



**Attachment C**  
**Pole Top Structure**  
**Replacements**  
**Ex post Review of Ergon**  
**Energy 2018-2023 Capital**  
**Expenditure**

January 2024



Part of Energy Queensland

## Note

This attachment forms part of Ergon Energy's justification of the ex post review of its 2018-2023 capital expenditure for submission to the AER as part of its 2025-30 Regulatory Proposal. It should be read in conjunction the main document.

The ex post review submission includes the following documents.

### Overview - Ex post Review of Ergon Energy 2018-2023 Capital Expenditure

Attachment A	Pole Replacements
Attachment B	Overhead Conductor Replacements
Attachment C	Pole Top Structure Replacements
Attachment D	Switchgear Replacements
Attachment E	Transformer Replacements
Attachment F	Underground Cable Replacements
Attachment G	Service Replacements
Attachment H	SCADA Replacements
Attachment I	Other Replacements
Attachment J	ICT Capex

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## 1 INTRODUCTION

Pole top structures support the overhead network which delivers electricity to customers across our distribution network. The most significant pole top assets are crossarms which are typically constructed from wood, laminated softwood, steel, concrete, or composite fibres with the majority constructed from wood.

Our expenditure on pole top replacements over the review period<sup>1</sup> was above the AER's forecast by \$225.8 million (\$2024-25). We have conducted a Post Implementation Review (PIR) on pole top structure replacements to evaluate the outcomes and benefits of the expenditure.

This paper provides the background and analysis of Ergon Energy's expenditure on pole top replacements to identify the causes and drivers behind the increase in expenditure.

## 2 ASSET MANAGEMENT PRACTICE

The asset management practice for Energex and Ergon as set out in the Asset Management Plan for Pole Top Structures in alignment with ISO55000 asset management framework.

Pole top structures are made up of crossarms, insulators, and other accessories such as transformer platforms, surge arrestors, and raiser brackets. The majority of crossarms are constructed from wood. Wood crossarms are susceptible to a wide variety of environmental damage including termite attack, rot and decay, and splitting due to effects of the weather. The current strategy is to transition away from wood crossarms in favour of alternatives such as composite crossarms or constructions with no crossarm for standard designs.

Pole top structures condition and failure consequence risks (safety, customer reliability, environmental and financial) are regularly assessed through our asset inspection and defect identification processes. Specific pole top structure replacements are managed as part of the defect replacement programs. As pole top structure replacement is closely related to pole replacements, increases in pole replacements will drive increase volumes of pole top structure replacements.

Further details are set out in Pole Top Structure Asset Management Plan.

## 3 2015-20 DISTRIBUTION DETERMINATION

Predictive modelling using the AER repex model was first used in the 2015-20 Determination for Ergon Energy. However, the AER repex model excludes pole top structures as an asset category in its predictive modelling due to lack of the asset age profile data needed as an input to the repex model.

Unless otherwise stated, all values in this section are in are \$2014-15.

Table 1 is a summary of information on pole top structure replacements from the 2015-20 Regulatory Determination.

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<sup>1</sup>The review period as defined in NER S6.2.2A(a1) is 2018-19 to 2022-23

**Table 1: 2015-20 Pole Top Structure Replacements<sup>23</sup>**

\$ 2014-2015 (\$,000)	POLE TOP STRUCTURES					
	2015-2020 Determination					
	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020	Total
Revised Regulatory Proposal	\$22,621	\$21,450	\$21,150	\$21,036	\$22,731	\$ 108,988
AER Final Decision Forecast	\$16,440	\$ 8,281	\$ 6,504	\$ 7,871	\$ 7,360	\$ 46,456

Key points in relation to pole top structure replacements are:

- The AER's alternative estimate of repex by asset category was \$786.6 million. The final repex forecast after adjusting for escalations was \$740.2 million.
- For the purpose of this ex-post review, the forecast for unmodelled categories have been pro-rated to align with the final total repex forecast of \$740 million. Hence, the total repex for pole top structures has been adjusted to \$46.45 million, instead of \$61 million.
- We submitted our forecast expenditure for pole top structure replacement in the reset RIN.
- In our regulatory proposal, we forecast \$103 million (\$2014-15) of pole top structures repex over the 2015–20 regulatory control period.
- The AER noted that our forecast expenditure of \$103 million was a 69 per cent or \$42 million increase on the previous regulatory control period.<sup>4</sup>
- In our revised proposal, we raised concerns on the exclusion of pole top structures from the repex model.
- The AER's response to this concern is set out on page 6-101.

*In the preliminary decision, we did not consider that there was sufficient justification to support Ergon Energy's forecast expenditure of \$103 million for pole top structure replacement, a 69 per cent or \$42 million increase on the previous regulatory control period. Ergon Energy's revised proposal raised concerns that we did not include pole top structures in the repex model despite being provided with estimated age information. We continue to consider, in accordance with our reasoning in the preliminary decision, that it is appropriate to exclude pole top structures from the model as it is related to expenditure on overall pole replacement and therefore modelling may result in double counting of replacement volumes. However, as we have asset age and historical replacement data, we tested whether predictive modelling would support Ergon Energy's proposed step increase*

<sup>2</sup> Pole top structures is not an asset category in the repex model - the repex model numbers are on the basis of a test of the predictive modelling undertaken by the AER

<sup>3</sup> AER's alternative estimate of repex by asset categories is \$786.6 million. The final repex forecast after adjusting for escalations is \$740.2 million. For the purpose of this ex post review, the forecast for unmodelled categories are pro-rated to align with the final total repex forecast of \$740 million. Hence total repex for pole top structure is \$46.45 million instead of \$61 million

<sup>4</sup> Page 6-101 AER Final Decision Attachment 6 – Capital expenditure | Ergon Energy determination 2015–20

*over historical expenditure. The calibrated repex outputs for pole top structure replacement are \$60 million where forecast unit costs are used and \$68 million where historical unit costs are used. From this, we observe that Ergon Energy's repex for pole top structures is likely to be closer to its expenditure in the 2010–15 regulatory period*

- On that basis the AER's final decision was a repex forecast of \$61 million for pole top structures<sup>5</sup>.
- As noted above, the repex forecast for pole top structures used in this ex-post analysis is \$46.45 million, instead of \$61 million.

## 4 2020-25 DISTRIBUTION DETERMINATION

Unless otherwise stated, all values in this section are in are \$2019-20.

A comparison of the expenditure (\$2019-20), volume and unit cost from the 2020-25 regulatory determination process is provided in Table 2 below:

**Table 2: Summary of 2020-25 Proposals and Decisions**

\$ 2019-2020 (\$,000)	POLE TOP STRUCTURES					
	2020-2021	2021-2022	2022-2023	2023-2024	2024-2025	Total
Revised Regulatory Proposal	\$28,362	\$28,511	\$29,464	\$29,973	\$27,668	\$ 143,977
AER Final Decision Forecast	\$24,500	\$24,500	\$24,500	\$24,500	\$24,600	\$ 122,600

Key points to note are:

- As pole top structures are not a modelled asset category, the AER adopted a detailed bottom-up assessment.
- In the RP, we forecast \$126m for pole top structure replacements, which was included in the "Other" category of replacement expenditure.
- In the RRP, we forecast \$125.5 million of repex for pole top structures excluding costs associated with the clearance program (totalling \$133 million) which was also included in the "Other" unmodelled category.
- In making its final assessment the AER included the clearance program into the pre-determined modelled and unmodelled asset categories in accordance with the allocation as advised by us.
- Based on the allocation, the AER included \$18.5 million<sup>6</sup> of the clearance program into the pole top structure category, resulting in an effective forecast of \$144 million for this category that was assessed by the AER.
- Based on its analysis, the AER concluded that we did not provide enough justification for an increase in expenditure for pole top structure replacements and adopted an approach of expenditure utilising the trend from prior years in their final decision.

<sup>5</sup> Page 6-102 AER Final Decision Attachment 6 – Capital expenditure | Ergon Energy determination 2015–20

<sup>6</sup> 14% of \$133 million

- The final decision provided a forecast of \$122.6 million of repex for pole top structures over the 5 years<sup>7</sup>.

## 5 HISTORICAL EXPENDITURE AND VOLUMES

This section presents data sourced from our proposals for 2015-20 and 2020-25 Determinations and CA RIN 2.2 Repex as submitted to the AER.

Unless otherwise stated, all values in this section have been converted to \$2024-25 for comparison purposes.

### 5.1 Actual 2015-20 Performance

A summary of the actual expenditure of pole top structure replacements over the 2015-20 regulatory control period is provided in Table 3 below.

**Table 3: Pole Top Structure Repex 2015-20**

\$ 2024-2025 (\$,000)	POLE TOP STRUCTURES					
	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020	Total
Revised Regulatory Proposal	\$29,847	\$28,303	\$27,907	\$27,756	\$29,993	\$ 143,807
AER Final Decision Forecast	\$21,692	\$10,926	\$ 8,582	\$10,385	\$ 9,712	\$ 61,297
Actual	\$21,665	\$24,871	\$36,235	\$47,902	\$69,976	\$ 200,650

#### Key Observations

- Over the 2015-2020 RCP, our expenditure on pole top structure replacements exceeded the AER forecast by 168%.
- The majority of the overspend occurred in the last two years of the RCP, which falls within the review period.
- In 2018-19 and 2019-20, the actual expenditure exceeded the AER forecast by over 300%.

### 5.2 2020-25 Actual and Estimated Performance

A summary of the actual expenditure of pole top structure replacements over the 2020-25 regulatory control period is provided in Table 4 below.

**Table 4: Pole Top Structure Repex 2020-2025<sup>8</sup>**

\$ 2024-2025 (\$,000)	POLE TOP STRUCTURES					
	2020-2021	2021-2022	2022-2023	2023-2024	2024-2025	Total
Revised Regulatory Proposal	\$34,331	\$34,511	\$35,665	\$36,282	\$33,491	\$ 174,280
AER Final Decision Forecast	\$29,656	\$29,656	\$29,656	\$29,656	\$29,777	\$ 148,403
Actual	\$75,200	\$67,965	\$73,902	\$59,183	\$64,841	\$ 341,091

<sup>7</sup> For the purpose of analysis, the total is spread evenly across all 5 years.

<sup>8</sup> Estimated for 2023-24 and 2024-25

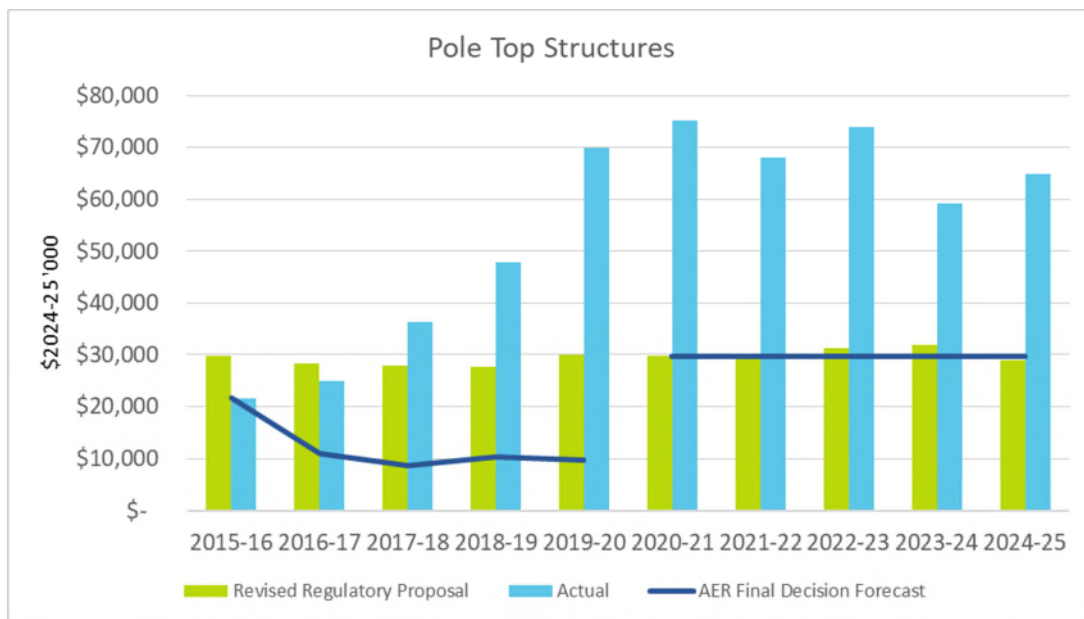
It is noted that:

- The actual spend in the first three years of this regulatory control period has exceeded the AER’s 5-year forecast by 144%.
- This trend is expected to continue in the remaining two years of the regulatory control period.
- The key driver of the overspend is the higher number of pole replacements, as discussed further in Section 5.4
- This is consistent with AER’s observations as noted in the 2015-20 final determination<sup>9</sup>.

### 5.3 Historical Trends and Performance

Figure 1 and Figure 2 compare the actual expenditure and volume of pole top structure replacements to our forecast in RRP, and the forecast in AER’s final decision.

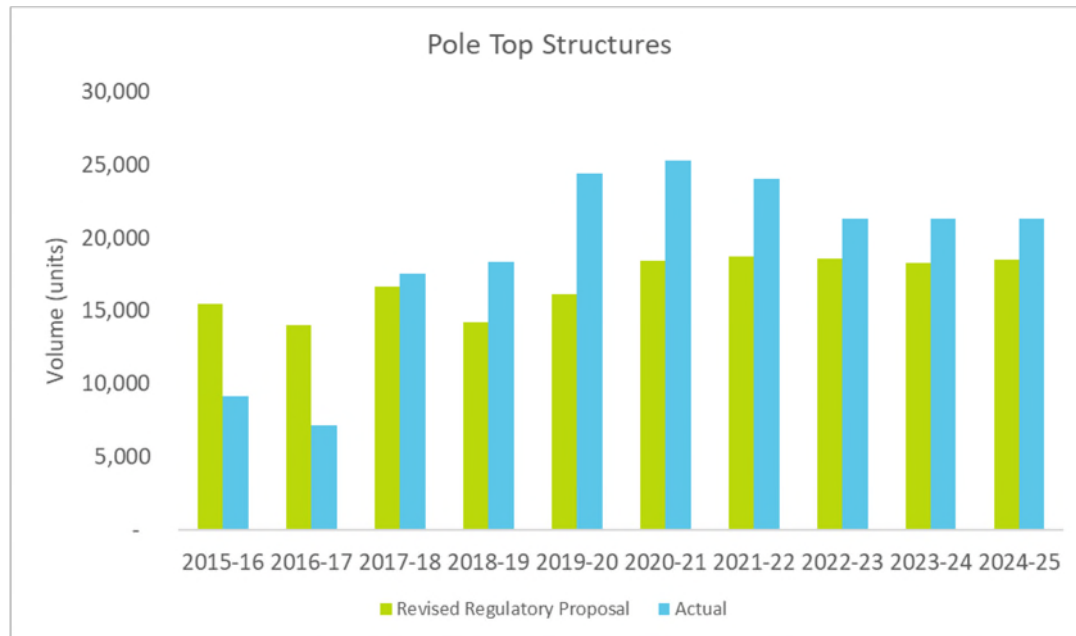
**Figure 1: Pole Top Structure – Expenditure**



<sup>9</sup> Page 6-101 AER Final Decision Attachment 6 – Capital expenditure | Ergon Energy determination 2015–20,



**Figure 2: Pole Top Structure - Volume**



## 5.4 Analysis of Pole Top Structure replacements

Crossarm replacements are mostly driven by inspection programs which identify severe structural strength degradation. They are actively managed through a condition-based approach including:

- Visual inspection of physical condition from ground level
- Aerial visual inspection carried out from helicopters/aircrafts/drones.
- Pole top structures inspection carried out from elevated work platform or climbing.

Physically defective crossarms identified through inspection are replaced. They may also be proactively replaced based on risk. Proactive replacement is typically undertaken with other work such as feeder refurbishment programs or bundled into logical groups for efficiency of delivery and cost.

Crossarms are also replaced in the course of other replacement programs such as pole replacements, reconductoring works and clearance programs (CTG/CTS)<sup>10</sup>. These consequential crossarm replacements have led to an increase in RIN reported pole top structure replacements.

The step change in expenditure from 2017-18 is predominantly driven by the increase in crossarm replacements as a consequence of an increase in pole replacements.

Approximately 38% of pole top structure replacements are directly attributable to defects, with the remaining consequential replacements from other projects or programs such as pole replacements (38%) and overhead conductor clearance rectification (11%)

The relationship of pole top structure replacements to pole replacements is noted by the AER in its 2015 final decision<sup>11</sup> where the AER stated the following:

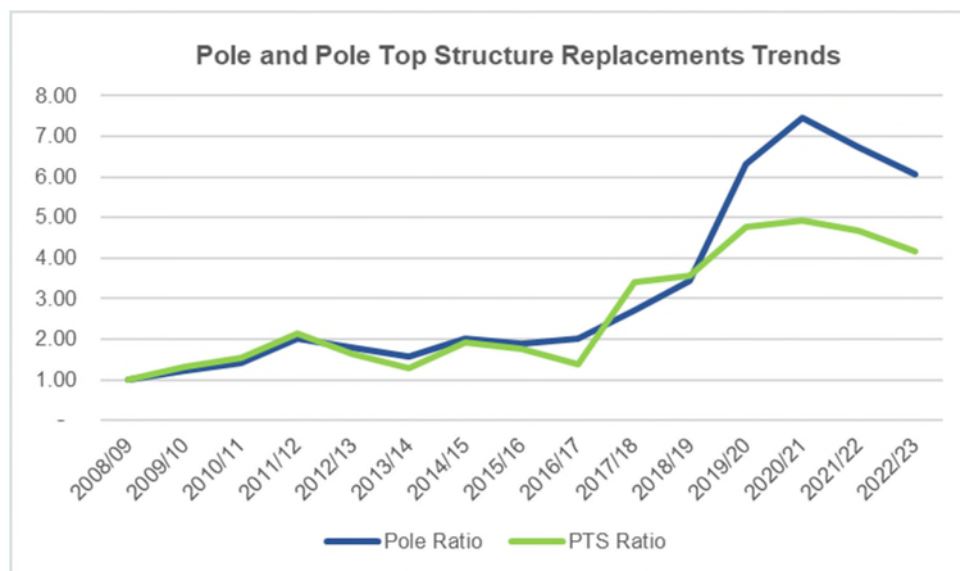
<sup>10</sup> Up until 2020-21 From 2021-22 onwards all clearance programs are categorised as augex

<sup>11</sup> Page 6-101 AER Final Decision Attachment 6 – Capital expenditure | Ergon Energy determination 2015–20

*We continue to consider, in accordance with our reasoning in the preliminary decision, that it is appropriate to exclude pole top structures from the model as it is related to expenditure on overall pole replacement and therefore modelling may result in double counting of replacement volumes.*

The chart in Figure 3 shows the relationship of pole top structure replacements to pole replacements since 2008-09 which confirms the dependency of pole top structure replacements to pole replacements.

**Figure 3: Trends of Pole replacements and Pole Top Structures replacements**



## 6 POST IMPLEMENTATION REVIEW

We have undertaken a post implementation review (PIR) of our pole top structure replacement expenditure over the review period and compare with alternative options. The PIR on cross-arms (the main component of pole top structure) replacements is set out in supporting document 5.3.14

Typically, the basis and assumptions used in our PIRs are:

- A cost benefit analysis over a twenty-year time horizon as a period
- The options analysis is based on the different volume of replacements.
- The actual delivery or selected option expenditure and unit cost over the 5 years review period is used as the starting point.
- The base case or counterfactual is based on the implied volume using the AER forecast and the actual delivery unit cost.
- The actual unit cost is applied across all other options.
- Only cost associated with pole top structure defects are included in the cost benefit analysis.
- Costs associated with replacements as a result of other projects or programs (e.g pole replacements, reconductoring, CTG/CTS) are excluded from this cost benefit analysis. They are included in the PIR of the respective asset classes.

When the above assumptions are applied to the PIR for pole top structures (predominantly cross-arms), the result is a replacement of only 20% of defects for the counterfactual case. This is not a viable option as the network will be put into an unacceptable risk, with a compounding and uncontrolled level of defects and subsequent in-service failures. If the option of replacing 20% defects annually is then applied in cost benefit analysis, the result is substantial benefits when compared to all other intervention options. Hence, for the purpose of evaluating the costs and benefits, we have adopted a counterfactual of replacing 80% of defects.

The cost benefit analysis in the PIR was based on the number of defective crossarms over the review period of 42,262 crossarms.

Table 5 sets out the basis of the PIR for pole top structure replacements and reconciliation to the annual CA RIN 2.2.

**Table 5: PIR/RIN Reconciliation**

Pole top Structures (\$ millions nominal)	2018-19	2019-20	2020-21	2021-22	2022-23	Total
RIN total	\$ 38.5	\$ 57.3	\$ 62.4	\$ 57.6	\$ 66.2	\$ 282.0
<b>Crossarm Defects</b>	<b>\$ 17.8</b>	<b>\$ 21.7</b>	<b>\$ 19.9</b>	<b>\$ 20.6</b>	<b>\$ 25.6</b>	<b>\$ 105.6</b>
<b>Non Defects / Added to other PIR</b>						
Poles	\$ 14.4	\$ 19.9	\$ 21.3	\$ 24.0	\$ 28.1	\$ 107.7
Conductors	\$ 1.3	\$ 3.9	\$ 6.2	\$ 8.5	\$ 12.1	\$ 32.0
Clearance	\$ 5.0	\$ 11.8	\$ 15.0	\$ 4.5	\$ 0.4	\$ 36.7
<b>Total PIR for PoleTopStructures</b>	<b>\$ 17.8</b>	<b>\$ 21.7</b>	<b>\$ 19.9</b>	<b>\$ 20.6</b>	<b>\$ 25.6</b>	<b>\$ 105.6</b>

The cost benefit analysis from the post implementation review confirms that the pole top structure replacements undertaken over the review period delivered a net benefit of \$100 million compared to the counterfactual case.

## 7 REVIEW PERIOD PERFORMANCE (2018-19 TO 2022-23)

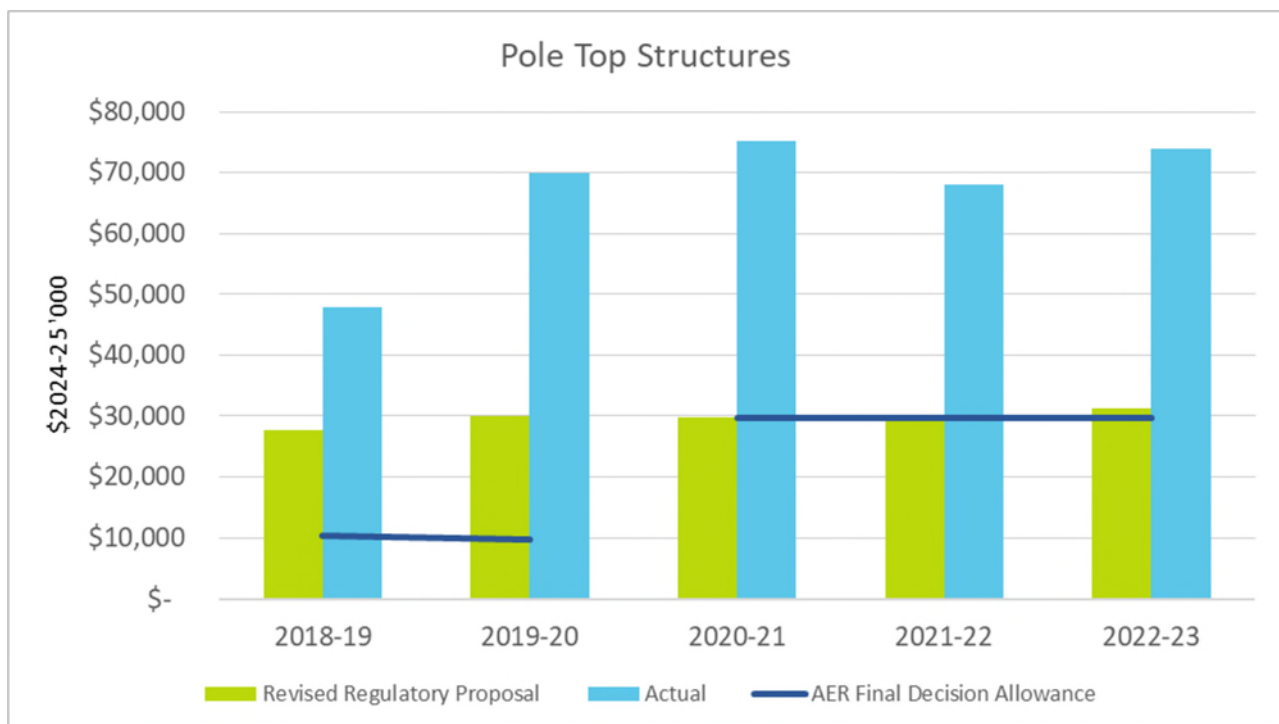
The *review period*<sup>12</sup> for the ex-post review spans across two regulatory control periods and two separate Distribution Determinations.

Actuals and performance against the forecasts set by the AER over the review period is provided in Table 6 below. Unless otherwise stated, all values have been converted to \$2024-25.

**Table 6: Review Period Performance- Pole Top Structures Replacement**

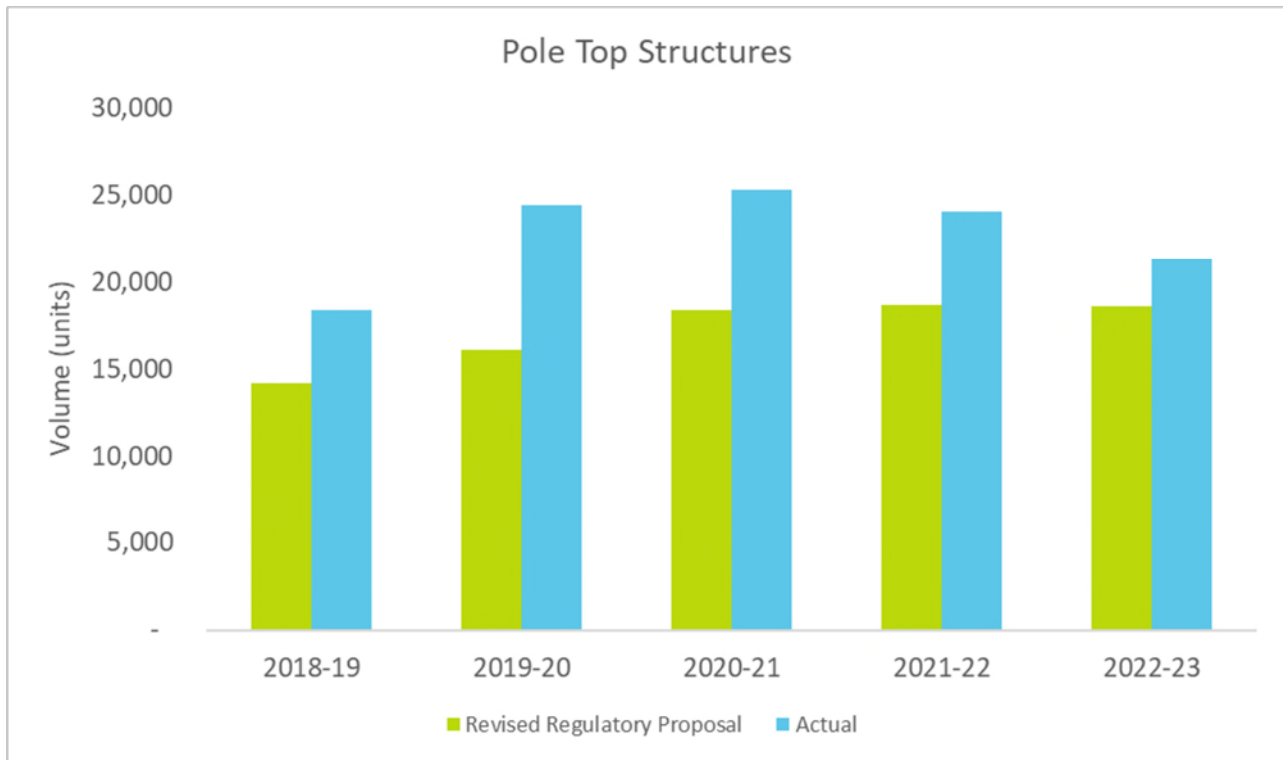
\$ 2024-2025 (\$,000)	POLE TOP STRUCTURES					Total
	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023	
Revised Regulatory Proposal	\$27,756	\$29,993	\$34,331	\$34,511	\$35,665	\$ 162,257
AER Final Decision Forecast	\$10,385	\$ 9,712	\$29,656	\$29,656	\$29,656	\$ 109,066
Actual	\$47,902	\$69,976	\$75,200	\$67,965	\$73,902	\$ 334,944

**Figure 4: Pole Top Structure Repex – Review Period**



<sup>12</sup> NER S6.2.2A (a1)

**Figure 5: Pole Top Structure Replacement Volume – Review Period**



**Key observations:**

- Overall, over the review period, our actual expenditure on pole top structure replacement is \$335 million compared to the AER's forecast of \$109 million.
- As set out in the PIR, some of the increase in repex is driven by consequential replacements in poles, CTG/CTS and reconductoring
- It is estimated that consequential replacements accounts for 63% of pole top structure replacements.
- These consequential replacements are not accounted for in our RRP and the AER forecast.
- Defect related replacements over the review period totalled \$125.7 million, exceeding the forecast by 15%

## 7.1 Adjustments for CTG/CTS

As discussed in our overview paper, CTG/CTS programs are better reflected as an augex program. Hence, from 2021-22 onwards all clearance programs are categorised as augex. Going forward, Ergon Energy will be reporting costs associated with the clearance programs as augex instead of repex.

Table 7 present a summary of the AER forecast with and without the CTG/CTS where:

- The AER Final Decision Forecast is the forecast with notional amount of CTG/CTS included.
- Actual as reported in RIN with CTG/CTS in repex in 2018-19, 2019-20 and 2020-21)
- Adjusted AER forecast is the forecast without the notional amount of CTG/CTS
- Adjusted actual shows repex with expenditure for CTG/CTS in 2018-19, 2019-20 and 2020-21 removed from the pole top structure asset category.

**Table 7: Review Period Performance – excluding CTG/CTS**

\$ 2024-2025 (\$,000)	POLE TOP STRUCTURES					
	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023	Total
AER Final Decision Forecast	\$ 10,385	\$ 9,712	\$ 29,656	\$ 29,656	\$ 29,656	\$ 109,066
Actual (as reported in RIN)	\$ 47,902	\$ 69,976	\$ 75,200	\$ 67,965	\$ 73,902	\$ 334,944
Adjusted AER Forecast (without CTG/CTS)	\$ 10,385	\$ 9,712	\$ 27,328	\$ 29,656	\$ 29,656	\$ 106,738
Adjusted Actual (CTG/CTS removed in 18-19,19-20 and 20-21)	\$ 42,055	\$ 57,079	\$ 57,454	\$ 67,965	\$ 73,902	\$ 298,455

## 8 JUSTIFICATION STATEMENTS AND CONCLUSION

We submit that the expenditure for replacement of pole top structures over the *review period* is prudent and efficient as demonstrated by

- The PIR which shows that the replacement of 42,262 units of defective pole top structures is prudent and delivered a net benefit of \$100million compared to the AER's forecast option.
- The remaining 71,247 units of pole top structures were replaced as part of other works such as pole replacement, conductor replacement, etc and they have been separately cost justified.
- As set out in our PIR for pole top structures (i.e. crossarms), the majority of crossarm replacements are bundled with other works such as pole replacements or overhead reconductoring.
- *Attachment - Cost Comparison of Ergon RIN unit cost to the NEM* shows that our overall basket of goods cost that include crossarm replacements compares favourably to the NEM.

We therefore submit that all the repex on pole top structure incurred over the review period are required and should be rolled into our RAB.