher than total actual/estimated ICT capex of the current regulatory control period.

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110 Essential Energy, *001.16 Essential - Gate 2 Interim Business Case - Fleet*, 17 May 2018.

111 Essential Energy, *Response to AER Information Request 011 - 011.2*, 25 June 2018.

112 The relevant Australian Standards include: Major inspection and rebuild to AS2550 Cranes, hoists and winches and AS1418 Cranes, hoists and winches - General requirements.

113 Arup, *Review of Essential Energy's past and forecast capital expenditure for the 2019/24 regulatory control period*, 24 August 2018, p. 83.

Essential submitted that it revised its ICT strategy in early 2017, and that its ICT capex forecast reflects investing "for long term business value, efficiency and sustainability through strategic investments", such that by 2020–21, it will have achieved a "stabilisation of expenditure at a sustainable prudent level".[114] Essential has submitted that the majority (77 per cent) of its ICT capex forecast is related to replacement of existing assets, while 22 per cent relates to the acquisition of new ICT assets or to broaden the functionality of existing ICT infrastructure.[115]

Essential provided business cases for each major ICT program,[116] which included quantified cost-benefit assessment. Essential provided NPV spreadsheets which outlined the input assumptions used in undertaking options analysis for each program, including base-case and deferral options.[117] This documentation also outlined the respective forecast improvements enabled by each respective investment. These were then aggregated to determine the total value of benefits achieved from the strategic initiatives investments outlined within the *Delivering Value* chapter of the regulatory proposal.[118] Essential also provided its ICT Financial cost model which outlined the capex forecasting methodology for ICT programs. Essential has therefore supported its proposed non-network ICT capex forecast.

B.4.7.1 Findings on ICT capex

Strategic Initiatives ICT capex

As outlined within its *Delivering Value* chapter of the regulatory proposal,[119] Essential has submitted that for the forthcoming regulatory control period it has "identified opportunities to improve value for customers through targeted initiatives and investment in enabling technologies."[120]

Essential has submitted that it will leverage ICT as the primary enabler of these efficiencies and has identified that $66 million, or 40 per cent of its non-network ICT capex forecast for the forthcoming regulatory control period relates to these initiatives. We note that the majority ($38 million) of this investment is planned in the first year of the forthcoming period, the main driver of the forecast peak in non-network capex in 2019–20.

The outcomes Essential has identified from this increased ICT investment are:[121]

- transformed core asset management practices
- transformed back office operations

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114 Essential Energy, *12.1.16a Information Technology Business Plan*, 30 April 2018, p.15.
115 Essential Energy, *Reset RIN*, 30 April 2018.
116 Essential Energy, *Response to AER Information Request 002*, 17 May 2018.
117 Essential Energy, *Response to AER Information Request 004*, 28 May 2018.
118 Essential Energy, *2019–24 regulatory proposal*, April 2018, pp. 31–34.
119 Essential Energy, *2019–24 regulatory proposal*, April 2018, pp. 31–34.
120 Essential Energy, *2019–24 regulatory proposal*, April 2018, p. 33.
121 Essential Energy, *2019–24 regulatory proposal*, April 2018, p. 69

- efficiently-bundled and scheduled work tasks
- advanced technology that provides asset health and asset management insights
- better ways of communicating with customers and other distributors.

Essential has submitted that the adoption of this technology will enable real cost reductions of $273 million over the forthcoming regulatory control period. When compared with the most recent financial year (2016–17), by the end of the forthcoming regulatory control period, Essential has forecast:

- a 10 per cent reduction to operating expenditure
- a 7 per cent reduction to capital expenditure.

CCP10 submitted that it was supportive of Essential's approach in reducing capital expenditure and was supportive of the proposed ICT investment.[122] While CCP10 was supportive overall, it had concerns with Essential's ability to deliver these reductions. In particular, CCP10 cited that implementing such significant changes to ICT, including the associated data management cultural change and ability to manage costs, has proven difficult elsewhere.[123] PIAC also submitted that it considered that Essential had made strong efforts to reflect the need for affordability in its proposal.[124]

We have reviewed the information provided by Essential to satisfy us that the forecast increase in ICT capex will be offset by the forecast reductions identified by Essential. In particular, we reviewed the business cases provided for individual ICT programs and asked Essential how it identified benefits and how these were incorporated into its overall proposal.

On review of this information, Essential has demonstrated that its proposal for $66 million of strategic initiatives capex is prudent and efficient and will lead to real cost reductions over the forthcoming regulatory control period. As discussed in our opex chapter, Essential has included within its opex forecast a negative opex step-change relating to the benefits of its strategic initiatives investments. [125] This step-change peaks in the final year, at a forecast opex reduction of $45 million. In relation to the forecast capex savings identified, Essential has included a $110 million reduction to repex, a $22 million reduction to augex and also reductions to connections, LiDAR and capitalised overheads.[126] As noted in the corresponding chapters for these categories of expenditure, Essential's forecast for these categories is prudent and efficient.

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122 CCP10, *Response to AER Issues paper and revenue proposals for NSW Electricity Distribution Businesses 2019–24*, August 2018.

123 CCP10, *Response to AER Issues paper and revenue proposals for NSW Electricity Distribution Businesses 2019–24*, August 2018, p. 75.

124 PIAC, *Submission in response to the NSW DNSPs 2019–24 regulatory proposals and AER Issues paper*, 8 August 2018.

125 AER, *Attachment 6 – Operating expenditure | Draft decision - Essential Energy distribution*, section 6.4.3.

126 Essential Energy, *Response to AER information request 007 - 007.1 Strategic Initiative 2*, 04 June 2018.

In ensuring the deliverability of these changes, Essential has recently hired an ICT transformation manager and has established an Enterprise Delivery Office in early 2017, and has initiated a transformation program. Our consultant Arup has found that Essential "has thus far implemented an effective governance and project management process through the Enterprise Delivery Office and on-boarded an experienced ICT transformation resource to drive this capability."[127] Essential's approach to ensuring the deliverability of its ICT program has therefore been demonstrated to be reasonable in ensuring the successful implementation of its ICT transformation program.

We agree with Arup that Essential should monitor closely the improvements it achieves from its ICT transformation program over the forthcoming period. We expect that as part of its submission for the 2024–29 regulatory control period Essential identifies the benefits delivered as part of the 2019–24 period from this investment.

Non-strategic Initiatives ICT capex

Excluding strategic initiative-related ICT capex, Essential has proposed $98 million for non-network ICT capex. This expenditure relates predominately to recurrent ICT investments such as renewal of client devices; data centres, servers & storage; ICT network infrastructure and cyber security.[128] Trend analysis has found that excluding strategic initiatives ICT capex, Essential's forecast is $40 million, or 29 per cent lower than total ICT capex of the current period.

We also note that Essential submitted[129] that over the first three years of the current period it "under-invested [in ICT] due to industry uncertainty" with the focus on "critical upgrades only".[130] A finding of a 2016 Utilities ICT Benchmarking report by KPMG found that Essential's ICT expenditure was lower than average in most measures. Our consultant Arup, on review of this finding, considered that this result "appears to be more symptomatic of under-investment than overall peer-leading business efficiency… There is therefore an underlying need to replace these systems, but also a need to upgrade Essential's capability to enable transformation across the business".[131]

Essential provided business cases and NPV analysis for the Smallworld Upgrade and VMS replacement programs included within this category of expenditure.[132] Essential submitted that the remaining expenditure relates predominately to minor ICT replacement programs relating to the renewal and refresh of core hardware, devices and security infrastructure.[133] Essential also submitted it included an allocation for

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127 Arup, *Review of Essential Energy's past and forecast capital expenditure for the 2019/24 regulatory control period*, 24 August 2018, p. 83.

128 Essential Energy, *Response to AER Information Request 15*, 22 June 2018.

129 Essential Energy, *12.1.16 Information and Communication Technology*, April 2018, p. 4.

130 Essential cited the state government joint venture between the three NSW distributors drove a focus on cash containment and other cost-cutting measures.

131 Arup, *Review of Essential Energy's past and forecast capital expenditure for the 2019/24 regulatory control period*, 24 August 2018, pp. 80–81.

132 Essential Energy, *Response to AER Information Request 002*, 17 May 2018.

133 Essential Energy, *Response to AER Information Request 15*, 22 June 2018, p. 3.

small (<$2 million) investments for essential remediation, updates, replacements and extensions of applications and systems. This expenditure was forecast based on trend analysis of historical costs from the current period.[134] Essential has therefore justified its proposed forecast for non-network ICT capex.

B.4.8 Buildings and property capex

Essential has proposed $94 million ($2018–19) for buildings and property capex for the 2019–24 regulatory control period. Essential's proposal is $45 million, or 90 per cent higher than total actual/estimated buildings and property capex of the current regulatory control period. Essential has submitted that its strategy is aligned with the following three strategic themes:[135]

- Maintain and sustain the property portfolio and ensure compliant and safe work environments
- Optimise property expenditure supporting efficient operations
- Drive to best practice property asset management.

Essential's forecast is comprised of 10 components. The largest component ($32 million, or 34 per cent of the forecast) is related to changes to Essential's capitalisation policy in response to changes to the new 'AASB 16 Leases' accounting standard, due to commence in 2019.[136] Under this new standard, rental lease payments currently recognised as opex are now capitalised on the balance sheet as a 'right of use' asset, with the rental payments considered as a straight line depreciation expense on the asset (over useful life) and an interest expense on the liability (the sum of these equal lease payments over the life of the lease).

Essential provided a business case for its buildings and property program[137] outlining the options considered and NPV analysis of the options. Essential submitted that it engaged Lycopodium consultancy in 2017 to undertake a building asset condition assessment of Essential's depots, office buildings, workshops and detached buildings. Lycopodium proposed three investment scenarios to maintain and sustain property condition across the property portfolio, which were the basis of the options considered in the business case.

B.4.8.1 Effect of AASB 16 Accounting Standard

Essential has proposed capex of $32 million relating to changes to Essential's capitalisation policy in response to changes to the new 'AASB 16 Leases' accounting standard, due to commence from 2019–20. Essential has correspondingly reduced its

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134 Essential Energy, *Response to AER Information Request* 15, 22 June 2018, p. 4.

135 Essential Energy, *Gate 2 Interim Business Case - Property*, 17 May 2018.

136 See Australian Accounting Standards Board, https://www.aasb.gov.au/admin/file/content105/c9/AASB16_02-16.pdf, accessed 3 October 2018.

137 Essential Energy, *Gate 2 Interim Business Case - Property*, 17 May 2017.

opex forecast by the amount equal to the existing operational lease costs. We have reviewed the calculation undertaken by Essential in determining the forecast corresponding increase in capex, which reflects the capitalisation of the lease. Essential's calculation is consistent with the implications and requirements of the standard.

B.4.8.2 Remaining buildings and property capex forecast

Essential's remaining forecast for non-network buildings and property capex is $62 million. This is $13 million higher than what Essential forecasts to spend over the current period. Essential's forecast is comprised of nine projects, including initiatives relating to the security, compliance and maintenance of non-network property. Essential has forecast no major buildings and property upgrades to occur over the forthcoming regulatory control period.

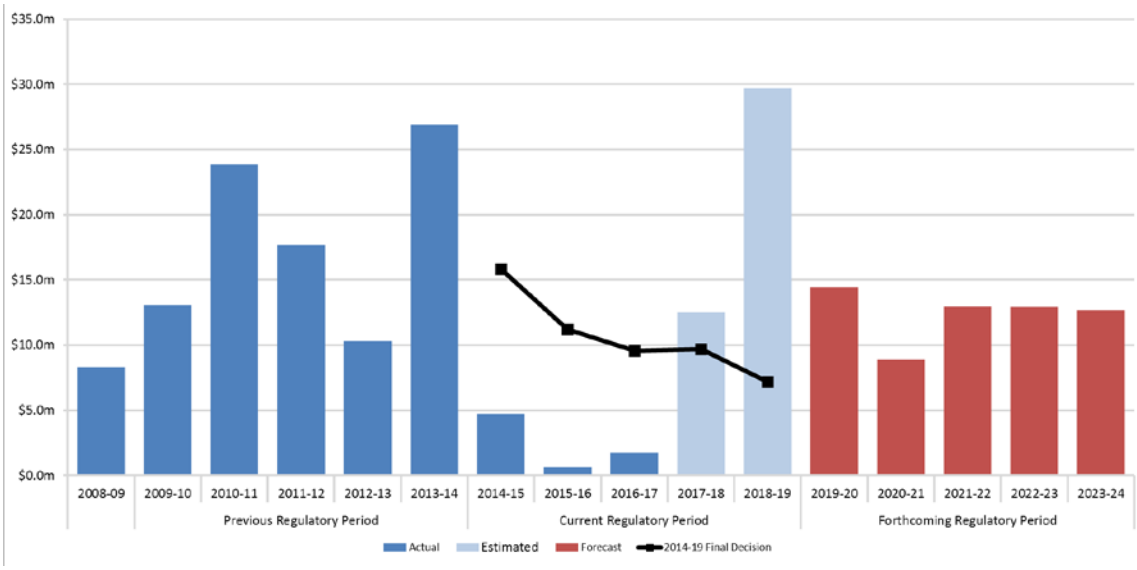
Trend Analysis

Trend analysis allows us to draw general observations about how a business is performing. In addition, one capex factor that we must have regard to is the actual and expected capital expenditure during any preceding regulatory control period.[138]

Figure 5.14 shows Essential's forecast buildings and property capex for each year of the 2019–24 regulatory control period. It also shows Essential's actual and estimated buildings and property capex from 2008–09 to 2018–19, as well as Essential's proposed and allowed buildings and property capex for the 2014–19 regulatory control period.

[138] NER, cl. 6.5.7(e)(5).

Figure 5.14 – Essential's total actual/estimated and forecast buildings and property capex ($2018–19, million)



Source: Essential Energy, *RIN Responses*; AER, *Draft decision Essential Energy distribution determination - Attachment 6 - Capital expenditure,* November 2014; AER, *Final Decision Essential Energy distribution determination - Attachment 6 - Capital expenditure*; April 2015.

As shown, Essential has reduced buildings and property capex over the first three years of the current period. Essential has submitted that this reflects previous years of cost containment, leading to latency issues resulting in increased capex.[139] Analysis of longer-term trends in buildings and property capex has found that Essential's forecast, while higher than forecast capex for the current period, is approximately equal to average actual buildings and property capex of the previous two regulatory control periods (2009–10 to 2016–17).

Business Case review

Essential provided a business case for its buildings and property program[140] outlining the options considered and NPV analysis of the options. We have reviewed this business case and sought further information for Essential to understand the drivers of its forecast. We found that Essential has not demonstrated the need for increased capital expenditure for buildings and property over the regulatory control period.

The business case identified that the highest NPV option was also the lowest cost. However, Essential did not identify this option as the chosen option, instead selecting a higher cost, lower NPV option. We asked Essential to clarify the reasons for this decision. Essential submitted that the highest NPV option "introduces a higher risk

139 Essential Energy, *12.1.18 Property Business Plan*, 30 April 2018, p. 6.

140 Essential Energy, *Gate 2 Interim Business Case - Property*, 17 May 2017.

profile resulting in greater probability of compliance breaches."[141] Essential also submitted that this option would affect workforce productivity. However, Essential submitted that these dis-benefits were not included within the NPV analysis because they are difficult to quantify.[142]

The business case also identified that Essential engaged Lycopodium consultancy in 2017 to undertake a building asset condition assessment of Essential's depots, office buildings, workshops and detached buildings. The business case stated that the condition assessment identified the capital expenditure requirements for its properties over the following ten years (2017–27).[143] The report by Lycopodium recommends expenditure forecasts that are significantly lower than the costs assumed in the regulatory proposal.

Essential later submitted that its proposed forecast capex has assumed that the entire ten-year forecast would occur in the five years of the 2019–24 regulatory control period "in order to mitigate the risks of having environments not maintained to standard for an extended period of time".[144] Essential did not provide any further evidence to support this position.

Essential has made attempts to quantify benefits associated with capex programs in other areas of its proposal, for example in its ICT expenditure proposal. We would expect distributors to also quantify benefits associated with buildings and property capex to ensure a robust NPV analysis of the regulatory proposal. Because of a lack of a complete benefit quantification, Essential has not justified its buildings and property capex forecast for the 2019–24 regulatory control period.

We have also had regard to the views of our consultant Arup who, while noting that Essential was forecasting an increase in buildings and property capex, was of the view that:[145]

> We would therefore expect this increase to represent a one-off adjustment to correct for these carry over issues, and for Essential Energy to be forecasting a reduction in property capex, all else equal, for the RCP following 2024.

B.4.9 'Other' Non-network capex

Essential has proposed $69 million ($2018–19) of 'other' non-network capex for the 2019–24 regulatory control period. The majority ($57 million) of the forecast relates to capital expenditure for Essential's LiDAR program, with minor expenditure forecast for furniture, tools and equipment.

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141 Essential Energy, *Response to AER Information Request 004*, 28 May 2018, p. 8.

142 Essential Energy, *Response to AER Information Request 004*, 28 May 2018, p. 8.

143 Essential Energy, *001.17 Essential Energy - Gate 2 Interim Business Case - Property*, 17 May 2018, p. 3.

144 Essential Energy, *Response to AER Information Request 013*, 27 June 2018, p. 4.

145 Arup, *Review of Essential Energy's past and forecast capital expenditure for the 2019/24 regulatory control period*, 24 August 2018, p. 3.

B.4.9.1 Findings on other non-network capex

We consider that Essential's 'other' non-network capex forecast forms part of a total capex forecast that reasonably reflects the capex criteria. This is on the basis that:

- Essential has undertaken these LiDAR inspections since 2014 through a market tender process. Essential's forecast is lower than actual/estimated cost of the current regulatory control period.[146]
- Our consultant Arup found that LiDAR has enabled Essential to "reduce the frequency of ground line levels inspections from four to four, five, and six year cycles."[147]
- Essential has also submitted that it has been able to observe multiple defects through LiDAR inspection that would not have been observed through regular ground line inspections.[148] Through better understanding of the network condition from LiDAR surveys, Essential can more efficiently manage risk and decrease the need for inspection cycles and offset this investment through lower opex.
- The forecast for furniture, tools and equipment is consistent with historical expenditure for this category of expenditure.[149]

B.5 Forecast capitalised overheads

Overhead costs are business support costs not directly incurred in producing output, or costs that are shared across the business and cannot be attributed to a particular business activity or cost centre. The allocation of overheads is determined by the Australian Accounting Standards and the distribution business's cost allocation methodology.

B.5.1 Essential's proposal

Essential proposed $598.8 million ($2018–19, including overheads related to capital contributions)[150], for capitalised overheads in 2019–24. This is $101.0 million, or 14 per cent, lower than its actual/estimated expenditure in 2014–19 of $699.8 million.[151]

Drivers for the forecast reduction in capitalised overheads for 2019–24 include, savings achieved through the strategic initiative program, changes to the accounting standards

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146 Essential Energy, *Response to AER Information Request 004 - 004.23 ELTNov2016 Aerial Inspection*, 28 May 2018.

147 Arup, *Review of Essential Energy's past and forecast capital expenditure for the 2019/24 regulatory control period*, August 2018, p. 17.

148 Essential Energy, *Response to AER Information Request 004 - 004.24 Est Aerial Inspect Value*, 28 May 2018.

149 NER, cl. 6A.6.7(e)(5).

150 Essential's proposal forecasts $593.4 million in capitalised overheads relating to net capex, and $5.4 million in capitalised overheads relating to capital contributions.

151 Essential Energy, *RIN responses*. The forecast for 2019–24 includes $5.4 million of overheads associated with capital contributions.

affecting property leasing costs, and a reduction in direct capex as a share of total direct costs (leading to a lower allocation of total business overheads to capex).[152]

B.5.2 Position

Essential has justified its proposed capitalised overheads of $598.8 million ($2018–19) forms part of a total capex forecast that reasonably reflects the capex criteria.

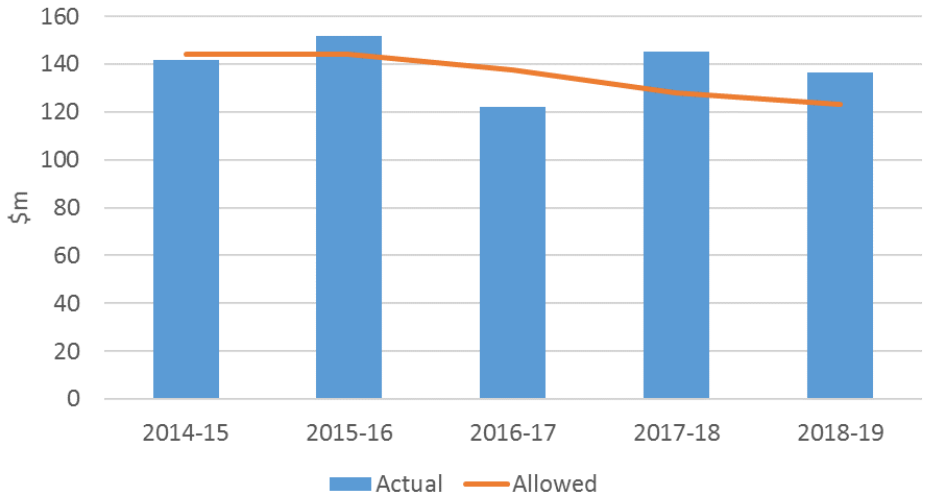
B.5.3 Reasons for our position

In coming to our position, we have looked at Essential's methodology, historical costs and trends, and considered total overheads across Essential's opex and capex functions.

Capitalised overheads in 2014–19

Figure 5.15 compares Essential's 2014–19 actual/estimated capitalised overheads with our final determination allowance. Essential estimates capitalised overheads of $699.8 million in 2014–19. This is 3 per cent higher than our final determination allowance of $677.1 million.

Figure 5.15 – Annual capitalised overheads, actual/estimated expenditure compared with our final determination allowance, 2014–19 ($2018–19, million)



Source: Essential Energy and AER, *Essential Energy - Final Determination 2014–19*.

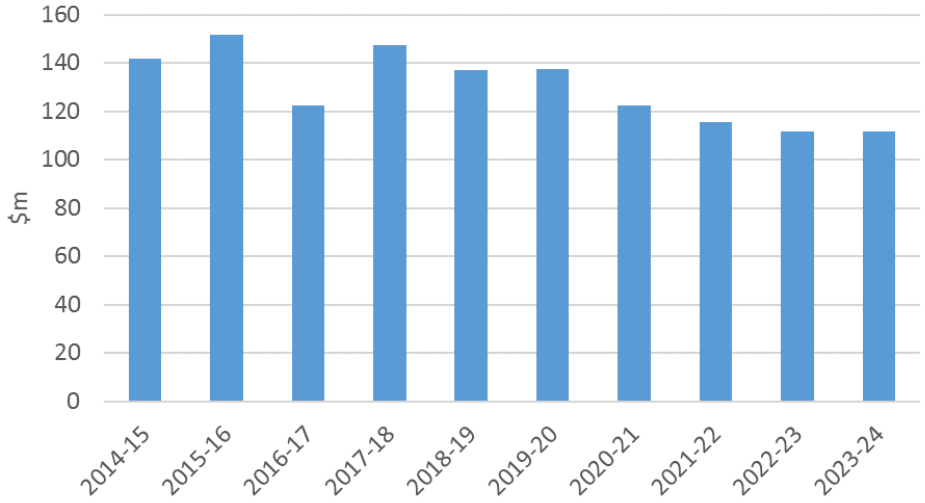
[152] Essential Energy, *response to information request 014*, 22 June 2018.

Forecast capitalised overheads compared with current period

Figure 5.16 compares Essential's 2019–24 forecast capitalised overheads with actual/estimated expenditure in 2014–19. Capitalised overheads are expected to be $140 million per year on average between 2014–15 and 2018–19. The increase in capitalised overheads in 2017–18 is due to the reallocation of costs to total business overheads that were previously included in "other network" opex, and expenditure on programs relating to stakeholder engagement, safety and environment and strategy and transformation.[153]

Capitalised overheads are forecast to decrease to $112 million by 2023–24, as savings increasingly outweigh the costs of implementing Essential's strategic initiative program over the 2019–24 regulatory control period.

Figure 5.16 – Annual capitalised overheads, 2014–15 to 2023–24 ($2018–19, million)



Source: Essential Energy, *RIN responses*.

Essential forecast a 37 per cent reduction in corporate overheads in 2019–24 compared with the current regulatory control period, while network overheads in 2019–24 are forecast to be 2 per cent lower than in 2014–19.

Our assessment of forecast capitalised overheads

Essential notes that the two primary factors that determine the forecast for capitalised overheads are:

- the value of total business overheads
- the allocation rate of total business overheads to capex.[154]

[153] Essential Energy, *response to information request 014*, 22 June 2018.
[154] Essential Energy, *response to information request 014*, 22 June 2018.

Calculation of total business overheads

To calculate capitalised overheads, Essential first calculates total overheads across its entire business (including SCS, ACS and its water business).

Essential has taken 2016–17 as the base year to forecast its total business overheads. It has then made adjustments for each year of the 2019–24 regulatory control period to reflect known changes and strategic initiatives.[155] This approach is illustrated in Table 5-9 below.

Table 5-9 – Essential's forecast of total business overheads for 2019–24 ($2018–19, million)

	2016–17	2019–20	2020–21	2021–22	2022–23	2023–24
Base	296	296	296	296	296	296
Adjustments for known changes		-2	-7	-4	-7	-8
Property lease capitalisation		-5	-5	-6	-6	-6
Strategic initiative investment		+31	+20	+14	+5	+2
Strategic initiative benefits		-7	-15	-29	-35	-39
Proposed overheads		313	289	272	254	246

Source: Essential Energy, *Response to information request 014*, 22 June 2018.

Essential's forecasting approach is reasonable because it:

- uses a base year where overhead costs are relatively low compared with historical actual costs, and best reflects efficiency-driven activities undertaken by Essential over the 2014–19 regulatory control period
- gives consideration to known changes, such as redundancies and changes in the Australian accounting standards for lease capitalisation
- incorporates the benefits forecast to be realised through Essential's strategic initiative program.

Essential's forecast for total business overheads is on average $21 million, or 7 per cent, lower per year than the base year expenditure.

Allocation to capex

Total business overheads are allocated to standard control services (SCS), and subsequently to SCS capex, based on forecast direct costs for 2019–24.[156] This is in accordance with Essential's cost allocation method. Direct capex as a proportion of

[155] Essential Energy, *Response to information request 014*, 22 June 2018.

[156] For the purposes of overhead allocation, forecast direct costs for SCS capex exclude gifted assets and non-network capex, but include LiDAR and customer cash contributions (excluding gifted assets).

total SCS direct costs in 2019–24 is forecast to be 50 per cent. This is a decrease from the current regulatory control period, where direct capex represents 55 per cent of total SCS direct costs. If the proportion of direct capex to total SCS direct costs were to remain at 55 per cent in 2019–24, capitalised overheads would be around $60 million, or 10 per cent, higher than Essential's forecast.

Essential’s approach to allocating overheads to capex is reasonable and consistent with its cost allocation model.

C Engagement and information-gathering process

Initial regulatory proposal

Essential lodged its regulatory proposal on the 30 April 2018, which was an extension from the original due date of 31 January 2018. Prior to lodgement, Essential requested an extension to the submission date from 31 January 2018 to 30 April 2018. Essential noted that the extension was necessary as it would alleviate resource constraints associated with its contemporaneous work for the 2014–19 remittal process and preparation for the 2019–24 regulatory control period.[157] At the time, Essential noted that, for efficiency reasons, it is resourced to undertake only one regulatory process at any given time.

We considered Essential's letter and agreed to the extension, as we acknowledged that the delay would enable Essential to formulate a better informed regulatory proposal for the benefit of customers.[158] Essential lodged its capex proposal on 30 April 2018, which included asset management plans, its network strategies and response to our regulatory information notices. Essential provided detailed options reports for its augmentation expenditure; however, we did not receive similar options reports for the other capex drivers (e.g. for repex or non-network).

Information-gathering process

To gain a better understanding of Essential's proposal, we requested further material through our information request process. We sent 18 information requests to Essential.[159] These included one information request which was prepared by our consultant, Arup.[160] Essential responded to all the information requests, within the agreed timeframe.

Engagement

We observe that, overall, Essential has engaged with us constructively, during the preproposal stage, the on-site discussions and through its responses to our information requests. Public submissions have made similar observations regarding Essential's Engagement. Origin Energy flagged its appreciation of Essential's engagement in explaining its revenue proposal.[161] Similarly, the CCP10 noted that Essential was

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157 Essential Energy, *Letter to the AER - Extension of time for the 2019–24 regulatory proposal*, Public, 14 September 2017.

158 AER, *Letter to Essential Energy - revised submission date for the 2019–24 regulatory proposal,* Public, 3 October 2017.

159 Each information request included multiple questions.

160 Arup prepared Information request #008, which included 24 questions for Essential Energy. See Essential Energy, *Response to AER Information Request 008 - Information request response*, Public, 8 June 2018.

161 Origin Energy, *Regulatory Proposals for NSW Electricity distributors 2019–24*, public, 8 August 2018, p.1.

proactive in addressing consumers' concerns and commended Essential for responding holistically to consumer and stakeholder input.[162] The ECA submitted that it has observed a real improvement in the way Essential has engaged with consumers and stakeholders.[163]

In terms of our engagement, we engaged with CCP10 and PIAC during the review process to understand and test their views on Essential's regulatory proposal. We have had regard to their public submissions, along with all the other submissions that we have received on Essential's capex proposal.

In terms of engagement with Essential, overall we acknowledge Essential's constructive engagement with us, which was open and transparent. In particular, our engagement gave us the opportunity to better understand the submitted information. The specific interactions we had with Essential in the lead up to the draft determination:

- In the pre-proposal stage:
    - In January 2018, we had a face-to-face discussion with Essential, where we sought to understand Essential's draft regulatory proposal.
    - We, along with CCP10, had a repex modelling meeting in March 2018 in Port Macquarie, where we explained our latest modelling refinement, and how it is likely to impact Essential. Similarly, Essential explained its process for developing the capex portfolio and the specific methodology it used to forecast repex. It was an opportunity for us to understand the results of the modelling and how it translated to Essential's asset replacement assumptions.
    - In March 2018, we provided Essential a copy of its repex modelling results as we considered it would be an opportunity for Essential to provide us with feedback on the assumptions as well as the input data. Those results prompted a number of information requests in the pre-proposal stage, which specifically related to poles and pole top structures.
- Following the submission of the regulatory proposal we supplemented our formal information requests with face-to-face discussions:
    - Between late May and early June, we had multiple face-to-face discussions with Essential and Arup, where we sought further detailed information on capex issues and tested our understanding of Essential's connections, non-network and repex proposals. We were particularly interested in the application of the Copperleaf (C55) system and how it was applied by Essential to arrive at its forecast. Arup's review is based on its observation

[162] CCP10, *Response to the AER Issues paper and revenue proposals for NSW Electricity Distribution Businesses 2019–24*, public, August 2018

[163] Energy Consumer Australia, *Submission to the AER Issues paper - Essential Energy Regulatory proposal 2019–24*, Public, August 2018, p.6.

from the on-site meetings, together with the information supplied prior to, at, and following the on-site discussion.

D Repex Modelling Approach

This section provides a guide to our repex modelling process. It sets out:

1. relevant background information
2. the data used to run the repex model
3. the key assumptions underpinning our repex modelling approach
4. the repex model outcomes under different scenarios.

D.1 Background to predictive modelling

In 2012, the AEMC published changes to the National Electricity and National Gas Rules.[164] Following these rule changes, we undertook a "Better Regulation" work program, which included publishing a series of guidelines setting out our approach to regulation under the new rules.[165]

The Expenditure Assessment Guideline describes our approach, assessment techniques and information requirements for setting efficient expenditure allowances for distribution network service providers (distributors).[166] It lists predictive modelling as one of the assessment techniques we may employ when assessing a distributor's repex. We first developed and used our repex model in our 2009–10 review of the Victorian electricity distributors' 2011–15 regulatory proposals and have also used it in subsequent electricity distribution decisions.

The technical underpinnings of the repex model are discussed in detail in the replacement expenditure model handbook.[167] At a basic level, our repex model is a statistical tool used to conduct a top-down assessment of a distributor's replacement expenditure forecast. Discrete asset categories within six broader asset groups are analysed using the repex model. These six asset groups are poles, overhead conductors, underground cables, service lines, transformers and switchgear.

The repex model forecasts the volume of assets in each category that a distributor would be expected to replace over a 20-year period. The model analyses the age of assets already in commission and the time at which, on average, these assets would be expected to be replaced, based on historical replacement practices. A total replacement expenditure forecast is derived by multiplying the forecast replacement volumes for each asset category by an indicative unit cost.

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164 AEMC, *Rule Determination, National Electricity Amendment (Economic Regulation of Network Service Providers) Rule 2012*, 29 November 2012.

165 See AER *Better regulation reform program* web page at https://www.aer.gov.au/networks-pipelines/better-regulation.

166 AER, *Expenditure Forecast Assessment Guideline for Electricity Distribution*, November 2013.

167 AER, *Electricity network service providers: Replacement expenditure model handbook*, November 2013.

The repex model can be used to advise and inform us and our consultants where to target a more detailed bottom-up review, and define an alternate repex forecast if necessary. The model can also be used to benchmark a distributor against other distributors in the NEM.[168] We have also had regard to feedback from distributors on some of the underlying assumptions and modelling techniques throughout our ongoing engagement during both the pre-proposal and proposal stages.

As detailed in our repex handbook, the repex model is most suitable for asset groups and categories where there is a moderate to large asset population of relatively homogenous assets. It is less suitable for assets with small populations or those that are relatively heterogeneous. For this reason, we exclude the SCADA and other asset groups from the modelling process and do not use predictive modelling to directly assess the asset categories within these groups.

Expenditure on and replacement of pole top structures is also excluded, as it is related to expenditure on overall pole replacements and modelling may result in double counting of replacement volumes. In addition, distributors do not provide asset age profile data for pole top structures in the annual category analysis RINs, so this asset group cannot be modelled using the repex model.

D.2 Data collection

The repex model requires the following input data:

- the age profile of network assets currently in commission
- expenditure and replacement volume data of network assets
- the mean and standard deviation of each asset's expected replacement life.

These data are derived from distributors' annual regulatory information notice (RIN) responses, and from the outcomes of the unit cost and expected replacement life benchmarking across all distribution businesses in the NEM. The RIN responses relied on are:

- annual category analysis RINs—issued to all distributors in the NEM
- Reset RINs—distributors are required to submit this information with their regulatory proposal.

Category analysis RINs include historical asset data and Reset RINs provide data corresponding to distributors' proposed forecast repex over the upcoming regulatory control period. In both RINs, the templates relevant to repex are sheets 2.2 and 5.2.

Our current approach of adopting a standardised approach to network asset categories provides us with a dataset suitable for comparative analysis and better equips us to assess the relative prices of capital inputs as required by the capex factors.[169]

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[168] This includes Power and Water Corporation.

[169] NER cl. 6.5.7(e)(7)

D.3 Scenario analysis

In this section we set out the broad assumptions used to run a series of scenarios to test the distributor's forecast modelled repex. The specific modelling assumptions applied for each distributor are outlined in each individual repex modelling workbook.

The four scenarios analysed are:

1. historical unit costs and calibrated expected replacement lives (**Historical Performance Scenario**)
2. comparative unit costs and calibrated expected replacement lives (**Cost Scenario**)
3. historical unit costs and comparative expected replacement lives (**Expected Lives Scenario**)
4. comparative unit costs and comparative expected replacement lives (**Combined Scenario**).

Comparative unit costs are defined as the minimum of a distributor's historical unit costs, its forecast unit costs and the median unit costs across the NEM. Comparative replacement lives are defined as the maximum of a distributor's calibrated expected replacement life and the median expected replacement life across the NEM.

D.4 Calibration

The calibration process estimates the average age at replacement for each asset category using the observed historical replacement practices of a distributor. The length of the historical period analysed during this process is referred to as the 'calibration period'. The inputs required to complete the calibration process are:

- the age profile of network assets currently in commission
- historical replacement volume and expenditure data for each asset category.

The calibrated expected replacement lives as derived through the repex model differ from the replacement lives that distributors report. During the calibration process, we assume the following:

- the calibration period is a historical period where a distributor's replacement practices are largely representative of its expected future replacement needs[170]
- we do not estimate a calibrated replacement life where a distributor did not replace any assets during the calibration period, because the calibration process relies on actual historical replacement volumes to derive a mean and standard deviation
- where a calibrated replacement life is not available, we substitute the value of a similar asset category.

[170] Each distributor's specific repex modelling workbook outlines more detailed information on the calibration period chosen.

D.5 Comparative analysis

The Cost, Lives and Combined Scenarios rely on a comparative analysis technique that compares the performance of all distributors in the NEM. The technique analyses the two variable repex model inputs—unit costs and replacements lives. The aim of the Cost, Lives and Combined Scenarios is to test unit cost and expected replacement life inputs that are most representative of distributors across the NEM.

Previous distribution determinations where we have used the repex model have primarily focused on the Historical Performance Scenario. This scenario forecasts a distributor's expected repex and replacement volumes based on its historical unit costs and asset replacement practices (which are used to derive expected replacement lives).

Our refined comparative analysis repex modelling approach builds on this previous analysis and introduces the historical performances of other distributors in the NEM into the forecast period. The Cost Scenario analyses the level of repex a distributor could achieve if its historical unit costs are substituted with comparative unit costs. Expected Lives Scenario analyses the level of repex a distributor could achieve if its calibrated expected replacement lives are substituted with comparative expected replacement lives.

Unit costs

The comparative analysis technique compares a distributor's historical unit costs, forecast unit costs and median unit costs across the NEM. Historical unit costs are derived from a distributor's category analysis RIN and forecast unit costs are derived from a distributor's Reset RIN, which is submitted as part of its regulatory proposal.

The median unit costs across the NEM are based on each distributor's historical unit cost for each asset category. The median unit cost is used for comparative analysis purposes because this approach effectively removes any outliers, either due to unique network characteristics or data reporting anomalies.

The United Kingdom's Office of Gas and Electricity Markets (Ofgem) has a similar approach to unit costs benchmarking, where Ofgem applies a unit cost reduction where the distributor's forecast unit cost was higher than industry median.[171]

The unit cost input used in the Cost and Lives Scenario is the minimum of a distributor's historical unit costs, its forecast unit costs and the median unit costs across the NEM.

[171] Ofgem, *Strategy decisions for the RIIO-ED1 electricity distribution price control - tools for cost assessment* - 4 March 2013.

Replacement lives

For expected replacement lives, the comparative analysis technique compares a distributor's calibrated replacement lives (based on historical replacement practices) and the median expected replacement lives across the NEM. Median expected replacement lives are based on each distributor's calibrated replacement lives for each asset category. Once again, using the median value effectively accounts for any outliers.

The expected replacement life input used in the Expected Lives and Combined Scenarios is the maximum of a distributor's calibrated replacement life and the median replacement life across the NEM.

Repex model threshold

Our repex model threshold is defined taking these results and other relevant factors into consideration. For the 2019–24 determinations, our approach is to set the repex model threshold equal to the highest result out of the Cost and Expected Lives Scenario.[172] This approach gives consideration to the inherent interrelationship between the unit cost and expected replacement life of network assets.

For example, a distributor may have higher unit costs than other distributors for particular assets, but these assets may in turn have longer expected replacement lives. In contrast, a distributor may have lower unit costs than other distributors for particular assets, but these assets may have shorter expected replacement lives.

D.6 Non-like-for-like replacement – the treatment of staked wooden poles

The staking of a wooden pole is the practice of attaching a metal support structure (a stake or bracket) to reinforce an aged wooden pole.[173] The practice has been adopted by distributors as a low-cost option to extend the life of a wooden pole. These assets require special consideration in the repex model because, unlike most other asset types, they are not installed or replaced on a like-for-like basis.

Replacement expenditure is normally considered to be on a like-for-like basis. When an asset is identified for replacement, it is assumed that the asset will be replaced with its modern equivalent and not a different asset.[174] The repex model forecasts the volume of old assets that need to be replaced, not the volume of new assets that need to be installed. This is simple to deal with when an asset is replaced on a like-for-like basis – the old asset is simply replaced by its modern equivalent. Where like-for-like

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[172] Our modelling approach means Historical Performance Scenario will always be higher than the Cost and Expected Lives scenarios, and the Combined Scenario will always be lower than Cost and Expected Lives scenarios.

[173] The equivalent practice for stobie poles is known as "plating", which similarly provides a low-cost life extension. SA Power Networks carries out this process. For simplicity, this section only refers to the staking process.

[174] For example, conductor rated to carry low-voltage will be replaced with conductor of the same rating, not conductor rated for high-voltage purposes.

replacement is appropriate, it follows that the number of assets that need to be replaced matches the number of new assets that need to be installed.

However, where old assets are commonly replaced with a different asset, we cannot simply assume the cost of the new asset will match the cost of the old asset's modern equivalent. As the repex model forecasts the number of old assets that need to be replaced, it is necessary to make adjustments for the asset's unit cost and calibrated expected replacement life. For modelling purposes, the only category where this is significant is wooden poles.

Staked and unstaked wooden poles

Staked wooden poles are treated as different assets to unstaked poles in the repex model. This is because staked and unstaked poles have different expected replacement lives and different unit costs.

There are two asset replacements options and two associated unit costs that may be made by a distributor – a new pole could replace the old one or the old pole could be staked to extend its life.[175] In addition, there are circumstances where an in-commission staked pole needs to be replaced. Staking is a one-off process. When a staked pole needs to be replaced, a new pole must be installed in its place. The cost of replacing an in-commission staked pole is assumed to be the same as the cost of a new pole.

Unit cost blending

We use a process of unit cost blending to account for the non-like-for-like asset categories. For unstaked wooden poles that need to be replaced, there are two appropriate unit costs – the cost of installing a new pole and the cost of staking an old pole. We use a weighted average between the unit cost of staking and the unit cost of pole replacement to arrive at a blended unit cost.[176]

For staked wooden poles, we ask distributors for additional historical data on the proportion of staked wooden poles that are replaced. The unit cost of replacing a staked wooden pole is a weighted average based on the historical proportion of staked pole types that are replaced. Where historical data is not available, we use the asset age data to determine what proportion of the network each pole category represented and use this information to weight the unit costs.

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[175] When a wooden pole needs to be replaced, it will either be staked or replaced with a new pole. The decision on which replacement type will be carried out is made by determining whether the stake will be effective in extending the pole's life and is usually based on the condition of the pole base. If the wood at the base has deteriorated significantly, staking will not be effective and the pole will need to be replaced. If there is enough sound wood to hold the stake, the life of the pole can be extended and the pole can be staked, which is a more economically efficient outcome.

[176] For example, if a distributor replaces a category of pole with a new pole 50 per cent of the time and stakes this category of the pole the other 50 per cent of the time, the blended unit cost would be a straight average of the two unit costs. If the mix was 60:40, the unit cost would be weighted accordingly.

Calibrating staked wooden poles

Special consideration also has to be given to staked wooden poles when determining their calibrated replacement lives. This is because historical replacement volumes are used in the calibration process. The RIN responses provide us with information on the volume of new assets installed over the calibration period. However, the repex model forecasts the volume of old assets being replaced. Since the replacement of staked poles is not on a like-for-like basis, we make an adjustment for the calibration process to function correctly.

We need to know the number of staked poles that reach the end of their economic life and are replaced over the calibration period, so an expected replacement life can be calibrated. The category analysis RINs currently only provide us with information on how many poles were staked each year, rather than how many staked poles were actually replaced. This additional information is provided by each of the distributors. Where this information is not available, we estimate the number of staked wooden poles replaced over the calibration period based on the data we have available.

E Demand

Maximum demand forecasts are fundamental to a distributor's forecast capex and opex, and to our assessment of that forecast expenditure. This is because we must determine whether the capex and opex forecasts reflect a realistic expectation of demand forecasts and cost inputs required to achieve the capex and opex objectives.[177] Hence, accurate demand forecasts are important inputs to ensuring efficient levels of investment in the network.

This appendix sets out our decision on Essential's forecast network maximum demand for the 2019–24 regulatory control period. We consider Essential's demand forecasts at the system level and the more local level.

System demand represents total demand in Essential's distribution network. System demand trends give a high-level indication of the need for expenditure on the network to meet changes in demand. Forecasts of increasing system demand generally signal an increased network utilisation which may, once any spare capacity in the network is used up, lead to a requirement for growth capex. Conversely, forecasts of stagnant or falling system demand will generally signal falling network utilisation, a more limited requirement for growth capex and the potential for the network to be rationalised in some locations.

Localised demand growth (spatial demand) drives the requirement for specific growth projects or programs. Spatial demand growth is not uniform across the entire network; for example, future localised demand trends would differ between established suburbs and new residential developments.

In our consideration of Essential's demand forecasts, we have had regard to:

- Essential's regulatory proposal
- AEMO's independent forecasts.

These are set out in more detail in the remainder of this appendix.

E.1 Draft determination

We consider that Essential's demand forecasts reflect a realistic expectation of demand over the 2019–24 regulatory control period. Our findings are that:

- Essential's forecasts of system summer peak demand grow at a higher rate than AEMO's forecast, but remain quite low at 0.1 per cent per annum from 2016–17 to 2023–24.

[177] NER, cll. 6.5.6(c)(3) and 6.5.7(c)(1)(iii).

- Essential forecasts that system winter peak demand will grow at 0.6 per cent per annum, which is lower than AEMO's forecast of 1.4 per cent per annum, for the period from 2016 to 2023.
- Essential's forecasts are based on those produced by the National Institute of Economic and Industry Research (NIEIR), which makes post modelling adjustments for PV generation, battery storage and electric vehicle adoption. These adjustments are generally less aggressive than those of AEMO.

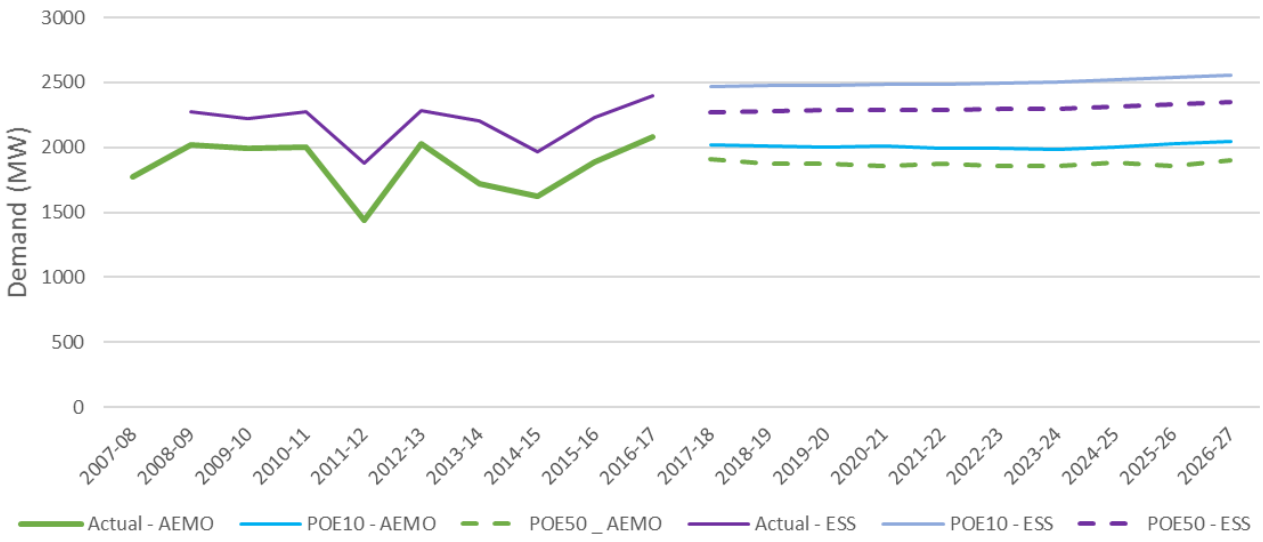
These findings are discussed below.

Comparison between the AEMO forecasts and Essential forecasts

Historically, Essential's network has been either a summer peaking or winter peaking network, largely depending on weather variance in the summer months. As such, we compared Essential's forecast with AEMO's for both the summer and winter peak.

As shown in Figure 5.17 below, Essential reported a system summer peak demand of 2394MW (2273MW after weather normalisation) in 2016–17. Essential has recorded a gradual growth in summer peak demand of 0.3 per cent per annum from 2008–09 to 2016–17. Essential forecasts that growth up to 2023–24 will be more modest at 0.1 per cent per annum, reaching a peak of 2298MW in 2022–23. In comparison, AEMO forecasts summer peak to decline over the same period, falling 0.5 per cent per annum to 1861MW in 2024, from a weather corrected peak demand of 1922MW in 2016–17.

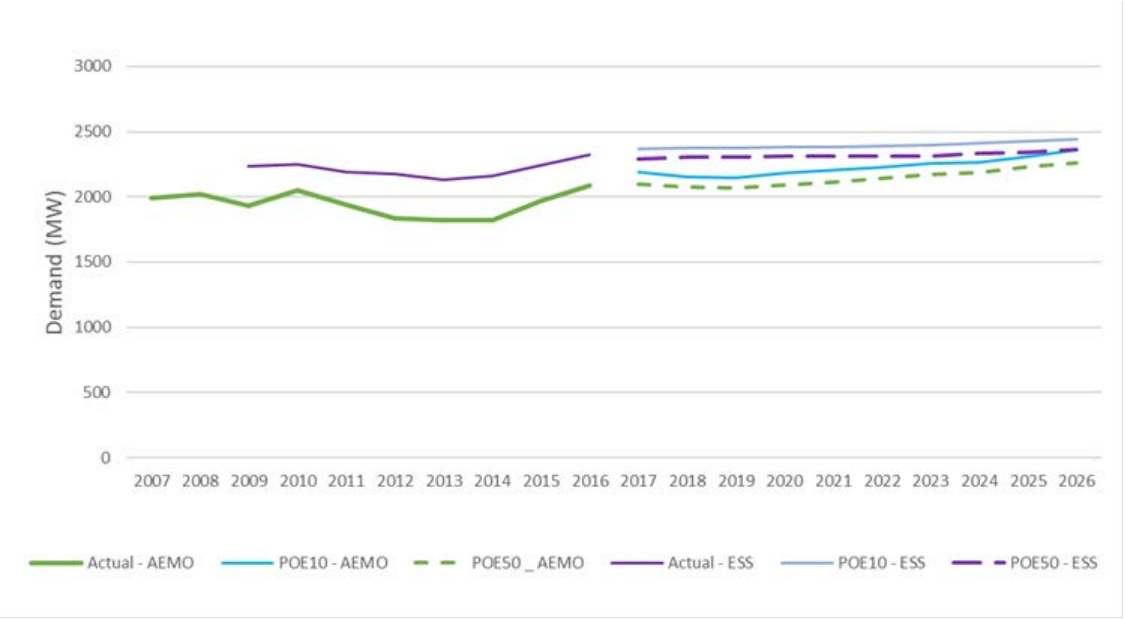
Figure 5.17 – Comparison of coincident summer peak demand forecasts by AEMO and Essential, 2008–2027



Source: AEMO, *2017 NSW-ACT Dynamic Interface; Essential Energy, Summer and Winter Peak Demand Projections for Essential Energy in New South Wales to 2029–30, Attachment 14.01 Volume 2*, prepared by National Institute of Economic and Industry Research (NIEIR), June 2017, Table 5.9.

Figure 5.18 compares AEMO and Essential's winter peak forecasts. For the winter peak, Essential reported a system peak demand of 2320MW for 2016, which is higher than AEMO's recorded peak demand of 2083 MW. In contrast to the summer peak demand, AEMO's forecast growth rate for winter peak demand is higher than Essential's. From 2016 to 2023, AEMO forecasts an average annual growth rate in winter peak demand of 1.4 percent, compared with Essential forecast growth rate over the same period of 0.6 per cent per annum. Essential's forecast growth rates for both summer and winter peak demand appear to be comparable to historical trends.

Figure 5.18 – Comparison of coincident winter peak demand forecasts by AEMO and Essential, calendar years 2007–26



Source: AEMO, *2017 NSW-ACT Dynamic Interface; Essential Energy, Summer and Winter Peak Demand Projections for Essential Energy in New South Wales to 2029–30, Attachment 14.01 Volume 2*, prepared by National Institute of Economic and Industry Research (NIEIR), June 2017, Table 5.10.

The consistent differences in historical peak demand recorded by AEMO and Essential in both summer and winter peaks are due to differences in the measurements taken, including different coincidental timing. For example, AEMO measures 65 transmission connection points that are connected to Essential's network, whereas Essential's modelling corresponds to 70 transmission node identifiers. Despite these differences in peak demand level, changes in demand over time are likely to be influenced by the same set of demand drivers. Therefore, when comparing the forecasts, it is important to compare the methodologies in terms of the demand drivers and their impacts on the growth rates.

Comparison of forecasting method

AEMO uses a combination of a bottom-up approach to forecast peak demand at the transmission connection point level and a top-down approach to forecast state-based system level peak demand. The bottom-up transmission connection point forecasts are

reconciled to state-based system level forecasts by applying individual diversity factors[178] and allocating remaining differences with the top-down forecasts to growth connection points on a proportional basis.

Essential engaged NIEIR to develop its summer and winter peak demand up to 2030 using a combination of top down and bottom-up approaches:

- Seasonal peak demand forecasts for each of Essential's three planning regions (i.e. North Coast, Northern and South Region) are developed using NIEIR's simulation based maximum demand model, known as PeakSim. These are aggregated into system forecasts using historic trends in coincident factors. Limited details are provided about the simulation model[179] and it is unclear how historic trends are derived for forming the coincidence factors used.
- Demand forecasts at the zone substation level are developed using similar but more basic regression based techniques to estimate the demand-weather relationship. These are used to derive the demand forecasts at the 70 transmission node identifiers. The forecasts are constrained to the top down system forecasts of summer and winter maximum demand.

Conceptually, NIEIR's approach separates demand into two segments: a temperature insensitive base load that is linked to energy sales, and temperature sensitive load linked to air conditioner sales. The relative share of temperature sensitive and insensitive demand depends on the composition of residential, commercial and industrial customers. Base load is approximately the level of demand on a mild temperature day while the temperature-sensitive demand is the part of demand varying with prevailing weather conditions. The two components can be jointly estimated (for any given year) using regression analysis or simulation to estimate the relationship between demand and weather.

Post-modelling adjustments were made for the effect of new technologies such as solar PV, battery storage and electronic vehicles, but not for increasing energy efficiency[180] or for spot loads. In comparison, AEMO has made more aggressive post-modelling adjustments for the impact that new technologies will dampen peak demand growth:

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[178] Diversity factor is the ratio between the demand at a location at the time of system peak demand to the maximum demand occurring at that location (whenever that maximum may occur).

[179] One useful source document on NIEIR's PeakSim model is the Acil Tasman review in 2012 of forecasting processes used for the SWIS. Acil Tasman (2012, p. viii) considers that the simulation approach to weather normalisation is superior to the econometric approach. See: Acil Tasman, *Review of Forecasting Processes used for the SWIS, Draft Report prepared for the Independent Market Operator*, September 2012.

[180] NIEIR considers that the NSW Energy Saving Scheme (ESS)'s impacts have been adequately captured in historical trends and the white certificate program is under-represented in rural areas. National Institute of Economic and Industry Research, *Attachment 14.1 – Volume 2: Summer and Winter Peak Demand Projections for Essential Energy in New South Wales to 2029–30*, June 2017, p. 63.

- AEMO projects the PV share of underlying summer peak demand to grow over time, from 2.8 per cent in 2016–17 to about 5 per cent by 2023–24.[181] In contrast, NIEIR's forecasts for Essential estimates a lower PV share, growing from 2.1 per cent in 2016–17 to 3.3 per cent in 2023–24.
- On electric vehicles, AEMO forecasts no peak demand impact while NIEIR projects gradually growing impact on peak demand over time which will reach close to 0.4 per cent by 2023–24.

Assesment of Essential's approach

We consider that Essential's overall forecasting approach is valid and reasonable. Whilst it is difficult to understand all the underlying assumptions for NIEIR's modelling on the information provided, it appears that the modelling has taken into account a similar set of key of electricity demand drivers to those considered by AEMO. Furthermore, Essential has forecast gradual growth rates for both winter and summer peak demand that are broadly consistent with historic trends and those of AEMO.

[181] AER analysis of AEMO's data from National Electricity Forecasting Reports 2017.

F Ex-post statement of efficiency and prudency

We are required to provide a statement on whether the roll forward of the regulatory asset base from the previous period contributes to the achievement of the capital expenditure incentive objective.[182] The capital expenditure incentive objective is to ensure that where the regulatory asset base is subject to adjustment in accordance with the NER, only expenditure that reasonably reflects the capex criteria is included in any increase in the value of the regulatory asset base.[183]

The NER require that the last two years of the previous regulatory control period (for the purposes of this decision, the 2017–18 and 2018–19 regulatory years) are excluded from the ex-post assessment of past capex. Further, the NER prescribe that the review period does not include the regulatory year in which the first *Capital expenditure incentive guideline* (the Guideline) was published (2013–14) or any regulatory year that precedes that regulatory year.[184] In addition, under the transitional rules, in making this distribution determination, the review of past capex does not apply to Essential prior to 1 July 2015.[185] Accordingly, our ex-post assessment only applies to the 2015–16 and 2016–17 regulatory years.

We may exclude capex from being rolled into the RAB in three circumstances:[186]

1. Where the distribution business has spent more than its capex allowance;
2. Where the distribution business has incurred capex that represents a margin paid by the distribution business, where the margin refers to arrangements that do not reflect arm's length terms; or
3. Where the distribution business's capex includes expenditure that should have been classified as opex as part of a distribution business's capitalisation policy.

F.1 Position

We are satisfied that Essential's capital expenditure in the 2015–16 and 2016–17 regulatory years should be rolled into the RAB.

F.2 Our approach

We have conducted our assessment of past capex consistent with the approach set out in the Guideline. The Guideline outlines a two-stage process for undertaking an ex-post assessment of capital expenditure:[187]

182 NER, cl. 6.12.2(b).
183 NER, cl. 6.4A(a).
184 NER, cl.11.60.5
185 NER, cl.11.56.5(a).
186 NER, cl. S6.2.2A(b).

- Stage one—initial consideration of actual capex performance
- Stage two—detailed assessment of drivers of capex and management and planning tools and practices.

The first stage considers whether the distribution business has overspent against its allowance and past capex performance. In accordance with the Guideline, we would only proceed to a more detailed assessment (stage two) if:

- a distribution business had overspent against its allowance; and
- the overspend was significant; and
- capex in the period of our ex-post assessment suggests that levels of capex may not be efficient or do not compare favourably to other distributors.

F.3 Our assessment

We have reviewed Essential's capex performance for the 2015–16 and 2016–17 regulatory years. This assessment has considered Essential's actual capex relative to the regulatory allowance given the incentive properties of the regulatory regime for a distribution business to minimise costs.

Essential incurred total capex below its forecast regulatory allowance in these regulatory years. Therefore, the overspending requirement for an efficiency review of past capex is not satisfied.[188] We also consider that the 'margin' and 'capitalisation' RAB adjustments are not satisfied.

We have also had regard to some measures of input cost efficiency as published in our latest annual benchmarking report.[189] We recognise that there is no perfect benchmarking model, but we consider that our benchmarking models are robust measures of economic efficiency and we can use this measure to assess and compare a distributor's efficiency.

The results from our most recent benchmarking report suggest that Essential's overall efficiency has improved in 2016–17 relative to 2015–16, but is still poor relative to other distributors. Essential was ranked eleventh of thirteen on our multilateral total factor productivity score in 2016–17, improving from twelfth in 2015–16.[190] While this provides relevant context, we have not used our benchmarking results in a determinative way for this capex draft decision, including in relation to this ex-post efficiency and prudency review.

In assessing the prudency and efficiency of Essential's capex in the ex-post review period, we may only take into account information and analysis that Essential could

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187 AER, *Capital Expenditure Incentive Guideline*, November 2013, pp. 19–22.

188 NER, cl. S6.2.2A(c).

189 AER, *Annual benchmarking report: Electricity distribution network service providers*, November 2017.

190 AER, *Annual benchmarking report: Electricity distribution network service providers*, November 2017, p. 8.

reasonably be expected to have considered or undertaken at the time that it undertook the relevant capex.[191] We have therefore not taken into account the information and analysis relied upon in other areas of this draft decision, for example Arup's analysis and advice on aspects of Essential's forecast capex, for this ex-post efficiency and prudency review.

For the reasons set out above, Essential's capital expenditure in the 2015–16 and 2016–17 regulatory years should be rolled into the RAB.

[191] NER, cl. S6.2.2A(h)(2).