ASSET CLASS OVERVIEW

POLES

UE BUS 4.01 – PUBLIC
2026–31 REGULATORY PROPOSAL

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1. Overview

Our network comprises over 167,000 poles, with the majority of these being wood poles. Our pole intervention program, therefore, is critical to our ability to maintain network reliability and minimise safety risk as far as practicable.

We are observing an increasing proportion of wood poles being identified as limited life or unserviceable due to deterioration. Through cyclical inspection 'sound wood' is measured which determines the internal rot of wood poles, which is the main deterioration cause leading to pole failure.

Our observed increasing volume of deteriorating poles has been corroborated against pole performance data. While pole failures have been relatively low, the failure rate has increased steadily since 2017.[1] In addition, wood pole defects have started to increase. Defects are a leading indicator of potential pole failures.

In response to these indicators, we are proposing an uplift in our wood pole interventions in the 2026–31 regulatory period. Our condition-based wood pole intervention forecast is based on the measured condition of our poles and predicts the condition and serviceability of wood poles over time using an annual decay rate which was informed by independent analysis.[2] A proportion of these poles will be staked, consistent with our historical staking ratio.

Our pole replacement forecasts also include expected fault interventions driven by external factors, such as vehicle impact. These forecasts reflect historical fault volumes.

In contrast to our wood pole population, we are not proposing any concrete or steel pole interventions. This reflects the current condition and historical performance of these assets.

A summary of our pole intervention volumes is set out in table 1, with expenditure (applying unit rates based on audited Regulatory Information Notices (RIN) data) in 2.

TABLE 1 FORECAST POLE INTERVENTIONS: VOLUMES

VOLUMES	FY27	FY28	FY29	FY30	FY31	TOTAL
LV pole replacements	887	887	887	887	887	4,436
HV pole replacements	675	675	675	675	675	3,374
Wood pole reinforcement	1,382	1,382	1,382	1,382	1,382	6,910
TOTAL	**2,944**	**2,944**	**2,944**	**2,944**	**2,944**	**14,720**

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[1] ESV, United Energy wood pole management: a review of sustainable wood pole safety outcomes, Public, June 2023, p. 10.

[2] UE ATT 4.02 – Simon Holcombe (Melbourne University) - EDPR defect forecasting methodology – Aug2024 – Public

TABLE 2 FORECAST POLE INTERVENTIONS: EXPENDITURE ($M, 2026)

EXPENDITURE	FY27	FY28	FY29	FY30	FY31	TOTAL
LV pole replacements	9.1	9.1	9.1	9.1	9.1	45.7
HV pole replacements	13.4	13.4	13.4	13.4	13.4	66.8
Wood pole reinforcement	1.5	1.5	1.6	1.6	1.6	7.9
TOTAL	**24.0**	**24.1**	**24.1**	**24.0**	**24.1**	**120.4**

2. Background

Poles are essential to an overhead electricity distribution network. Their basic function is to support overhead electrical conductors and other pole mounted assets, and to provide safe clearance from the ground and other adjacent objects (including vegetation).

This section provides an overview of our pole asset class, including a high-level summary of our compliance obligations, pole population and age profile.

2.1 Compliance obligations

We operate under a combination of national and state legislation which establish our obligations and the regulatory framework under which we operate.

The National Electricity Rules sets out reliability and safety obligations and the Electricity Distribution Code of Practice include performance requirements. We must also manage our network assets in accordance with the Electricity Safety Act 1998, the Electricity Safety (Management) Regulations 2019, the Electricity Safety (Bushfire Mitigation) Regulations 2013 and the Victorian Environment Protection Act 2017.

These obligations can be summarised as follows:

- Electricity Safety Act 1998 – requires us to minimise safety risk 'as far as practicable' including bushfire danger
- Electricity Distribution Code of Practice – requires us to manage our assets in accordance with principles of good asset management and to minimise the risks associated with the failure or reduced performance of assets
- National Electricity Rules – requires us to forecast expenditure to maintain the quality, reliability and security of supply of our networks and maintain the safety of the distribution system
- Victorian Environment Protection Act (2017) – requires us to reduce the risk of harm from our activities to human health and the environment and from pollution or waste.

In short, we must maintain reliability, minimise safety risk 'as far as practicable' including bushfire danger arising from our network, and reduce the risk of harm to the environment.

2.2 Asset population

Our poles asset class includes low voltage (LV), high voltage (HV), sub-transmission and public lighting poles.[3] The corresponding material types used are wood, concrete and steel.

As shown in table 3, the majority of this asset class are LV and HV wood poles.

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[3] As public lighting poles are not part of our standard control services, we have excluded them in this document.

TABLE 3 EXISTING POLE POPULATION: TYPE

POLE TYPE	WOOD	CONCRETE	STEEL	TOTAL
LV	66,429	14,307	418	**81,154**
HV	66,031	9,562	5	**75,598**
Sub-transmission	9, 705	1,110	5	**10,820**
Other	337	25	1	**363**
Total	**142,502**	**25,004**	**429**	**167,935**

Our wood pole population also includes staked poles (i.e. additional supports to reinforce the pole and extend its life).

Our wood pole population can be further disaggregated by durability class. This refers to the natural ability of a wood pole to resist attack by fungi and insects. Australian Standards divide timbers into four durability classes, which relate to only the non-preservative treated heartwood or ‘true-wood’.

Durability class one represents our strongest poles, with poles of unknown durability class treated as class three by default. Class three poles have generally been pressure treated with creosote, which is used to protect timber from white ants and decay.

2.3 Asset age profile

Table 4 sets out the expected service life for our different pole assets. This service life is the expected period of time after which the asset is unlikely to be fit for purpose, typically determined by safety, technology and/or obsolescence.

TABLE 4 EXPECTED SERVICE LIFE: POLES (YEARS)

POLE TYPE	EXPECTED SERVICE LIFE
Wood (durability class one)	70
Wood (durability class two)	60
Wood (durability class three)	50
Concrete	80
Steel	60

Figure 1 also shows the age profile of our poles by material type, and figure 2 shows the corresponding wood pole population based on durability class. Collectively, these charts show that our existing wood pole population comprises a large cohort of aged, lower durability poles, including a significant volume of wood woods that are beyond their expected service life.

FIGURE 1 NUMBER OF POLES BY MATERIAL AND AGE (YEARS)

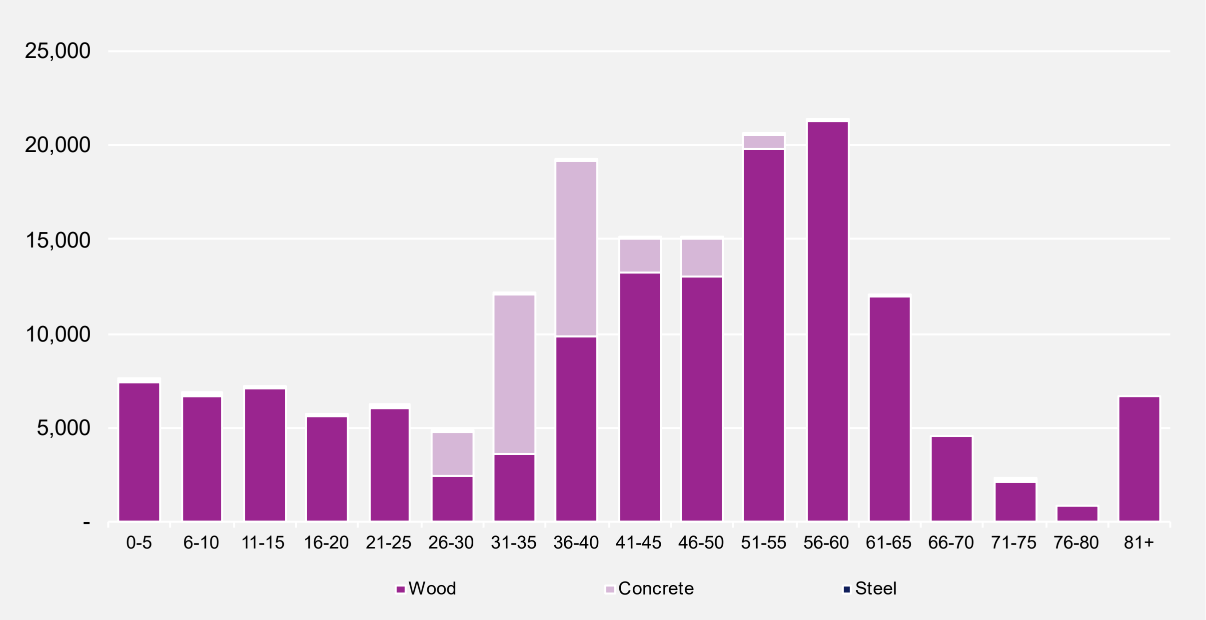
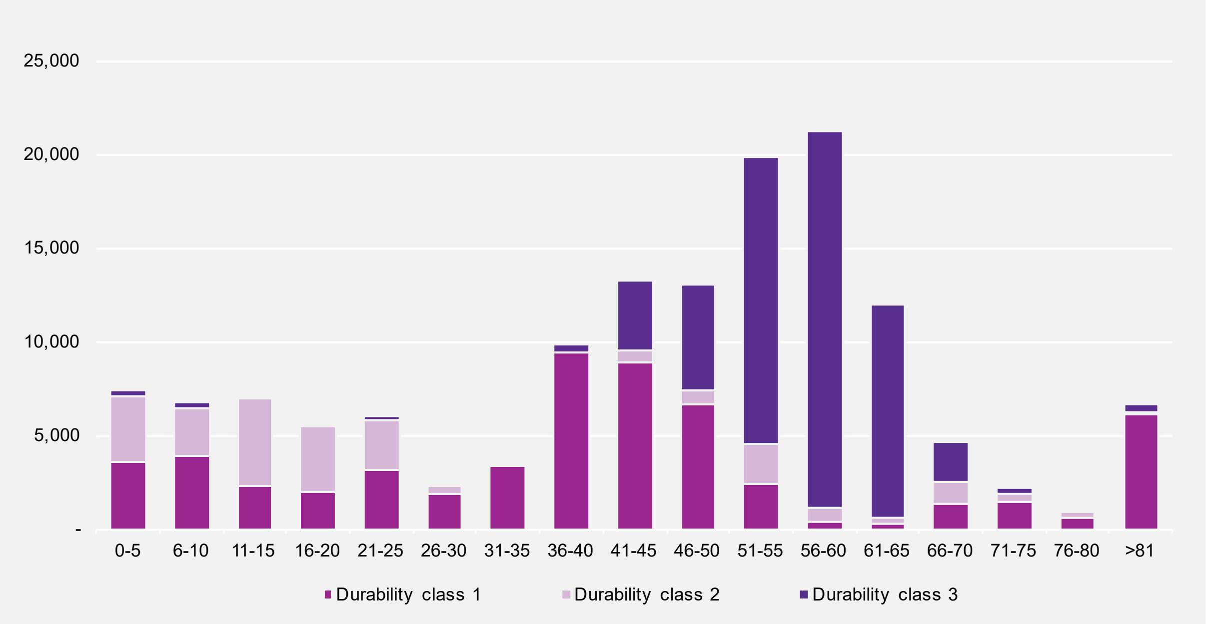


FIGURE 2 NUMBER OF WOOD POLES BY DURABILITY CLASS AND AGE (YEARS)



3. Identified need

The performance of our pole asset class may impact our network service level, as pole failures may lead to a loss of supply for customers, pose safety risks to our personnel and the public, and potentially start a fire, including in hazardous bushfire risk areas (HBRA).

The identified need, therefore, is to manage our pole asset class to maintain reliability and minimise safety risks as far as practicable, consistent with our regulatory and legislative obligations.

The large volume of our wood pole population, and its underlying condition and age profile, is also driving the need to maintain sustainable intervention volumes to prudently manage deliverability and safety factors.

This section outlines the historical performance of our poles, which has informed how we assess (and respond, as required) to these identified needs.

3.1 Historical performance

In considering any pole intervention needs, we monitor several asset performance indicators, including asset failures, high priority defects, and asset condition. These indicators inform our underlying asset management response—for example:

- increasing unassisted asset failures indicates a likely need to act immediately and review asset management practices (noting that robust inspection practices and governance over the application of these methods may drive low failure rates, but if the underlying condition of the relevant asset population is poor and/or deteriorating, high and/or increasing intervention volumes may still be prudent and efficient)
- increasing high-priority defects or deteriorating condition (relative to asset management thresholds) indicates a likely need to act soon to increase interventions over time, and/or undertake risk-based assessments.

3.1.1 Unassisted wood pole failures

We report unassisted pole failures to ESV annually, with no observed concrete or steel failures in the last five years.

Our unassisted wood pole failures have increased steadily since 2017 but remain relatively low in number. These failures were assessed in ESV's review of our wood pole management practices.[4] In this review, ESV noted that failure rates are a lagging indicator of the adequacy of inspection and management practices, and not a leading indicator of preventative safety performance. That is, intervention volumes may need to be high and/or increasing because underlying condition of the wood pole population can be poor and/or deteriorating, even with low failure rates.

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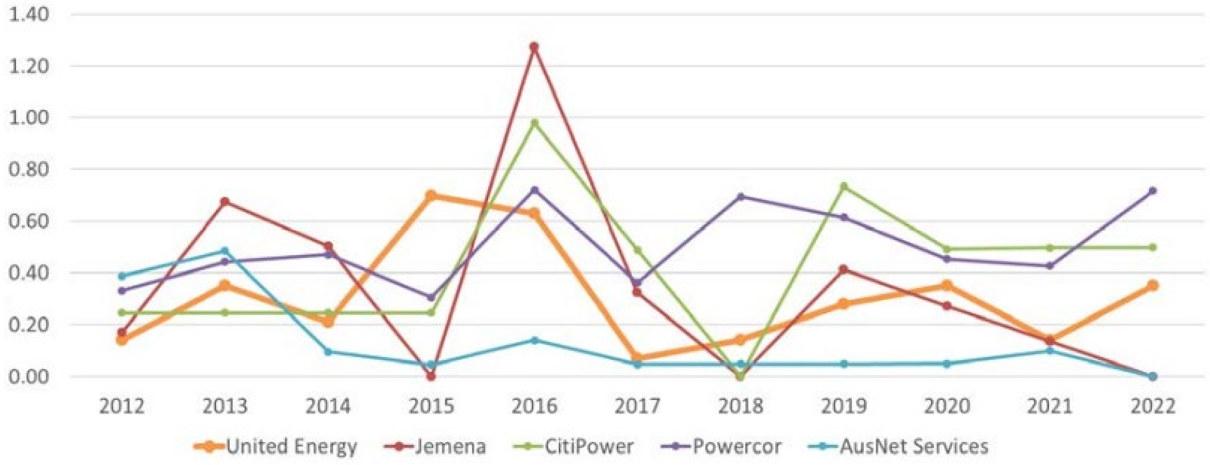
[4] ESV, United Energy wood pole management: a review of sustainable wood pole safety outcomes, Public, June 2023, p. 9

FIGURE 3 UNASSISTED WOOD POLE FAILURE COMPARISON



Source: ESV, United Energy wood pole management: a review of sustainable wood pole safety outcomes, Public, June 2023

3.1.2 Observed and measured defects[5]

Consistent with our regulatory obligations, we inspect our poles located in HBRA every 2.5 years, and every five years for poles in low bushfire risk areas (LBRA). These cyclic pole inspections provide snapshots in time of the pole condition and identify any pole defects.

The main deterioration cause for wood poles is timber rot, which reduces the strength of the wood pole and may eventually lead to failure. Internal timber rot primarily affects the centre ‘heart’ wood at the base of the pole and results in the pole being hollowed out.

Our long-standing approach to determining internal rot is to measure the sound wood thickness of a pole. Sound wood thickness (SWT) is measured regularly via our cyclic inspections, and is a key input into determining the serviceability of the pole.

In addition to measured defects, observable factors—such as splitting wood, fire and lightning damage—will also inform serviceability assessments.

Based on these inspection outcomes, we categorise poles into the following three serviceability categories:

- serviceable – pole can remain in service
- limited life – pole capacity has been reduced and requires additional controls to remain serviceable
- unserviceable – pole is unsuitable to remain in service and requires timely intervention.

Defects are recorded where a pole is deemed either limited life, or unserviceable. Our response to identified defects depends on the nature and severity of the defect, and may include more frequent re-inspections.

High-priority defects that result in intervention are shown in table 5.

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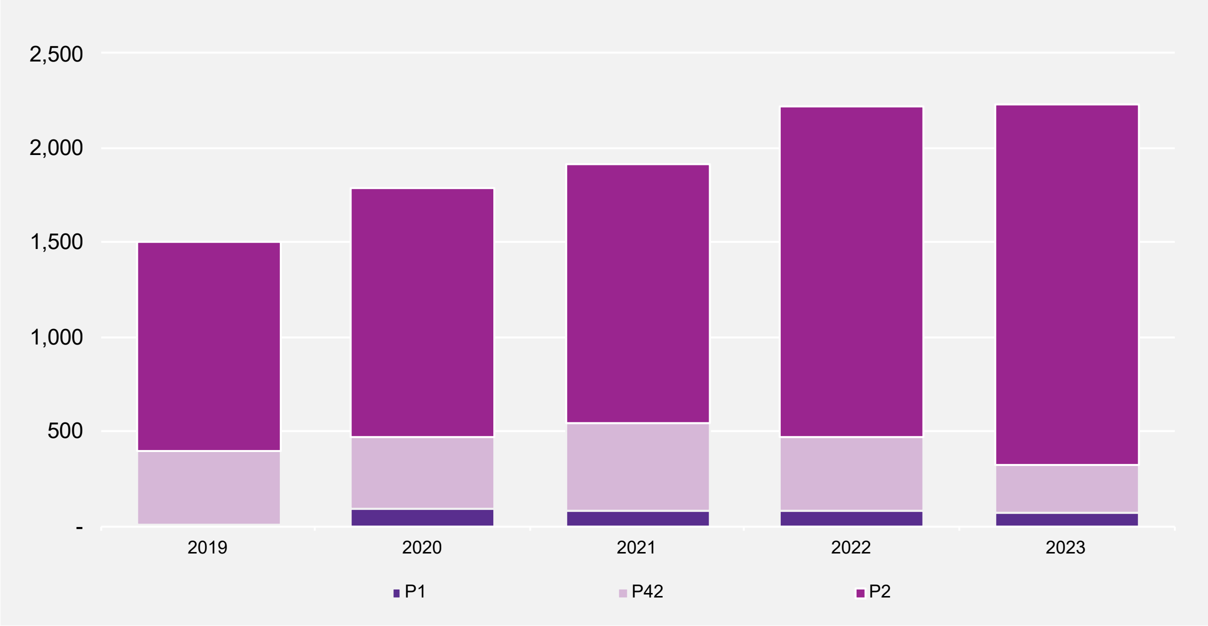
[5] This section focuses on our wood pole population, as we currently have no condition measurements available for concrete and steel poles

TABLE 5 RESPONSE TIMEFRAMES FOR HIGH PRIORITY DEFECTS

PRIORITY	TIMEFRAME FOR INTERVENTION
P1	Make safe within 24 hours of identification (replacements or repairs can occur beyond the initial 24 hours)
P42	Addressed within 42 days of identification
P2	Addressed within 32 weeks of identification

As shown in figure 4, the number of high priority defects has been steadily increasing, largely driven by P2 defects. This is consistent with an ageing and deteriorating population of lower durability wood poles, and as set out in the following section, we expect this elevated trend to remain over multiple regulatory periods.

FIGURE 4 HIGH PRIORITY DEFECTS



4. Forecast interventions

Our asset management practices mean we intervene on our poles in response to asset failures, or based on observed defects and measured condition following inspection. When intervening, we either stake or replace wood poles, and replace concrete and steel poles.

Generally, our high-volume asset forecasts are based on three broad categories—faults, corrective and risk-based forecasts. This approach is summarised in figure 5, with further detail on each category provided below (except for risk-based, which we have not forecast under this option).

FIGURE 5 FORECAST CATEGORIES

Forecast interventions = **Fault** + **Corrective** + **Risk-based**

Fault	Corrective	Risk-based
Responses to asset failures that caused outages, including those due to external factors (such as third-party damage)	Interventions to address conditional failures associated with observable defects, deteriorated asset condition, and non-compliances	Proactive interventions based on cost-benefit analysis, where risk reduction benefits outweigh intervention costs

4.1 Forecast volumes

For the 2026–31 regulatory period, a summary of our forecast volumes for poles is shown in table 6. This forecast includes maintaining our existing proportions of reinforced poles (i.e. staked poles) relative to replacements.[6]

TABLE 6 FORECAST POLE INTERVENTIONS: VOLUMES

VOLUMES	FY27	FY28	FY29	FY30	FY31	TOTAL
LV pole replacements	887	887	887	887	887	4,436
HV pole replacements	675	675	675	675	675	3,374
Wood reinforcement	1,382	1,382	1,382	1,382	1,382	6,910
TOTAL	**2,944**	**2,944**	**2,944**	**2,944**	**2,944**	**14,720**

Note: We are not proposing any concrete or steel pole interventions due to very low historical intervention volumes.

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[6] Pole staking is a suitable and cost-efficient method to extend the life of our wood poles to maintain affordability for our customers.

4.1.1 Fault forecasts

Faults, including from third-party damage, occur somewhat randomly across our network. Accordingly, our fault-based pole intervention forecast is based on a simple average over the previous four-year period.

4.1.2 Corrective forecasts

Our corrective forecast comprise two separate subcategories—observable visual defects, and measurable pole condition.

Observable defect forecast

Observable visual defects, such as splitting wood, fire and lightning damage, are again somewhat random in occurrence across our network. Similar to faults, therefore, our observable defects forecast is based on a simple average over the previous four-year period.

Measured pole condition

Our wood pole measurable condition-based intervention forecast is based on the predicted condition and serviceability of wood poles over time.[7] This forecast is modelled using the following key inputs:

- measurements from the last pole inspection (current condition)
- annual internal decay rate of sound wood thickness.

This approach is consistent with the findings of ESV in its review of our asset management practices, where they recommended we adopt a forecast method that accounts for intervention drivers such as asset condition.[8]

To determine the annual internal decay rate, three predictive models were considered, based on independent statistical analysis.[9] These models included the following:

- linear regression: analysis included testing both simple (with a single independent variable) and multiple linear regressions (examining the influence of multiple variables) to model the relationships between variables, assuming normally distributed data residuals
- gradient boosting: the model constructs multiple decisions trees one after the other, with each tree correcting the errors of the one before it. This method allowed for the consideration of various influential factors, enhancing our understanding and predictivity regarding asset decay rates and defect occurrences
- random forest: the model operates by constructing multiple decision trees during training and outputs the model of the classes (classification) or mean prediction (regression) of the individual trees for unseen data

In selecting the most effective model for each measurement, consideration was made to the average root mean squared error (RMSE) and the confidence range. RMSE quantifies the average differences between the model's predicted values and the actual outcomes, providing a reliable indicator of the model's predictive performance. A lower RMSE signifies a higher accuracy in the model's predictions, reflecting a closer alignment between predicted values and actual result.

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[7] UE MOD – 4.06 – pole deterioration model – Jan2025 – Public

[8] ESV, United Energy wood pole management: a review of sustainable wood pole safety outcomes, Public, June 2023, p. 21

[9] UE ATT 4.02 – Simon Holcombe (Melbourne University) - EDPR defect forecasting methodology – Aug2024 – Public

TABLE 7 PREDICTIVE MODELS FOR INTERNAL DECAY RATE (MM PER ANNUM)

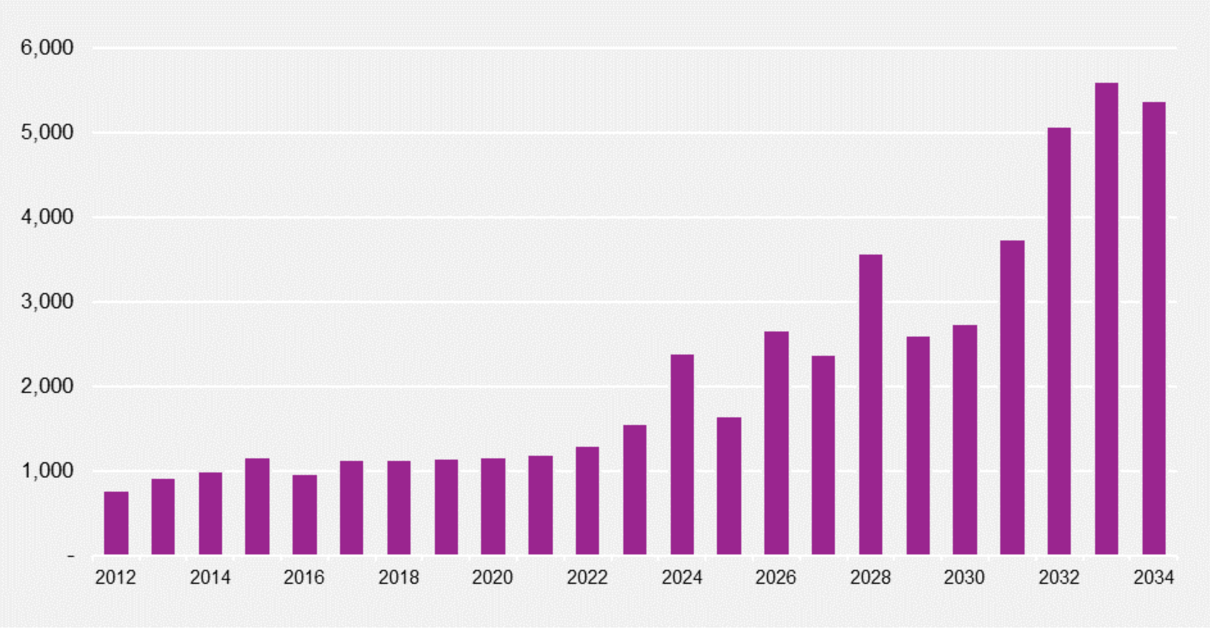
MODEL	ACCURACY (RMSE)	AVERAGE DECAY RATE (CLASS 1)	AVERAGE DECAY RATE (CLASS 2)	AVERAGE DECAY RATE (CLASS 3)
Linear regression	4.518 ± 0.423	2.38	3.14	2.54
Gradient boosting	4.488 ± 0.421	2.08	2.83	2.41
Random forest	4.468 ± 0.413	1.75	2.56	2.27

As shown in table 7, the most accurate model for predicting robust estimates of internal decay was the 'random forest' model with the lowest RMSE value. This model also yielded a lower decay rate than the other models. A lower decay rate will result in a lower intervention volume.

We selected the random forest model to determine the annual internal decay rate. Based on the random forest model, a set of sound wood decay rates, by wood durability class and age group, was produced. These decay rates were applied to the most recent measurements of each wood pole, which were then used to determine the future serviceability of the wood pole.

As set out in figure 6, the forecast of future wood thickness shows an increasing volume of unserviceable and limited poles in the 2026–31 regulatory period.

FIGURE 6 FORECAST VOLUME OF UNSERVICEABLE AND LIMITED LIFE POLES BASED ONLY ON SOUND WOOD THICKNESS



Our 2026–31 wood pole intervention volume forecast proposes to intervene on all wood poles which are forecast to be unserviceable and approximately 80 per cent of wood poles which are limited life, consistent with our historical condition-based interventions.

We have also split the intervention volumes derived from the model into replacement and staking volumes based on historical ratios.

4.1.3 Top-down portfolio review

We undertook top-down testing and validation of our forecast volumes to further challenge whether they are prudent. Based on the typical replacement age of our poles historically, a substantial uplift in pole volume replacements will likely to be required over multiple regulatory periods, which therefore suggests our volume replacements in the 2026–31 regulatory period can be considered ‘least regrets’ investments.

Our forecast annual intervention volumes also correspond to less than two per cent of our total pole population, which suggests that our pole intervention volumes are not unreasonable.

4.2 Expenditure forecast

To develop expenditure forecasts for our poles asset class, we have multiplied the forecast intervention volumes by the applicable unit rate from our historical data.

Table 8 summarises this expenditure forecast for the 2026–31 regulatory period.

TABLE 8 FORECAST POLE INTERVENTIONS: EXPENDITURE ($M, 2026)

EXPENDITURE	FY27	FY28	FY29	FY30	FY31	TOTAL
LV pole replacements	9.1	9.1	9.1	9.1	9.1	45.7
HV pole replacements	13.4	13.4	13.4	13.4	13.4	66.8
Pole reinforcement	1.5	1.5	1.6	1.6	1.6	7.9
TOTAL	**24.0**	**24.1**	**24.1**	**24.0**	**24.1**	**120.4**

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