RIN response question 5 asset replacement

UE ATT106 - Repex RIN attachment - Jan2020 - Public

Regulatory proposal 2021–2026

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Contents

1 Replacement forecasts

1.1 Introduction

This document outlines details with respect to the Australian Energy Regulator's (**AER**) repex model as required by the reset regulatory information notice (**RIN**). This document provides information for the following asset groups:

- poles
- pole top structure (it is noted that this asset group is excluded from the AER's repex modelling review process)
- overhead conductors
- underground cables
- service lines
- transformers
- switchgear
- public lighting (it is noted that this asset group is excluded from the AER's repex modelling review process)
- supervisory control and data acquisition (**SCADA**), network control and (protection (it is noted that this asset group is excluded from the AER's repex modelling review process)

The 'other' asset group is reported in the historical category analysis RIN and the 2021–26 reset RIN. The miscellaneous, unspecified and heterogeneous nature of the asset categories and types within this group do not allow this expenditure group to be modelled using the repex model. As such the description of asset group is excluded from this document.

1.2 Poles

1.2.1 Asset category description

Asset scope and boundary issues

The assets included in this category are all poles (wood, concrete or steel) that are used to support:

- sub-transmission, high voltage (**HV**) or low voltage (**LV**) conductors
- overhead line switchgear
- overhead line capacitors
- pole top transformers
- HV and LV outdoor fuses
- HV surge arrestors
- HV pole supporting public lights.

The following pole types are specifically excluded:

- steel and concrete public lighting poles supporting public lighting
- privately owned electric lines.

Age profile determination

The following assumptions were applied to determine the pole age profiles:

- pole start-up date or date staked recorded in SAP was used
- only poles we owned were included in the recorded quantities
- out of commission poles were excluded from the reported quantities
- public lighting poles are excluded from this asset group and covered within the public lighting asset group.

Main drivers of replacement

The main driver of replacement is the asset condition based on inspection regime and/or asset failure. Assets left to deteriorate, if left untreated, pose risk (safety, bushfire, reliability and reputational) and cost (unplanned capital and operational expenses) consequences.

Staking wood poles is a refurbishment (or an asset life extension) activity and not an asset replacement activity.

Unit cost scope

The cost in this asset group includes materials, labour, plant and equipment, mobilisation and travel, and the project or program overheads. The cost includes procurement, inventory, logistics, excavation, removal of old assets, hardware, installation, reinstatement and outage management.

The staking of wood pole includes the cost of the reinforcing stake or nails for support. New pole includes the pole installation with cross arms, fittings and insulators. Project overheads are allocated proportional to asset expenditure. Corporate overheads are excluded

The proposed repex and quantities in 2021–2026 reset RIN table 2.2.1 for pole staking allow for the extension of the existing pole's life by a nominal 30 years. The proposed repex and quantities in 2021-2026 Reset RIN Table 2.2.1 for the remainder of asset categories in this asset group, allow for complete replacement of the asset. In both instances, this cost is capitalised.

Projects and programs of work are usually delivered to resolve an issue or constraint. They include multiple asset categories that has been demarcated and described separately by the AER for its review and modelling purpose.

1.2.2 Asset replacement drivers during 2016–2020 [5.1(a)(ii)]

Replacement due to various drivers that can be proxied by age

We calculated these statistics by referring to 2015-2018 category analysis RIN table 2.2.1 and dividing the quantity replaced by the total quantity replaced and failed. We assumed that all the replacement quantities reported in the category analysis RIN table 2.2.1 represent asset replacement due to factors (such as asset condition, increasing safety risk) that can be a proxy of asset age. Therefore, we expect these expenditure activities can be largely captured by the AER repex modelling methodology.

Asset group	Asset category	Proportion of assets replaced due age based drivers				
		2016	2017	2018	2019	2020
Poles	Staking of a wooden pole	100.00%	100.00%	100.00%	100.00%	100.00%
	< = 1 kV; wood	98.26%	99.23%	99.44%	98.98%	98.98%
	> 1 kV & < = 11 kV; wood	100.00%	100.00%	98.73%	99.58%	99.58%
	> 11 kV & < = 22 kV; wood	99.74%	98.79%	98.82%	99.12%	99.12%
	> 22 kV & < = 66 kV; wood	97.44%	100.00%	100.00%	99.15%	99.15%
	< = 1 kV; concrete					
	> 1 kV & < = 11 kV; concrete					
	> 11 kV & < = 22 kV; concrete					
	> 22 kV & < = 66 kV; concrete					
	< = 1 kV; steel					
	> 1 kV & < = 11 kV; steel					
	> 11 kV & < = 22 kV; steel					
	> 22 kV & < = 66 kV; steel					
	Other					
	Unweighted asset group overall	99.48%	99.66%	99.75%	99.63%	99.63%
	Unit cost weighted asset group overall	99.28%	99.29%	99.33%	99.30%	99.30%

Source: United Energy

Not all the asset categories within this asset group are being replaced in the 2016-2020 regulatory period. Thus some categories do not have proportional statistics. The AER should consider the average historical proportion of the remainder of asset categories if the repex model identifies replacement in 2021-2026 period of such missing asset categories. The unweighted and weighted average historical proportion statistics by asset group are provided in the above table.

Replacement due to other drivers

These statistics represent annual replacement activities due to asset failures. We calculated this statistics by referring to 2015-2018 category analysis RIN table 2.2.1 and dividing the quantity failed by the total quantity replaced and failed. Failed assets are replaced like-for-like. Asset failure can occur at any point in time and therefore the asset age cannot be a proxy for such reactive or emergency expenditure activities. Such expenditure activities should not be reviewed using the AER repex modelling methodology.

Asset group	Asset category	Proportion of assets replaced due to asset failure that cannot be proxy by age				
		2016	2017	2018	2019	2020
Poles	Staking of a wooden pole	0.00%	0.00%	0.00%	0.00%	0.00%
	< = 1 kV; wood	1.74%	0.77%	0.56%	1.02%	1.02%
	> 1 kV & < = 11 kV; wood	0.00%	0.00%	1.27%	0.42%	0.42%
	> 11 kV & < = 22 kV; wood	0.26%	1.21%	1.18%	0.88%	0.88%
	> 22 kV & < = 66 kV; wood	2.56%	0.00%	0.00%	0.85%	0.85%
	< = 1 kV; concrete					
	> 1 kV & < = 11 kV; concrete					
	> 11 kV & < = 22 kV; concrete					
	> 22 kV & < = 66 kV; concrete					
	< = 1 kV; steel					
	> 1 kV & < = 11 kV; Steel					
	> 11 kV & < = 22 kV; Steel					
	> 22 kV & < = 66 kV; Steel					
	Other					
	Unweighted asset group overall	0.52%	0.34%	0.25%	0.37%	0.37%
	Unit cost weighted asset group overall	0.72%	0.71%	0.67%	0.70%	0.70%

Source: United Energy
Empty cells indicate no asset replacements

Not all the asset categories within this asset group had a failure in this current regulatory period. Thus some asset categories do not have proportional statistics to report. Asset failure can occur at any point in time (due to a range of issues that are beyond our control such as weather, manufacturing defect, accident) and we are unable to foresee or forecast the proportion of assets that will fail in the 2021-2026 regulatory period. The AER should therefore consider the average historical proportion of the asset categories where failure occurred to represent the failure proportion in missing asset categories for the 2021-2026 regulatory period. The unweighted and weighted average historical proportion statistics for the asset group is provided in the above table.

Additional assets due to augmentation, extension or development

No repex has occurred in the current regulatory period due to augmentation, extension or network development within any asset categories in this asset group.

The proportion of new assets each year due to such factors can be calculated by referring to 2015-2018 category analysis RIN tabs 2.3(a), 2.3(b) and 2.5 (for new quantities added). There are also asset quantities associated with the 'non-material projects' collectively summarised and reported at the bottom of the tables 2.3.1 and 2.3.2. All asset quantities are due to augmentation, extension and development of network.

Additional assets due to other drivers

No additional repex has been recorded in the current regulatory period due to other factors within any asset categories in this asset group.

1.2.3 Changes in asset replacement drivers during 2011–2026 [5.1(b)]

Statutory requirements

Due to updates in the earthing requirements from AS2067:2016, we conducted a risk based analysis which identified concrete poles in non-common multiple earth neutral areas to have a higher likelihood of causing injury to the public. A proactive program has been proposed to mitigate this risk.

Internal planning and asset management approaches

There has been one change in asset replacement approach during the 2016-2020 regulatory period. There has been a change in staking policy to allow for a 10% increase in the ratio of poles staked (as a proportion of all unserviceable poles). This has been incorporated into our forecast for the 2021-2026 regulatory period.

Measureable asset factors

None.

Measureable and forecastable external factors

None.

Network technology/solution

Non-destructive testing technology has been assessed but given our high staking ratio for pole assets and business delivery model, we do not see that the technology could have a material benefit to the customer and is not included in our forecast.

Non-network technology/solution

None.

Other significant matters

Recent industry experience and reviews by Energy Safe Victoria (**ESV**) has demonstrated heightened probabilities and consequences of failure of lower durability pole types. As a consequence we have reviewed our methodology and enhanced it by introducing age-based factors to ensure residual strength; resulting in a step up in our pole replacement forecasts.

Supporting information

Refer to our 2021–2026 regulatory proposal.

1.3 Pole top structures

1.3.1 Asset category description [5.1(a)(i)]

Asset scope and boundary issues

This category of assets includes all pole top structures that support overhead electrical conductors and other cross arm mounted assets, providing safe clearance and isolation from the ground and between phases plus to other adjacent objects, and complying with safety regulations (i.e. cross-arms, insulators and fittings). These have interfaces with other overhead line asset groups including poles, overhead conductors, transformers (pole top types), and switchgear (pole mounted types).

Age profile determination

This information has never been reported in historical category analysis RINs.

Main drivers of replacement

The main driver of replacement is the asset condition based on the inspection regime and/or consequence of asset failure. Deteriorating asset condition, if left untreated, will increase risk (safety, bushfire, reliability and reputational) and cost (unplanned capital and operational expenses) consequences.

Unit cost scope

The cost in this asset group includes the materials, labour, plant and equipment, mobilisation and travel, and the project or program overheads. Corporate overheads are not included. The cost includes procurement, inventory, logistics, hardware, removal of old assets, installation cost and outage management. It includes the cross-arms, fittings and insulators.

The project or program overheads have been proportionally allocated, where applicable, between this asset group and other asset groups that typically are delivered together (i.e. poles and overhead conductor asset groups).

The proposed repex and quantities in 2021-2026 reset RIN table 2.2.1 allows for complete replacement of asset within the described boundary. This cost is capitalised.

Projects and programs of work are usually delivered to resolve an issue or constraint and include multiple asset categories that has been demarcated and described separately by the AER for its review and modelling purpose.

1.3.2 Asset replacement drivers during 2016–2020 regulatory period [5.1(a)(ii)]

Replacement due to various drivers that can be proxy by age

We calculated this statistic by referring to 2015-2018 category analysis RIN table 2.2.1 and dividing the quantity replaced by the total quantity replaced and failed. We have assumed all the replacement quantities reported in the category analysis RIN table 2.2.1 represents asset replacement due to factors (such as condition, increasing safety risk, jurisdictional directives, fixed periodic frequency) that can be a proxy for asset age. Therefore, it is expected that such expenditure activities can be largely captured by the AER repex modelling methodology.

Asset group	Asset category	Proportion of assets replaced due to various drivers that can be proxy by age				
		2016	2017	2018	2019	2020
Pole top structures	< = 1 kV	99.85%	99.31%	99.57%	99.58%	99.58%
	> 1 kV & < = 11 kV	99.79%	100.00%	98.89%	99.56%	99.56%
	> 11 kV & < = 22 kV	99.80%	99.53%	99.61%	99.65%	99.65%
	> 22 kV & < = 66 kV	100.00%	100.00%	96.88%	98.96%	98.96%
	Other					
	Unweighted asset group overall	99.83%	99.42%	99.52%	99.59%	99.59%
	Unit cost weighted asset group overall	99.83%	99.44%	99.51%	99.59%	99.59%

Source: United Energy
Empty cells indicate no asset replacements

Not all the asset categories within this asset group are being replaced in this 2016–2020 regulatory period, and thus some asset categories do not have proportional statistics to report. The AER should therefore consider the average historical proportion of the asset categories where failure occurred to represent the failure proportion in missing asset categories for the 2021–2026 regulatory period. The unweighted and weighted average historical proportion statistics for the asset group is provided in the above table.

Replacement due to other drivers

These statistics represent annual replacement activities due to asset failures. We calculated this statistics by referring to 2015-2018 category analysis RIN table 2.2.1 and dividing the quantity failed by the total quantity replaced and failed. Failed assets are replaced like-for-like immediately. Asset failure can occur at any point in time and therefore the asset age cannot be a proxy for such reactive or emergency expenditure activities. Such expenditure activities should not be reviewed using the AER repex modelling methodology.

Asset group	Asset category	Proportion of assets replaced due to various drivers that cannot be proxy by age				
		2016	2017	2018	2019	2020
Pole top structures	< = 1 kV	0.15%	0.69%	0.43%	0.42%	0.42%
	> 1 kV & < = 11 kV	0.21%	0.00%	1.11%	0.44%	0.44%
	> 11 kV & < = 22 kV	0.20%	0.47%	0.39%	0.35%	0.35%
	> 22 kV & < = 66 kV	0.00%	0.00%	3.13%	1.04%	1.04%
	Other					
	Unweighted asset group overall	0.17%	0.58%	0.48%	0.41%	0.41%
	Unit cost weighted asset group overall	0.17%	0.56%	0.49%	0.41%	0.41%

Source: United Energy
Empty cells indicate no asset replacements

Not all the asset categories within this asset group had a failure in this current regulatory period, and thus some asset categories do not have proportional statistics to report. Asset failure can occur at any point in time (due to a range of issues that are beyond our control such as weather, manufacturing defect, accident) and we are unable to foresee or forecast the proportion of assets that will fail in the 2021–2026 regulatory period. The AER should therefore consider the average historical proportion of the asset categories where failure occurred to represent the failure proportion in missing asset categories for the 2021–2026 regulatory period. The unweighted and weighted average historical proportion statistics for the asset group is provided in the above table.

Additional assets due to augmentation, extension or development

No repex has occurred in the current regulatory period due to augmentation, extension or network development within any asset categories in this asset group.

The proportion of new asset each year due to such factors can be calculated by referring to 2015-2018 category analysis RIN tabs 2.3(a), 2.3(b) and 2.5 (for new quantities added). There are also asset quantities associated with the 'non-material projects' collectively summarised and reported at the bottom of the tables 2.3.1 and 2.3.2. All such asset quantities are due to augmentation, extension and development of network.

Additional assets due to other drivers

No additional repex has been recorded in the current regulatory period due to other factors within any asset categories in this asset group.

1.3.3 Changes in asset replacement drivers during 2011–2026 period [5.1(b)]

Statutory requirements

None.

Internal planning and asset management approaches

From 2017, we have implemented condition based risk management (**CBRM**) for cross-arm replacement. This means the replacement priorities for cross-arms have been adjusted based on the consequence (in addition to

condition), meaning priority for replacement is based on the risk outcomes. This has resulted in a step-down in expenditure for the asset category because a number of pole top structure replacements have been deferred by assigning a lower priority. This has been incorporated into the 2021–2026 forecast.

We have also reduced our pole-top structure replacement forecast for the 2021–2026 regulatory period due to our incremental pole replacement program (i.e. additional risk-based pole replacements).

Measureable asset factors

None.

Measureable and forecastable external factors

None.

Network technology/solution

We have used pole-mounted cameras to inspect pole top structures since 2016. This has resulted in a more accurate inspection results, and in conjunction with the implementation of CBRM, has allowed us to forecast a decrease in expenditure for this asset class compared with historical levels. Refer to 2021–2026 regulatory proposal and supporting documents.

Non-network technology/solution

None.

Other significant matters

A change to the contract with the major service provider has created more work categories (simple and complex works) for cross arm related works. This has changed the volumes in cross arms reporting categories but has not driven overall replacement volumes. Refer to our volumes model.[1]

Supporting information

Refer to our 2021–2026 regulatory proposal.

1.4 Overhead conductor

1.4.1 Asset category description [5.1(a)(i)]

Asset scope and boundary issues

This asset group includes overhead conductors and connectors used on the overhead distribution network. It also includes associated hardware such as HV/LV spreaders, vibration dampers and armour rods.

Age profile determination

The following assumptions were applied to determine the overhead conductor age profiles:

- out of service overhead conductor were excluded from the reported quantities
- overhead conductor lengths reported are those recorded as computed length in GIS.

The age profile for overhead conductor asset group is based on construction year. In instances where construction year is NULL then the insertion date in GIS is used.

[1] UE MOD4.02, Unitised volume model, Jan2020 - public.

Main drivers of replacement

The main driver of replacement is the asset condition based on inspection regime and/or consequence of asset failure. Deteriorating asset condition, if left untreated, have potential risk (safety, bushfire, reliability and reputational) and cost (unplanned capital and operational expenses) consequences.

Unit cost scope

The cost in this asset group includes the materials, labour, plant and equipment, mobilisation and travel, and the project or program overheads. The cost represents the procurement, inventory, logistic, removal of old assets, hardware, installation or stringing and outage management.

It excludes cross arms, fittings and insulators as they are accounted for in the pole top structure asset group. The project or program overheads have been proportionally allocated, where applicable, between this asset group, poles and pole top structure asset groups. Corporate overheads are not included.

The proposed repex and quantities in 2021-2026 reset RIN table 2.2.1 allows for complete replacement of the asset within the described boundary. This cost is capitalised.

Projects and programs of work are usually delivered to resolve an issue or constraint and include multiple asset categories that has been demarcated and described separately by the AER for its review and modelling purpose.

1.4.2 Asset replacement drivers during 2016-2020 regulatory period [5.1(a)(ii)]

Replacement due to various drivers that can be proxied by age

We calculated this statistic by referring to 2015–2018 category analysis RIN table 2.2.1 and dividing the quantity replaced by the total quantity replaced and failed. We have assumed all the replacement quantities reported in the category analysis RIN table 2.2.1 represents asset replacement due to factors (such as condition, increasing safety risk, jurisdictional directives, fixed periodic frequency) that can be a proxy for asset age. Therefore, it is expected that such expenditure activities can be largely captured by the AER repex modelling methodology.

Asset group	Asset category	Proportion of assets replaced due to various drivers that can be proxy by age				
		2016	2017	2018	2019	2020
Overhead conductors	< = 1 kV	86.99%	78.35%	56.59%	73.98%	73.98%
	> 1 kV & < = 11 kV	100.00%	81.29%	87.87%	89.72%	89.72%
	> 11 kV & < = 22 kV ; SWER	100.00%			100.00%	100.00%
	> 11 kV & < = 22 kV ; single-phase	100.00%			100.00%	100.00%
	> 11 kV & < = 22 kV ; multiple-phase	98.70%	97.66%	96.54%	97.63%	97.63%
	> 22 kV & < = 66 kV	100.00%			100.00%	100.00%
	Other					
	Unweighted asset group overall	97.60%	95.26%	82.84%	100.00%	100.00%
	Unit cost weighted asset group overall	98.75%	97.00%	92.39%	100.00%	100.00%

Source: United Energy

Empty cells indicate no asset replacements

Not all the asset categories within this asset group are being replaced in this 2016–2020 regulatory period, and thus some asset categories do not have proportional statistics to report. The AER should therefore consider the average historical proportion of the asset categories where failure occurred to represent the failure proportion in missing asset categories for the 2021–2026 regulatory period. The unweighted and weighted average historical proportion statistics for the asset group is provided in the above table.

Replacement due to other drivers

These statistics represent annual replacement activities due to asset failures. We calculated these statistics by referring to 2015-2018 category analysis RIN table 2.2.1 and dividing the quantity failed by the total quantity replaced and failed. Failed assets are replaced like-for-like. Asset failure can occur at any point in time and therefore the asset age cannot be a proxy for such reactive or emergency expenditure activities. Such expenditure activities should not be reviewed using the AER repex modelling methodology.

Asset group	Asset category	Proportion of assets replaced due to asset failure that cannot be proxy by age				
		2016	2017	2018	2019	2020
Overhead conductors	< = 1 kV	13.01%	21.65%	43.41%	26.02%	26.02%
	> 1 kV & < = 11 kV	0.00%	18.71%	12.13%	10.28%	10.28%
	> 11 kV & < = 22 kV ; SWER	0.00%			0.00%	0.00%
	> 11 kV & < = 22 kV ; single-phase	0.00%			0.00%	0.00%
	> 11 kV & < = 22 kV ; multiple-phase	1.30%	2.34%	3.46%	2.37%	2.37%
	> 22 kV & < = 66 kV	0.00%			0.00%	0.00%
	Other					
	Unweighted asset group overall	2.40%	4.74%	17.16%	8.10%	8.10%
	Unit cost weighted asset group overall	1.25%	3.00%	7.61%	3.95%	3.95%

Source: United Energy
Empty cells indicate no asset replacements

Not all the asset categories within this asset group had a failure in this current regulatory period. Thus some asset categories do not have proportional statistics to report. Asset failure can occur at any point in time (due to a range of issues that are beyond our control such as weather, manufacturing defect, accident) and we are unable to foresee or forecast the proportion of assets that will fail in the 2021–2026 regulatory period. The AER should therefore consider the average historical proportion of the asset categories where failure occurred to represent the failure proportion in missing asset categories for the 2021–2026 regulatory period. The unweighted and weighted average historical proportion statistics for the asset group is provided in the above table.

Additional assets due to augmentation, extension or development

No repex has occurred in the current regulatory period due to augmentation, extension or network development within any asset categories in this asset group.

The proportion of new asset each year due to such factors can be calculated by referring to 2015-2018 category analysis RIN tabs 2.3(a), 2.3(b) and 2.5 (for new quantities added). There are also asset quantities associated with the 'non-material projects' collectively summarised and reported at the bottom of the tables 2.3.1 and 2.3.2. All such asset quantities are due to augmentation, extension and development of network.

Additional assets due to other drivers

None.

1.4.3 Changes in asset replacement drivers during 2011-2026 period [5.1(b)]

Statutory requirements

None.

Internal planning and asset management approaches

The asset management approach for this asset class has largely remained the same.

Following the escalation of failure rate of HV aerial bundled cable (**ABC**) at the start of this regulatory period, we undertook a high bushfire risk area (**HBRA**) population replacement program. This resulted in an increase in expenditure. This program is now completed. Refer to historical category analysis RIN 2.2 Repex for historical replacements.

Measureable asset factors

None.

Measureable and forecastable external factors

None.

Network technology/solution

We have approved covered conductor as an alternative insulated replacement to HV ABC. No material change in repex.

Non-network technology/solution

None.

Other significant matters

We undertook a targeted open wire conductor replacement program in 2014. Refer to category analysis RIN 2.2 Repex for historical replacements and volume model for details.[2]

Supporting information

Refer to our 2021–2026 regulatory proposal.

[2] UE MOD 4.02 - Unitised volume model - Jan2020 - Public.xlsx

1.5 Underground cables

1.5.1 Asset category description [5.1(a)(i)]

Asset scope and boundary issues

Underground assets in our network comprise of HV cables, LV cables, pillars and pits and HV terminations asset classes. Surge arrestors are also included in this category (i.e. underground cable - other), consistent with the AER's RIN (although the age-profile data is reported in a specific line item in the overhead switchgear category).

Age profile determination

The following assumptions were applied to determine the underground cable age profiles:

- out of service underground cables were excluded from the reported quantities
- the computed underground cable length for three phase cable runs that utilise three separate single core cables has been divided by three, to enable consistent cable length reporting regardless of actual cable configuration installed.

Where an underground cable voltage was unknown, the quantity of underground cable was apportioned across the other underground cable voltages, in direct proportion with the known sub-category quantities.

Where an underground LV cable type was unknown, the quantity of underground cable was apportioned across the other underground LV cable types in direct proportion with the known sub-category quantities.

Main drivers of replacement

The main driver of replacement is the asset condition and risk profile based on operational experience, fault history, value of lost load, emergency cost, and/or asset failure.

Unit cost scope

The costs in this asset group include materials, labour, plant and equipment, mobilisation and travel, and the project or program overheads. The cost represents procurement, inventory, logistics, trenching, excavation, removal of old assets, cable, joints, conduit, communication, monitoring system, installation or cable laying or pulling, new joining pits, terminations on switchgear and outage management.

The project or program overheads have been proportionally allocated, where applicable, between this asset group, switchgear and/or transformers asset groups. Corporate overheads have not been included.

The proposed repex and quantities in 2021–2026 reset RIN table 2.2.1 allows for complete replacement of asset within the described boundary. This cost is capitalised. Projects and programs of work are usually delivered to resolve an issue or constraint and includes multiple asset categories that has been demarcated and described separately by the AER for its review and modelling purpose.

1.5.2 Asset replacement drivers during 2016-2020 regulatory period [5.1(a)(ii)]

Replacement due to various drivers that can be proxy by age

We calculate these statistics by referring to 2015–2018 category analysis RIN table 2.2.1 and dividing the quantity replaced by the total quantity replaced and failed. We have assumed all the replacement quantities reported in the category analysis RIN table 2.2.1 represent asset replacement due to factors (such as condition, increasing safety risk, jurisdictional directives, fixed periodic frequency) that can be a proxy for asset age. Therefore, it is expected that such expenditure activities can be largely captured by the AER repex modelling methodology.

Asset group	Asset category	Proportion of assets replaced due to various drivers that can be proxy by age				
		2016	2017	2018	2019	2020
Underground cables	< = 1 kV	77.94%	51.06%	96.77%	75.26%	75.26%
	> 1 kV & < = 11 kV	97.59%	98.29%	94.33%	96.74%	96.74%
	> 11 kV & < = 22 kV	87.62%	95.03%	97.91%	93.52%	93.52%
	> 33 kV & < = 66 kV		100.00%		100.00%	100.00%
	Public lighting underground cable	97.87%	88.40%	98.44%	94.90%	94.90%
	Unweighted asset group overall	89.93%	83.42%	97.24%	90.20%	90.20%
	Unit cost weighted asset group overall	96.29%	92.56%	97.60%	95.48%	95.48%

Source: United Energy
Empty cells indicate no asset replacements

Not all the asset categories within this asset group are replaced in this current regulatory period. Thus some asset categories do not have proportional statistics to report in the above table. The AER is advised to consider the average historical proportion of the remainder of asset categories if the repex model identifies replacement in 2021-2026 period of such missing asset category. The unweighted and weighted average historical proportion statistics for the asset group is provided in the above table.

Replacement due to other drivers

These statistics represent annual replacement activities due to asset failures only. We calculated this statistics by referring to 2015-2018 Category Analysis RIN Table 2.2.1 and dividing the quantity failed by the total quantity replaced and failed. Failed assets are replaced like-for-like. It is noted that asset failure can occur at any point in time in the assets life and therefore the asset age cannot be a proxy for such reactive or emergency expenditure activities. Such expenditure activities should not be reviewed using the AER repex modelling methodology.

Asset group	Asset category	Proportion of assets replaced due to asset failure that cannot be proxy by age				
		2016	2017	2018	2019	2020
Underground cables	< = 1 kV	22.06%	48.94%	3.23%	24.74%	24.74%
	> 1 kV & < = 11 kV	2.41%	1.71%	5.67%	3.26%	3.26%
	> 11 kV & < = 22 kV	12.38%	4.97%	2.09%	6.48%	6.48%
	> 33 kV & < = 66 kV		0.00%		0.00%	0.00%
	Public lighting underground cable	2.13%	11.60%	1.56%	5.10%	5.10%
	Unweighted asset group overall	10.07%	16.58%	2.76%	9.80%	9.80%
	Unit cost weighted asset group overall	3.71%	7.44%	2.40%	4.52%	4.52%

Source: United Energy
Empty cells indicate no asset replacements

Not all the asset categories within this asset group had failure in this current regulatory period. Thus some asset categories do not have proportional statistics to report in the above table. At noted earlier, asset failure can occur at any point in time in asset life (due to a range of issues that are beyond our control such as weather, manufacturing defect, accident etc.) and we are unable to foresee or forecast proportion of assets that will fail in 2021-2026. The AER is therefore advised to consider the average historical proportion of the remainder of asset categories to represent the failure proportion in 2021-2026 regulatory period for asset categories with no statistics. The unweighted and weighted average historical proportion statistics for the asset group is provided in the above table.

Additional assets due to augmentation, extension or development

No repex has occurred in the current regulatory period due to augmentation, extension or network development within any asset categories in this asset group.

If the AER wishes to appreciate the proportion of new asset each year due to such factors, please calculate this by referring to 2015-2018 category analysis RIN Tabs 2.3(a), 2.3(b) and 2.5 (for new quantities added). Please note that there are asset quantities associated with the 'non-material projects' collectively summarised and reported at the bottom of the Tables 2.3.1 and 2.3.2 also. All such asset quantities are due to augmentation, extension and development of network.

Additional assets due to other drivers

No additional repex has been recorded in the current regulatory period due to other factors within any asset categories in this asset group.

1.5.3 Changes in asset replacement drivers during 2011-2026 period [5.1(b)]

Statutory requirements

There have been no current or future statutory requirement changes for this asset group.

Internal planning and asset management approaches

None.

Measureable asset drivers

We are in the process of developing a CBRM model for this asset group from which we can form a risk profile to prioritise replacement. Additionally, we are also replacing damaged sections in piecemeal fashion. Another portion of cable replacement is driven from asset replacement not within this category e.g. switchgear replacement. As a result, we are not expecting the CBRM works to have an effect on repex.

Measureable and forecastable external drivers

None.

Network technology/solution drivers

None.

Non-network technology/solution drivers

There are no known or expected non-network solutions for this asset group.

Other significant matters

We are not aware of any other significant factors that have affected replacement expenditure requirements for the previous, current and forthcoming regulatory periods.

Supporting information

Refer to our 2021–2026 regulatory proposal.

1.6 Services

1.6.1 Asset category description [5.1(a)(i)]

Asset scope and boundary issues

Services are network assets that connect a customer from their premise to the electricity network. They can be overhead conductors or underground cables and supply all residential, industrial and commercial customers. There are fewer services than customers as a single service can supply apartment complexes that can contain more than one customer.

Our cost capture for this asset class is limited to overhead services only. This is because we are only responsible for the LV mains up to the pit or pillar for underground distribution. Cost capture for pits or pillars are reported in the “Underground – Other” category.

Private overhead electric lines (**POELs**) are above ground lines that start at the point of supply (connection point with our network) to the point at which the line is first connected to a building or other structure (not including a pole) on customer installations. POELs are recorded within SAP as being attached to a pole that belongs to a private land owner. There are more than 5,000 poles carrying private overhead electric lines, 3,166 in the LBRA and 1,939 in the HBRA. With respect to POELs, the service is considered the connection from our network to the first pole on the customer’s property that starts the privately owned line.

Age profile determination

The following assumptions were applied to determine the service line age profiles:

- only in service lines were in included in reported quantities
- the quantity and length of services is captured in our GIS
- the premise and supply complexity is based on a combination of GIS and SAP data.

< = 11 kV ; residential ; simple type age profile has been adjusted to report the number of services installed instead of the total length of services installed.

< = 11 kV ; commercial and industrial ; simple type age profile has been adjusted to report the number of services installed instead of the total length of services installed.

< = 11 kV ; residential ; complex type age profile has been adjusted to report the number of services installed instead of the total length of services installed.

< = 11 kV ; commercial and industrial ; complex type age profile has been adjusted to report the number of services installed instead of the total length of services installed.

Main drivers of replacement

The main driver of replacement is the asset condition based on inspection regime and/or asset failure. Deteriorating asset condition, if left untreated, will have risk (safety, reliability and reputational) and cost (unplanned capital and operational expenses) consequences.

Proactive programs are forecasted based on the heightened risk profile of specific service types which are more likely to cause injury to the public as they deteriorate.

Unit cost scope

The cost in this asset group includes materials, labour, plant & equipment, mobilisation & travel, and the project or program overheads. The cost includes procurement, inventory, logistics, removal of old assets, hardware, installation and connection. Corporate overheads are excluded.

It excludes customer switchboard and metering, and also network utility cross arms, fittings and insulators as they are accounted for in the pole top structure asset group. The project or program overheads have been proportionally allocated, where applicable, between this asset group, poles and pole top structure asset groups.

The proposed repex and quantities in 2021-2026 reset RIN Table 2.2.1 allows for complete replacement of asset within the described boundary. This cost is capitalised.

It is noted that projects and programs of work are usually delivered to resolve an issue or constraint and includes multiple asset categories that has been demarcated and described separately by the AER for its review and modelling purpose.

1.6.2 Asset replacement drivers during 2016-2020 period [5.1(a)(ii)]

Replacement due to various drivers that can be proxy by age

We calculate this statistics by referring to 2015-2018 category analysis RIN Table 2.2.1 and dividing the quantity replaced by the total quantity replaced and failed. We have assumed that all the replacement quantities reported in the category analysis RIN Table 2.2.1 represent asset replacement due to various factors (such as asset condition, increasing safety risk, jurisdictional directives, fixed periodic frequency etc.) that can be proxy by asset age. Therefore, it is expected that such expenditure activities can be largely captured by the AER repex modelling methodology.

Asset group	Asset category	Proportion of assets replaced due to various drivers that can be proxy by age				
		2016	2017	2018	2019	2020
Services	< = 11 kV ; residential ; simple type	97.82%	95.78%	92.38%	95.33%	95.33%
	< = 11 kV ; commercial & industrial ; simple type	97.80%	97.48%	92.33%	95.87%	95.87%
	< = 11 kV ; residential ; complex type	98.99%	95.14%	92.32%	95.48%	95.48%
	< = 11 kV ; commercial & industrial ; complex type	95.00%	96.83%	92.07%	94.63%	94.63%
	Other	100.00%			100.00%	100.00%
	Unweighted asset group overall	97.95%	95.94%	92.37%	95.42%	95.42%
	Unit cost weighted asset group overall	97.97%	95.92%	92.37%	95.42%	95.42%

Source: United Energy
Empty cells indicate no asset replacements

Replacement due to other drivers

These statistics represent annual replacement activities due to asset failures only. We calculated these statistics by reference to the 2015-2018 category analysis RIN Table 2.2.1 and dividing the quantity failed by the total quantity replaced and failed. Failed assets are replaced like-for-like. It is noted that asset failure can occur at any point in time in an asset's life and therefore the asset age cannot be a proxy for such reactive or emergency expenditure activities. Such expenditure activities should not be reviewed using the AER repex modelling methodology.

Asset group	Asset category	Proportion of assets replaced due to asset failure that cannot be proxy by age				
		2016	2017	2018	2019	2020
Services	< = 11 kV ; residential ; simple type	2.18%	4.22%	7.62%	4.67%	4.67%
	< = 11 kV ; commercial & industrial ; simple type	2.20%	2.52%	7.67%	4.13%	4.13%
	< = 11 kV ; residential ; complex type	1.01%	4.86%	7.68%	4.52%	4.52%
	< = 11 kV ; commercial & industrial ; complex type	5.00%	3.17%	7.93%	5.37%	5.37%
	Other	0.00%			0.00%	0.00%
	Unweighted asset group overall	2.05%	4.06%	7.63%	4.58%	4.58%
	Unit cost weighted asset group overall	2.03%	4.08%	7.63%	4.58%	4.58%

Source: United Energy
Empty cells indicate no asset replacements

Asset failure can occur at any point in time in asset life (due to a range of issues that are beyond our control such as weather, manufacturing defect, accident etc.) and we are unable to foresee or forecast the proportion of assets that will fail in 2021-2026 regulatory period. The AER is therefore advised to consider the average historical proportion of the remainder of asset categories to represent the failure proportion in 2021-2026 regulatory period.

Additional assets due to augmentation, extension or development

No repex has occurred in the current regulatory period due to augmentation, extension or network development within any asset category in this asset group.

If the AER wishes to appreciate the proportion of new asset each year due to such factors, please calculate this by referring to 2015-2018 category analysis RIN Tabs 2.3(a), 2.3(b) and 2.5 (for new quantities added). Please note that there are asset quantities associated with the 'non-material projects' collectively summarised and reported at the bottom of the Tables 2.3.1 and 2.3.2 also. All such asset quantities are due to augmentation, extension and development of network.

Additional assets due to other drivers

No additional repex has been recorded in the current regulatory period due to other factors within any asset categories in this asset groups.

1.6.3 Changes in asset replacement drivers during 2011-2026 regulatory period [5.1(b)]

Statutory requirements

There have not been any current or future expected statutory requirement changes for this asset class.

Internal planning and asset management approaches

In 2016 we developed a new data analysis platform using smart meter data to identify replacement needs. As part of this, prior to 2016, we undertook a proactive replacement program to replace neutral screen services due to failure history. This program was placed on hold from 2016, where we trialled smart meters analytic software to be able to detect possible service failures. This has been successful to date, reducing the number of electric shocks to the public. Refer to category analysis RIN 2.2 Repex for historical replacements and unitised volume model for details.[3]

Measureable asset factors

The replacement program is based on asset age, geography, supply feeder history etc.

Measureable and forecastable external factors

None.

Network technology/solution

None.

Non-network technology/solution

There are no known or expected non-network solutions for this asset group.

[3] UE MOD 4.02 - Unitised volume model - Jan2020 - Public.xlsx

Other significant matters

We are not aware of any other significant factors that have affected replacement expenditure requirements for the previous, current and forthcoming regulatory periods.

Supporting information

Refer to our 2021–2026 regulatory proposal.

1.7 Transformers

1.7.1 Asset category description [5.1(a)(i)]

Asset scope and boundary issues

This asset group covers a number of different transformer types, each with their own distinct design. In general, the asset scope is limited to the transformer itself, and for larger transformers, all ancillary componentry including on-load tap changers and cooling systems.

Foundations, walls, enclosures and oil containment are excluded from this asset group.

Age profile determination

The following assumptions were applied to determine the transformer age profiles:

- only in service (in-commission) transformers were included in reported quantities
- only transformers we owned were included in reported quantities
- transformer voltages, capacities and phase types are captured as equipment characteristics, the quantity of transformers was allocated to the appropriate sub-categories
- the age profile of transformers is based on the construction date as recorded in SAP.

Main drivers of replacement

Asset condition based on inspection regime, operational experience and/or asset failure for distribution transformers.

Asset condition and risk profile based on inspection and testing regime, operational experience such as fault history, health indices, value of lost load, emergency cost, and/or asset failure for zone substation transformers.

Unit cost scope

The cost in this asset category includes materials, labour, plant & equipment, mobilisation & travel, and the project or program overheads. The cost includes procurement, inventory, logistics, factory acceptance testing (if applicable or larger zone substation transformers), all associated zone substation hardware (oil, fan, tap-changer, surge arrestor or bushings), all associated distribution substation hardware (HV/LV switch/fuse, termination, and concrete plinth), removal of old assets, connection, and commissioning.

It excludes zone substation civil costs such as earth grid, foundation, bunding, firewall, transformer runway, gantry structures, fencing and associated zone substation electrical costs such as corresponding busbar, switchgear and secondary systems. It excludes distribution substation costs such as earthing, pole, fencing and chamber building.

The project or program overheads have been proportionally allocated, where applicable, between this asset group and other asset groups that typically are delivered together. Corporate overheads are excluded

The proposed repex and quantities in 2021-2026 reset RIN Table 2.2.1 allows for complete replacement of asset within the described boundary. This cost is capitalised.

It is noted that projects and programs of work are usually delivered to resolve an issue or constraint and includes multiple asset categories that has been demarcated and described separately by the AER for its review and modelling purpose.

1.7.2 Asset replacement drivers during 2016-2020 regulatory period [5.1(a)(ii)]

Replacement due to various drivers that can be Proxy by age

We calculated these statistics by reference to 2015-2018 category analysis RIN Table 2.2.1 and dividing the quantity replaced by the total quantity replaced and failed. We have assumed that all replacement quantities reported in the category analysis RIN Table 2.2.1 represent asset replacement due to various factors (such as asset condition, technological obsolescence, increasing safety risk etc.) that can be proxy by asset age. Therefore, it is expected that such expenditure activities can be largely captured by the AER repex modelling methodology.

Asset group	Asset category	Proportion of assets replaced due to various drivers that can be proxy by age				
		2016	2017	2018	2019	2020
Transformers	Pole mounted ; < = 22kV ; < = 60 kVA ; single phase	76.92%	78.26%	90.91%	82.03%	82.03%
	Pole mounted ; < = 22kV ; > 60 kVA and < = 600 kVA ; single phase	100.00%	100.00%		100.00%	100.00%
	Pole mounted ; < = 22kV ; > 600 kVA ; single phase					
	Pole mounted ; < = 22kV ; < = 60 kVA ; multiple phase	100.00%	100.00%	40.00%	80.00%	80.00%
	Pole mounted ; < = 22kV ; > 60 kVA and < = 600 kVA ; multiple phase	84.72%	86.11%	95.00%	88.61%	88.61%
	Pole mounted ; < = 22kV ; > 600 kVA ; multiple phase					
	Kiosk mounted ; < = 22kV ; < = 60 kVA ; single phase					
	Kiosk mounted ; < = 22kV ; > 60 kVA and < = 600 kVA ; single phase					
	Kiosk mounted ; < = 22kV ; > 600 kVA ; single phase					
	Kiosk mounted ; < = 22kV ; < = 60 kVA ; multiple phase					
	Kiosk mounted ; < = 22kV ; > 60 kVA and < = 600 kVA ; multiple phase	98.18%	90.48%	85.71%	91.46%	91.46%
	Kiosk mounted ; < = 22kV ; > 600 kVA ; multiple phase	100.00%		100.00%	100.00%	100.00%
	Ground outdoor / indoor chamber mounted; < 22 kV ; < = 60 kVA ; single phase					
	Ground outdoor / indoor chamber mounted; < 22 kV ; > 60 kVA and < = 600 kVA ; single phase					
	Ground outdoor / indoor chamber mounted; < 22 kV ; > 600 kVA ; single phase					

Ground outdoor / indoor chamber mounted; < 22 kV ; < = 60 kVA ; multiple phase					
Ground outdoor / indoor =chamber mounted; < 22 kV ; > 60 kVA and < = 600 kVA ; multiple phase	100.00%		100.00%	100.00%	100.00%
Ground outdoor / indoor chamber mounted; < 22 kV ; > 600 kVA ; multiple phase	100.00%		100.00%	100.00%	100.00%
Ground outdoor / indoor chamber mounted; > = 22 kV & < = 33 kV ; < = 15 MVA		100.00%	100.00%	100.00%	100.00%
Ground outdoor / indoor chamber mounted; > = 22 kV & < = 33 kV ; > 15 MVA and < = 40 MVA					
Ground outdoor / indoor chamber mounted; > = 22 kV & < = 33 kV ; > 40 MVA					
Ground outdoor / indoor chamber mounted; > 33 kV & < = 66 kV ; < = 15 MVA					
Ground outdoor / indoor chamber mounted; > 33 kV & < = 66 kV ; > 15 MVA and < = 40 MVA	66.67%	100.00%	100.00%	88.89%	88.89%
Ground outdoor / indoor chamber mounted; > 33 kV & < = 66 kV ; > 40 MVA					
Others	100.00%	100.00%	100.00%	100.00%	100.00%
Unweighted asset group overall	91.26%	89.47%	93.28%	91.34%	91.34%
Unit cost weighted asset group overall	82.90%	95.21%	97.39%	91.83%	91.83%

Source: United Energy
Empty cells indicate no asset replacements

Not all the asset categories within this asset group are replaced in this regulatory period. Thus some asset categories do not have proportional statistics to report in the above table. The AER is advised to consider the average historical proportion of the remainder of asset categories if the repex model identifies replacement in 2021-2026 period of such missing asset category. The unweighted and weighted average historical proportion statistics for the asset group is provided in the above table.

Replacement due to other drivers

These statistics represent annual replacement activities due to asset failures only. We calculated these statistics by reference to 2015-2018 category analysis RIN Table 2.2.1 and dividing the quantity failed by the total quantity

replaced and failed. Failed assets are replaced like-for-like. It is noted that asset failure can occur at any point in time of an asset's life and therefore the asset age cannot be a proxy for such reactive or emergency expenditure activities. Such expenditure activities should not be reviewed using the AER repex modelling methodology.

Asset group	Asset category	Proportion of assets replaced due to asset failure that cannot be proxy by age				
		2016	2017	2018	2019	2020
Transformers	Pole mounted ; < = 22kV ; < = 60 kVA ; single phase	23.08%	21.74%	9.09%	17.97%	17.97%
	Pole mounted ; < = 22kV ; > 60 kVA and < = 600 kVA ; single phase	0.00%	0.00%		0.00%	0.00%
	Pole mounted ; < = 22kV ; > 600 kVA ; single phase					
	Pole mounted ; < = 22kV ; < = 60 kVA ; multiple phase	0.00%	0.00%	60.00%	20.00%	20.00%
	Pole mounted ; < = 22kV ; > 60 kVA and < = 600 kVA ; multiple phase	15.28%	13.89%	5.00%	11.39%	11.39%
	Pole mounted ; < = 22kV ; > 600 kVA ; multiple phase					
	Kiosk mounted ; < = 22kV ; < = 60 kVA ; single phase					
	Kiosk mounted ; < = 22kV ; > 60 kVA and < = 600 kVA ; single phase					
	Kiosk mounted ; < = 22kV ; > 600 kVA ; single phase					
	Kiosk mounted ; < = 22kV ; < = 60 kVA ; multiple phase					
	Kiosk mounted ; < = 22kV ; > 60 kVA and < = 600 kVA ; multiple phase					
	Kiosk mounted ; < = 22kV ; > 600 kVA ; multiple phase	1.82%	9.52%	14.29%	8.54%	8.54%
	Ground outdoor / indoor chamber mounted; < 22 kV ; < = 60 kVA ; single phase	0.00%		0.00%	0.00%	0.00%
	Ground outdoor / indoor chamber mounted; < 22 kV ; > 60 kVA and < = 600 kVA ; single phase					
	Ground outdoor / indoor chamber mounted; < 22 kV ; > 600 kVA ; single phase					

Ground outdoor / indoor chamber mounted; < 22 kV ; < = 60 kVA ; multiple phase					
Ground outdoor / indoor chamber mounted; < 22 kV ; > 60 kVA and < = 600 kVA ; multiple phase	0.00%		0.00%	0.00%	0.00%
Ground outdoor / indoor chamber mounted; < 22 kV ; > 600 kVA ; multiple phase	0.00%		0.00%	0.00%	0.00%
Ground outdoor / indoor chamber mounted; > = 22 kV & < = 33 kV ; < = 15 MVA		0.00%	0.00%	0.00%	0.00%
Ground outdoor / indoor chamber mounted; > = 22 kV & < = 33 kV ; > 15 MVA and < = 40 MVA					
Ground outdoor / indoor chamber mounted; > = 22 kV & < = 33 kV ; > 40 MVA					
Ground outdoor / indoor chamber mounted; > 33 kV & < = 66 kV ; < = 15 MVA	33.33%	0.00%	0.00%	11.11%	11.11%
Ground outdoor / indoor chamber mounted; > 33 kV & < = 66 kV ; > 15 MVA and < = 40 MVA					
Ground outdoor / indoor chamber mounted; > 33 kV & < = 66 kV ; > 40 MVA					
Others	0.00%	0.00%	0.00%	0.00%	0.00%
Unweighted asset group overall	8.74%	10.53%	6.72%	8.66%	8.66%
Unit cost weighted asset group overall	17.10%	4.79%	2.61%	8.17%	8.17%

Source: United Energy
Empty cells indicate no asset replacements

Not all the asset categories within this asset group had failures in the current regulatory period. Thus some asset categories do not have proportional statistics to report in the above table. At noted earlier, asset failure can occur at any point in time in an asset's life (due to a range of issues that are beyond our control such as weather, manufacturing defect, accident etc.) and we are unable to foresee or forecast proportion of assets that will fail in 2021-2026. The AER is therefore advised to consider the average historical proportion of the remainder of asset categories to represent the failure proportion in 2021-2026 period of such missing asset category. The unweighted and weighted average historical proportion statistics for the asset group is provided in the above table.

Additional assets due to augmentation, extension or development

No repex has occurred in the current regulatory period due to augmentation, extension or network development within any asset category in this asset group.

If the AER wishes to appreciate the proportion of new asset each year due to such factors, please calculate this by referring to 2015-18 category analysis RIN Tabs 2.3(a), 2.3(b) and 2.5 (for new quantities added). Please note that there are asset quantities associated with the 'non-material projects' collectively summarised and reported at the bottom of the Tables 2.3.1 and 2.3.2 also. All such asset quantities are due to augmentation, extension and development of network.

Additional assets due to other drivers

No additional repex has been recorded in the current regulatory period due to other factors within any asset categories in this asset groups.

1.7.3 Changes in asset replacement drivers during 2011-2026 period [5.1(b)]

Statutory requirements

In 2018 there was an amendment to the Environmental Protection Act. The amended Act has significantly increased compliance obligations and penalties which are expected to drive further environment related investment that affects this asset group. As this asset group is a major determinant of our environmental performance, the change will increase the level of risk associated with this asset class by increasing the consequence of environmental-related issues. Refer to 2021–2026 regulatory proposal and supporting attachments.

Internal planning and asset management approaches

There has been a change in the internal planning and asset management approach for the following asset category: Ground outdoor / indoor chamber mounted; > 33 kV & < = 66 kV ; > 15 MVA and < = 40 MVA

We have made improvements to the risk assessment quantification for this category. These changes primarily involve a refinement of the estimated failure probability for transformers, taking into account failures and replacements separately, and shifting the analysis focus to a substation level, including joint and conditional probability assessment. As a result, some asset retirements have been deferred, and other future retirements have been brought forward. We believe these changes are in alignment with the AER's Industry practice application note on Asset replacement planning.

As a result, we have shifted investment focus into the following works:

- implement a cost-effective mobile-readiness program including:
  - procurement of two additional relocatable transformers to use as a risk-mitigation measure in the medium term to defer replacement
  - make-ready works at targeted locations where the risk reduction is sufficient to enable deferral of asset replacement, or as an interim control until asset replacement can take place.
- move away from focussing on replacement of transformers in poor condition to replacing one of two like assets within a substation. Prioritisation of replacements within the analysis bounds is selected using a health score.

These actions have resulted in the deferral of expenditure during the 2016-2020 regulatory period by managing risk, however expenditure during the period is increasing post-review. Refer to category analysis RIN 2.2 Repex for historical replacements.

There has been no change to the management of other transformer categories.

Measureable asset factors

Asset failure data is used to derive likelihoods and consequences of failure that serve as an input into the risk quantification and forecasting process. Where we do not have sufficient data, industry figures are used.

Measureable and forecastable external factors

None.

Network technology/solution

Whilst we employ network technology solutions to monitor assets and manage risk, there are no specific replacement that has been deferred as a result of technology as this is generally limited to monitoring fraction of the overall number of failure modes.

Non-network technology/solution

We have requested non-network solutions from the market for transformer replacement as part of our Distribution Annual Planning Report. No alternative solutions have been received so far.

Other significant matters

We are not aware of any other significant factors that have affected replacement expenditure requirements for the previous, current or forthcoming regulatory periods.

Supporting information

Refer to our 2021–2026 regulatory proposal.

1.8 Switchgear

1.8.1 Asset category description [5.1(a)(i)]

Asset scope and boundary issues

This asset group covers all switchgear of different types and capabilities as described in the RIN template, from fuses up to circuit breakers capable of breaking fault current. From 2018 onwards, this asset group also includes surge diverters.

For metal-enclosed switchgear, this asset group includes all componentry within the metal enclosure such as instrument transformers.

Age profile determination

The following assumptions were applied to determine the underground cable age profiles:

- out of service switchgear were excluded from the reported quantities
- only our switchgear was included in reported quantities.

Main drivers of replacement

Asset condition based on inspection regime, operational experience and/or asset failure for distribution or overhead line switchgear. It is noted a portion of assets within such asset categories are proactively replaced due to a higher likelihood to cause safety (injury and/or bushfire) concerns or jurisdictional directives.

Asset condition and risk profile based on inspection and testing regime, operational experience such as fault history, value of lost load, emergency cost, and/or asset failure for zone substation switchgear.

Unit cost scope

The cost in this asset category includes materials, labour, plant & equipment, mobilisation & travel, and the project or program overheads. The cost includes procurement, inventory, logistics, hardware, removal of old assets, connection, and commissioning. It also represents any zone substation civil cost such as structure or foundation. It excludes zone substation civil costs such as gantry structures and electrical costs such as corresponding busbar and secondary system. At the distribution level, it excludes cross arms, poles, underground cable /overhead conductor and fencing.

The project or program overheads have been proportionally allocated, where applicable, between this asset group and other asset groups that typically are delivered together. Corporate overheads are excluded.

The proposed repex and quantities in 2021-2026 reset RIN Table 2.2.1 allow for complete replacement of assets within the described boundary. This cost is capitalised.

It is noted that projects and programs of work are usually delivered to resolve an issue or constraint and includes multiple asset categories that has been demarcated and described separately by the AER for its review and modelling purpose.

1.8.2 Asset replacement drivers during 2016-2020 regulatory period [5.1(a)(ii)]

Replacement due to various drivers that can be proxied by age

We calculate these statistics by reference to the 2015-2018 category analysis RIN Table 2.2.1 and dividing the quantity replaced by the total quantity replaced and failed. We have assumed that all the replacement quantities reported in the category analysis RIN Table 2.2.1 represent asset replacement due to various factors (such as condition, technological obsolescence, increasing safety risk, jurisdictional directives etc.) that can be proxied by asset age. Therefore, it is expected that such expenditure activities can be largely captured by the AER repex modelling methodology.

Asset group	Asset category	Proportion of assets replaced due to various drivers that can be proxy by age				
		2016	2017	2018	2019	2020
Switchgear	< = 11 kV ; fuse	100.00%	100.00%	100.00%	100.00%	100.00%
	< = 11 kV ; switch	93.37%	87.50%	43.58%	74.82%	74.82%
	< = 11 kV ; circuit breaker	100.00%	100.00%		100.00%	100.00%
	> 11 kV & < = 22 kV ; switch	98.58%	98.99%	100.00%	99.19%	99.19%
	> 11 kV & < = 22 kV ; circuit breaker	100.00%	100.00%	100.00%	100.00%	100.00%
	> 22 kV & < = 33 kV ; switch					
	> 22 kV & < = 33 kV ; circuit breaker					
	> 33 kV & < = 66 kV ; switch	100.00%	100.00%	100.00%	100.00%	100.00%
	> 33 kV & < = 66 kV ; circuit breaker		100.00%		100.00%	100.00%
	Other	93.65%	60.00%	100.00%	84.55%	84.55%
	Unweighted asset group overall	94.72%	94.36%	93.35%	94.14%	94.14%
	Unit cost weighted asset group overall	96.37%	96.46%	94.94%	95.93%	95.93%

Source: United Energy
Empty cells indicate no asset replacements

Not all the asset categories within this asset group have been replaced in the current regulatory period. Thus some asset categories do not have proportional statistics to report in the above table. The AER is advised to consider the average historical proportion of the remainder of asset categories if the repex model identifies replacement in 2021-2026 period of such missing asset category. The unweighted and weighted average historical proportion statistics for the asset group is provided in the above table.

Replacement due to other drivers

These statistics represent annual replacement activities due to asset failures only. We calculated this statistics by reference to the 2015-2018 category analysis RIN Table 2.2.1 and dividing the quantity failed by the total quantity replaced and failed. Failed assets are replaced like-for-like. It is noted that asset failure can occur at any point in an asset's life and therefore the asset age cannot be a proxy for such reactive or emergency expenditure activities. Such expenditure activities should not be reviewed using the AER repex modelling methodology.

Asset group	Asset category	Proportion of assets replaced due to asset failure that cannot be proxy by age				
		2016	2017	2018	2019	2020
Switchgear	< = 11 kV ; fuse	0.00%	0.00%	0.00%	0.00%	0.00%
	< = 11 kV ; switch	6.63%	12.50%	56.42%	25.18%	25.18%
	< = 11 kV ; circuit breaker	0.00%	0.00%		0.00%	0.00%
	> 11 kV & < = 22 kV ; switch	1.42%	1.01%	0.00%	0.81%	0.81%
	> 11 kV & < = 22 kV ; circuit breaker	0.00%	0.00%	0.00%	0.00%	0.00%
	> 22 kV & < = 33 kV ; switch					
	> 22 kV & < = 33 kV ; circuit breaker					
	> 33 kV & < = 66 kV ; switch	0.00%	0.00%	0.00%	0.00%	0.00%
	> 33 kV & < = 66 kV ; circuit breaker		0.00%		0.00%	0.00%
	Other	6.35%	40.00%	0.00%	15.45%	15.45%
	Unweighted asset group overall	5.28%	5.64%	6.65%	5.86%	5.86%
	Unit cost weighted asset group overall	3.63%	3.54%	5.06%	4.07%	4.07%

Source: United Energy
Empty cells indicate no asset replacements

Not all the asset categories within this asset group had failure in this current regulatory period. Thus some asset categories do not have proportional statistics to report in the above table. At noted earlier, asset failure can occur at any point in an asset's life (due to a range of issues that are beyond our control such as weather, manufacturing defect, accident etc.) and we are unable to foresee or forecast proportion of assets that will fail in 2021-2026. The AER is therefore advised to consider the average historical proportion of the remainder of asset categories to represent the failure proportion in 2021-2026 regulatory period of such missing asset category. The unweighted and weighted average historical proportion statistics for the asset group is provided in the above table.

Additional assets due to augmentation, extension or development

No repex has occurred in the current regulatory period due to augmentation, extension or network development within any asset categories in this asset group.

If the AER wishes to appreciate the proportion of new asset each year due to such factors, please calculate this by reference to the 2015-2018 category analysis RIN Tabs 2.3(a), 2.3(b) and 2.5 (for new quantities added). Please note that there are asset quantities associated with the 'non-material projects' collectively summarised and reported at the bottom of the Tables 2.3.1 and 2.3.2 also. All such asset quantities are due to augmentation, extension and development of network.

Additional assets due to other drivers

No additional repex has been recorded in the current regulatory period due to other factors within any asset categories in this asset groups.

1.8.3 Changes in asset replacement drivers during 2011-2026 regulatory period [5.1(b)]

Statutory requirements

No change for this asset group.

Internal planning and asset management approaches

For distribution switchgear, there has been no change to internal planning and asset management approach.

For zone substation switchgear, locations have been reprioritised following the same principles that are outlined in 1.7.3. This has led to an increase in focus for indoor switchgear replacement, whilst a number of outdoor circuit breaker replacements have been deferred. Refer to category analysis RIN 2.2 Repex for historical replacements.

Measureable asset factors

None.

Measureable and forecastable external factors

None.

Network technology/solution

Whilst we employ network technology solutions to monitor assets and manage risk, there are no specific replacements that has been deferred as a result of technology as this is generally limited to monitoring a fraction of the overall number of failure modes.

Non-network technology/solution

We have requested non-network solutions from the market for major substation switchgear replacement as part of our Distribution Annual Planning Report. No alternative solutions have been received so far.

Other significant matters

We are not aware of any other significant factors that have affected replacement expenditure requirements for the previous, current and forthcoming regulatory periods.

Supporting information

Refer to our 2021–2026 regulatory proposal.

1.9 Public lighting

1.9.1 Asset category description [5.1(a)(i)]

Asset scope and boundary issues

This asset group includes lanterns owned and operated by us as well as public lighting poles that have the sole purpose of supporting one or more public lighting lanterns.

Age profile determination

The following assumptions were applied to determine the public lighting age profiles:

- only in-service and billable assets were included in reported quantities

- records of installation dates are maintained in GIS a hierarchy of attributes is used to determine reported age for public lighting assets. The allocation of public lighting poles between major and minor roads is based on information maintained in GIS.

Main drivers of replacement

Fixed periodic frequency, irrespective of age or condition assessment as it is more economical to do so and/or asset failure for luminaires and lamps.

Asset condition based on inspection regime and/or asset failure for brackets and poles.

Unit cost scope

The cost in this asset group includes the materials, labour, plant & equipment, mobilisation & travel, and the project or program overheads. The cost represents the procurement, inventory, logistics, hardware, removal of old assets, and installation. It includes luminaires, lamps, brackets and poles. Corporate overheads are excluded.

The project or program overheads have been proportionally allocated, where applicable, between the respective asset categories in this asset group that typically are delivered together. Cost share status was used to separate between major road and minor road assets.

The proposed repex and quantities in 2021-2026 reset RIN Table 2.2.1 allows for complete replacement of assets within the described boundary. This cost is capitalised.

1.9.2 Asset replacement drivers during 2016-2020 regulatory period [5.1(a)(ii)]

Replacement due to various drivers that can be proxied by age

We calculate these statistics by reference to 2015-2018 category analysis RIN Table 2.2.1 and dividing the quantity replaced by the total quantity replaced and failed. We have assumed that all the replacement quantities reported in the category analysis RIN Table 2.2.1 represent asset replacement due to various factors (such as condition, technological obsolescence, increasing operational expenses, fixed periodic frequency etc.) that can be proxied by asset age. Therefore, it is expected that such expenditure activities can be largely captured by the AER repex modelling methodology.

Asset group	Asset category	Proportion of assets replaced due to various drivers that can be proxy by age				
		2016	2017	2018	2019	2020
Public lighting	Luminaires ; major road		50.00%	100.00%	75.00%	75.00%
	Luminaires ; minor road		50.00%	100.00%	75.00%	75.00%
	Brackets ; major road			100.00%	100.00%	100.00%
	Brackets ; minor road			100.00%	100.00%	100.00%
	Lamps ; major road					
	Lamps ; minor road					
	Poles / columns ; major road		50.00%	100.00%	75.00%	75.00%
	Poles / columns ; minor road		50.00%	100.00%	75.00%	75.00%
	Other					
	Unweighted asset group overall		50.00%	100.00%	75.00%	75.00%
	Unit cost weighted asset group overall		50.00%	100.00%	75.00%	75.00%

Source: United Energy
Empty cells indicate no asset replacements

Not all the asset categories within this asset group have been replaced in this regulatory period. Thus some asset categories do not have proportional statistics to report in the above table. The AER is advised to consider the average historical proportion of the remainder of asset categories if the repex model identifies replacement in 2021-2026 period of such missing asset category. The unweighted and weighted average historical proportion statistics for the asset group is provided in the above table.

Replacement due to other drivers

This statistics represent annual replacement activities due to asset failures only. We calculated these statistics by referring to 2015-2018 category analysis RIN Table 2.2.1 and dividing the quantity failed by the total quantity replaced and failed. Failed assets are replaced like-for-like. It is noted that asset failure can occur at any point in time in an asset's life and therefore the asset age cannot be a proxy for such reactive or emergency expenditure activities. Such expenditure activities should not be reviewed using the AER repex modelling methodology.

Asset group	Asset category	Proportion of assets replaced due to asset failure that cannot be proxy by age				
		2016	2017	2018	2019	2020
Public lighting	Luminaires ; major road		50.00%	0.00%	25.00%	25.00%
	Luminaires ; minor road		50.00%	0.00%	25.00%	25.00%
	Brackets ; major road			0.00%	0.00%	0.00%
	Brackets ; minor road			0.00%	0.00%	0.00%
	Lamps ; major road					
	Lamps ; minor road					
	Poles / columns ; major road		50.00%	0.00%	25.00%	25.00%
	Poles / columns ; minor road		50.00%	0.00%	25.00%	25.00%
	Other					
	Unweighted asset group overall	100.00%	50.00%	0.00%	50.00%	50.00%
	Unit cost weighted asset group overall	100.00%	50.00%	0.00%	50.00%	50.00%

Source: United Energy
Empty cells indicate no asset replacements

Not all the asset categories within this asset group had failure in the current regulatory period. Thus some asset categories do not have proportional statistics to report in the above table. As noted earlier, asset failure can occur at any point in an asset's life (due to a range of issues that are beyond our control such as weather, manufacturing defect, accident etc.) and we are unable to foresee or forecast proportion of assets that will fail in 2021-2026. The AER is therefore advised to consider the average historical proportion of the remainder of asset categories to represent the failure proportion in 2021-2026 regulatory period of such missing asset category. The unweighted and weighted average historical proportion statistics for the asset group is provided in the above table.

Additional assets due to augmentation, extension or development

No repex has occurred in the current regulatory period due to augmentation, extension or network development within any asset categories in this asset group.

If the AER wishes to appreciate the proportion of new asset each year due to such factors, please calculate this by referring to 2015-2018 category analysis RIN Tabs 2.3(a), 2.3(b) and 2.5 (for new quantities added). Please note that there are asset quantities associated with the 'non-material projects' collectively summarised and reported at the bottom of the Tables 2.3.1 and 2.3.2 also. All such asset quantities are due to augmentation, extension and development of network.

Additional assets due to other drivers

No additional repex has been recorded in the current regulatory period due to other factors within any asset categories in this asset groups.

1.9.3 Changes in asset replacement drivers during 2011-2026 regulatory period [5.1(b)]

Statutory requirements

None

Internal planning and asset management approaches

None

Measureable asset factors

None.

Measureable and forecastable external factors

None.

Network technology/solution

None

Non-network technology/solution

Not applicable for this asset group.

Other significant matters

We are not aware of any other significant factors that have affected replacement expenditure requirements for the previous, current or forthcoming regulatory periods.

Supporting Information

Refer to our 2021–2026 regulatory proposal.

1.10 SCADA, network control & protection systems

1.10.1 Asset category description [5.1(a)(i)]

Asset scope and boundary issues

This asset group covers protection relays, network communications assets, including RTUs, supervisory cable, and distribution communications assets.

Age profile determination

The following assumptions were applied to determine the secondary systems age profiles:

- only in-service assets were included in reported quantities
- records of construction dates are maintained in SAP for assets contributing to this reporting category.

Main drivers of replacement

Technology obsolescence, lack of market support, technology disruption and/or asset failure.

Unit cost scope

The costs in this asset group include materials, labour, plant & equipment, mobilisation & travel, and the project or program overheads. The costs represent the procurement, inventory, logistics, hardware, and termination, removal of old assets, connection, and commissioning. It excludes any zone substation civil cost such as demountable building, switch room building, switchyard trenching, and any primary electrical assets.

The project or program overheads have been proportionally allocated, where applicable, between this asset group and other asset groups that typically are delivered together. Corporate overheads are excluded.

The proposed repex and quantities in 2021-2026 reset RIN Table 2.2.1 allow for the complete replacement of assets within the described boundary. This cost is capitalised.

It is noted that projects and programs of work are usually delivered to resolve an issue or constraint and includes multiple asset categories that has been demarcated and described separately by the AER for its review and modelling purpose.

1.10.2 Asset replacement drivers during 2016-2020 regulatory period [5.1(a)(ii)]

Replacement due to various drivers that can be proxied by age

We calculated these statistics by reference to 2015-18 category analysis RIN Table 2.2.1 and dividing the quantity replaced by the total quantity replaced and failed. We have assumed that all the replacement quantities reported in the category analysis RIN Table 2.2.1 represents asset replacement due to various factors (such as condition, technological obsolescence, lack of market support, technology disruption, fixed periodic frequency etc.) that can be proxied by asset age. Therefore, it is expected that such expenditure activities can be largely captured by the AER repex modelling methodology.

Asset group	Asset category	Proportion of assets replaced due to various drivers that can be proxy by age				
		2016	2017	2018	2019	2020
SCADA, network control & protection	Field devices	100.00%	100.00%	100.00%	100.00%	100.00%
	Local network wiring assets	100.00%	100.00%	100.00%	100.00%	100.00%
	Communications network assets		100.00%	100.00%	100.00%	100.00%
	Master station assets					
	Communications site infrastructure		100.00%	100.00%	100.00%	100.00%
	Communications linear assets		100.00%		100.00%	100.00%
	AFLC					
	Other	100.00%			100.00%	100.00%
	Unweighted asset group overall	100.00%	100.00%	100.00%	100.00%	100.00%
	Unit cost weighted asset group overall	100.00%	100.00%	100.00%	100.00%	100.00%

Source: United Energy
Empty cells indicate no asset replacements

Not all the asset categories within this asset group are being replaced in this current regulatory period, and thus some asset categories does not have proportional statistics to report in the above table. The AER is advised to consider the average historical proportion of the remainder of asset categories if the repex model identifies replacement in 2021-2026 period of such missing asset category. The unweighted and weighted average historical proportion statistics for the asset group is provided in the above table.

Replacement due to other drivers

These statistics represent annual replacement activities due to asset failures only. We calculated these statistics by reference to 2015-2018 category analysis RIN Table 2.2.1 and dividing the quantity failed by the total quantity replaced and failed. Failed assets are replaced like-for-like. It is noted that asset failure can occur at any point in an asset's life and therefore the asset age cannot be a proxy for such reactive or emergency expenditure activities. Such expenditure activities should not be reviewed using the AER repex modelling methodology.

Asset group	Asset category	Proportion of assets replaced due to asset failure that cannot be proxy by age				
		2016	2017	2018	2019	2020
SCADA, network control & protection	Field devices	0.00%	0.00%	0.00%	0.00%	0.00%
	Local network wiring assets	0.00%	0.00%	0.00%	0.00%	0.00%
	Communications network assets		0.00%	0.00%	0.00%	0.00%
	Master station assets					
	Communications site infrastructure		0.00%	0.00%	0.00%	0.00%
	Communications linear assets		0.00%		0.00%	0.00%
	AFLC					
	Other	0.00%			0.00%	0.00%
	Unweighted asset group overall	0.00%	0.00%	0.00%	0.00%	0.00%
	Unit cost weighted asset group overall	0.00%	0.00%	0.00%	0.00%	0.00%

Source: United Energy
Empty cells indicate no asset replacements

Not all the asset categories within this asset group recorded a failure in this regulatory period. Thus some asset categories do not have proportional statistics to report in the above table. As noted earlier, asset failure can occur at any point in an asset's life (due to a range of issues that are beyond our control such as manufacturing defect, user error or accident etc.) and we are unable to foresee or forecast proportion of assets that will fail in 2021-2026. The AER is therefore advised to consider the average historical proportion of the remainder of asset categories to represent the failure proportion in 2021-2026 regulatory period of such missing asset category. The unweighted and weighted average historical proportion statistics for the asset group is provided in the above table.

Additional assets due to augmentation, extension or development

No repex has occurred in the current regulatory period due to augmentation, extension or network development within any asset categories in this asset group.

If the AER wishes to appreciate the proportion of new asset each year due to such factors, please calculate this by referring to 2015-2018 category analysis RIN Tabs 2.3(a), 2.3(b) and 2.5 (for new quantities added). Please note that there are asset quantities associated with the 'non-material projects' collectively summarised and

reported at the bottom of the Tables 2.3.1 and 2.3.2 also. All such asset quantities are due to augmentation, extension and development of network.

Additional assets due to other drivers

No additional repex has been recorded in the current regulatory period due to other factors within any asset categories in this asset groups.

1.10.3 Changes in asset replacement drivers during 2011-2026 regulatory period [5.1(b)]

Statutory requirements

None.

Internal planning and asset management approaches

None.

Measureable asset factors

None.

Measureable and forecastable external drivers

None.

Network technology/solution drivers

None.

Non-network technology/solution drivers

None.

Other significant matters

We are not aware of any other significant factors that have affected replacement expenditure requirements for the previous, current and forthcoming regulatory control periods.

Supporting information

Refer to our 2021–2026 regulatory proposal.