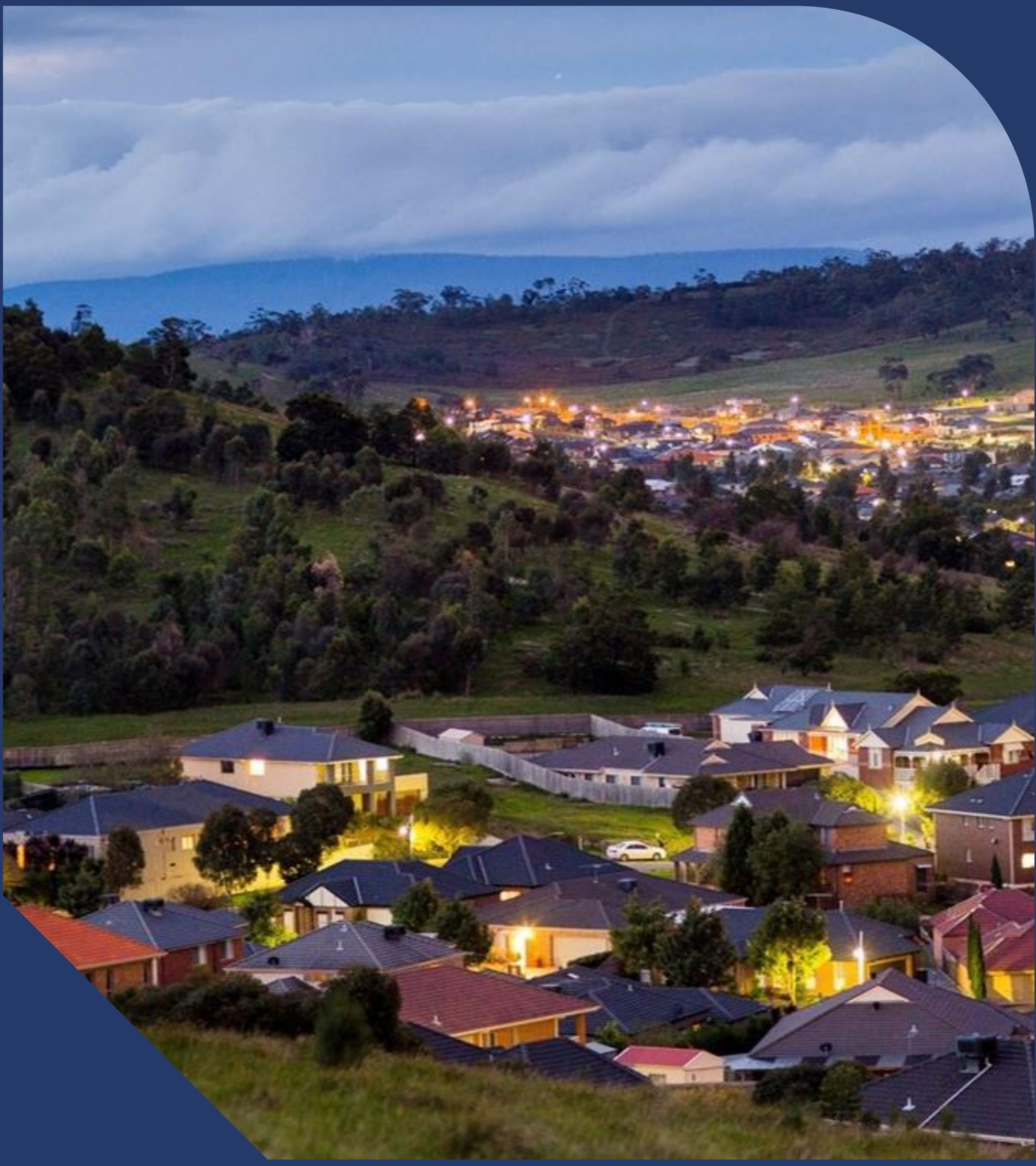
AusNet

Civil Infrastructure

AMS – Electricity Distribution Network



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1. Executive Summary

This document is part of the suite of Asset Management Strategies relating to AusNet's electricity distribution network. The purpose of this strategy is to outline the inspection, maintenance, replacement and monitoring activities identified for economic life cycle management of civil infrastructure facilities in AusNet's Victorian electricity distribution network.

AusNet operates about 69 sites that including zone substations and 91 sites that including 66kV distribution voltage regulator sites and shared assets in terminal stations, as critical hubs in the electricity distribution network. These sites provide switching and/or transformation functions. The civil infrastructure aspects of these sites affect the environmental performance, safety, security and reliability of the network.

Assets within the classification of civil infrastructure are generally situated within the boundaries of each site. Civil infrastructure includes buildings, environmental systems, security fencing, switchyard, equipment support structures, foundations, cable ducts and trenches, signage and nameplates, access roads, station lighting, transformer enclosures and water supply and drainage systems.

The majority of these assets are maintained by corrective maintenance activities based on condition with limited preventative maintenance specific to civil infrastructure. Condition assessment has been performed on major civil infrastructure assets such as buildings, environmental systems, security fences and switchyards.

The amount of work done by AusNet on zone substations in the past regulatory periods (Significantly 2011-2015, 2016-2020) have addressed most of the issues and/or improved the condition of the Civil Infrastructure assets.

There remains only a handful of sites whose buildings and switchyards have asbestos containing materials (ACMs), switchyards need to be improved, and security systems required upgrading. The current period will see some of these sites addressed with the rest targeted for the 2026-31 period.

The Environment Protection Act 2017, amended in 2018 and effective from July 2020, introduced the General Environmental Duty (GED), which requires identifying and minimizing risks of harm from oil pollution or waste to protect human health and the environment.

As part of the upcoming regulatory period, AusNet will prioritise addressing outdated and non-compliant oil management systems at zone substations and distribution voltage regulator sites. AusNet will focus on replacing or upgrading infrastructure where necessary. A risk-based, prioritised approach will be applied to minimise potential risks to human health and the environment, ensuring that all feasible steps are taken to eliminate or mitigate these risks.

The summary of the proposed asset strategies is listed below.

1.1. Asset Strategies

1.1.1. Buildings

- Restore building condition at old zone substation sites to comply to Building Code of Australia by 2025.
- Use modular type buildings in replacing deteriorated control buildings, battery rooms, amenities building etc.
- For the existing buildings whose function has been replaced by the new modular buildings, all asbestos containing materials (ACMs) are to be removed and disposed safely.
- Ensure new buildings comply with the requirements of Building Code of Australia and Australian Standard AS2067: Substations and high voltage installations exceeding 1000 volts, AC.

1.1.2. Environmental System

- Improve the environmental systems at high-risk zone substation sites to meet the new EPA Act requirements and AS2067: Substations and high voltage installations exceeding 1000 volts, AC.
- Improve the environmental systems at high-risk distribution voltage regulator sites to meet the EPA Act requirements and AS2067: Substations and high voltage installations exceeding 1000 volts, AC.

1.1.3. Security Fences

- Improve security fence conditions at high-risk zone substation sites during the 2026-2031.

- Take appropriate actions to restore the security fence condition whenever a damaged fence is identified in order to maintain safety and security of power supply at all times.

1.1.4. Civil Infrastructure Management

- Re-assess civil infrastructure condition at all zone substations before the end of 2028 and record results in Asset Management System (SAP).
- Where possible implement civil works and improved infrastructure security as part of major project/rebuild works.

2. Abbreviations and Definitions

TERM	DEFINITION
ACMs	Asbestos containing materials
AMS	Asset Management Strategy
BCA	Building Code of Australia
BWR	Bayswater zone substation
CERA	Capacitor bank Erica
CLPS	Clover Power Station
CYN	Croydon zone substation
ISRAT	Infrastructure Security Risk Assessment Tool
LYD	Lysterfield zone substation
MBY	Mt. Beauty zone substation
MJG	Merrijig zone substation
MPS	Morwell Power Station
MWT	Morwell Terminal
RMFN	Voltage Regulator Mafra North
RSME	Voltage Regulator Seymour
RWT	Ringwood Terminal
SLE	Sale zone substation
TT	Thomastown zone substation
WGL	Warragul zone substation
WOTS	Wodonga Terminal Station
WT	Watsonia zone substation
YPS	Yallourn Power Station
PGI	Plant Guidance Information
SMI	Standard maintenance Instruction

3. Introduction

3.1. Purpose

The purpose of this document is to outline the inspection, maintenance, replacement and monitoring activities identified for economic life cycle management of civil infrastructure associated with the AusNet electricity distribution network. This document intends to be used to inform asset management decisions and communicate the basis for activities.

In addition, this document forms part of our Asset Management System for compliance with relevant standards and regulatory requirements. It is intended to demonstrate responsible asset management practices by outlining economically justified outcomes.

3.2. Scope

The scope of this asset management strategy includes civil infrastructure in zone substations, switching stations and voltage regulator sites supporting the electricity distribution network for the period 2026 to 2031. The strategy also includes shared civil infrastructure in terminal stations and power stations which connected to the electricity distribution network.

Civil infrastructure includes buildings, environmental systems, security fence condition and overall switchyard including switchyard surface, access roads, stations lights, cable ducts and trenches, signage and name plates, support structures and foundations that all contribute to the overall function of the station/site.

The security system assets are also covered by;
AMS 20-14: Infrastructure Security.

3.3. Asset Management Objectives

The high-level asset management objectives are outlined in AMS 01-01 Asset Management System Overview.

The electricity distribution network objectives are stated in AMS 20-01 Electricity Distribution Network Asset Management Strategy.

4. Asset Description

4.1. Function

AusNet owns, operates and maintains zone substations in the eastern part of Victoria including distribution voltage regulator sites, a Capacitor bank at Erica (CERA), switching station at Bairnsdale, shared assets forming part of the distribution network are located at Yallourn Power Station (YPS), Clover Power Station (CLPS) as well as Morwell (MWT), Ringwood (RWT) and Wodonga (WOTS) terminal stations are incorporated in this strategy.

4.2. Population

Population Considerations

The population profile is an important aspect of effective lifecycle management. Population data typically includes data on the quantity, types, locations, and specifications of the assets within the electrical distribution network.

An understanding of the population profile allows asset managers to:

- **Identify Critical Assets**: Determine which buildings, environmental systems, security fences, and switchyards are essential for maintaining the integrity and reliability of the network.
- **Allocate Resources Efficiently**: Plan and allocate maintenance resources effectively by knowing the exact number and location of assets. Example: Knowing that a certain region has a high concentration of prefabricated (modular) buildings can help in scheduling maintenance activities more efficiently.
- **Risk Management**: Assess and manage risks associated with different assets. Example: If the population profile indicates that certain security fences are in high-risk areas for vandalism or theft, additional security measures can be implemented in those areas.
- **Optimise Maintenance Schedules**: Develop optimised maintenance schedules based on the distribution and condition of assets.
- **Enhance Reliability and Safety**: Ensure that all components, including buildings, environmental systems, and security fences, meet the required standards for reliability and safety.
- **Support Strategic Planning**: Inform long-term strategic planning and investment decisions.

Geographic Impact Areas

The AusNet electrical distribution network covers a significant portion of Victoria, including Melbourne's northern and eastern suburbs, and extends across eastern and north-eastern Victoria. This region encompasses a diverse range of geographic locations, each with specific environmental impacts on the assets and infrastructure within the electrical distribution network. Understanding these impacts is essential for effective asset and lifecycle management.

Notable examples include:

- **High Wind Areas**: High wind areas, particularly in elevated regions and open plains, subject buildings and switchyard structures to significant stress and fatigue.
- **Corrosive Areas**: Coastal areas and industrial regions where salt and pollutants are prevalent can cause corrosion of metallic components in buildings, security fences, and other civil infrastructure.
- **Bushfire Areas**: Bushfire-prone areas, common in many parts of Victoria, pose a risk of fire damage to buildings, security fences, and environmental systems.
- **Flood-Prone Areas**: Areas prone to flooding can impact the performance and integrity of switchyards, foundations, and underground cable ducts and trenches.

Type in Population

Buildings

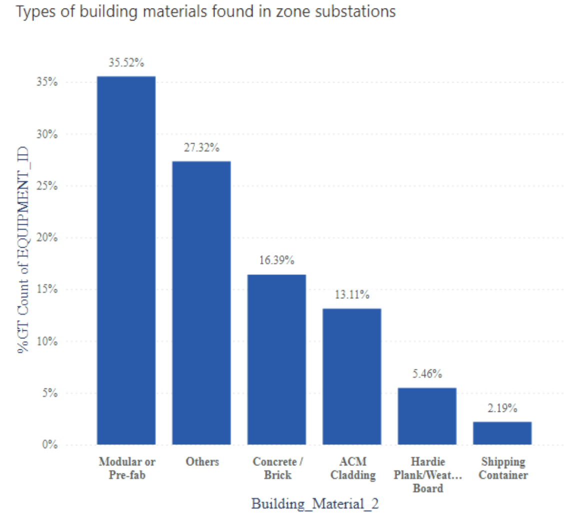

Figure 1 - Types of building materials found in zone substations

Summary Explanation

- **Form and Function**: Buildings in the context of civil infrastructure for electrical distribution networks are structures designed to house and protect various types of electrical and operational equipment. They are constructed using various materials, including concrete, brick, modular prefabricated units, asbestos-clad, and weatherboard or Hardie plank clad on stumps. (refer Figure 1)
- **Purpose within Asset Class**: These buildings provide all-weather protection for critical equipment such as control equipment, protection relays, communication facilities, batteries, switchgear, and other operational necessities. They ensure the safe and efficient operation of the network's infrastructure.
- **Purpose within Network Design**: In the network design, buildings serve as secure and controlled environments that house essential operational equipment. This ensures that the equipment is protected from environmental factors and unauthorised access, thereby maintaining network reliability and safety.
- **Process Function**: The buildings facilitate the operational process by providing a controlled environment for sensitive and critical equipment. This includes control rooms, workshops, storage areas, and office spaces essential for the maintenance and management of the electrical distribution network.

Historical Application

- **Construction Materials**: Includes concrete, cement sheeting, brick, asbestos-containing materials, modular or prefabricated steel, timber, and metal sheeting.
- **Roofing Materials**: Includes Colourbond steel, terracotta tiles, and roofing materials similar to the body material of shipping containers used as control buildings.
- **Prefabricated (Modular) Buildings**: These are the most common building types, providing economical and efficient housing for new infrastructure.
- **Concrete and Brick Buildings**: These provide excellent fire resistance and security performance.
- **Asbestos Clad Buildings**: Present in a small percentage of sites, targeted for removal due to health and environmental risks.
- **Weatherboard or Hardie plank Clad Buildings on Stumps**: Used in a small percentage of sites, typically built on timber or concrete stumps.

Asset Sub-Types for Buildings

Construction Materials

- **Form and Function**: Construction materials refer to the various types of materials used in the external wall cladding of buildings. These include concrete, cement sheeting, brick, asbestos-containing materials, modular or prefabricated steel, timber, and metal sheeting.
- **Purpose within Asset Class**: Different construction materials provide varying degrees of durability, fire resistance, and environmental protection. The choice of material affects the building's longevity, safety, and maintenance requirements.
- **Purpose within Network Design**: In the network design, using appropriate construction materials ensures that buildings can withstand environmental conditions, protect internal equipment, and maintain structural integrity.
- **Process Function**: These materials are integral to the construction and maintenance processes, ensuring that buildings provide a safe and secure environment for housing critical electrical infrastructure.

Roofing Materials

- **Form and Function**: Roofing materials encompass the various types of materials used for the roofs of buildings, including Colorbond steel, terracotta tiles, and the body material of shipping containers used as control buildings. (refer figure 2)
- **Purpose within Asset Class**: Roofing materials protect buildings from weather elements, ensuring that internal equipment remains dry and secure. They also contribute to the overall structural stability of the building.
- **Purpose within Network Design**: Proper roofing materials are essential for maintaining the operational integrity of buildings, preventing water ingress, and providing thermal insulation.
- **Process Function**: The roofing materials are a crucial component of building construction and maintenance, directly impacting the building's ability to protect internal infrastructure.

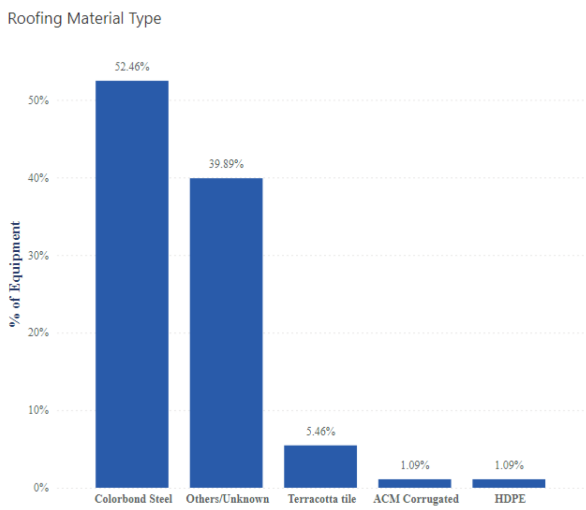

Figure 2 - Types of Roofing Material Used in Buildings

Prefabricated (Modular) Buildings

Figure 3 - Prefabricated buildings at Lysterfield zone substation (LYD)

- **Form and Function**: Prefabricated or modular buildings are structures assembled offsite and transported to the installation location. They typically consist of sheet-metal cladding over a galvanised steel frame with plasterboard linings and laminated timber floors. (refer figure 3)
- **Purpose within Asset Class**: These buildings provide an economical and efficient solution for housing critical infrastructure. They have minimal installation costs and are quick to deploy.
- **Purpose within Network Design**: Modular buildings are used to house control rooms, switchgear, and other operational equipment. Their rapid deployment helps in maintaining and expanding the network efficiently.
- **Process Function**: Prefabricated buildings streamline the construction process, reducing onsite labour and costs while ensuring high-quality and durable structures.

Concrete and Brick Buildings

- **Form and Function**: Concrete and brick buildings are traditional structures known for their fire resistance, security, and durability. They are constructed using brick veneer, concrete slab flooring, and tilt-slab concrete. (refer figure 4)
- **Purpose within Asset Class**: These buildings provide robust and secure housing for electrical infrastructure, ensuring high levels of protection and longevity.
- **Purpose within Network Design**: They are used for control rooms and housing indoor switchgear, providing a stable and secure environment for critical operations.
- **Process Function**: The construction process involves laying concrete slabs, erecting brick walls, and ensuring proper sealing and insulation to protect internal equipment.

Figure 4- Brick control building at Croydon zone substation (CYN)

Asbestos Clad Buildings

Figure 5 - ACM panels on a Control Building at Thomastown zone substation (TT)

- **Form and Function**: Asbestos-clad buildings use asbestos-containing materials for wall cladding, eave linings, doors, windows, and roof sheeting. These materials have been historically used for their fire resistance and insulation properties. (refer figure 5)
- **Purpose within Asset Class**: While asbestos provides durability and fire resistance, it poses significant health and environmental risks. These buildings require careful management and removal plans.
- **Purpose within Network Design**: Asbestos-clad buildings are being phased out and replaced due to the associated risks. They highlight the importance of upgrading and maintaining safe infrastructure.
- **Process Function**: The process involves identifying asbestos materials, implementing risk management strategies, and eventually removing and replacing asbestos with safer materials.

Weatherboard or Hardie plank Clad Buildings on Stumps

Figure 6 - Wood board cladded control

- **Form and Function**: These buildings use Hardie plank or timber weatherboard for cladding and are typically built on timber or concrete stumps with timber flooring and framing. (refer figure 6)
- **Purpose within Asset Class**: They provide a cost-effective and flexible housing solution for certain types of equipment, particularly in less critical areas.
- **Purpose within Network Design**: These buildings are used in locations where a more temporary or less robust structure is sufficient. They offer ease of construction and relocation.
- **Process Function**: The construction involves erecting a timber frame, attaching weatherboard cladding, ensuring the building is mounted on stumps.

Types of buildings in zone substation premises is shown in figure 7.

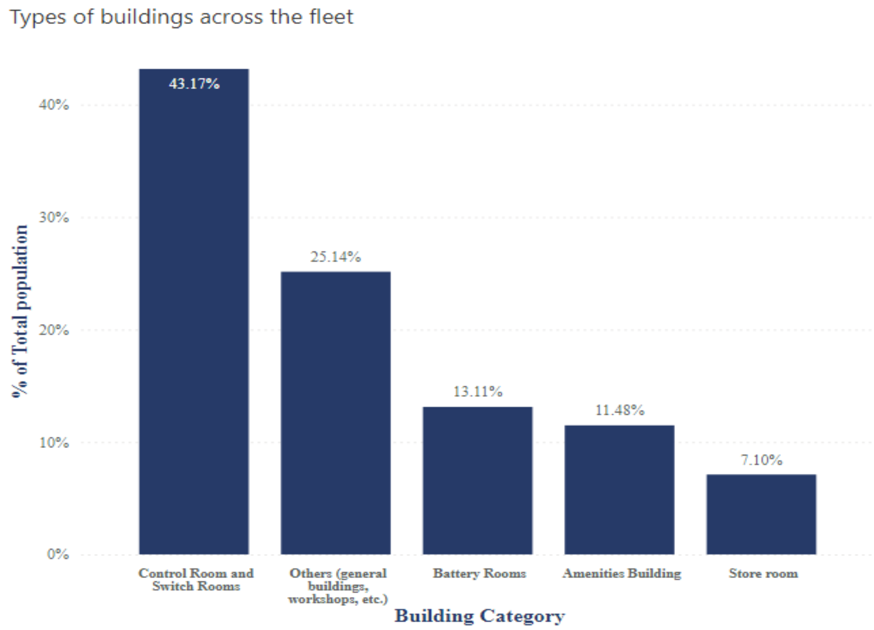

Figure 7 – Type of buildings in Zone Substations

Environmental Systems

Summary Explanation

- **Form and Function**: Environmental systems refer to the infrastructure and practices implemented to manage and mitigate the environmental impact of the electrical distribution network. This includes systems for oil management and containment, spill containment, and environmentally compliant construction designs.
- **Purpose within Asset Class**: These systems ensure that the operations of the electrical distribution network are environmentally sustainable and compliant with regulations. They manage potential contaminants like transformer oil and provide containment measures to prevent environmental damage.
- **Purpose within Network Design**: Within the network design, environmental systems are critical for preventing contamination and managing waste, particularly oil spills. This helps maintain the ecological integrity of the areas surrounding the electrical infrastructure.
- **Process Function**: The process function includes capturing leaking oil, managing spills, and ensuring that new constructions comply with environmental standards. This involves installing concrete bunds, spill kits, and advanced oil containment systems.

Historical Application

- **Legacy Oil Management System**: Used in older stations where oil leaks were allowed to settle onto gravel surfaces including distribution voltage regulator sites.
- **Modern Oil Containment System**: Captures leaking oil in sealed bunds to prevent contamination.
- **Supplementary Oil Management Measures**: Includes spill containment and clean-up kits.
- **Advanced Transformer Installation System**: Features concrete-floored sealed bunds and specialised drainage systems.
- **Compliant New Construction Design**: Adhere to AS 2067 standard and ensuring minimal environmental impact as per EPA Act 2017 (which came into effect from Year 2020).

Asset Sub-Types for Environmental Systems

Legacy Oil Management System

- **Form and Function**: The legacy oil management system allows oil leaks to settle onto gravel surfaces, where they are absorbed into the local soil.
- **Purpose within Asset Class**: This system was used historically but poses environmental risks due to soil contamination.
- **Purpose within Network Design**: It reflects older practices that are being replaced with more environmentally friendly solutions.
- **Process Function**: The process involves managing oil leaks without containment, which is no longer considered best practice.

Modern Oil Containment System

Figure 8 - Concreted bunded area at Bayswater zone substation (BWR)

- **Form and Function**: Modern systems capture leaking oil in sealed bunds to prevent soil and water contamination. (refer figure 8)
- **Purpose within Asset Class**: These systems ensure that any oil leaks are contained and managed, minimising environmental impact.
- **Purpose within Network Design**: They are critical for maintaining environmental compliance and protecting local ecosystems.
- **Process Function**: The process involves installing sealed bunds, flame traps, and oil-water separators to manage oil leaks effectively.

Supplementary Oil Management Measures

- **Form and Function**: These measures include spill containment and oil clean-up kits installed at all stations, and oil-handling vehicles equipped with spill kits.
- **Purpose within Asset Class**: They provide additional safety measures to manage accidental spills and leaks.
- **Purpose within Network Design**: These supplementary measures ensure quick response to oil spills, preventing environmental damage.
- **Process Function**: The process involves regular checks and maintenance of spill kits and training personnel in spill response procedures.

Advanced Transformer Installation System

- **Form and Function**: This system includes features like concrete-floored sealed bunds, oil-impervious materials, Oil puracepter units, and specialised drainage systems.
- **Purpose within Asset Class**: It represents the most effective way to manage transformer oil, minimising environmental risks.
- **Purpose within Network Design**: These systems are used for new transformer installations, ensuring compliance with modern environmental standards.
- **Process Function**: The process involves installing advanced containment and drainage systems that allow rainwater to drain while trapping oil.

Environmental Compliant Construction Design

- **Form and Function**: This design adheres to AS2067 standard, ensuring minimal environmental impact meeting EPA Act 2017 regulatory requirements.
- **Purpose within Asset Class**: It ensures that all new constructions meet stringent environmental regulations.
- **Purpose within Network Design**: Compliance with these standards is critical for maintaining the environmental integrity of the network.
- **Process Function**: The process involves using compliant materials and construction techniques to limit oil discharge and other environmental hazards.

Security Fence

Summary Explanation

- **Form and Function**: Security fences are physical barriers designed to protect electrical infrastructure from unauthorised access and potential vandalism. They are typically made from materials like chain-wire mesh, timber palings, metallic panels, PVC-coated wire mesh, and welded mesh panels. (refer figure 9(a) and 9 (b)
- **Purpose within Asset Class**: These fences provide a critical security layer for high-voltage switchyards, installations, and buildings. They help prevent unauthorised access, reducing the risk of vandalism, theft, and accidental injury.
- **Purpose within Network Design**: In the network design, security fences ensure the physical security of critical infrastructure, thereby enhancing the overall safety and reliability of the electrical distribution network.
- **Process Function**: The process function includes deterring and preventing unauthorised entry, which is achieved through robust construction and adherence to security standards. Additional features like concrete plinths, metallic rails, and razor wire toppings enhance security.

Figure 8a - Security fence & gate at Mt. Beauty zone substation (MBY), before augmentation

Figure 8b - Security fence & gate at Mt. Beauty zone substation (MBY), after augmentation

Historical Application

- **Current Security Fencing Overview**: Encloses approximately 71 sites, totalling around 25 km of fencing.
- **Standard Fencing Specifications**: Includes chain-wire mesh panels on galvanised posts, topped with barbed wire or tape.
- **Enhanced Security Assessment**: Utilises the Infrastructure Security Risk Assessment Tool (ISRAT) for periodic reassessment.
- **Improved Security Fencing Features**: Includes concrete plinths, metallic rails, and concertina razor wire toppings.
- **Additional Security Measures for High-Risk Sites**: Includes electrified fences, electronic access controls, intruder detection systems, remote-control lighting, motion detection cameras, and padlocks on outdoor electrical control boxes.

Asset Sub-Types for Security Fences

Standard Security Fencing Overview

- **Form and Function**: Security fences typically utilise chain-wire mesh panels on galvanised posts topped with barbed wire or tape.
- **Purpose within Asset Class**: They provide a physical barrier to deter unauthorised access to high-voltage switchyards and installations.
- **Purpose within Network Design**: These fences are essential for protecting critical infrastructure and ensuring operational security.
- **Process Function**: The process involves constructing and maintaining fences to meet security standards and mitigate risks.

Standard Security Fencing Specifications

- **Form and Function**: Specifications include a minimum height of 2.5 m, barbed wire topping with at least four strands, and a maximum gap between the bottom wire and ground of 50 mm.
- **Purpose within Asset Class**: These specifications ensure that fences provide adequate security against climbing and excavation.
- **Purpose within Network Design**: Adhering to these standards helps maintain the overall security of the electrical distribution network.
- **Process Function**: The process involves constructing fences to these specifications and periodically reassessing them for compliance.

Security Measures for High-Risk Sites

- **Form and Function**: Enhanced security measures include electrified fences, weldmesh or palisade fence construction, electronic access control, intruder detection systems, remote-control lighting, motion detection cameras, and padlocks on outdoor electrical control boxes.
- **Purpose within Asset Class**: These measures provide additional protection for sites identified as high-risk, preventing unauthorised access and potential sabotage.
- **Purpose within Network Design**: They enhance the security posture of the network, particularly at vulnerable points.
- **Process Function**: The process involves assessing risk levels and implementing appropriate security measures to mitigate identified risks.

Additional design considerations for High-Risk Sites:

- **Electrified Fences**: Electrified fences deliver a non-lethal electric shock to deter and prevent unauthorised access, enhancing security by providing a strong deterrent against intrusion, particularly in high-risk areas where additional security measures are needed to protect critical infrastructure.

- **Weldmesh or Palisade Fence Construction**: Weldmesh fences are made from welded steel wires, and palisade fences are constructed from vertical steel pales with sharp edges, offering high security through physical deterrence by being difficult to cut or climb, making them suitable for high-risk sites.

- **Electronic Access Control for Buildings and Stations**: Electronic access control systems, using keycards, biometric scanners, or PIN codes, manage entry to buildings and stations, ensuring that only authorised personnel can access sensitive areas, thereby enhancing security and maintaining the integrity of critical infrastructure.

- **Intruder Detection Systems in Stations and Buildings**: Intruder detection systems, including sensors and alarms, detect unauthorised entry into buildings and stations, providing real-time monitoring and alerting capabilities for quick response to potential security breaches, thus preventing damage and theft of critical infrastructure.

- **Integration with Electric Fencing**: Integrating electric fencing with other security measures, such as intruder detection and access control systems, creates a multi-layered security approach that increases the difficulty of breaching the security perimeter, ensuring comprehensive protection of critical infrastructure.

- **Remote-Control Lighting**: Remote-control lighting systems allow for the activation of lights from a remote location in response to security events, enhancing security by illuminating areas during an alarm event or when unauthorised access is detected, thereby deterring intruders and improving visibility for security personnel.

- **Motion Detection Recording and Cameras**: Motion detection systems activate cameras to record footage when movement is detected, providing surveillance and recording capabilities to monitor and document any unauthorised activity, enhancing security by enabling real-time monitoring of critical infrastructure.

- **Padlocks on Outdoor Electrical Control Boxes**: Padlocks secure outdoor electrical control boxes, preventing unauthorised access to critical controls and systems, providing a simple yet effective physical security measure to protect control boxes from tampering and maintaining the integrity and operation of the electrical distribution network.

Switchyards

Summary Explanation

Figure 9 - Unsurfaced Switchyard surface at Watsonia zone substation (WT)

- **Form and Function**: Switchyards are designated areas within substations where switching, transforming, and controlling of electrical power takes place. They include various components such as surfaces, structures, foundations, access roads, stormwater drainage, lighting, cable ducts, and trenches. (refer figure 10)
- **Purpose within Asset Class**: Switchyards house critical components that facilitate the distribution and regulation of electrical power within the network. They provide a controlled environment for the safe operation of electrical equipment.
- **Purpose within Network Design**: Within the network design, switchyards play a central role in ensuring the reliable and efficient distribution of electrical power. They act as nodes where power is managed, transformed, and redirected as needed.
- **Process Function**: The process function involves managing electrical flows, transforming voltage levels, and providing control mechanisms for the distribution network. Switchyards ensure that electrical power is distributed safely and efficiently.

Historical Application

- **Switchyard Surface**: Typically surfaced with crushed rock or bitumen to provide a stable and resistive layer.
- **Structures and Foundations**: Include galvanised steel bolted lattice or welded components and reinforced concrete platforms or slabs.
- **Access Roads**: Provide all-weather access for maintenance and operational activities.
- **Stormwater Drainage**: Includes spoon drains, kerb and channel, and underground drainage pipes.
- **Station Lighting**: Ensures safe access for operators and maintenance staff during nighttime operations.
- **Cable Ducts and Trenches**: Comprise preformed concrete trenching with concrete or galvanised steel covers.
- **Signage and Nameplates**: Provide clear and durable labelling for operational safety and maintenance.

Asset Sub-Types for Switchyards

Switchyard Surface

- **Form and Function**: The surface of switchyards is typically made from crushed rock or bitumen to provide a stable and resistive layer.
- **Purpose within Asset Class**: These surfaces ensure safe working conditions and contribute to the electrical safety of the switchyard by reducing step and touch potentials.
- **Purpose within Network Design**: They provide a stable and safe environment for operating and maintaining electrical equipment.
- **Process Function**: The process involves maintaining the surface to prevent soil buildup and ensuring it remains level and stable for safe operation.

Structures and Foundations

- **Form and Function**: Structures are typically galvanised steel bolted lattice or welded components, with reinforced concrete platforms or slabs for transformer support.
- **Purpose within Asset Class**: These structures support electrical plant and equipment, ensuring stability and safety.
- **Purpose within Network Design**: They are essential for maintaining the physical integrity of the switchyard and supporting the safe operation of electrical infrastructure.
- **Process Function**: The process involves regular inspection and maintenance to address corrosion, physical damage, and settlement issues.

Access Roads

- **Form and Function**: Access roads within switchyards consist of sealed or unsealed surfaces, providing all-weather access for maintenance and operational activities. (refer figure 11)
- **Purpose within Asset Class**: They facilitate the movement of personnel and equipment within the switchyard, ensuring efficient operation and maintenance.
- **Purpose within Network Design**: Access roads are crucial for enabling timely and safe access to critical infrastructure, particularly during emergencies.
- **Process Function**: The process involves maintaining the roads to prevent subsidence, erosion, and other issues that could impede access.

Figure 10 - Access Road surface located at Warragul zone substation (WGL)

Stormwater Drainage

- **Form and Function**: Drainage systems include spoon drains, kerb and channel, and underground drainage pipes to manage surface water runoff.
- **Purpose within Asset Class**: Proper drainage prevents water accumulation, which can damage equipment and create hazardous conditions.
- **Purpose within Network Design**: Effective stormwater management is essential for maintaining the operational integrity of the switchyard.
- **Process Function**: The process involves ensuring drainage systems are clear and functional, preventing flooding and erosion.

Station Lighting

Figure 11 - Switchyard Lighting at Sale zone substation (SLE)

- **Form and Function**: Station lighting includes various technologies such as sodium vapour, metal halide, and mercury vapour fluorescent lights to illuminate switchyards and buildings. (refer figure 12)
- **Purpose within Asset Class**: Lighting ensures safe access and operation during nighttime and low-visibility conditions.
- **Purpose within Network Design**: Proper lighting is crucial for maintaining safety and security in the switchyard, enabling safe operations and deterring theft.
- **Process Function**: The process involves installing, maintaining, and replacing lighting fixtures as needed to ensure consistent illumination.

Cable Ducts and Trenches

- **Form and Function**: Cable ducts and trenches are typically made from preformed concrete with covers to protect and organise cables. (refer figure 13)
- **Purpose within Asset Class**: They provide a safe and organised pathway for cables, protecting them from physical damage and environmental exposure.
- **Purpose within Network Design**: Proper cable management is essential for ensuring reliable electrical connections and preventing faults.
- **Process Function**: The process involves regular inspection and maintenance to address issues such as breakage, soil intrusion, and capacity limitations.

Figure 12 - Cable trench and cover lids at Mount Beauty zone substation (MBY)

Signage and Nameplates

Figure 13 - Operational nameplates at Mount Beauty zone substation (MBY) and Perimeter and Gate Signage at Merrijig zone substation (MJG)

- **Form and Function**: Signage and nameplates are used to clearly label key parts of the station installation, including busbar systems, switchgear, and protection equipment. (refer figure 14)
- **Purpose within Asset Class**: These labels provide critical information for the safe and reliable operation and maintenance of electrical assets.
- **Purpose within Network Design**: Clear and durable signage helps prevent errors and enhances safety by providing essential information to operators and maintenance personnel.
- **Process Function**: The process involves installing and maintaining signage to ensure it remains legible and compliant with standards.

4.3. Age

Age Considerations

An informed understanding of the age profile of network assets is crucial for effective asset management and lifecycle planning. Knowing the age distribution of the assets and infrastructure helps in predicting their remaining useful life and planning maintenance, upgrades, or replacements accordingly.

3.3.1.1 Buildings

- **Construction Materials**: The age profile of buildings constructed with different materials (e.g., concrete, brick, modular, asbestos-clad, weatherboard) is essential for determining the need for maintenance or replacement. Older buildings may require more frequent inspections and refurbishments to ensure structural integrity and safety. For example, buildings with asbestos cladding that are several decades old may need to be prioritised for removal and replacement due to health risks.

- **Roofing Materials**: Understanding the age profile of roofing materials (e.g., Colorbond steel, terracotta tiles) can help in planning for roof replacements or repairs. Older roofs, especially those exposed to harsh weather conditions, may be more prone to leaks and damage. For example, Colorbond steel roofs that have been in place for over 30 years in coastal areas may require replacement due to corrosion.

- **Prefabricated (Modular) Buildings**: Prefabricated buildings, often with a lifespan of 40 years or more, require monitoring of their age to plan for eventual replacement or refurbishment. For instance, modular buildings approaching their designed lifespan may need structural assessments to determine if refurbishment can extend their use.

3.3.1.2 Environmental Systems

- **Legacy Oil Management System**: Older environmental systems designed to manage oil leaks in transformers may become less effective over time. The age profile of these systems helps in planning upgrades to more modern and environmentally compliant solutions. For example, systems over 30 years old may be replaced with modern oil containment systems to prevent soil contamination.
- **Modern Oil Containment System**: Even modern systems require periodic assessment as they age. Understanding the age profile allows for timely upgrades to maintain environmental compliance. For example, oil containment systems installed 20 years ago might need to be evaluated for potential seal deterioration or system enhancements.

3.3.1.3 Security Fence

- **Current Security Fencing**: The age profile of security fences, including chain-wire mesh and other materials, is crucial for ensuring they remain effective at deterring unauthorized access. Older fences may require more frequent repairs or replacements. For instance, fences over 25 years old in high-risk areas may need to be upgraded to include modern security features like electronic access control.
- **Standard Fencing Specifications**: Monitoring the age of standard fencing specifications can indicate when updates are needed to meet current security standards. For example, fences installed according to older standards may require modifications to incorporate features like razor wire or increased height.

3.3.1.4 Switchyards

- **Switchyard Surface**: The age profile of switchyard surfaces, such as crushed rock or bitumen, helps in planning resurfacing projects to maintain safety and electrical performance. Older surfaces may accumulate soil and fines, requiring renewal. For example, switchyard surfaces over 20 years old may need resurfacing to restore their electrical performance.
- **Structures and Foundations**: Understanding the age of support structures and foundations is essential for maintaining their integrity. Older structures, especially those exposed to environmental stressors, may need reinforcement or replacement. For example, steel structures over 30 years old may require corrosion treatment or replacement to ensure stability.
- **Access Roads**: The age profile of access roads, whether sealed or unsealed, is crucial for ensuring safe and reliable access for maintenance and construction vehicles. Older roads may require more frequent maintenance or resurfacing. For example, unsealed roads that have been in use for over 15 years may need resurfacing to maintain stability and access.
- **Stormwater Drainage**: Monitoring the age of stormwater drainage systems helps in planning upgrades to prevent flooding and ensure proper drainage. Older systems may need modifications to meet current standards. For example, drainage systems installed over 20 years ago may require upgrades to handle increased stormwater volumes.
- **Station Lighting**: The age profile of station lighting systems, including various technologies like sodium vapour and metal halide, helps in planning replacements to maintain safe and effective illumination. Older lighting systems may need upgrades to more energy-efficient technologies. For example, sodium vapour lights over 25 years old might be replaced with LED lighting for better efficiency and performance.
- **Cable Ducts and Trenches**: The age profile of cable ducts and trenches is critical for ensuring their structural integrity and capacity. Older systems may require repairs or upgrades to prevent failures. For example, cable ducts over 30 years old may need reinforcement or replacement to prevent soil ingress and maintain safe cable routing.
- **Signage and Nameplates**: Understanding the age of operational nameplates and signage helps in planning replacements to ensure clarity and compliance with standards. Older signs may become faded and illegible. For example, nameplates over 10 years old might be replaced to prevent human error and ensure safety.

Age Profile

Most of the civil infrastructure within the zone substation is established with the initial development of the station and therefore, the site establishment date is representative of the age profile of the station civil infrastructure. As shown in Figure 15 below, over half of the stations are more than 50 years old.

Partial or full replacement of civil infrastructure as part of station rebuild works or targeted refurbishment projects within last 15 years has contributed toward a better balance in the civil infrastructure service age and condition profiles. Several stations [1] have had complete rebuilds (including civil infrastructure works) while three new stations[2] were installed on the network during the last 15 years. Furthermore, the completion of asset replacements and refurbishments at a selected number of stations has reduced the overall service age of civil infrastructure at targeted stations.

Average age of ground mounted and Distribution Voltage regulator sites is 28.3 years and the oldest being 85.6 years.

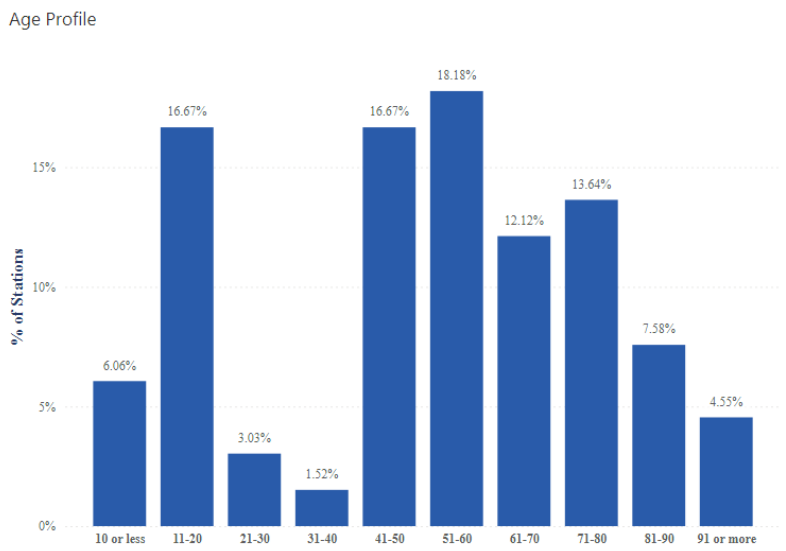

Figure 14 – Service age profile of zone substations

Figure 16 provides the service age profile of civil infrastructure; buildings, zone substation environment systems and security fences. It is noted that approximately 21% of the civil infrastructure are more than 50 years old.

[1] BRT (BRT), Lilydale (LDL), Traralgon (TGN), Pakenham (PHM), Bairnsdale (BDL) and Rubicon (RUB A)
[2] Cranbourne (CRE), South Morang (SMG) and Doreen (DRN)

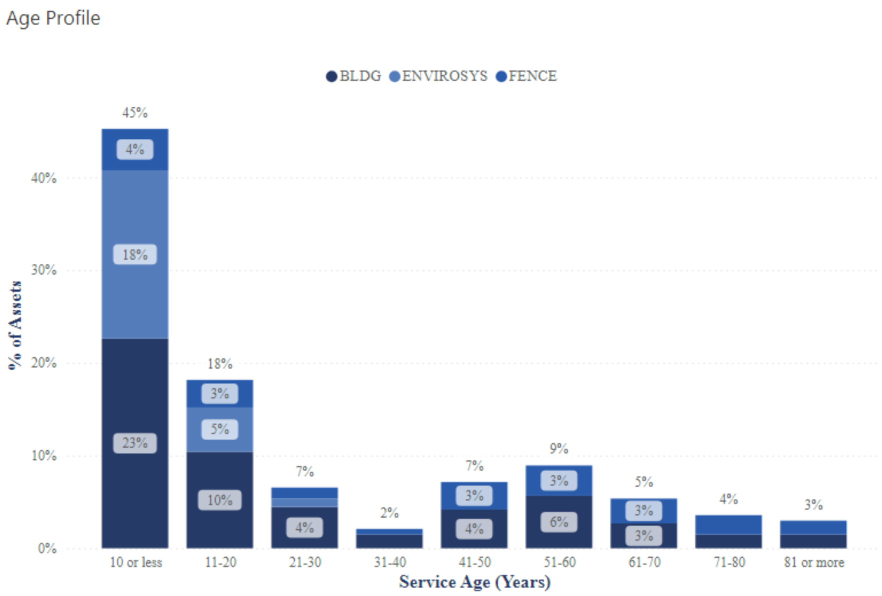

Figure 15 – Service age profile of civil infrastructure

5. Risk

AusNet maintains a risk management system designed in accordance with ISO 31000 Risk Management – Guidelines to ensure risks are effectively managed to provide greater certainty for the owners, employees, customers, suppliers, and the communities in which we operate.

There are varying risks associated for each component of a station's Civil Infrastructure, ranging from asset and public safety for the security system/fence, environmental contamination for environmental systems and personnel safety with regards to buildings and switchyard condition.

Depending on the nature and scale of the deficiencies of the civil infrastructure assets, solutions vary from targeted asset replacement, station refurbishment or whole station rebuild. Depending on the nature and scale of the deficiencies of the civil infrastructure assets, solutions vary from targeted asset replacement, station refurbishment or whole station rebuild. The overall approach to quantified asset risk management is detailed in AMS 01-09.

5.1. Likelihood of failure

An asset is deemed to have failed when it does not meet the functional requirements for which it was acquired. Both quantitative and qualitative analysis is used to assess the condition of the asset to determine the probability of failure and to estimate the remaining useful life. AMS 01-09 describes the detailed methodology used to calculate and derive the probability of a failure considering four key factors: asset life, asset utilization, location and physical condition.

5.1.1. Failure Causes

Typical failure causes in civil infrastructure are; structural degradation, asbestos contamination in buildings, Transformer oil spill and contamination of waterways and physical deterioration of security fences, switchyards and other civil infrastructure assets as explained below.

5.1.2. Failure Modes

Understanding Failure Modes

Understanding failure modes is an important tool that supports measuring the criticality of assets, especially when assessing the risk of potential failures and their impact on the overall system. By identifying and analysing the various ways in which an asset can fail (including the root causes and mechanisms of failure), asset managers can better predict and mitigate risks.

Failure Modes by Asset Type

Buildings

- **Failure Mode: Structural Degradation**
  - Description: Structural degradation refers to the weakening of a building's structural integrity due to factors such as weathering, material fatigue, or poor construction. This can lead to issues like cracking, bending, or collapsing of structural components.
  - Impact: Structural degradation can compromise the safety and functionality of a building, making it unsafe for occupancy and use.
  - Example: The structural integrity of a building can degrade over time due to factors such as weathering, material fatigue, or poor construction. Regular inspections and maintenance can identify early signs of structural degradation, allowing for timely interventions.
- **Failure Mode: Asbestos Contamination**
  - Description: Asbestos contamination occurs when asbestos-containing materials in buildings deteriorate or are disturbed, releasing harmful fibres into the air.
  - Impact: Exposure to asbestos fibres poses serious health risks, including respiratory diseases and cancer.

- Example: Buildings with asbestos-containing materials pose health risks if the asbestos is disturbed. Identifying and safely removing asbestos materials is crucial to ensure the safety of personnel and compliance with health regulations.

- **Failure Mode: Roof Leaks**
  - Description: Roof leaks occur when the roofing materials fail, allowing water to penetrate the building. This can be due to wear and tear, poor installation, or damage from external factors.
  - Impact: Water ingress can cause significant damage to the interior of the building, including structural components, electrical systems, and interior finishes.
  - Example: Roofs can develop leaks over time due to wear and tear, leading to water damage inside the building. Regular maintenance and timely repair of roofing materials can prevent water ingress and structural damage.

Environmental Systems

- **Failure Mode: Oil Leakage**
  - Description: Oil leakage occurs when the containment systems for transformer oil fail, allowing oil to escape into the environment.
  - Impact: Environmental impacts of oil leakage/spills include harm to wildlife, damage to ecosystems, soil contamination as well as water contamination. All of these pose significant environmental and regulatory risks. Oil leakage and spills will have detrimental effects on local waterways and neighbouring properties. Effectively managing environmental obligations is a key component of Asset Class Planning, promoting the sustainable operation of civil infrastructure. Adherence to environmental laws and standards is vital to avoid legal penalties, operational interruptions, and reputational damage. Failure to control environmental systems can have significant negative impacts on waterways, wildlife, ecosystems, soil, and neighbouring properties. These effects can include waterway contamination, biodiversity loss, soil degradation, property damage, health risks to local communities, and long-term ecosystem disruption.
  - Example: Older oil management systems may fail to contain leaks, leading to environmental contamination. Upgrading to modern containment systems with proper bunding and drainage can mitigate these risks.

- **Failure Mode: Inadequate Drainage**
  - Description: Inadequate drainage systems fail to effectively channel water away from the site, leading to flooding and water damage.
  - Impact: Poor drainage can cause operational disruptions, equipment damage, and safety hazards, while also increasing the risk of environmental harm. When drainage systems fail, oil and other contaminants can accumulate and be discharged into local waterways, which is especially concerning given that many AusNet sites are located near these water sources. Contaminated water can easily enter waterways during heavy rainfall, making it critical to meet water quality objectives.
  - Example: Inefficient drainage systems can cause flooding, leading to system failures and environmental damage. Ensuring proper design and maintenance of drainage systems is crucial for preventing such issues.

- **Failure Mode: Bunding Failure**
  - Description: Bunding failure occurs when the protective barriers around oil-containing equipment, like transformers, fail to contain spills.
  - Impact: Bunding failures can lead to uncontrolled oil spills, causing environmental contamination and regulatory non-compliance. Any non-compliance to EPA Regulations can lead to significant penalties.
  - Example: Concrete bunds around transformers may crack or deteriorate over time, leading to oil spills. Regular inspection and maintenance of bunding structures can prevent environmental contamination.

Security Fences

- **Failure Mode: Physical Deterioration**
  - Description: Physical deterioration of security fences involves corrosion, wear, or damage that weakens the structural integrity and effectiveness of the fences.

  - Impact: Weakened fences can fail to prevent unauthorised access, leading to security breaches.
  - Example: Security fences may suffer from corrosion, weakening their structural integrity and effectiveness. Regular maintenance and replacement of corroded sections can ensure the continued security of the site.
- **Failure Mode: Insufficient Height**
  - Description: Fences that do not meet required height standards are easier to climb, compromising security.
  - Impact: Lower fences increase the risk of unauthorised access and potential security threats.
  - Example: Fences that do not meet required height standards may be easily climbed, compromising security. Upgrading to fences that meet or exceed height requirements can enhance site security.
- **Failure Mode: Gate Malfunction**
  - Description: Gate malfunction involves the failure of security gates due to mechanical wear or electronic faults, hindering proper operation.
  - Impact: Malfunctioning gates can allow unauthorised access or prevent authorised personnel from entering or exiting.
  - Example: Security gates may fail due to mechanical wear or electronic malfunction, leading to unauthorised access. Regular inspection and maintenance of gate mechanisms can ensure reliable operation.

Switchyards

- **Failure Mode: Surface Degradation**
  - Description: Surface degradation in switchyards involves the wearing down or damage of the ground surface due to heavy use, weather conditions, or insufficient maintenance.
  - Impact: Degraded surfaces can create safety hazards, reduce operational efficiency, and damage equipment.
  - Example: Switchyard surfaces can degrade over time due to erosion or heavy vehicle traffic, creating hazards. Regular resurfacing and maintenance can ensure a stable and safe working environment.
- **Failure Mode: Foundation Settlement**
  - Description: Foundation settlement occurs when the ground beneath foundations shifts or compacts, causing uneven settling of structures.
  - Impact: Settling foundations can lead to misalignment, cracking, or structural instability of switchyard components.
  - Example: Foundations can settle or shift due to soil conditions, causing structural issues. Monitoring and addressing foundation settlement early can prevent significant structural failures.
- **Failure Mode: Cable Trench Failure**
  - Description: Cable trench failure involves the cracking, collapsing, or obstruction of cable trenches, which are essential for protecting and routing cables.
  - Impact: Failed cable trenches can expose cables to damage, leading to electrical faults and safety hazards.
  - Example: Cable trenches may crack or collapse, exposing cables to damage. Regular inspection and maintenance of cable trenches can prevent electrical failures.
- **Failure Mode: Lighting Failure**
  - Description: Lighting failure in switchyards refers to the malfunction or inadequacy of lighting systems, affecting visibility and safety.
  - Impact: Poor lighting can compromise safety during night-time operations and inspections, increasing the risk of accidents.
  - Example: Switchyard lighting can fail due to bulb burnout or electrical faults, compromising safety. Regular maintenance and timely replacement of lighting fixtures can ensure adequate illumination.

5.2. Consequence

Risk of likelihood of a major failure or major defect of civil infrastructure (buildings, fences, environment systems) may not necessarily cause a supply failure but may cause issues, including:

- personnel safety concerns (e.g. unstable building),
- public safety concerns (fence failures creating unhindered access to a live electrical environment),
- environmental incident (e.g. failure of bunding causing soil contamination).
- damage to electrical apparatus (e.g. water ingress into building from damaged roofing material).

Furthermore, it may result in a breach of regulatory compliance obligations (refer section 9, Legislative References) so needs to be considered during assessment.

5.3. Risk Treatment

Risk treatments are required to maintain risk by targeting reduction of Probability of failures (Likelihood of failure) or consequence depending on the nature of the risk. Treatment measures include asset replacement, asset refurbishment, inspections, testing or system redesign, and are achieved through capital projects or operational expenditure. Risk treatment options are described in the section on 'Risk Treatment' in AMS 01-09.

Capital replacement is a major component of asset risk management. The prerequisites for replacing assets:

- replacement of an asset will result in a material risk reduction
- risks can't be feasibly managed through maintenance or refurbishment
- monetised risk exceeds the replacement cost – i.e. replacement is economic.

Environment Systems (Oil Control)

The Environment Protection Act 2017, as amended by the Environment Protection Amendment Act 2018, came into effect in July 2020. This new legislation introduced several proactive obligations, including the General Environmental Duty (GED) under Clause 25 of the EPA Act 2017, as well as duties to manage and notify about contaminated land. The GED requires risks of harm to human health or the environment from oil pollution or waste to identify and minimize those risks **as far as reasonably practicable** aiming to enhance environmental protection through a more proportionate, risk-based approach.

Investment drivers for oil control program and voltage regulator include:

- Environmental Compliance to EPA Act 2017
- Financial risk reduced from reduced probability of rectification and penalty costs resulting from damage to the surrounding land and waterways

For Environment systems in zone substations and distribution voltage regulator sites, a risk model was developed considering likelihood and consequence in the event of an oil spill. Likelihood is based on number of Power transformers /Voltage Regulators, bunding type and magnitude of Oil leak. Consequence is based on the impact to environment, fines and remediation and restoration costs.

The environment system risk model provides the relative risk at each zone substation /Voltage regulator site.

The pre requisite for a capital environment improvement project under oil control program:

- risks can't be feasibly managed through associated asset maintenance or asset refurbishment
- monetised risk exceeds the environment system improvement cost – i.e. improvement is economic.
- replacement of an associated asset will result in a material risk reduction (Station Rebuild program)

6. Performance

Performance Considerations

In the context the management of assets and asset types within an Electrical Distribution Networks, assessing asset performance is a vital tool for effective lifecycle management. Performance information provides a comprehensive understanding of how these assets behave under various conditions, enabling asset managers to make informed decisions that enhance the reliability, safety, and efficiency of the infrastructure.

Performance data helps identify trends and patterns in asset behaviour, which are crucial for making strategic decisions regarding maintenance, upgrades, and replacements. Understanding how assets perform over time allows for proactive management, reducing the risk of unexpected failures. The assessment employed by AusNet involves analysing failure trends and any significant impacts resulting from failure, which provides valuable insights into the health and reliability of the assets.

The current performance of environmental oil control systems is poor and reactive, highlighting the need for improvement in the next regulatory period. A prevention-based approach, underpinned by the General Environmental Duty (GED), should be implemented to prevent non-compliance and address environmental risks effectively. Only 68% of the Zone substation sites are either fully or partially compliant with active or passive environment systems (purification units or triple interceptor tanks) in place. Approximately 12% of the zone substation sites are with single stage separators or with no holding tank. It should be noted that approximately 20% of the zone substation sites have only brick bunding around Power Transformers with gravel floor (legacy systems with unsealed bunding), the worst of all the environment systems if oil leaks do occur.

It should also be noted all distribution voltage regulator sites do not have a fully compliant environment systems in place. Many of these sites rely on simple brick or concrete bunding with a gravel floor, which may not meet compliance standards.

Performance Profile

Stations are inspected at regular intervals as per SMI 67-10-05: Routine Station Inspections. It classifies stations, both terminal stations and zone substations as either being Low Risk or High Risk[3].

All stations are inspected every three months. Inspections are conducted on the perimeter such as fences, gates, warning signs and locks; checking for signs of vandalism, forced entry and other security breaches; major oil or water leaks; environmental breaches; and filter element in the Puraceptor, interceptor tank.

Inspection on general items include items such as asset signage, missing or damaged covers/gratings, stormwater drainage system, cracks in the buildings, cleanliness of the toilets, yard lighting, earthing connections and copper earth grids.

For the control buildings and COMMS room, the inspector makes sure that the following items are operational: lighting, doors & windows are able to be secured, panel lights are operational, the air conditioning systems are operational, any signs of vermin and that the vermin guards are adequate.

The station fire protection is likewise inspected monthly which include fire extinguishers, fire hydrants, automatic sprinkler, detection system and identifying any fire hazard. Environmental systems include the bund area, interceptor pit, oil-water separator, waste management in rubbish bins, noise levels from inside the stations and vegetation.

Items identified by the stations inspection as needing maintenance or refurbishment are to be flagged using the Corporate Asset Management System (SAP) by raising a ZA notification (condition-based maintenance) with the appropriate priority rating.

Figure 17 show the % ZA notifications during the period 2020 – 2024 in civil infrastructure.

[3] Low Risk -stations that have electrical fences and continuous monitoring; High Risk- stations which do not have the said security enhancements.

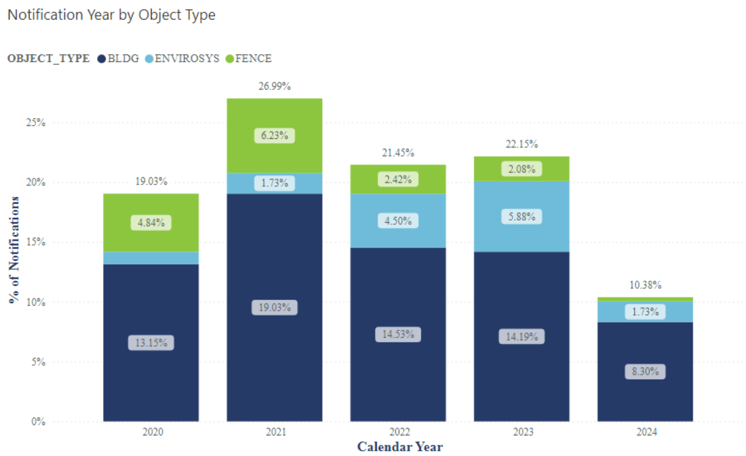

Figure 17: ZA notifications during the period 2020 – 2024 -civil infrastructure

Notification analysis revealed the following:

- It is noted that ZA most notifications were reported from buildings (69.2%) compared to environment systems (14.9%) and fences (15.9%). It would be prudent to consider restoring the very poor condition buildings during station rebuild /augmentation projects or under asset replacement projects. (refer figure 17) Major causes were associated with deterioration due to age, corrosion, roof leaks etc. But accurate data is not available for detail notification cause, defect type analysis.
- Although ZA notifications were comparatively lower than for buildings, environment systems could be improved from current levels during station rebuild /augmentation projects or under environment system improvement projects in order to minimize the risk of environment incidents.
- Consider installation of new monitoring systems available in the market which can analyse water quality with respect to water quality and pollution levels – assuring that the discharge from environmental systems are within the EPA Guidelines and complies with the company requirement of having particulate levels of not greater than 5 ppm. These systems can be remotely accessed providing real-time capability for environmental management. (Refer section 7.4)
- Data quality of notifications and events reported need to be improved. Process review of the use of appropriate assembly codes, maintenance cause, object part, damage type used in ZA and Zk notifications is needed as a continuous improvement opportunity in enterprise management systems for buildings, fence systems and environment systems. (Refer section 7.4)

7. Related Matters

7.1. Regulatory Framework

Compliance Factors

Refer section 9 for compliance to Building code of Australia and Environment protection Act 2017 for details.

Regulatory and Legislative Reference

Effectively managing compliance obligations specific to legislation and policies is a core element of Asset Class Planning and supports the sustainable operation and management of Network Assets. Ensuring adherence to relevant laws, policies and codes helps prevent legal and regulatory breaches, which can lead to significant penalties, operational disruptions, and reputational damage.

Note: further to the above, section 9 provides a quick reference table for the legislative and regulatory laws, acts, and policies that are of material consideration for this Asset Class (with links to the reference material).

Technical Standards and Procedures

Effectively managing compliance with technical standards and operational procedures is an important element of Asset Class Planning. Adhering to these standards ensures that the assets are designed, constructed, maintained, and operated in a manner that meets industry best practices, enhances safety, and ensures reliability. Compliance with technical standards helps prevent asset failures, reduces risks, and ensures interoperability within the electrical distribution network. For example, ensuring that all components of various asset types are installed and maintained according to Australian Standards can prevent unplanned failure and operational faults, enhancing network reliability.

Refer to Station Design Manual for detailed guidance notes and references, supplied to support the assessment of this factor and the ways it impacts and influences the management of this Asset Class.

7.2. External Factors

Technical Factors

Understanding and managing the technical factors that can directly impact the lifecycle planning for Network Assets across all the AusNet Asset Classes is a core element of effective asset management. These factors encompass various design, engineering, and technical performance considerations that directly impact the ability to manage and maintain these assets efficiently. Ensuring that Network Assets meet specific technical performance standards is vital for maintaining the reliability and safety of the electrical distribution network. For example, selecting construction materials with appropriate durability and weather resistance is essential to prevent faults and ensure consistent performance under varying environmental conditions.

Environmental Factors

6.2.2.1 Environmental Management

Effectively managing obligations specific to environmental management is a core element of Asset Class Planning and supports the sustainable operation and management of Civil Infrastructure. Ensuring adherence to relevant environmental laws and standards helps prevent legal and regulatory breaches, which can lead to significant penalties, operational disruptions, and reputational damage. Poor environmental systems control can have detrimental impacts on waterways, wildlife, ecosystems, soil and neighbouring properties. These impacts can include, but are not limited to,

- **Waterway Contamination**: Pollutants like oil, chemicals, or sediment can degrade water quality, harm aquatic species, and disrupt ecosystems.
- **Biodiversity Loss**: Poor environmental systems can reduce biodiversity by damaging habitats and harming wildlife.

 Soil Degradation: Contaminated runoff can leach into soil, affecting its fertility and suitability for agriculture or natural vegetation.

 Property Damage: Pollutants may seep into neighbouring properties, reducing land value and harming gardens, water sources, or landscaping.

 Health Risks: Exposure to harmful chemicals or pollutants can pose health hazards to local communities.

 Ecosystem Disruption: Contamination can have long-term effects on ecosystems, reducing their resilience and sustainability.

Stakeholder/ Social Factors

Social Factors

Understanding social factors is essential for the effective management of critical network infrastructure assets. Social factors, including community expectations, public safety, and environmental impacts, play a significant role in shaping asset management strategies. Ensuring that these social considerations are addressed helps build public trust, maintain social license to operate, and enhance the organisation's reputation. For instance, ensuring that maintenance activities for Civil Infrastructure do not disrupt local communities or pose safety risks is crucial for maintaining public support and compliance with social responsibilities.

Stakeholder Factors

Understanding the requirements of stakeholders with a direct interest in the assets associated with the [Civil Infrastructure] asset class is an important aspect of effective asset management. Key stakeholders, including customers, regulatory bodies, and industry partners, have specific expectations that influence asset management strategies and operational decisions. Ensuring clear communication and alignment with these requirements helps maintain regulatory compliance, enhance service reliability, and build robust partnerships. For example, customers expect reliable infrastructure and timely responses to issues, which requires minimal disruption during maintenance activities of Civil Infrastructure. Similarly, regulatory bodies impose standards that must be adhered to, such as safety requirements for buildings and environmental systems, to avoid legal penalties and ensure operational legitimacy.

7.3. Internal Factors

Training and Competency Factors

Effective training and competency development is a core element of asset class. Ensuring that asset managers, engineers, operational staff, and field personnel possess the necessary skills and knowledge is crucial for maintaining the reliability, safety, and efficiency of the asset network. Competent staff can effectively perform inspections, maintenance, and repairs, preventing asset failures and minimising downtime. Continuous training helps in keeping up with technological advancements, regulatory changes, and best practices, thereby enhancing overall asset management performance.

Resource Management Factors

Resource Management is a core element of asset class planning for Network Assets. Proper oversight ensures that the management of AusNet's resource bases meets stringent quality and performance standards, which is essential for preventing asset failures, managing risks, and maintaining compliance with regulatory requirements. Effective resource management contributes to cost efficiency via activities such as leveraging the expertise of specialised in-house skills and contractors while avoiding hidden costs associated with inefficiencies and non-compliance.

There are three sub-categories of consideration for this factor, which are:

- Resourcing strategies
- Outsourcing
- Supply Chain Management

Economic Factors

Economic factors significantly influence the lifecycle management of network assets, impacting financial stability, investment decisions, and overall network performance. Major contracts being tendered, such as those for infrastructure development, maintenance, and technology upgrades, can materially affect asset management. These contracts involve substantial investments, requiring rigorous management to align with long-term asset goals, mitigate risks, and control costs. Effective contract management ensures that service providers deliver value, supporting the network's reliability and performance while maintaining financial health.

Material developments and significant commercial agreements also play pivotal roles in the economic landscape of asset management. Commercial agreements, including customer service agreements, dictate service levels, performance metrics, and penalties, impacting operational priorities. Regular reviews of these agreements ensure adaptability to changing economic conditions, customer expectations, and regulatory landscapes. Additionally, planned renewal programmes and changes to asset types and purchasing strategies must be evaluated for their financial impact to ensure efficient resource allocation. By addressing these economic factors, AusNet can manage financial risks, optimise investments, and support robust lifecycle models, aligning financial planning with operational goals and regulatory requirements.

Safety Factors

Safety is a paramount concern in the management of electricity distribution network assets, as outlined in **ESMS 20-01**. Effective asset management planning and activities are crucial for protecting employees, contractors, the public, and the environment from potential hazards associated with electrical infrastructure. Ensuring adherence to safety regulations and standards through diligent asset management helps prevent accidents, minimise risks, and maintain the integrity of the network.

Targeted asset management activities include conducting regular safety audits and risk assessments, maintaining a robust Bushfire Mitigation Plan, providing ongoing safety training and competency assessments, regularly reviewing and updating emergency response plans, engaging with the community to raise awareness about electrical safety, and adopting new technologies and practices to enhance network safety. By integrating these safety-focused activities into asset management planning, AusNet can effectively minimise safety risks "as far as practicable," as outlined in the Electricity Safety Act 1998 and reflected in **ESMS 20-01**.

7.4. Future Developments

Technology and Innovation Factors

Effectively managing the process of tracking future technology developments and innovations is a core element of asset class planning. Staying informed about technological advancements ensures that asset management practices remain up-to-date, efficient, and competitive. Innovations can lead to improved materials, better monitoring systems, and enhanced maintenance techniques that increase the reliability, safety, and longevity of critical infrastructure. For example, advancements in diagnostic tools for detecting early signs of wear and the development of advanced materials for asset components can significantly enhance their performance and maintenance. **For technology and innovation, this is a process that looks to existing technologies, processes, or practices that have been proven in the market and have already been taken to market**.

REF	DETAILS OF MATERIAL CONSIDERATIONS
01	Consider installation of new monitoring systems available in the market which can analyse water quality with respect to water quality and pollution levels – assuring that the discharge from environmental systems are within the EPA Guidelines and complies with the company requirement of having particulate levels of not greater than 5 ppm. These systems can be remotely accessed providing real-time capability for environmental management.

Research and Development Factors

Effectively managing the process of investing in research and development (R&D) and seeking funds for R&D activities is a core element of asset class planning. R&D investment ensures that the organisation stays at the forefront of technological advancements, develops innovative solutions to emerging challenges, and enhances the reliability, safety, and efficiency of its assets. For example, developing new materials with improved structural properties for buildings or advanced monitoring systems for environmental systems can significantly extend their lifespan and reduce maintenance costs. **Research and development is the process of researching and investing in an idea, process, practice, or technology that has not been realised in the market yet; it is a step before tracking innovation and technology because the investment to build and take the item to market still needs to be proven**.

Continuous Improvement

Continuous Improvement (CIP) is a critical lynchpin process in the overall application of asset management, particularly for managing Civil Infrastructure. CIP ensures that asset management practices remain effective, efficient, and adaptive to changing conditions and emerging challenges. By consistently seeking ways to enhance processes, technologies, and strategies, organisations can maintain high levels of performance, reliability, and safety. For example, regularly updating maintenance protocols for buildings, environmental systems, and security fences based on feedback and new insights can prevent issues before they become major problems, thereby extending the lifespan of critical infrastructure.

Best practice asset management promotes a culture of continuous improvement, encouraging organisations to regularly evaluate their asset management systems, identify areas for enhancement, and implement changes. This iterative process involves monitoring performance, analysing data, and applying lessons learned to refine practices. By focusing on CIP, organisations can ensure that their asset management activities remain dynamic, resilient, and aligned with best practices and strategic objectives. This approach not only enhances the overall efficiency and effectiveness of asset management but also supports long-term sustainability and success. **CIP differs from technology and innovation as well as R&D because it involves the ongoing enhancement of existing processes and practices based on real-world feedback and performance data, rather than the development and introduction of new technologies or the exploration of unproven ideas**.

Targeted Activities (Technology and Innovation Factors)

REF	DETAILS OF MATERIAL CONSIDERATIONS
01	Re-assess civil infrastructure condition at all zone substations before the end of 2028 and record results in Asset Management System (SAP). Using latest civil infrastructure inspection data needs to be improved by periodically verifying the data and updating SAP enterprise system.
02	Process review of the use of appropriate assembly codes, maintenance cause, object part, damage type used in ZA and Zk notifications is needed as a continuous improvement opportunity in enterprise management systems for buildings, fence systems and environment systems.

8. Asset Strategies

New Asset Considerations

A strategic asset strategy for the introduction of new assets provides high-level guiding principles and overarching goals for asset management, focusing on long-term planning and sustainability. This strategy outlines the aspects of asset upgrades or changes, detailing the conditions under which new assets may be introduced into the network. This is not a like-for-like replacement but rather a strategic change or upgrade to a different type of asset to enhance reliability, improve efficiency, and incorporate advanced technologies. It serves as a roadmap that is ideal to follow if possible, guiding the decision-making process for integrating new assets into the AusNet network.

Targeted Activities (New Asset Consideration Strategies)

REF	DETAILS OF MATERIAL CONSIDERATIONS
01	Continue to build new zone substation buildings to comply to Building Code of Australia and Australian Standard AS2067: Substations and high voltage installations exceeding 1000 volts, AC.
02	Use modular type buildings in replacing deteriorated control buildings, battery rooms, amenities building etc.
03	Continue to build new environmental systems at high-risk zone substation sites to meet the new EPA Act requirements and AS2067: Substations and high voltage installations exceeding 1000 volts, AC.

8.1. Inspections and Monitoring

A strategic plan for inspections and monitoring provides high-level guiding principles and overarching goals for asset management, focusing on long-term planning and sustainability. This strategy outlines the ideal framework and objectives for conducting inspections and monitoring activities, such as enhancing reliability, improving efficiency, and incorporating advanced technologies. It serves as a roadmap that is ideal to follow if possible, guiding the decision-making process for establishing comprehensive inspection and monitoring protocols within the AusNet network.

Targeted Activities (Inspection and Monitoring Strategies)

REF	DETAILS OF MATERIAL CONSIDERATIONS
01	Continue with routine visual inspections of buildings, fire protection systems, environment systems and fencing systems as per PGI 02-01-04 and relevant SMIs in zone substations
02	Re-assess civil infrastructure condition at seventy zone substations before the end of 2028 and record results in Asset Management System (SAP)

8.2. Maintenance Planning

A strategic plan for maintenance provides high-level guiding principles and overarching goals for asset management, focusing on long-term planning and sustainability. This strategy outlines the ideal framework and objectives for conducting maintenance activities, such as enhancing reliability, improving efficiency, and incorporating advanced technologies. It serves as a roadmap that guides the decision-making process for establishing comprehensive maintenance protocols within the AusNet network. This involves creating a structured approach to regular maintenance activities to ensure optimal performance and longevity.

8.3. Renewals Planning

A strategic asset strategy for renewals and replacements provides high-level guiding principles and overarching goals for asset management, focusing on long-term planning and sustainability. This strategy outlines the aspects of asset refurbishments or like-for-like replacements, detailing the conditions under which existing assets may be renewed or replaced within the network. This process ensures continued reliability and efficiency, manages obsolescence, and maintains adequate spares. It serves as a roadmap that is ideal to follow if possible, guiding the decision-making process for renewing or replacing assets within the AusNet network.

Targeted Activities (Renewal Strategies)

REF	DETAILS OF MATERIAL CONSIDERATIONS
01	Carry out restoration of building condition at old zone substation sites to comply to Building Code of Australia.
02	For the existing buildings whose function has been replaced by the new modular buildings, all asbestos containing materials (ACMs) are to be removed and disposed safely.
03	Improve the environmental systems at high-risk zone substation sites to meet the new EPA Act requirements and AS2067: Substations and high voltage installations exceeding 1000 volts, AC.
04	Improve the environmental systems at high-risk distribution voltage regulator sites to meet the EPA Act requirements and AS2067: Substations and high voltage installations exceeding 1000 volts, AC.
04	Where possible implement civil works and improved infrastructure security as part of major project/rebuild works.

8.4. Decommissioning

A strategic asset strategy for decommissioning provides high-level guiding principles and overarching goals for asset management, focusing on long-term planning and sustainability. This strategy outlines the aspects of safely and efficiently removing assets from service, detailing the conditions under which decommissioning may occur. It ensures that the process is conducted in a way that minimises disruption, manages environmental impacts, and complies with regulatory requirements. It serves as a roadmap that is ideal to follow if possible, guiding the decision-making process for decommissioning assets from within the AusNet network.

9. Legislative References

NO.	ACT /STANDARD	LINK
1	Electricity Safety Act 1998	https://content.legislation.vic.gov.au/sites/default/files/2024-06/98-25aa083-authorised.pdf
2	AS 2067	Substations and high voltage installations exceeding 1000 volts
3	AS 1940	The storage and handling of flammable and combustible liquids
4	EPA Act 2017	Environment Protection Act 2017

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10. Resource References

NO.	ID (LINK)	TITLE
1	AMS 01-01	Asset Management System - Overview
2	AMS 20-01	Electricity Distribution Network Asset Management Strategy
3	AMS 20-14	Infrastructure Security
4	PGI 02-01-04	Plant Guidance Information -ZSS
5	SMI 67-10-05	Routine Station Inspections

11. Schedule of revisions

ISSUE	DATE	AUTHOR	DETAILS OF CHANGE	APPROVED BY
1	26/10/2009	L. Cough	Draft	
	24/11/2009	L. Cough	Final	G. Towns
2	30/10/2014	P. Senevirante S. Goel G. Jegatheeswaran	Review and update	J. Bridge
3	21/06/2019	F. Lirios	Major Revision to the content and format of the document	P. Ascione
4	22/01/2025	N. Boteju, Tim Baumgarten	Updated to new template. Strategy review for 2026-2031 period.	

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