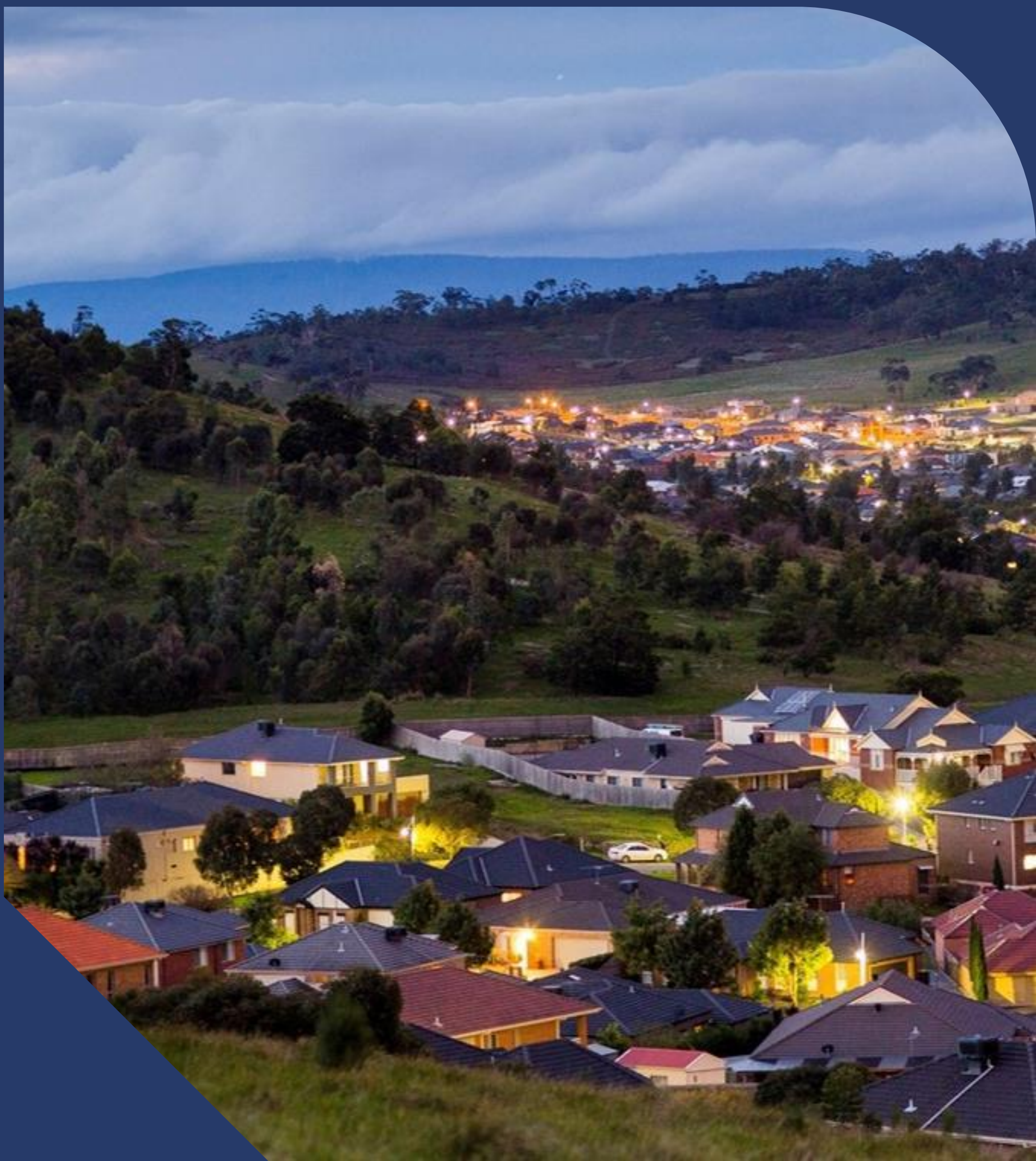
AusNet

Transmission Communication Systems

Asset Management Strategy



AusNet

Document number:	AMS 10-56
Issue number:	11
Status:	Approved
Approver:	[C.I.C]
Date of approval:	23/10/2025

AusNet

Table of Contents

Abbreviations and Definitions

TERM	DEFINITION
ACMA	Australian Communications and Media Authority
ADG	Asset Data Gathering
ADSS	All Dielectric Self Supporting
AEMO	Australian Energy Market Operator
AMI	Advance Metering Infrastructure
AMS	Asset Management Strategy
CEOT	Customer and Energy Operations Team
COF	Consequence of Failure
CWDM	Coarse Wave Division Multiplexing
DIC	Digital Interface Cubicle
DWDM	Dense Wave Division Multiplexing
WDM	Wave Division Multiplexing
EHV	Extra High Voltage
EMI	Electromagnetic Interference
HV	High Voltage
ICT	Information Communication Technology
IED	Intelligent Electronic Device
IP	Internet Protocol
IPVPN	Internet Protocol Virtual Private Network
IS	Information Security
LAN	Local Area Network
LDT	Line Despatch Terminal
MIP	Market Impact Parameter
MPLS	Multi-Protocol Label Switching
MPLS-TP	Multi-Protocol Label Switching – Transport Profile
NBN	National Broadband Network
NOC	Network Operations Centre

ODN	Operational Data Network
OFC	Optical Fibre Cable
OMN	Operational Management Network
OPGW	Optical Fibre in Ground Wire
OSS	Operational Support Systems
OTN	Operational Telephony Network
PDH	Plesiochronous Digital Hierarchy
POF	Probability of Failure
POTS	Plain Old Telephone Service
PSTN	Public Switching Telephony Network
PTP	Point-to-Point
QoS	Quality of Service
EDAMS	Electricity Distribution Metering Asset Management Strategy
RTU	Remote Terminal Unit
SCADA	Supervisory Control and Data Acquisition
SDH	Synchronous Digital Hierarchy
SIEM	Security Information and Event Managers
TDM	Time Division Multiplexing
TMR	Trunk Mobile Radio
TPS	Tele-protection System
TS	Terminal Station
U/G	Under Ground
VCR	Value of Customer Reliability
VFRB	Very Fast Runback
VOIP	Voice Over Internet Protocol
VRLA	Valve Regulated Lead Acid
VSWR	Voltage Standing Wave Ratio
WAN	Wide Area Network

1. Executive Summary

AusNet's transmission network relies on robust communications systems to support the safe, reliable, and efficient operation of the electricity grid. These systems support:

- Electrical protection signalling between generating stations and terminal stations
- Monitoring and control between AusNet Services' control room (CEOT), generators, terminal stations, and AEMO
- Operational voice and business communications across the network, including Network Operations Centre (NOC) depots, substations, and external stakeholders

A range of telecommunications technologies underpin these services, including optical fibre, microwave radio, Synchronous Digital Hierarchy (SDH), Plesiochronous Digital Hierarchy (PDH), Multi-Protocol Label Switching – Transport Profile (MPLS-TP), Wave Division Multiplexing (WDM), Internet Protocol (IP) routing, telephony systems, and supporting infrastructure such as battery systems and radio towers. Asset availability is regularly assessed considering utilisation, historical performance, vendor support, spare parts access, with legacy systems posing an increasing risk to business continuity as vendor support diminishes.

This Asset Management Strategy (AMS) provides an overview of the current state of communications assets and details the strategic direction for maintaining and upgrading these systems. Key drivers for this strategy include:

- Compliance with National Electricity Rules (NER)
- Managing technology lifecycle challenges, including obsolescence and integration of legacy and new services
- Mitigating physical and cyber security risks
- Progressing the replacement program transitioning from SDH to modern platforms such as MPLS-TP, ensuring continuity of critical services and supporting future communications needs

The AMS also addresses the replacement of the Operational Telephony Network due to obsolescence and regulatory requirements, and targets other communications systems, focusing on legacy assets phased out in the past decade. For optical fibre, priority is given to replacing end-of-life ADSS cables that have experienced repeated damage, leading to reduced reliability.

Through these initiatives, the AMS aims to enhance the reliability and resilience of the regulated transmission network, ensuring that the communications infrastructure continues to meet current demands and is prepared for future operational requirements.

1.1. Asset Strategy Summary

These communications systems strategies aim to enable the strengthening of the transmission electricity network, the modernisation of ICT systems to efficiently deliver existing and future communication services, and revising practices to improve operational efficiencies, security and safety. The key asset strategies are:

- Replace end-of-life or obsolete products /platforms
- Establishing redundant (independent) communications bearers where justified.
- Establishing "next generation" communications architecture to economically support current and future communications services.
- Enhancing communications service performance and (cyber) security monitoring

2. Introduction

2.1. Purpose

This document describes the Asset Management Strategies for Communication Systems in the AusNet Services regulated Victorian Electricity Transmission Network.

The purpose of this asset management strategy is to provide an overview of the AusNet Services' existing communications technologies, assets, asset age profiles, asset condition, issues affecting performance of the assets, and strategic initiatives to address identified concerns.

In addition, this document forms part of the AusNet Services Asset Management System for compliance with ISO 55001 and relevant regulatory requirements. This document demonstrates responsible asset management practices by outlining economically justifiable outcomes.

2.2. Scope

The following communication systems are included in this document:

- Communications Bearers: Optic Fibre cables (OFC) and Point-to-Point (PTP) radio systems
- Network Technologies: Tele-protection systems (TPS), Plesiochronous Digital Hierarchy (PDH), Synchronous Digital Hierarchy (SDH), Wave Division Multiplex (WDM), and Multiprotocol Label Switching (MPLS)
- Telephony Technologies: Operational Telephony Systems, Trunk Mobile Radio (TMR)
- DC Power Supplies - Batteries, Chargers at Radio Sites

The following assets are covered in other AMS documents:

- Buildings and air conditioners - AMS 10-55 Civil Infrastructure
- Station Direct Current (DC) Power supplies (Batteries, chargers) - AMS 10-52 Auxiliary Power Supplies
- Optical Ground Wire OPGW – AMS 10-79 Line Conductors and Ground Wires
- Business Telephone Systems, Public Carrier and Other Telephony, Network Management Systems (NMS) (Digital Submission)

2.3. Asset Management Objectives

As stated in Strategic Asset Management Plan REF: AMS 01-05, asset management objectives are:

Trusted to bring the energy today and build a cleaner tomorrow							
Strategic Pillars						Ambition	
Safely deliver our customer's energy needs today				Create the energy network of tomorrow	Enable the transition to a net zero future	Be a leader in asset management practice	
Asset Management Objectives						Enabling AMOs	
Safety: Minimise risk to our people, contractors, customers and communities AFAP across our networks	**Reliability:** Meet the reliability expectations of our customers and communities, and meet our reliability targets	**Resilience:** Improve the resilience of our network to adapt to a changing climate and energy system environment	**Compliance:** Comply with all legislation, regulations, relevant standards and industry codes	**Planning and decision-making:** Deliver valued planning and network outcomes through optimising asset lifecycle management	**Sustainability:** Build stakeholder trust and deliver social value. Reduce our environmental impact. Operate efficiently to sustain financial value creation.	**Competency and capability:** Develop asset management capability and competency in the organisation	**Continuous improvement:** Continually improve asset management maturity for effective delivery of services

3. Asset Description

3.1. Function

The AusNet Services communications network enables the transfer of information between various electricity network operating systems, applications, and devices. The information can be classified in any one of the following categories:

- Signalling
- Data
- Commands
- Voice

Protection devices use signalling to constantly exchange information over a communication channel and in the event of an incident, messages are exchanged so that appropriate protection devices operate to protect equipment and minimise the risk of injury.

Field devices, which include Remote Terminal Units (RTUs), line monitoring devices, and weather stations, send electricity network data to the Supervisory Control and Data Acquisition (SCADA) master or other master server and receive commands from the SCADA master to reconfigure the electricity network through communication channels.

The telephony system provides voice channels which enable operational teams to talk during periods of emergency or planned network maintenance work and allows customers to contact AusNet Services to report faults or emergencies.

Through communication systems, engineers and field teams can remotely access field devices and diagnose network failures or get access to network databases that are used to maintain the network and avoid multiple trips between the terminal station and depots or offices.

Video surveillance and site access applications are reliant on communication services to protect AusNet Services assets by sending video data to the security centre.

The communication network is divided into three main functions: communication transmission, communication transport, and communication network access. Communication transmission provides the physical interconnection between communicating sites, communication transport aggregates multiple messages and interfaces with the physical transmission systems. The network access function provides the interfaces for the clients (users) to connect to the communication network.

3.2. Population

Various technologies are used to enable the provision of the communications services. The technologies can be generalised under the following headings:

- Communications bearers
- Network technologies
- Telephony technologies
- Operational support systems
- Supporting Infrastructure

3.2.1. Communication Bearers

Communication bearers are the telecommunications interconnectivity medium that provide the "highways" on which individual communication services can be transported from one physical location to another. Total asset quantities can be seen in table 1 and 2.

The AusNet Services' transmission telecommunication system consists of the following bearer technologies:

- Optical Fibre Cable:
  - Optical Ground Wire (OPGW)
  - All Dielectric Self Supporting (ADSS)
  - Underground (U/G)
- Radio:
  - Point-to-point Microwave (M/W) radio
- Power Line Carrier (PLC)

The following table provides a summary of Communication Bearer by type and length.

3.2.1.1. Optic Fibre Cable

Optical fibre cables provide benefits over other telecommunications bearers due to the:

- Increasing predominance and maturity of optical communications (interfaces) in the telecommunications and utility equipment markets.
- Inherent opto/electrical isolation and EMI resilient properties of optical fibre glass.
- High data bandwidth/throughput capabilities (relative to other alternatives) provided by optical and laser technologies.
- Relative immunity to environmental conditions (e.g. rain events, electrical noise etc.)

Use of optical bearer technology within AusNet Services (and its predecessors) began in the late 1980's. Its use has continued to grow as legacy bearer technologies such as supervisory (copper) cable and power line (carrier) have required replacement and end-devices have evolved from analogue to digital equivalents.

3.2.1.2. OPGW

OPGW bearers are the predominant optical bearer cable technology currently utilised within AusNet Services. OPGW has benefits over other bearer alternatives through the leveraging of existing electrical network ground-wires and EHV towers (as a physical bearer) and contributing high availability/low failure rates that is characteristic of the physical infrastructure. OPGW installations are typically driven by operational telecommunications requirements (for electrical network purposes) and/or condition-based replacement of existing ground-wires. (Refer to AMS 10-79 Line Conductors and Ground Wires).

3.2.1.3. ADSS

ADSS bearers are strung on distribution electricity poles (both within and without AusNet Services Distribution region) to provide optical bearer(s) between transmission sites. ADSS provides particular benefit when OPGW (or other) bearers cannot satisfactorily provide the (redundant) bearer requirements of a particular site. Some ADSS cables have progressively been replaced by equivalent OPGW fibre cable when the opportunity has arisen.

3.2.1.4. U/G OFC

Underground optical fibre cables provide the interconnection of equipment in adjacent buildings or sites and enable the connection to other optical bearer assets on distribution poles (ADSS) and EHV towers (OPGW).

3.2.1.5. Point to point Microwave radio

Point to point microwave radio bearers typically provide digital communications bearers to sites in regional areas where the distances and/or viable alternatives necessitate. For sites with mission critical protection services, radio links are not relied upon as the sole bearer technology due to the risk/likelihood of correlated/simultaneous failures (e.g. radio path fading due to weather events). For this reason, radio bearers primarily provide supporting bearers (to other bearer technologies) for redundant (route) purposes. It is anticipated that some radio bearers will be decommissioned when suitable redundant (optical) alternatives become available (in line with network redundancy requirements). As part of the Southwest Communications Replacement project, which is currently in the delivery phase, fibre is being installed between TGTS and Portland. This upgrade will enable the decommissioning of multiple radio links between these two sites.

3.2.1.6. Power line Carrier

Power Line Carrier (PLC) systems modulate communication signals onto EHV lines to enable signalling between the two ends of a line. They are a narrowband technology enabling low data rate (e.g. 9600 bps) and voice signals between sites and only suitable as a bearer choice when data rate, protection scheme or other application requirements permit. They remain the sole means of (operational) communications across the South Australian border (from Heywood) and across the NSW border at Redcliffs (Mildura). Wind farm network connections in the northwestern region and over the South Australian border are currently driving some PLC replacements and/or reconfigurations to accommodate the requirements associated with generator interconnections to the transmission network.

	CABLES	QTY	TOTAL LENGTH (KM)
Optical	ADSS	35	278
	OPGW	57	2,600
	U/G	153	47

Table 1: Communication type and length

OTHER BEARER SYSTEMS	QUANTITY
Point to point Radio	51 links
Power Line Carrier	3 links

Table 2: Other bearer quantities

3.2.2. Network Technologies

Network technologies provide a physical interface for the user to access the communication network. The multiple services are combined into one signal and sent to the bearers for transfer to the next physical location.

AusNet Services has three networks that support the various applications depending on specific requirements and interface specifications:

- Operational Data Network (ODN)
- Operational IP-WAN Network (OPSWAN)
- Corporate Network

3.2.2.1. Operational Data Network (ODN)

The Operational Data Network (ODN) refers to the integrated system of technologies that facilitate the connecting of mission-critical 'operational' functions and services across transmission sites. The ODN is AusNet's primary communication network, enabling fast, reliable, and redundant intercommunications for key network operations. These functions or applications include:

It is AusNet Services' primary communication network,

- Power Line Protection schemes
- B/U and remote/inter-tripping signalling
- Wide-area control signalling
- SCADA traffic
- Operational Telephony Network (OTN) for electricity network operations.

The ODN consists of a range of telecommunications technologies to support inter-site communications requirements:

Synchronous Digital Hierarchy (SDH) multiplexers: This is the legacy TDM type multiplex network equipment that forms the backbone 'Transport' network interconnected through the (use of) optical or wireless transport bearers. While interoperable with other SDH vendor products, it is typically managed and operated as a network based on vendor and associated vendor management platform.

Plesiochronous Digital Hierarchy (PDH) multiplexers: This is the legacy 'access' TDM type multiplex network equipment that enables 'adding or dropping' of individual communications services between sites and devices. It typically connects to the SDH or MPLS-TP equipment for site interconnectivity.

Wavelength Division Multiplexing (WDM layer): Typically used to augment the transport (TDM) layer to either extend the geographical distance between the SDH nodes or address optical fibre capacity limitations. There are two types of WDM technology implemented by AusNet Services. These are Coarse Wavelength Division Multiplexing (CWDM) & Dense Wavelength Division Multiplexing (DWDM).

Multiprotocol Label Switching -Transport Profile (MPLS-TP): Is new generation replacement technology for SDH, essentially replacing the 'Transport' function traditionally provided by SDH. It is a native packet network technology than can natively carry packet-based traffic while still being capable of emulating legacy, synchronous TDM type traffic.

In some cases, teleprotection equipment is required to provide the interface between the application (e.g. protection) and the ODN, enabling the reliable transmission of discrete protection controls end-to-end between (remote) IED's. Most legacy Voice frequency (VF) signalling systems have been replaced by digital equivalents as Power Line Carrier (PLC) systems have been upgraded or replaced with other digital bearer technologies (e.g. fibre).

MULTIPLEX (DIGITAL) NETWORK	QUANTITY/NODES
WDM - DWDM	90
WDM - CWDM	10
SDH	161
PDH	472
MPLS-TP	28
Teleprotection Systems	467

Table 3: Multiplex network quantities

3.2.2.2. Operational IP-WAN Network (OPSWAN)

In the AusNet Services environment, the Operational IP-WAN network (OPSWAN), formerly the Operational Management Network (OMN), provides engineering access to staff for remote management and interrogation of various power network and communication devices and carries sensitive information about power network management settings, and more broadly provides IP connectivity to devices located at operational substation sites. Other networked applications include on-site corporate system access for field staff, video monitoring of stations and assets, and secure (electronic) access and logging to sites. This network has been built based on Packet Switched technology and consist of switches and routers. OPSWAN spans 44 locations and connects to over 6000 IED's at terminal station sites. The sites are predominantly connected via AusNet Services owned bearers and communications infrastructure. Where there is no AusNet Services bearer or communication infrastructure, or existing infrastructure is technologically unsuitable, other 3rd Party bearers and services (e.g. Telstra services) have been used to connect OPSWAN sites.

The OPSWAN currently supports the following key applications:

- Remote engineering access to power system intelligent electronic devices (IED's).
- Asset data gathering information from intelligent electronic devices (IED's) and systems.
- Management access to communications access devices e.g. management of communication network switches, routers & serial servers.
- Video monitoring of terminal station sites and associated assets.
- On-site field worker access to corporate IT systems.
- VoIP traffic to (some) OTN endpoints.

OPERATIONAL IP-WAN NETWORK (OPSWAN)		QUANTITY/NODES
Managed IED's/Devices		6,564
Network Elements	Routers	92
	Switches	160
	Serial Servers	147
	Engineering Servers	23

Table 4: IP-WAN quantities

3.2.3. Corporate Network

The Corporate Network underpins business operations by providing reliable data connectivity for corporate applications and administrative functions. It facilitates seamless communication and data exchange for non-operational activities, supporting services such as business applications, email, internet access, and other corporate tools. The network connects various office locations and enables secure access to corporate resources and applications.

3.2.4. Wireless technologies

Wireless technologies are currently limited to third-party mobile services deployed at remote weather and environmental monitoring stations located on EHV towers. Around ten devices are currently in operation, transmitting relevant weather and status data to the master SCADA system for monitoring and system loading purposes.

AusNet has also implemented tablets for operational staff as part of the mobility initiative. This solution uses a combination of Telstra 4G connectivity when off-site and Wi-Fi when on-site.

Additionally, AusNet has deployed operational mobile phones at Terminal Stations, utilising Telstra 4G-enabled Pixel devices.

3.2.5. Telephony (OT) Technologies

AusNet Services heavily relies on voice communications (aka telephony) for communicating between operational staff and external parties. The telephony domain currently includes:

- Operational Telephony Systems
- Telco SIP Gateways or Session Border Controllers (SBC)

3.2.5.1. Operational Telephony Systems

Operational telephone systems are intended to provide high reliability telephony (voice) capability to operational sites and staff for the purpose of operating and maintaining the electricity network. Being a combination of AusNet Services owned and 3rd Party service provider solution ([C.I.C] Mobile Radio Network), the Operational telephony systems can be critical during major network events, including a System Black event, due to its resilience and ability to function when other communication channels may be compromised.

TELEPHONY		QUANTITY/NODES
Operational Systems	PBX's/exchanges	39
	Console	38
	Pixel phones	53

Table 5: Telephony technology (Operational) summary

Operational telephony consists of the following:

Operational Telephone Network (OTN): Consists of [C.I.C] IPx PABX and handsets at terminal station sites. Gateways are provided to AusNet Services' control room (CEOT) front end (BT console) and other controlling authorities that have interconnecting interests to AusNet Services' electricity transmission network. It is designed to provide voice communications under typical operational scenarios (for example when carrier services are adversely impacted by a power outage).

Control Room (CEOT) Console systems: The [C.I.C]Command & Control system and associated consoles Terminals provide a common front-end interface for controllers (via consoles) to voice and mobile radio communications within the Control Room (CEOT) environment, enabling features that best enable the managing, prioritising and recording of operational calls to/from the control room. These systems interface with the OTN, PSTN (public carrier) and mobile radio networks.

Mobile Radio: The [C.I.C] Mobile Radio (SMR) network is a Telstra public wireless network service providing emergency radio (voice and data) communications to 95% of the state. Field staff largely use this network for critical remote voice communication and where service coverage or performance is limited with other mobile services (e.g. mobile phones). This network is scheduled for shutdown in June 2026, with current initiatives anticipated to replace with equivalent network capability to maintain suitable field workforce coverage and 'emergency' voice.

Public Voice Services: The PSTN network is used to communicate with stakeholders not on the OTN network, or as an alternative/back-up means to AusNet Services internal/private systems (e.g. Pixel phones at Terminal Stations). Mobile phone services (e.g. 4G) are also used by field staff for operational purposes, supported by other dedicated systems (e.g. mobile radio) when circumstances (e.g. mobile phone coverage and/or channel capacity) require.

3.2.5.2. Telco SIP Gateways

The Telco SIP gateways were installed in conjunction with the shutdown of ISDN services by [C.I.C] in 2022, which forced AusNet to migrate all existing OTN PSTN (ISDN) trunking to a packet SIP equivalent. These perform the function of securing voice traffic in/out of AusNet's network and providing the interoperation between SIP and legacy voice systems and (ISDN) protocols.

3.2.6. Supporting Facilities

Communications facilities consist of assets that are essential to supporting the communications system, but do not actively carry or transport communications traffic themselves.

These can include:

- Antenna towers and associated attachments
- Radio site buildings, fencing, security systems
- Batteries, chargers, dc-dc converters and solar panels
- AC mains power systems and diesel generators
- Air Conditioning systems.

COMMUNICATIONS FACILITIES AND RADIO INFRASTRUCTURE		QTY
Radio Sites		38
Radio Towers	Lattice type	45
	Pole type	3
Battery Systems	24V	12
	48V	65
Battery Chargers		77

Table 6: Communications facilities summary

3.2.7. Operational Support Systems

Operational Support Systems (OSS) assist in the monitoring, maintenance, administration and operation of the telecommunications network. These include:

- Telecommunications Network and/or Element Management Systems (EMS/NMS) – providing network status, fault and performance information on (vendor specific) telecommunications components that form the telecommunications network.
- Overarching "manager-of-manager" – provides an overarching network wide view for fault and event management across various vendors and network technologies.
- Physical & Logical configuration management system(s) and database(s).

3.2.8. Security Systems

From a Wireline perspective, currently transmission sites are secured by:

- Configuration of Access Control Lists (ACL's) of on-site (OPSWAN) networking equipment for all connections on backhaul infrastructure, or on a carriers' private cloud service.
- Use of 802.1x on all on-site networking equipment such as switches.
- A secure access management system that limits and logs remote 'engineering' user access to critical site infrastructure (e.g. IED's).

More recent site implementations have seen embedded firewalls configured in some operational networking devices to further secure data traffic to/from operational station sites. Further enhancements to (network) cyber security are planned as part of, and in line with wider enterprise ICT security initiatives.

As part of the evolution of both the Operational Data Network (ODN) and the Operational management Network (OPSWAN), security capabilities and enhancements will be rolled out as part of replacement projects. This is particularly important as new packet (IP/Ethernet) based technology is introduced.

3.3. Age

3.3.1. Age Considerations

Understanding the age profile of communication systems is essential for effective asset management and lifecycle planning. Knowing the age distribution of these assets helps in understanding obsolescence and predicting their remaining useful life and planning maintenance, upgrades, or replacements accordingly.

Optical Fibre Cables: The age profile of optical fibre cables can indicate potential issues related to fibre attenuation and connector degradation. Older cables may require more frequent inspections and condition assessments to work towards the continue to operate safely and efficiently.

Point-to-Point Radio Systems: Over time, point-to-point radio systems can experience component wear and frequency drift. By analysing the age profile, asset managers can identify systems that are at higher risk of failure and prioritise them for maintenance or replacement.

Network Technologies: The age profile of ODN systems can reveal areas where technology upgrades may be needed to maintain reliability and performance. [C.I.C]systems are classified legacy technologies and should be replaced.

PABX EXCH Systems: The age of [C.I.C]systems indicates that technology upgrades are necessary to maintain telephony services.

3.3.2. Age Profile

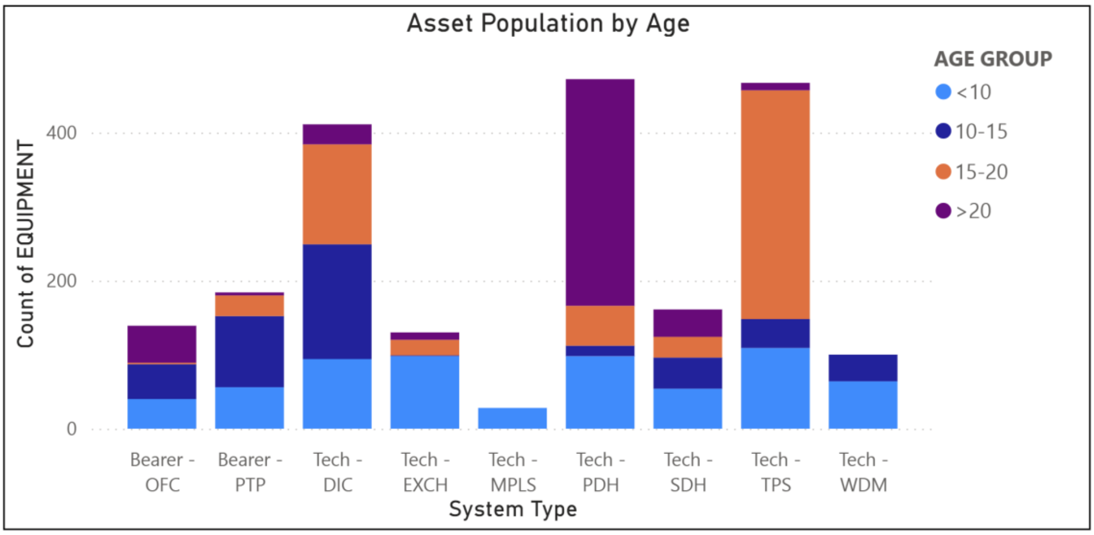


Figure 1: System types within age brackets

Figure 1 above shows the age distribution of communication assets, with majority of the equipment being in the 10 – 20 year band.

Several technology systems particularly SDH (Synchronous Digital Hierarchy), TPS (Telephony Processing Systems), and PDH (Plesiochronous Digital Hierarchy) show a high concentration of assets aged over 15 years. SDH and PDH are legacy technology and require to be replaced. Their continued operation poses a risk to service continuity and operational efficiency, making them prime candidates for targeted renewal or replacement strategies.

Multiprotocol Label Switching (MPLS), which has only recently been introduced to the network, is intended to replace SDH. Meanwhile, Wavelength Division Multiplexing (WDM) systems have a predominantly younger asset profile, with current efforts focused on replacing end-of-life / end-of-support models.

Overall, this age profile analysis underscores the need for a dual-pronged maintenance strategy: one that prioritises the renewal of legacy systems with aging infrastructure, while simultaneously investing in the long-term sustainability of newer systems through advanced maintenance practices. As part of the replacement programs, the focus is on addressing ageing equipment.

4. Asset Performance

4.1. Condition & Performance Factors

Communication equipment is considered a low-risk asset class in terms of physical degradation and failure. While the functional role of these systems can be complex, the physical components themselves are typically robust and straightforward. This drives the evaluation of communication asset condition to be based on two key factors:

- Limited options for network augmentation or expansion, as compatible hardware, software, and firmware become increasingly scarce
- Reduced ability to repair or replace components, driven by declining availability of spare parts and diminishing vendor support

These considerations centre on the technical capability and mechanical/electrical integrity of individual assets to perform their intended functions and meet capacity expectations.

Managing fleet condition and performance has become increasingly complex due to the widespread use of multi-vendor supply chains and the rapid pace of technological evolution. Vendors frequently announce product end-of-life with minimal notice, creating significant challenges for asset managers.

4.2. Performance Analysis

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 electrical transmission network.

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.

Performance Profile

Due to their resilient construction and relatively low exposure to environmental stressors, communication assets are well-suited to a simplified monitoring regime. Routine visual inspections and periodic condition assessments are usually sufficient to support ongoing reliability, without the need for intensive or continuous monitoring systems.

ZA notifications are defect notices, reporting equipment issues that do not affect normal operation. ZK notifications are fault notices, indicating the equipment has stopped performing as specified.

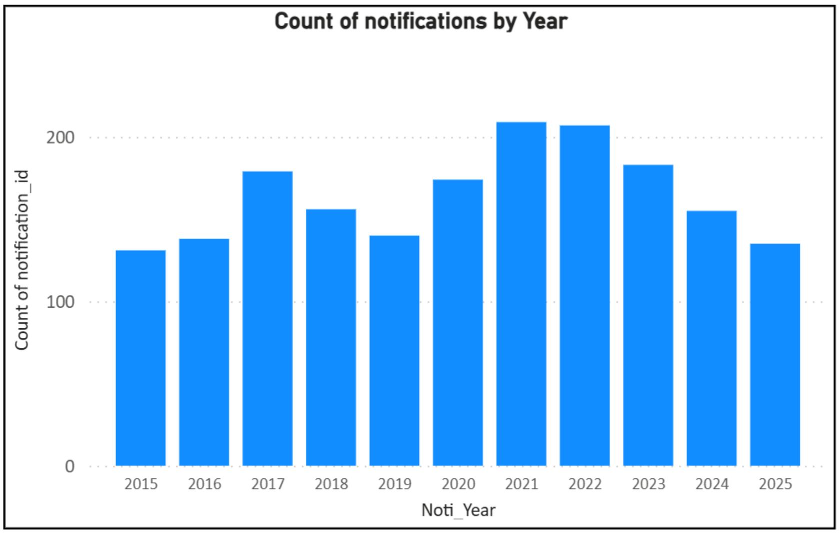


Figure 2: ZA & ZK notifications by year for communication assets

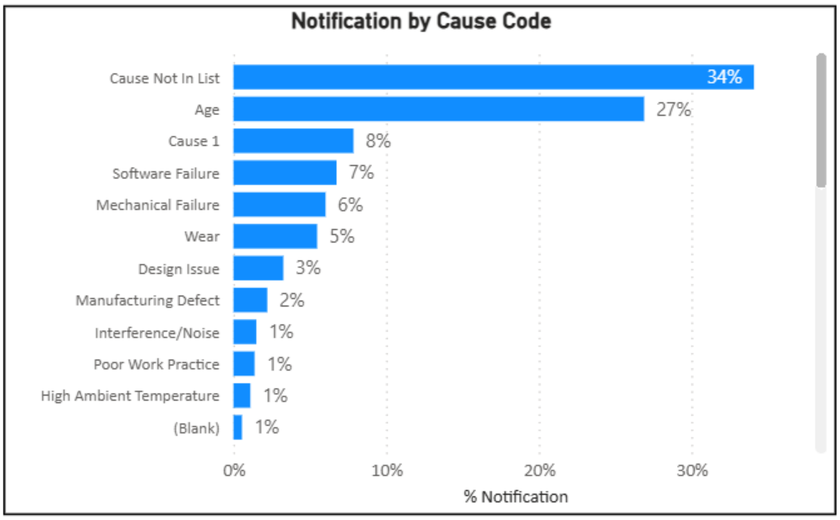


Figure 3: Top 12 Communication causes for ZA & ZK notifications

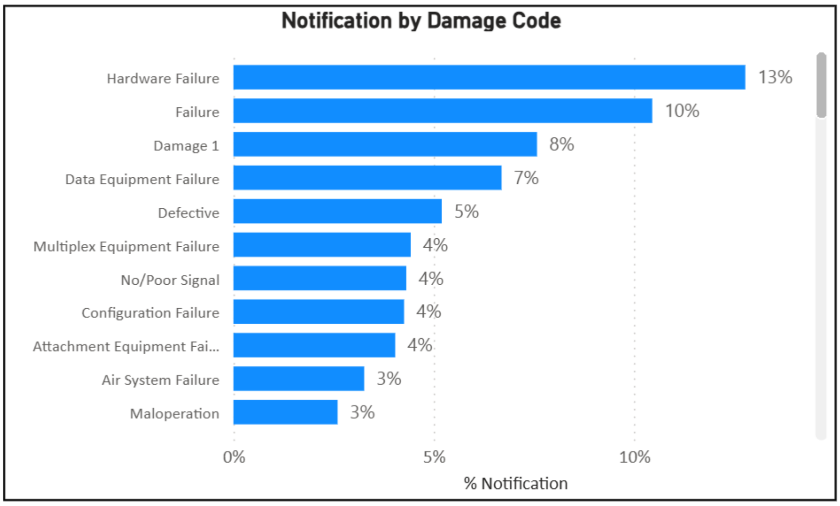


Figure 4: Top 11 of notifications by damage

Figures 3 and 4 delineate asset performance by illustrating the distribution of notification codes. Figure 3 details the allocation of cause codes, providing insights into the root causes of asset-related issues, while Figure 4 examines damage codes, highlighting patterns of physical or functional degradation. Collectively, these figures present a comprehensive overview of field asset performance and facilitate the identification of trends that can inform both maintenance planning and risk assessment.

Notification volumes for communications works increased significantly between 2020 and 2022, stabilising in subsequent years. This trend was largely driven by improved data reporting and notification capture from early 2020. Additionally, the maintenance backlog was addressed more rapidly during periods of reduced project activity associated with COVID-19. It should be noted that the notification count for 2025 represents an incomplete year but is expected to align with previous annual trends.

At present, cause and damage codes are required at the time a notification is raised, often before investigations can be conducted. Consequently, generic codes such as "Cause Not in List" or "Cause 1" are frequently used due to limited information availability at entry. To enhance accuracy and reliability, the notification process will be reviewed to support failure investigations are completed prior to assigning final cause and damage codes.

Optic fibre profile

The optical fibre profile covers both underground and overhead ADSS cables. It excludes OPGW, which is addressed under AMS 10-79 – Line Conductors and Ground Wires.

Optical fibre notifications are handled separately from other communications assets because they are simpler, with fewer failure modes and less complex notifications. This allows for more accurate analysis of optical fibre performance trends without affecting insights into more complicated technologies.

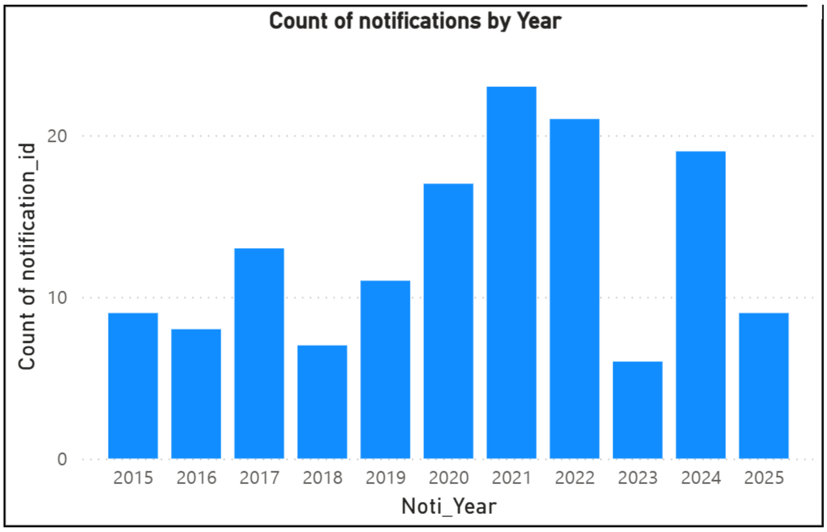


Figure 5: Optic fibre notifications by year

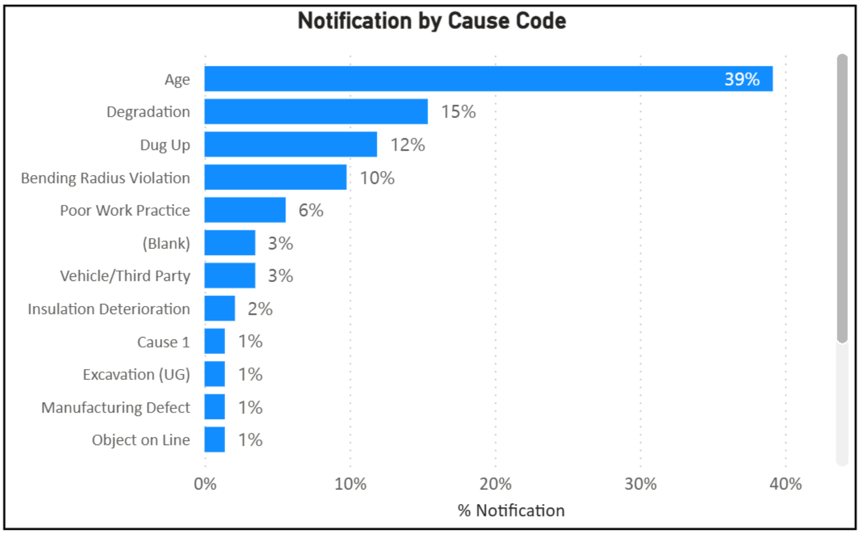


Figure 6: Optic fibre notification cause codes

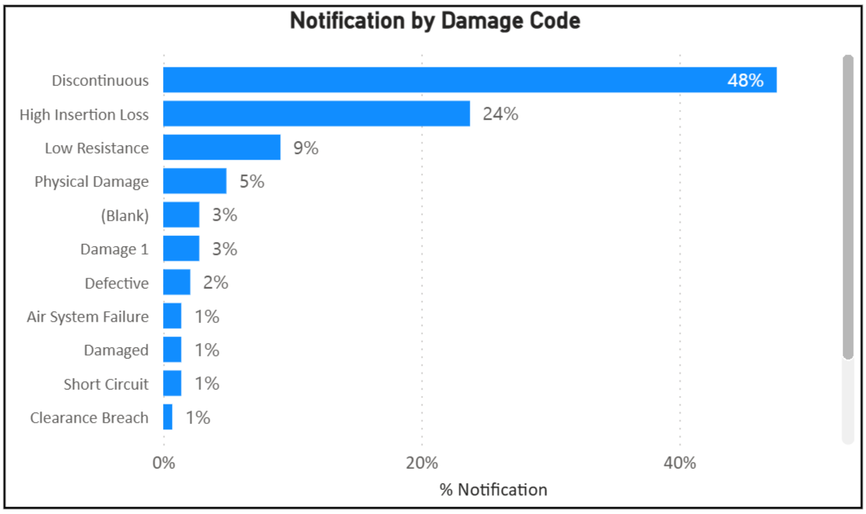


Figure 7: Optic fibre of notifications by damage code

Figures 6 and 7 present the distribution of cause and damage codes associated with optical fibre notifications, offering insights into failure trends within this asset category.

Notification volumes for fibre-related works remained elevated from 2020 to 2022, attributable to enhanced data reporting practices and accelerated maintenance activities during the COVID period, when broader project initiatives were temporarily reduced. In contrast to other communications assets, optical fibre failures are predominantly influenced by external factors, leading to marked year-on-year variability. The notification number for 2025 is not yet representative of a complete year and is anticipated to rise by year-end.

Figure 8 highlights that the damage codes "Discontinuous" and "High Insertion Loss" collectively account for 72% of cases, underscoring a key characteristic of optical fibre assets: a failure pattern dominated by multiple breaks in fibre cables, typically caused by external factors.

The cause codes "Age" and "Degradation" collectively represent 54% of recorded incidents, reflecting the cumulative impact of these breaks over the asset's operational life, as well as the deterioration of cable sheathing due to damage or ageing.

Key risks for optical fibre cables include cable breaks, commonly stemming from external interference, degradation of the protective jacket, and signal attenuation caused by wear or poor connections. Our proposed replacement program focuses on end-of-life ADSS cables that have experienced damage or degradation, which has led to significant optical loss and compromised reliability.

4.3. Recent Major Events

Loss of SCADA and line protections at Keilor Terminal Station on 29/06/2023

A blue phase-to-ground fault occurred on the ATS–KTS 220 kV line. The X and Y line differential protection relays operated at both ends, resulting in the line being tripped. In association with the earth fault, KTS experienced an unplanned interruption to its 48V DC supplies, both “A” and “B” feeds to the communications equipment, impacting several communication circuits as well as damaging a number of communications power supply cards. This led to a loss of SCADA communication at the AusNet Master SCADA station and a widespread failure of line differential protection signalling on the lines at KTS, including remote end stations.

The loss of protection signalling impaired both X and Y line differential protection (primary protection) for all 220 kV lines and some 66 kV lines at KTS that rely on-line current differential protection.

While the root cause was not a failure of the communications equipment itself, the impact of losing communication circuits was critical, and this highlighted the impact and significant consequences for comms loss to system protection and SCADA visibility.

5. Related Matters

Issues and drivers that influence the decisions around technology changes and/or asset replacement are multi-fold. There are specific drivers for each technology category, and these are described in general terms in the following sections.

5.1. Regulatory Requirements

The National Electricity Rules (NER) outlines performance and other technical requirements for the electricity transmission network. Requirements that directly impact communications systems include:

- **Performance** – Fault clearance times as outlined in rule S5.1a.8 for protection systems at specified electricity transmission network voltages. These specified times are end-to-end operation times which include communications operation and signal transmission time.
- **Redundancy** – specifies that the system must operate within the performance constraints with any single communications element out of service S5.1.9d.
- **Availability** – Electrical protection systems, which includes communications signalling, always available, apart from a maximum period of 8 hours outlined in S5.1.2.1d.
- **Availability** – A back-up telephone facility independent of commercial telephone service providers S5.2.6.2.

The Electricity Safety Act (section 98(a)) requires AusNet Services to "design, construct, operate, maintain and decommission its supply network to minimise as far as is practicable the hazards and risks to the safety of any person arising from the supply network, having regard to the:

(1) severity of the hazard or risk in question; and

(2) state of knowledge about the hazard or risk and any ways of removing or mitigating the hazard or risk; and

(3) availability and suitability of ways to remove or mitigate the hazard or risk; and

(4) cost of removing or mitigating the hazard or risk".

To fulfil these requirements, AusNet Services depends on the Communications Network to support protection, control, and monitoring of the transmission network. Therefore, it is essential to maintain highly reliable and available communications between the CEOT, terminal stations, switchyards, and for SCADA operations.

Ensuring high reliability and availability necessitates keeping communication assets in optimal working condition through ongoing maintenance and robust vendor support.

AusNet Services utilises the ISO27001 framework as the foundation for its security management and governance practices, integrating people, processes, and technology in accordance with this international standard. For ICT systems, reference is made to NERC-CIP and IEC62443 (ISA99) frameworks to facilitate alignment with current best practices for securing critical infrastructure.

5.2. Technological Issues

5.2.1. Supportability

Ongoing support and the supply of spare parts from vendors and manufacturers are necessary to maintain the availability of the communications network. As communication technology advances quickly, some products are replaced by newer versions within short periods, leading to regular updates in technology.

Support and spare parts for legacy systems quickly become scarce and often requires a long-term financial commitment to a supplier to secure spare parts. This is not always economic considering the age of those technologies and hence regular technology refreshment is required. Existing PDH, SDH, WDM and Cisco (3750 & 3550 models) fall into this category.

Rapidly changing technologies and vendors declaring end-of-support, introduce an increasing risk to the Communications Network, which is an influencing factor in this Asset Management Strategy.

5.2.2. Legacy Systems

The communications network consists of devices from various vendors, causing interoperability issues due to proprietary protocols and vendor-specific features. These challenges can lead to product changes that disrupt overall network compatibility, prompting technology upgrades and asset replacements. Managing diverse technologies has become more difficult and less cost-effective over time. AusNet Services aims to streamline operations by implementing efficient, automated, and integrated processes to support a dynamic business model.

PDH & SDH are now considered legacy technologies and most users have already transitioned to newer technologies. AusNet Services plans a smooth migration to next-generation alternatives, balancing ongoing support for legacy services while enabling next-generation capability.

IEC 61850 is an International Standard for Substation Automation and heavily dependent on Communication System needs outlined in ten broad categories (Ref: Annex – I). AusNet Services is currently analysing suitable IEC 61850 practices and standards for substation automation and requires the Communications systems to be aligned to IEC 61850 requirements and standards. In its current format, the Communication system cannot accommodate the IEC 61850 requirements and changes need to be made in the wireline domain. The forward looking ODN & OPSWAN networks are being developed to provide a suitable pathway for these capabilities.

On the telephony side, TDM based telephony systems (e.g. PABX) are becoming increasingly difficult to maintain as these technologies are migrating to packet-based VoIP equivalents. Similarly analogue signal based 'Plain Old Telephone Services' (POTS) are also becoming increasingly difficult to support as systems are replaced by the likes of NBN and VoIP service. Office locations and operational sites are being impacted by the reduced maintenance support and require migration of existing analogue Telecom services to digital NBN based equivalents.

As part of the transition from SDH to the new MPLS-TP technology, AusNet commenced in the current TRR with the Metro East loop, followed by upgrades in the Southeast, Northwest, and Northeast regions. These upgrades support readiness to meet future demand across these areas and will be completed in current 2022-27 period.

The SDH replacement program will continue in the next TRR with upcoming works in the Metro and Gippsland regions.

The Operational Telephony Network replacement initiative will encompass the entire system, motivated by both technological obsolescence and the necessity to comply with regulatory requirements.

For other communications systems, including Radio, DIC, and WDM, the focus has been on replacing older models that have been progressively phased out over the past decade.

6. Proposed Program of Work

6.1. Approach

6.1.1. Risk

AusNet's asset management decisions within the transmission network are guided by a risk-based approach, ensuring alignment with our organisational risk appetite. For the transmission communication system, risk treatment required to achieve this over time involves replacement & maintenance activities. Justification for these projects are developed based on current risk and extrapolated risk.

The risk of each asset is calculated as the product of Probably of Failure (PoF) of the asset and the Consequence of Failure (CoF). This risk is then extrapolated into the future accounting for forecast changes in PoF and CoF.

AusNet's approach to asset risk management is detailed in REF: AMS 01-09 Asset Risk Assessment Overview.

6.1.1.1. Asset Risk Quantification Methods

Probability of Failure

The PoF forecasts for communications systems are calculated using Weibull distribution. The asset age and failure notifications are analysed using the Weibull distribution to models that determine the PoF for the remaining life of the asset.

Failure mode is the way in which an asset might fail. By identifying and analysing the various ways in which an asset can fail, including the mechanisms of failure, asset managers can better predict and mitigate the probability of failure. This understanding allows for a more accurate definition of maintenance tasks and measurements to be taken. Assessing failure modes and utilising the detailed information about each mode plays a crucial role in various aspects of Asset Management Planning. Some notable failure modes for communication systems are detailed below.

Optical Fibre Cables

Cable Breaks: Most optical fibre cable runs are strung on electricity network poles and, where not practical, such as road crossings or major urban areas, the cables are run underground. The main cause of failure is cable breaks due to cars and trucks knocking down poles, pulling down cables that run across roads, or damage during excavations. Example: In urban areas, construction activities often lead to accidental cable cuts, disrupting communication services.

Jacket Degradation: Over time, the protective sheathing of optical fibre cables can degrade due to environmental factors such as UV exposure and physical wear. Example: In coastal areas, salt exposure can lead to faster degradation of the cable sheath, necessitating more frequent inspections and replacements.

Signal Attenuation: The signal strength can degrade over long distances, especially if the cables are damaged or poorly maintained. Example: Physical damage from construction work can lead to signal loss in urban areas.

Point-to-Point Radio Systems

Frequency Drift: Over time, radio systems may experience drift in their operating frequencies due to component aging or environmental factors. Example: High temperatures can cause frequency drift, leading to communication disruptions.

Physical Damage: Environmental factors such as high winds can physically damage antennas and other components. Example: A point-to-point radio system in an exposed area may suffer from misalignment due to wind, affecting signal quality.

Structural Damage: Antennas and supporting structures can suffer from physical damage due to environmental factors such as high winds or corrosion. Example: An antenna in a coastal area may corrode faster, compromising its structural integrity. Antennas experience damage due to breaks emanating from mounting failures, excessive mechanical stress due to wind or snow, and corrosion.

Telephony Technologies

Electronic Component Failure: PABX systems and other telephony technologies rely on electronic components that can fail over time due to aging or environmental factors. Example: A PABX system exposed to high humidity may suffer from corrosion of electronic components.

Software Obsolescence: Telephony systems may become outdated if software updates are not regularly applied, leading to compatibility issues and reduced functionality. Example: Outdated firmware in TMR units can lead to communication failures in emergency situations.

General Communication Systems Failure Mechanisms

Extreme Heat: High temperatures can affect the performance and longevity of electronic components in communication systems.

Heavy Rain: Prolonged exposure to rain can lead to moisture ingress, affecting the functionality of outdoor communication equipment.

Moisture: Moisture can cause corrosion and electrical failures in various components of the communication network.

Rodents: Rodents can damage cables and other infrastructure, leading to communication failures.

Consequence of Failure

AusNet assigns a monetised value to CoF which provides an economic basis of calculating potential consequence.

The cost of failure is assessed through three key lenses: Safety, Market Impact and Financial impact. These lenses provide a structured view of the potential impacts from communication system failures. Table 7 summarises the focus of each lens:

CONSEQUENCE LENSES	DESCRIPTION
Safety	Threat to health and safety of the public and employees
Customer / Market	Loss of Supply to Customer Impact on energy market
Financial impact	Asset replacement costs Emergency response

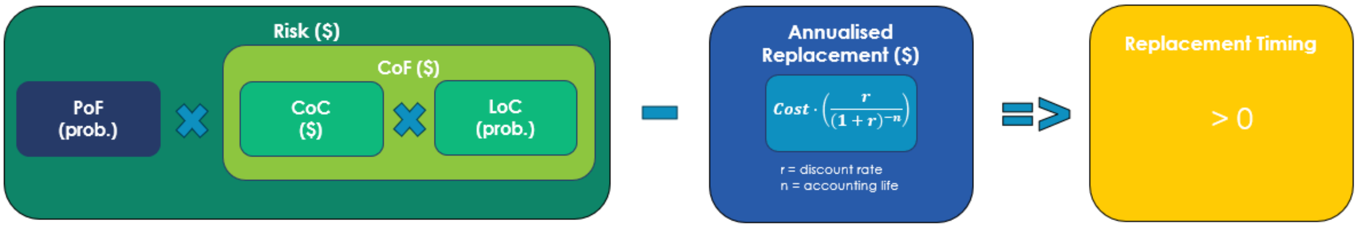
Table 7: Consequence lens description

6.2. Economic Viability

6.2.1. Economic Model

Asset Managers use the calculated risk based on PoF and CoF outputs to identify optimal intervention timing, balancing technical feasibility with economic efficiency. These outputs are incorporated into an economic model. The economic model demonstrates the year when the calculated annualised risk is higher than the annualised replacement cost, and as such when the asset becomes economically viable to replace. The concept is illustrated below.

The economic model is producing a structured approach for each asset in the fleet. The economic model for the justified replacement program is available in asset class economic mode REF: ANT – TRR 2028-32 Asset Replacement Economic Model – Transmission communication systems – Final



6.3. Engineering Validation

Following the generation of economic models and asset Weibull models, a structured validation process is undertaken by Senior subject matter experts. Steps are taken to align model outputs are interpreted within the broader context of engineering intervention options, operational experience, and current asset condition knowledge

SMEs assess whether the asset replacement or refurbishment or change in maintenance regime or no action are reasonably practicable choices. This involves verifying condition data, evaluating operational priorities, and considering strategic timing of interventions. Where appropriate, SMEs may recommend alternative actions based on their professional assessment.

This validation process complements the use of economic model. It supports a balanced and accountable approach to asset management, one that upholds technical integrity while remaining responsive to operational realities.

6.4. Proposed Program

As outlined in Section 5 of this strategy, projects aimed at maintaining communications equipment are primarily delivered through economic viability studies of assets. The key driver for these programmes is device and/or technology obsolescence, as advised by asset manufacturers and suppliers. Then scrutinised through viability studies

6.4.1. Replacement Criteria

The prerequisites for replacing assets:

CRITERIA	DESCRIPTION
Cost-Benefit Justification	Long-term cost savings through reduced maintenance and improved energy efficiency. Avoidance of reactive replacement costs during emergency failures.
Risk Mitigation	Proactive replacement to avoid catastrophic failure or unplanned outages. Supports business continuity and asset management strategy.
End-of-Life (EOL) Status	The asset has reached or exceeded its expected service life. Manufacturer has declared the product EOL, increasing operational risk.
Asset Obsolescence and spares management	The existing equipment is no longer supported by the manufacturer. Spare parts are difficult to source or unavailable. Firmware/software updates are discontinued.

Reliability Concerns	Increased frequency of failures or faults. Historical data shows declining performance or increased maintenance needs

Table 8: Criteria for replacement program

We are prioritising proactive replacement across different asset categories as follows:

6.4.2. Bearers

ADSS fibre cables

The focus is on replacing end-of-life ADSS cables, particularly those that have sustained repeated damage, resulting in a substantial increase in optical loss and reduced reliability. Table five articulates the replacement program of ADSS cables.

LOCATION	ASSET CLASS	FINAL QUANTITY
HTS-MTS	ADSS Cable	1
NPSD-YARR	ADSS Cable	1
YARR - BLTS	ADSS Cable	1
HTS-ROTS	ADSS Cable	1
TTS-BTS	ADSS Cable	1
Total		**5**

Table 9: ADSS cable replacement scope

6.4.3. PTP Radios

The priority is to replace older radio models that have largely been phased out over the past decade, with only a few units remaining in the network. This will significantly reduce maintenance costs. Additionally, 16 Ceragon IP10 links will be replaced to free up spares for the remaining fleet.

ASSET CLASS	EQUIPMENT TYPE	FINAL QUANTITY
Radio Link	[C.I.C]	5
Radio Link	[C.I.C]	3
	[C.I.C]	16
Total		**24**

Table 10: PTP radio line program scope

6.4.4. Network Technologies

The strategy is to replace a portion of end-of-sale/end-of-support equipment across each technology type to free up spares for the remaining fleet. Additionally, the rollout of MPLS-TP will continue, replacing legacy SDH technology.

Key considerations:

Network assets are interconnected in loops and at endpoints. Replacing a high-risk asset in a loop necessitates replacing all assets within that loop.

Similarly, replacing a high-risk terminal asset requires replacing all systems connected to it.

SDH and WDM assets are typically looped, so some low-risk assets will also be replaced.

Adjusted replacement quantities:

ASSET CLASS	FINAL QUANTITY
PDH	50
SDH	38
TPS	103
CWDM	10
DWDM	10
DIC	44
Total	**255**

Table 11: Network technology program Scope

6.4.5. Operational Telephony Network

The operational telephony network will be replaced across 39 transmission network sites. This network must be replaced in its entirety to support compatibility and reliability.

6.4.6. Facilities

Monitoring Systems

- Replace 11 monitoring RTUs at Radio Sites. The scope for this program is covered In AMS 10-68 Secondary Systems.

DC Supply Systems

- Replace DC supply systems at 7 Radio Sites. Condition assessment is covered in AMS 10-52 Auxiliary Power Supplies.

7. Asset Strategy

7.1. Bearer Strategy

- Facilitate a minimum of 2 independent communications bearers to each EHV Terminal Station site, in line with EHV plant protection scheme and NER regulatory requirements.
- In line with functional and regulatory requirements, selection priority for new and/or replacement communications bearers to be as follows (where economically justified):
  - Where applicable, establish and/or maintain a 3rd (independent) communications bearer to select transmission sites where excessive operational risk and repair/restoration times justify.
  - Where justified, install OPGW in conjunction with planned EHV ground wire replacement programs.
  - Install OPGW fibre on new EHV line construction or upgrades/refurbishments.
  - Upgrade end-of-life radio links to enable both native TDM and packet based (Ethernet/IP) communications traffic were justified as alternatives to, or supporting, other bearer options (e.g. fibre).
- Maintain and/or replace existing ADSS based on end-of-life and/or physical/optical condition degradation when economic.
- Identify ongoing suitability of digital Power Line Carrier technology for long distance (regional) power lines when requirements satisfy and other bearer alternatives cannot be justified.

7.2. Wireless Technologies Strategy

- Develop connectivity solutions that best leverages latest capabilities and advances in mobile network and IoT technology to enhance network visibility and operability.
- Migrate 4G wireless technology to equivalent (wireless) service when required.

7.3. Network Technologies Strategy

- Identify opportunities for Wireline Networks consolidation where feasible and justified
- Operational Data Network (ODN).
  - Continue the roll-out, development and optimisation of MPLS/packet network technologies as replacements for legacy and end-of-life TDM platforms (SDH & PDH) for mission critical interstation communications.
  - Install and/or replace WDM technologies to support MPLS roll-out program, enable on-going support and maintainability, and to mitigate fibre-core constraints in existing optical fibre cables.
  - Implement EMS and NMS capability for next generation (ODN) equipment in line with OSS strategy.
  - Establish next-generation interstation control and teleprotection type functions using packet-based type standards, including IEC61850, IEEE C37.118 etc.
- Operational IP-WAN/LAN Network (OPSWAN/OPSLAN).
  - Identify and standardise suitable network solution(s) that best enable & support ongoing growth and resiliency requirements in IP related connectivity and services at operational sites and installations.
  - Implement EMS and/or NMS capability for IP (OT) network equipment to enhance network observability and operational agility.

  - Upgrade user access control system for users and devices.
  - Replace end-of-life Routers, Switches and Serial Servers in line with next generation solution(s).
- Communication Design Standard shall be amended to support IEC 61850 applications within and between Terminal stations.

7.4. Telephony Technologies Strategy

Operational:

- Replace end-of-life Operational Telephony Network assets with suitable next generation solution that best satisfies operational (CEOT and Incident/Emergency Response) processes and requirements.
- Upgrade [C.I.C] CEOT Control Room Command & Console System to suitable supportable version to best enable 3rd party support and any uptake of latest platform features and enhancements.
- Enhance current CEOT telephony solution(s) to better support call prioritisation and crisis management.
- Identify options for use of [C.I.C]as alternative or addition to 'traditional' voice applications (i.e. vehicle mobile radio/TMR).
- Replace 'back-up' (to OTN) operational telephones at Terminal station sites from current 4G technology to latest equivalent alternative(s). (in line with NER requirements).

Carrier Services Strategy:

- Replacement of Carrier (or Telecommunications company) Gateway(s), identifying opportunities for consolidation, and enabling multi-telco and multi-network interoperability.
- Develop interoperation capability between operational (MPLS-TP) network and Telco links/services to maximise opportunities for network diversity where suitable and feasible.
- Migrate carrier L2/L3 data services in line with Telco service supportability requirements and demands.

7.5. Operational Support Systems Strategy

- Replace end-of-life network management systems hardware and software, including DR capability, in line with enterprise server architecture principles and system supportability.
- Existing supporting Telecommunications platform applications (e.g. NMS, EMS) to be kept current in line with vendor software version upgrades and associated vendor support framework.
- Replace existing overarching Telecommunications OSS capability (e.g. Netcool, Castlerock) to a supportable platform, while maximising opportunities to enhance OSS interoperability, cross-network/vendor observability and operational practices.

7.6. Supporting Infrastructure Strategy

- Replace batteries at risk of failure or satisfying regulatory system uptimes within the next five years – refer to AMS10-52.
- Enable extended back-up power capability through use of external diesel generator capability (or alternative technologies) to support uptime during extended (mains) power outages.

- Replace air conditioning systems based on (temperature) performance and asset condition – refer to AMS 10-55.

7.7. Security Strategy

- Align ICT initiatives with the NIST Cybersecurity Framework – Identify, Protect, Detect and Respond.
- Align with SOCI Act requirements to improve and enhance existing information and cyber security capability (in line with industry best practice) commensurate with the risk and potential impact.

8. Resource References

NO.	DOCUMENT TITLE
1	Electricity Safety Act 1998
2	National Electricity Rule
3	Station Design Manual
4	AMS 01-05 Strategic Asset Management Plan
5	AMS 01-09 Asset Risk Assessment Overview
6	AMS 01-09-02 Consequence Analysis - Addendum
7	AMS 10-52 Auxiliary Power Supplies.
8	AMS 10-68 Secondary Systems
9	AMS 10-55 Infrastructure
10	AMS 10-79 Line Conductors and Ground Wires
11	ANT – TRR 2028-32 Asset Replacement Economic Model – Transmission communication systems – Final

9. Schedule of Revisions

ISSUE NUMBER	DATE	DESCRIPTION	AUTHOR	APPROVED BY
0.1	23/09/2011	Initial 2011/2012 updates	[C.I.C]	[C.I.C]
0.9	13/11/12	ICT Review	[C.I.C]	[C.I.C]
1.0	20/11/12	Final for NSD editorial review	[C.I.C]	[C.I.C]
1.1	3/12/12	Final - Modified as per review comments	[C.I.C]	[C.I.C]
1.2	20/05/2015	Initial 2015 updates incorporating latest template	[C.I.C]	[C.I.C]
1.3	17/07/2015	Draft version for comment	[C.I.C]	[C.I.C]
9	16/09/2015	Final – Modified as per review comments	[C.I.C]	[C.I.C]
10	30/09/2020	Review and update	[C.I.C]	[C.I.C]
11	30/09/2025	Review and update	[C.I.C]	[C.I.C]

Disclaimer

Contact

This document is the responsibility of Transmission - Network Management Division of AusNet. Please contact the indicated owner of the document with any inquiries.

AusNet

Level 31, 2 Southbank Boulevard

Melbourne Victoria 3006

Ph: (03) 9695 6000

AusNet

Level 31
2 Southbank Boulevard
Southbank VIC 3006
T +613 9695 6000
F +613 9695 6666
Locked Bag 14051 Melbourne City Mail Centre Melbourne VIC 8001
www.AusNetcom.au

Follow us on

@AusNet
@AusNet
@AusNet.Energy

AusNet