

# Substation Buildings and Property Investment Case

Zone substation buildings and property are key assets for Essential Energy providing:

- A secure and suitable operating environment for high voltage electrical equipment (ie secure perimeter fencing).
- A safe working environment for Essential Energy staff and contractors (ie. Buildings, eye wash stations, lighting, exit signs)
- An appropriately designed site to minimise risk of environmental impacts (ie, bunding).

## Scope

This investment case covers substation buildings and property and focuses on zone substation assets directly supporting their installation, safety, and maintainability.

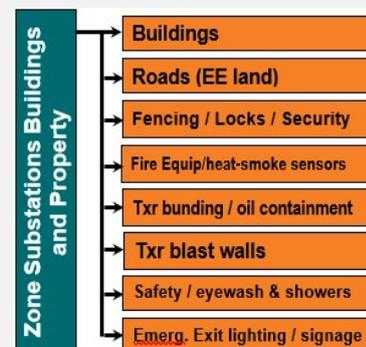
The investment is required to meet the capital expenditure objectives (NER 6.5.7) for quality, reliability, safety and security of electricity supply and to meet regulatory and legislative obligations for Standard Control Services.

## Forecast \$FY24

The Substation Buildings & Property forecast accounts for 0.95% of the total Repex portfolio for FY25 to FY29.

FY25	FY26	FY27	FY28	FY29
\$2.1m	\$2.1m	\$2.1m	\$2.1m	\$2.2m

## Asset Breakdown Structure:

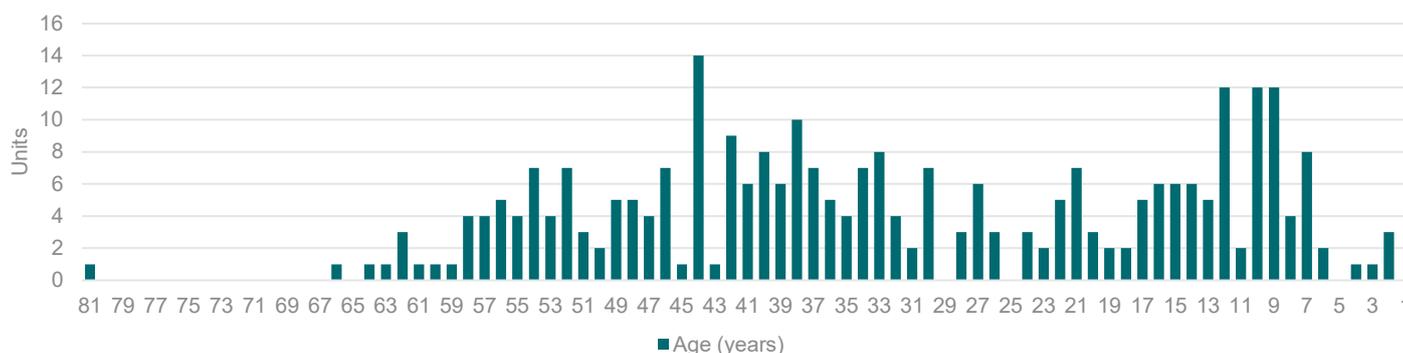


## Asset Profile/Health

There are approximately 365 buildings across the zone substations, with a construction date range from the 1941 through to 2020. 24% of these buildings were constructed prior to 1980, utilising traditional construction techniques with brick, timber, corrugated iron & tile materials. These buildings are showing advanced signs of deterioration and conditional failure due to being subjected to a wide range of climatic, environmental, and service factors over many decades, resulting in significant deterioration.

Asset health is determined through regular inspections and property reports (example of in Attachment 10.09.03)

Age Profile



This section provides an overview of the Substation Buildings and Property risk model. It is supported by documents and **6.03.02 Managing Network Risks, 6.03.03 Appraisal Value Framework and 6.03.04 System Capital Risk and Value Based Investment** methodology.

**Probability of Failure (PoF) – not developed**

Failure modes for substation buildings and property have been identified through a Failure Mode Effects Analysis (FMEA). Analysis indicates there is a very low probability that a functional failure of ZS building, fence or civil works will occur that will affect network risk performance.

Total Safe records, corrective tasks list from EAM and audit data were used to identify ZS building and property related failures. A total of 4776 tasks (from 2010-2021) were analysed. The consistency of data made it difficult to classify failures as repair or replace. The tasks' 'Note Text' field was used to manually allocate tasks to failures using key words and common failure types (e.g. "Water Ingress", "Material degradation", "Weather Damage", "Vermin Ingress", "Other Defects"). Further validation with SME input was undertaken where most failures were classified as repairable component failures. Following this method, a total of 577 conditional failure tasks and 1044 correctional maintenance tasks were mapped to assets. The component, and asset categorisation, limited task clarity on task description and unclear asset task data / audit data, made the assessment less data-driven than other asset class strategies.

**Consequence of Failure**

The consequence of failure for these assets describes the impact of a functional failure. Consequence of failure models have been developed for catastrophic asset failure, evaluated using the **6.03.03 Appraisal Value Framework** and ranked as shown in table:

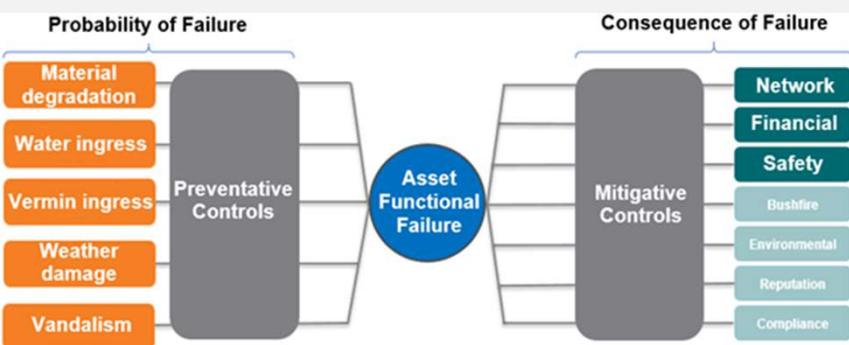
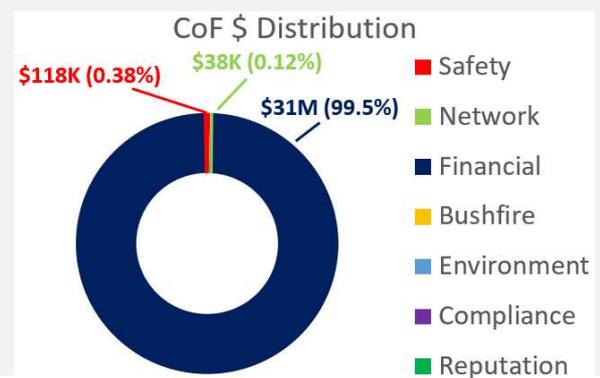
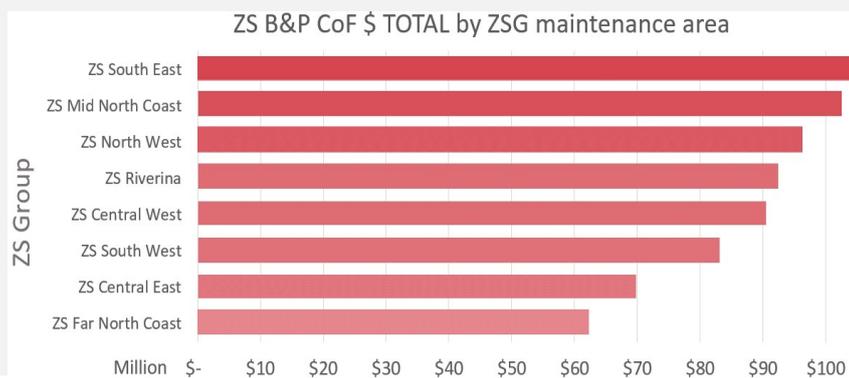
A safety fatality rate was calculated for each of the following asset types as per **6.03.02 Network Risk Management manual** with all assets having a tolerable safety risk tolerability.

ZS B&P assets: Area/zone	Description	Tolerable
Perimeter boundary	Fire: hydrant etc	390
Perimeter Fence & gates - sterile zone	-	443
Locking - perimeter fence	-	443
Fire equipment	Hose reels, extinguishers, smoke & heat sensors, water storage for Fire fighting etc	246
Transformer Blast Walls	-	368
Zone Substation building	Building fabric - roof, walls	365
Zone Substation building	Security locking mechanisms - windows & doors	365
Zone Substation building	Eye wash stations etc	365
Zone Substation building	Emergency EXIT lighting & signage	365

Component	Consequence		
	Total (\$ million)	Average (\$ per ZS Civil Asset)	Median (\$ per ZS Civil Asset)
Safety	\$0.118	\$32	\$30
Network	\$0.038	\$103	\$90
Financial	\$31.135	\$80,842	\$73,213
Bushfire	\$0.000	\$0	\$0
Environment	\$0.000	\$0	\$0
Compliance	\$0.000	\$0	\$0
Reputation	\$0.000	\$0	\$0

Consequence costs are dominated by Financial. There were smaller contributions from Safety and Network. Environment, Compliance, Bushfire and Reputational risks have been considered but deemed insignificant based on the value framework.

The images below display a summary of asset criticality for substations buildings and property by area. The number of assets within a maintenance area, in conjunction with individual asset average CoF, influence where the area sits in the ranked list.



**Network Risk**

Asset risk is a function of the probability of failure and the consequence of failure. The risk assessment has been developed using the Asset Risk Management Framework and represents the relationship between the primary drivers behind Zone substation buildings and property functional failures and the components used to determine the consequence of failure.

The replacement Capex forecast (FY25-FY29) has been calculated using Essential Energy's optimisation software (Copperleaf) which uses a risk based methodology to maximise the value of the investment portfolio within constraints established by Essential Energy that are consistent with our Corporate Risk Framework, Asset Management System, applicable standards, rules, regulations and licence conditions. To assure efficiency our portfolio has been constrained to meet customer and stakeholder expectations.

In line with NER capital objectives, the objectives of the total replacement portfolio have been informed through extensive stakeholder engagement and consist of:

- **Maintain reliability performance (network risk)**
- **Long term reduction of bushfire start risk by 20% over 20 years (2.5% FY25-29)**
- **Maintain safety performance**

The replacement of Substation Buildings and Property consist of:

1. Building structures within the zone substation area including areas such as switch rooms
2. External structures that maintain the security of the zone substation area such as fences and gates
3. Civil structures that support equipment in the zone substation area such as plinths and bunds

Forecasts have been flatlined across the period based on previous expenditure and in line with inspection data.

Refer to **6.03.04 System Capital Risk and Value Based Investment** methodology for details on the **portfolio** wide optimisation planning approach and risk outcomes.

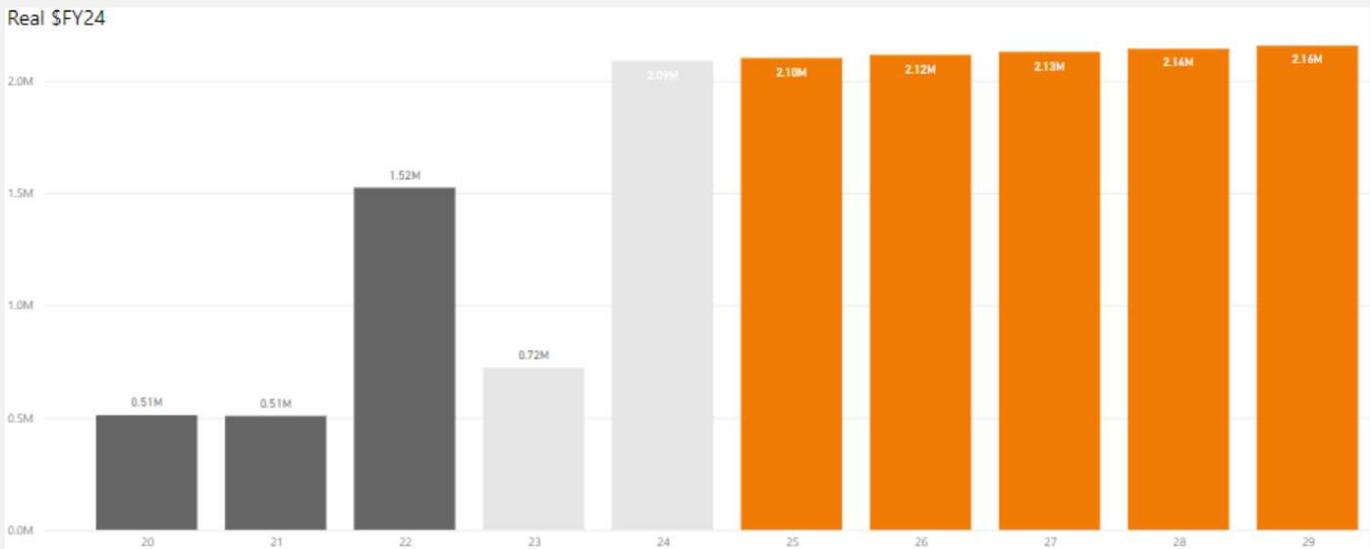
#### **Risk Trend (2024-29 Optimised portfolio)**

Optimised portfolio outcomes are not available for Substation Buildings and Property as the risk model has not been calibrated and PoF values have not been derived.

- The Substation Buildings and Property assets have been grouped into a single Repex investment, necessary to maintain asset condition such that they can acceptably perform their function.

1. Substation Buildings and Property replacement expenditure has been modelled on a replace with like-for-like, to maintain safety, security, protection of network assets and adherence to statutory requirements.
  2. Larger investments such as full building refurbishment require demonstration of a positive value calculation, whereas costs associated with statutory replacements (e.g. fire extinguishers; emergency and exit lighting) are treated as unavoidable activities.
  3. If functional requirements of individual zone substation sites change, through the addition or removal of network assets, or through alternative options to supply customers (e.g. SAPS), then Building and Property investment requirements will be considered accordingly.
- Non-network solutions are not considered for replacement of this asset class.

Forecast replacement expenditure for Substation Buildings and Property across the 2024-29 period is \$10.7M, averaging \$2.1M per annum. Actual and projected expenditure for the remainder of the 19-24 period is \$5.4M.



Data source: Actuals: Internal delivery reports, Forecasts: Copperleaf  
 Note: All values are in FY2023-24 real dollar terms

We are confident that our approach delivers an efficient and prudent level of investment as:

- **Clear drivers from Asset Management Objectives** for Reliability, Quality, Safety and Compliance (as detailed in **Attachment 10.01 Strategic Asset Management Plan**).
- **Review and moderation:** Our forecasts have been tested and reviewed by our executive management and the Board, subject to top-down challenges (as detailed in **6.03.04 System Capital Risk and Value Based Investment**) and the forecasts moderated based on feedback and discussion.
- **Critical Environmental Factors:** Risk associated with Substation Buildings and Property due to factors such as oil containment and public access.
- **Customer needs:** Through customer engagement, refer Chapter 4 of our Regulatory Proposal, customers indicated a desire to maintain current levels of safety and reliability. The investment will contribute to maintaining safety and reliability, within the wider Repex portfolio.

The major benefits from the proposed Substation Buildings and Property investments (against the **change nothing** scenario) are:

- **Improved network risk and maintainability:** Investment in this asset class will reduce network and safety risk through replacement of degraded condition or non-compliant assets; and
- **Maintain levels of service for our customers:** Maintaining the health of assets through addressing locations of highest risk, will result in fewer trespasses, unplanned failures from asset degradation and therefore will enable us to maintain service reliability for customers.

Forecast Substation Buildings and Property Repex expenditure for the 2024-29 period is \$10.7M. The increase from 2019-24 actual/forecast of \$5.4M is due to:

- Increased volume of replacements due to aging population of assets and clarity of budget ownership.
- Based on Macutex condition assessments undertaken by Property Division

Note: Non-system Property capex covers low value minor works/repairs of Zone Substation property and buildings ie. no large projects such as roof replacement.

- **Attribution of tasks to specific assets** - to approximate an age at task date for replacements, modelling assumed an installation date for the replaced asset equivalent.
- **Categorisation of task maintenance activity** was performed in a task code mapping spreadsheet and categorised (Replace, Repair, Inspect, Install, Modify) based off their task group, task description, and cause description. The 'Replace' category was reserved for replacement of an entire asset, with minor component replacements being categorised as 'Repair'.
- **Age profile** was determined using the asset installation date where available, or assumptions without site age.
- **Development of PoF assessment** occurred through FMECA evaluation on user-selected filtering and censoring of the categorised data (tasks and in-service asset ages).
- **Consequence models** were developed in accordance with 6.03.03 Appraisal Value Framework

## Lifecycle Stages

Acquisition	<p><b>Selection and design Criteria</b></p> <ul style="list-style-type: none"> <li>Zone substation building materials: Maintain current selection criteria.</li> <li>Perimeter Fencing: Design drawings, policy documents and assessment tools all require review and improvement to provide a safe, economical and consistent approach to all EE zone substation sites.</li> <li>Roads EE: Maintain current design and selection criteria.</li> <li>Transformer bunding: Maintain current design and selection criteria.</li> </ul> <p>Maintain awareness of alternate supplier designs and trial where commercially and technically viable. Investigate viability of replacing failures only where value can be demonstrated.</p>		<p><b>Procurement</b></p> <ul style="list-style-type: none"> <li>Continue the current period contract approach with vendors for Zone substation buildings and property. Maintain awareness of obsolescence issues and availability of critical components.</li> </ul> <p><b>Supply Chain</b></p> <ul style="list-style-type: none"> <li>Continue to work with suppliers for new product opportunities.</li> <li>Maintain catalogue options for Zone substation buildings and property assets from multiple suppliers, to maintain supply diversity.</li> </ul>		
	Ops & Maintenance	<p><b>Preventative Maintenance (Inspections):</b></p> <ul style="list-style-type: none"> <li>Continue to do non-intrusive examination and inspection of Zone substation buildings and property with visual inspections to detect signs of materials degradation defects on assets.</li> <li>Align inspection programs across both Property and Transmission services teams as per final RACI.</li> <li>Continue to inspect assets as per <i>CEOP8011. Substation Buildings and property Inspection intervals:</i></li> <li>Fire Hydrants: 6 monthly intervals. (Statutory requirement)</li> <li>Perimeter Fencing and gates: 3 monthly interval.</li> <li>Electronic keyed padlocks: Any tampering instigates an alarm.</li> <li>Smoke and heat Sensors / Hose reels / Valve / water storage: 6monthly inspection. (Statutory requirement)</li> <li>Extinguishers: 6monthly inspection. (Statutory requirement)</li> <li>Buildings and roads : 3 monthly inspection.</li> <li>Air conditioning &amp; AC humidity controls: 3 monthly inspection.</li> <li>Transformer bunding and blast walls: 3 monthly inspection.</li> </ul>		<p><b>Corrective Maintenance (Repairs):</b></p> <ul style="list-style-type: none"> <li>Continue with existing repair (ref Asset Forecast Lifecycle – p6). Continue on-condition corrective maintenance where required using current contractors.</li> </ul> <p><b>Breakdown Maintenance:</b></p> <p>Continue to carry out breakdown maintenance found by the inspection program on Zone substation buildings and property assets for repair or replacement.</p> <p>Larger investments will undergo and require demonstration of a positive value calculation.</p>	
		<p><b>Replacement Programs</b></p> <ul style="list-style-type: none"> <li>Buildings: Replace on functional failure and develop a cost-effective replacement program based on asset EOL.</li> <li>Extinguishers: Replace every 5 years. (Statutory requirement)</li> <li>Continue to improve the Value assessments for Zone substation buildings and property to determine the future use and where replacement of these assets are required.</li> <li>Ekey locking: Continue to improve battery life to minimise replacement.</li> </ul>		<p><b>Prioritisation</b></p> <ul style="list-style-type: none"> <li>Continue to prioritise replacement projects with the value calculation and investment optimisation process.</li> <li>Update <i>CEOP8032 Transmission and Zone Substation Design Guidelines</i> to include design recommendations for Zone substation buildings and property.</li> </ul>	
	Disposals	<p><b>Individual Assets</b></p> <ul style="list-style-type: none"> <li>Continue to investigate opportunities to re-use and recycle assets in accordance with <i>CECP8074</i>.</li> <li>Continue to dispose of assets as per <i>CECP8074.01 Company Policy Asset Disposal</i>.</li> </ul>		<p><b>Hazardous Materials</b></p> <p>Continue to manage hazardous materials in accordance with <i>CECM1000.10</i>.</p>	
		<p><b>Entire Asset Variant</b></p> <ul style="list-style-type: none"> <li>Continue to dispose of assets as per <i>CECP8074.01 Company Policy Asset Disposal</i>.</li> </ul>			
	Asset Support	<p><b>Process &amp; Information</b></p> <ul style="list-style-type: none"> <li>Continue the use of Macutex data (Macuport) asset information for preventative and corrective actions and inspection results. Continue to improve and develop use of the new EAM to improve data capture and alignment with corporate goals</li> <li>Create records in Macuport / EAM for Zone substation buildings and property and their failures to capture asset profile.</li> <li>Enhance asset risk-value assessments leveraging capabilities of new and existing software.</li> <li>Continue to follow <i>CEOM7074 Operational Manual: Entry into electrical stations</i> for safety directions for employees working in Zone Substations.</li> </ul>			
<p><b>People &amp; Training</b></p> <ul style="list-style-type: none"> <li>Continue with other current training practices, including awareness of associated conditional failure when inspecting or maintaining zone substation building and property assets.</li> <li>Continue to manage knowledge and skills regarding significant repairs.</li> </ul>					
<p><b>Supply Chain</b></p> <ul style="list-style-type: none"> <li>Continue to manage spares for zone substation building and property assets.</li> </ul>					