AusNet Gas Services Pty Ltd

Gas Access Arrangement Review 2018–2022

Appendix 6L: Communication Systems Strategy – Public

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Communication Systems Strategy

Gas Network

2018 – 2022

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AusNet Services
Level 31, 2 Southbank Boulevard
Melbourne Victoria 3006
Ph: (03) 9695 6000

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Executive Summary

This strategy document outlines the various communications related assets, their condition and the strategies and related program(s) aimed to support AusNet Services gas network over the 2018 to 2022 period.

AusNet Services operates and maintains a range of communications assets and services to support the gas distribution network, including various private and leased point-to-point and last mile wireless and backhaul/network assets and infrastructure. This strategy covers field device communications assets that are related to the management and operation of the gas network and associated sites, primarily related to Supervisory Control and Data Acquisition (SCADA) applications and the remote control and monitoring of (gas) regulating stations.

AusNet Services' four Gas Network Objectives underpin the Gas Access Arrangement Review proposal for 2018-22 and therefore drive the strategic capital programs proposed for the communication system(s). They are summarised below:

1. Maintain Network Safety in accordance with the Gas Safety Case;
2. Maintain top quartile operating efficiency;
3. Undertake prudent and sustainable network investment;
4. Delivery of services valued by our customers.

The vision for AusNet Services' communication systems is to "connect our business", providing dependable fit for purpose communication capabilities that enable the management of our network(s) and assets.

Table 1: Financial Year Capital Expenditure to 2022

Program	2017	2018	2019	2020	2021	2022	Total
Replacement of Equipment on the Communication Network					$960.45	$960.45	$1,921
TOTAL Expenditure ('000)					**$960.54**	**960.54**	**$1,921**

1 Document Overview

1.1 Purpose

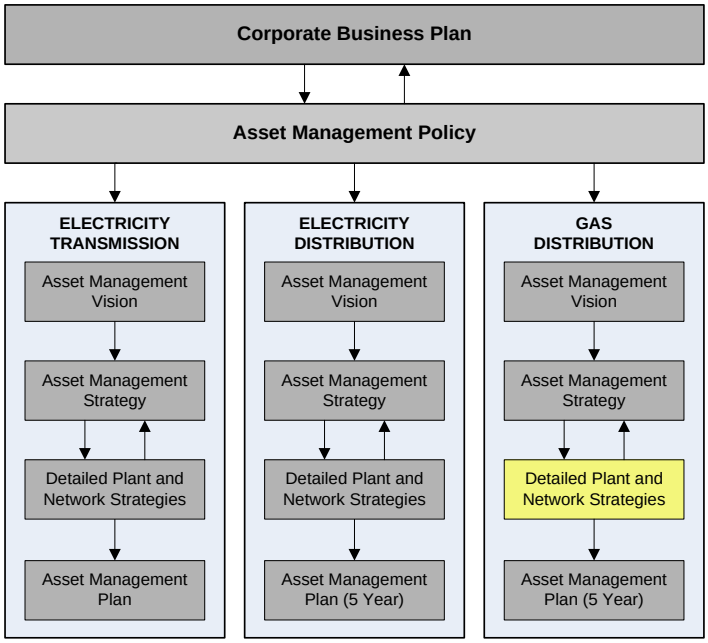
The purpose of this document is to provide an overview of Communications Systems assets and strategies in the AusNet Services' Gas network. The intended audience for this strategy is internal employees and external regulators; both economic and safety.

The Gas Communication Systems Strategy is one of a suite of plant strategies relevant to the planning, maintenance and operation of the AusNet Services' gas transmission and distribution network. Its objectives are as follows:

1.2 Relationship with Other Management Documents

The Communication Systems Strategy is but one of a number of asset management related documents developed and published by AusNet Services in relation to its gas distribution network. As indicated in the figure below, detailed plant strategies, in which the Gas Communication Systems Strategy belongs, informs both the Asset Management Strategy (AMS) and Asset Management Plan (AMP) of the required capital programs needed to achieve the long-term objectives of the gas distribution network.

Figure 1: Asset Management System document interdependencies



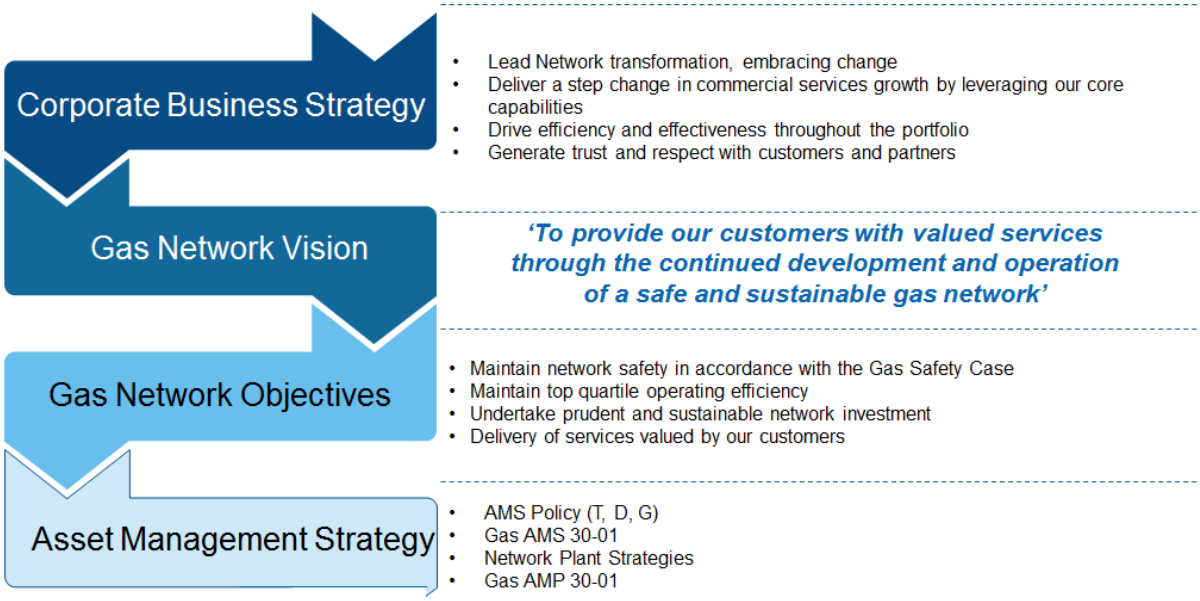
2 Alignment of AusNet Services Business Drivers and Objectives

AusNet Services' purpose statement is to "Empower communities and their energy future". This statement places the customer (as individuals and communities) at the forefront as a business driver and acknowledges the critical relationship with their energy supply and usage, and is a key theme throughout the Corporate Business Strategy. The following diagram provides the linkage between

Communication Systems Strategy 2018-2022

AusNet Services' corporate strategy, and the gas network vision consistent with providing valued customer service and sustainable network investment. The gas network objectives which stems from the network vision drives the development of the programs for each of the asset strategies

Figure 2: Alignment of Corporate, Business and Network objectives



The gas network objectives alignment with the business, regulators, and the delivery of plant strategies are detailed below:

Maintain network safety in accordance with the Gas Safety Case

Maintains the alignment to AusNet Services' commitment to 'Mission Zero'. The objective to maintain network safety is in recognition of AusNet Gas Services' current safety performance and design of the network.

Maintain top quartile operating efficiency

Aligns to the Corporate Business Plan with AusNet Services' aspiration to operate "all three core networks in the top quartile of efficiency benchmarks".

Undertake prudent and sustainable network investment

Alignment to AusNet Services' obligation to undertake prudent and sustainable network investment, as defined in the National Gas Rules and Gas Distribution System Code.

Delivery of valued services to our customers

Establishes the need to better understand our customers (their needs and behaviours) and deliver services they value.

2.1 References

This asset management strategy forms part of a suite of documentation that supports the management of AusNet Services' assets, which include the following:

- AMS 30-01 – Gas Network Strategy (2016)
- AMS 30-57 – SCADA Strategy – Gas Network, 2018-2022 (2016)
- Information Technology Plan FY 2016/2017 – FY 2020/2021 (2016)

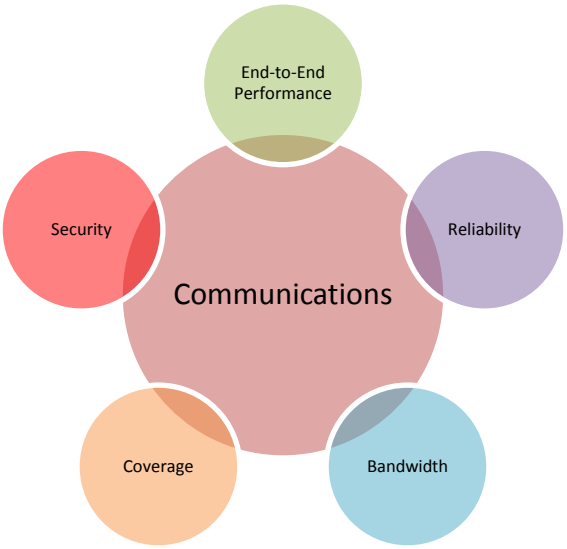
2.2 Glossary

Abbreviation	Description
3G	3rd Generation (mobile phone system)
4G	4th Generation (mobile phone system)
ACMA	Australian Communications and Media Authority
AMS	Asset Management Strategy
APN	Access Point Name
CEOT	Customer & Energy Operations Team
CWDM	Corse Wave Division Multiplexing
DWDM	Dense Wave Division Multiplexing
EMS	Element Management System
GPRS	General Packet Radio Service
ICT	Information Communication Technology
IED	Intelligent Electronic Device
IPMAN	Internet Protocol Metro Access Network
IPVPN	Internet Protocol Virtual Private Network
LTE	Long-Term Evolution
MPLS	Multi-Protocol Label Switching
M2M	Machine-to-Machine
NMS	Network Management System
NOC	Network Operations Centre
OSS	Operational Support Systems
PDH	Plesiochronous Digital Hierarchy
PSTN	Public Switching Telephony Network
P2MP	Point-to-Multipoint
P2P	Point-to-Point
RTU	Remote Terminal Unit
SCADA	Supervisory Control and Data Acquisition
SDH	Synchronous Digital Hierarchy
SIEM	Security Incident and Event Monitoring
TDM	Time Division Multiplexing
TMR	Trunk Mobile Radio
VOIP	Voice Over Internet Protocol
VPN	Virtual Private Network
WAN	Wide Area Network
WDM	Wave Division Multiplexing

3 Asset Overview

Communications services within the power utility industry have a range of technical and functional requirements, some of which are unique to the industry. In general, the requirements associated with those services are differentiated by five main criteria – reliability, (end-to-end) performance, bandwidth, security and (geographical) coverage (or service availability) as illustrated in Figure 3 below.

Figure 3: Requirements for Communication Systems



Communications in the gas distribution network is predominantly required to enable the remote monitoring and control of gas network pressures, communicating to remote SCADA devices (RTU outstations) that are strategically located at appropriate gas network asset locations. Specifically, the functions are:

- The monitoring of pressures, temperatures and (physical) security breaches at city gate locations;
- The sending of control commands to increase or decrease the pressure at pressure regulating stations;
- The monitoring of the gas network fringe pressure to ensure no decrease in pressure or loss-of-supply to end customers.

The loss of communications to the SCADA control devices at pressure regulating stations (for a given time period) will by design force the gas system into a “fail safe” mode, causing the station to automatically increase pressure to a pre-determined pressure setting. While this ensures a “safe” network pressure that will maintain supply and minimise the likelihood of the ingress of moisture/air into the gas pipelines, any ongoing short (“fluttering”) or longer term communications link failures will heighten the risk to both gas network integrity and public safety due to the increased likelihood of gas network freezing resulting in failure through gas leaks.

The current communications (data) services and technologies that support Gas SCADA and monitoring devices in the field consist predominantly of the following:

- Private (Narrowband) Radio
- 3rd party (M2M) mobile – GPRS, 3G

The choice and use of a particular service (either private or 3rd party mobile) is largely determined by the coverage (or availability) and cost of a service for a particular location. Most other requirements (i.e. security, performance, bandwidth) for gas network function(s) are satisfied by the various service options.

AusNet Services preferred communications strategy has been to leverage private communications capability, where available and applicable, to minimise the risk of longer term communications outages, particularly during critical/emergency system or regional events. Through this, AusNet Services is able to engineer a communications network that is highly available and reliable during both normal and emergency events, including extended electricity failures.

AusNet Services operational communications requirements, including those of the Gas transmission and distribution network, are provisioned by 3rd party services and dedicated private communications network infrastructure. This enables the delivery of a secure and dependable communications services for a range of asset monitoring, control and protection functions.

3.1 Asset Locations

The AusNet Services gas distribution communications assets are located in, and cover parts of western Victoria, allowing for the interconnecting of various remote gas sites to AusNet Services data centre(s) and control room(s).

In total, the AusNet Services gas distribution network operates communication related assets at approximately 230 different geographical locations, including modem devices located at gas network RTU locations (control and/or monitor of regulator/fringe sites), radio sites that include gas related communication assets and data centres that include gateway devices into the gas SCADA system (see Table 2).

Table 2: Gas Distribution Communication Asset Locations

Gas Communication Asset Locations	Quantity
Radio Sites	9
Data/Control Centres	2
RTU's (Control and/or Monitor Regulator sites, Fringe sites)	219
Total sites with (gas related) Communications Assets	230

3.2 Network Architecture Overview

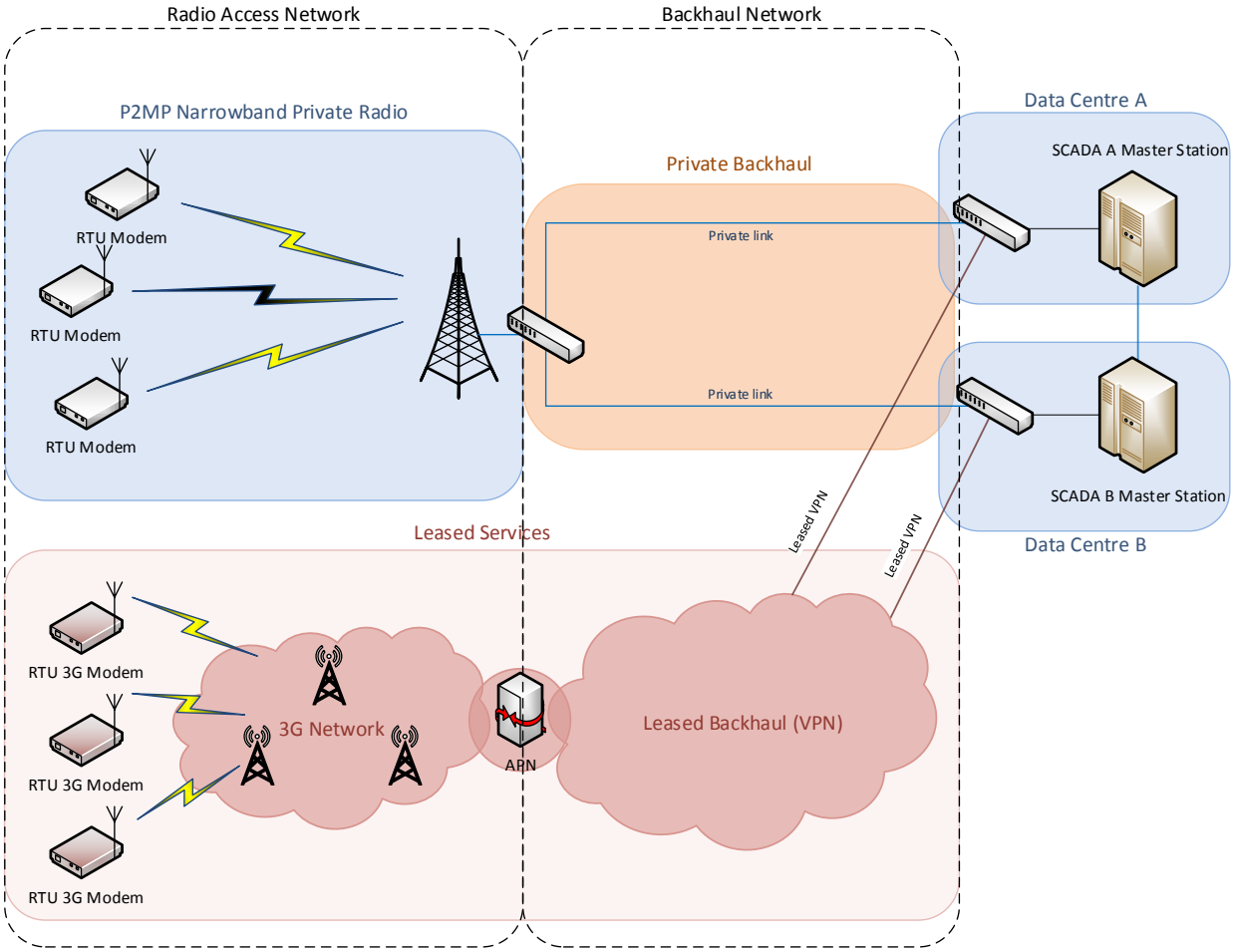
AusNet Services has a range of communications assets and services that are the communications enabler for the operation, monitoring and support of the gas distribution network (see Figure 2). These include:

- Radio Access Network (RAN) – providing “last mile” communications to remote field and intelligent devices, providing an access point through a base station or concentration point for backhaul to backend systems;
- Backhaul & networking – incorporates various telecommunications and inter-networking components that enable consolidated backhaul and switching/routing of various communication channels/devices to/from the RAN to the associated backend systems, users and applications (most typically at the data centres). This includes major bearer assets such as optical fibre cable and point-to-point radio links utilised by the active network elements;

In some remote regions where private communications coverage is more challenging (both economically and logistically), leased 3rd generation mobile telecommunications (3G) technology services (e.g. Telstra's Next G) have provided wider reaching coverage, enabling the leveraging of Telco (cellular) network infrastructure and services to best provide coverage to gas asset locations.

To accommodate higher availability, redundant backhaul links are required between the remote P2MP radio base stations to AusNet Services two data centres, at Richmond and Rowville, to bridge the gap between the P2MP radio network (that communicate the "last mile to remote RTU outstations) and the back-end SCADA master station system(s), databases and other condition monitoring applications. Backhaul to leased mobile services are provisioned via virtual private network (VPN) data links to both data centres from the Telco private network (e.g. Telstra's Next G network).

Figure 4: Gas Communications Network Architecture



3.3 Radio Access Network

The Radio Access Network comprises a range of wireless communications services and networks that enable wireless communications to the wider neighbourhood area outside of gas facility locations, and is predominantly used for the "last mile" of communications to a field device or asset. AusNet Services utilises the following wireless services/technologies for gas network devices:

- Narrowband Point-to-Multi-Point (P2MP) Private Radio
- Leased (3G) services

The private radio network utilises AusNet Services assets and locations (where applicable) to best provide wireless coverage to field located assets, and has proven to be of particular value in areas of high device concentration or weak 3rd party (services) coverage. Leased (3rd party) services are used to supplement this, through covering areas (and devices) where private radio is not feasible, or where there are black spots in (existing) private radio coverage.

3.3.1 Narrowband P2MP Private Radio

AusNet Services installed digital narrowband radio as part of an analogue radio and RTU replacement program in 2009. This was supplemented in 2011 with an additional base station (at Brooklyn) to accommodate the high concentration and growth of gas devices in the western Melbourne metropolitan area. The network includes 8 narrowband point-to-multipoint (P2MP) radio base-stations in total (as outlined in Table 2), each communicating on a 12.5 kHz channel in the 400Mz licenced spectrum covering a region of approximately 40km in radius (from the base-station). Depending on the RTU data requirements and SCADA polling methods, each station can accommodate up to 40 end-devices per base-station/channel. In total, there are currently 157 field gas devices communicating on the private radio network (see Table 3), demonstrating a marginal (organic) growth of approximately 20 devices in the space of 5 years.

All current private radio base stations are utilising existing AusNet Services sites and infrastructure, aiming to best leverage existing sites and assets to cost effectively provide communications capability to a maximum number of gas field assets.

Table 3: Narrowband P2MP Private Radio Assets

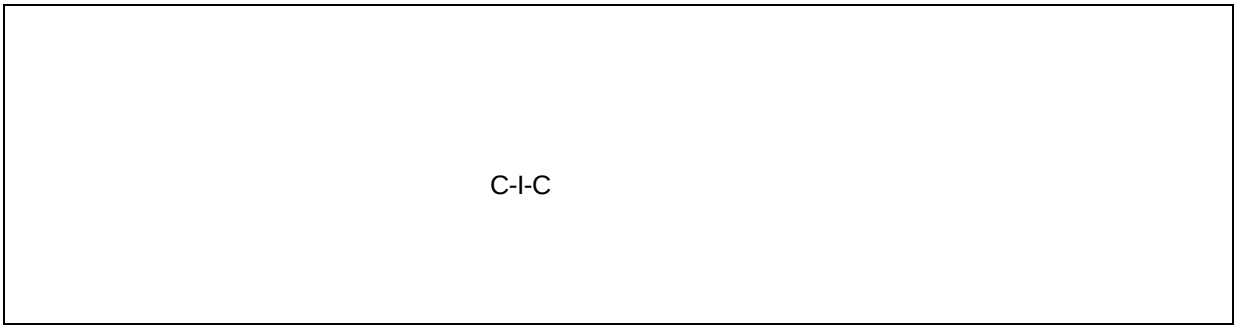
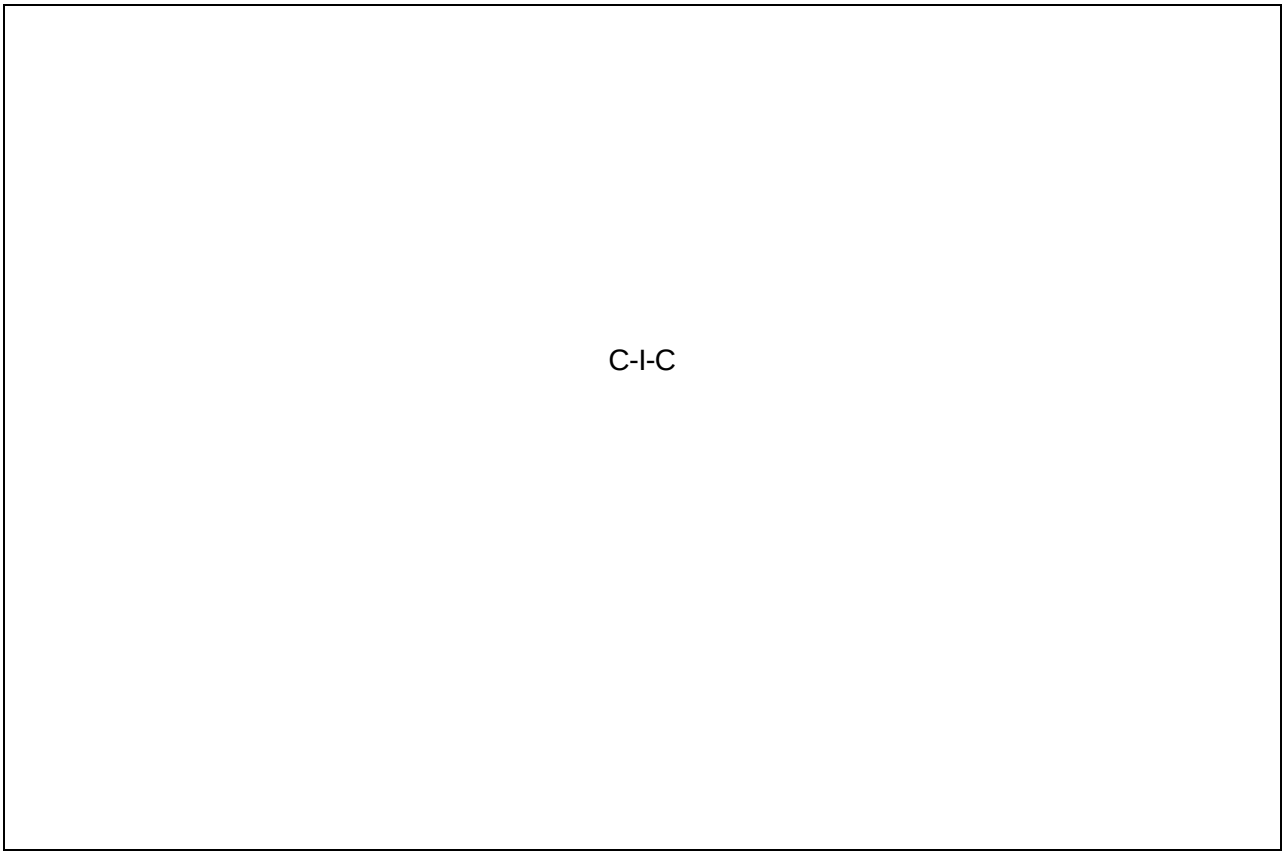


Figure 5 outlines the geographical locations of private radio base-stations (as outlined in Table 3) and their respective device location region that communicates to that base-station (as represented by the coloured polygon overlay). Overlapping coverage areas assist in high density device regions (that a single base-station cannot satisfactorily communicate) and enabling communications in coverage “black spots”.

Figure 5: Private Radio base-station and devices coverage regions



3.3.2 Leased Services

There are currently a total of 62 leased 3G services being utilised for gas network RTU field devices (see Table 4). 12 services previously utilising GPRS services in the Geelong area were migrated to 3G services as part of a program to satisfy Telstra's GPRS service discontinuation at the end of 2016.

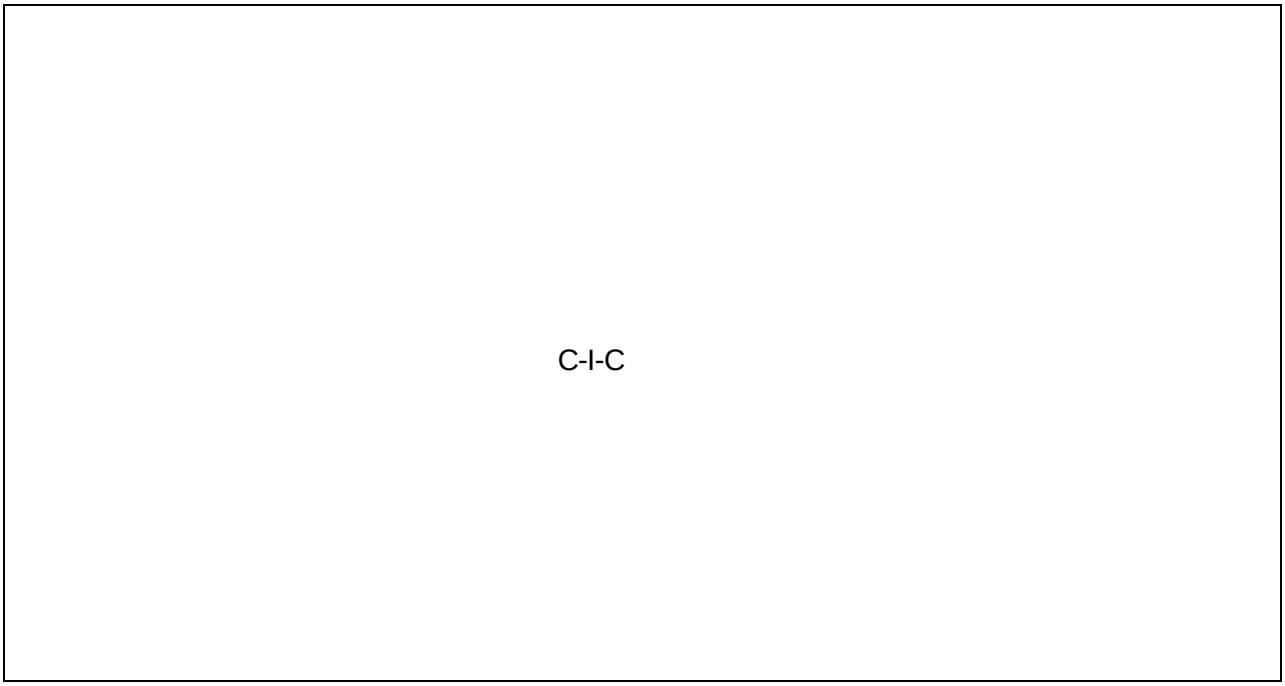
Table 4: Leased Services

Technology	Service Provider	No. of Devices/RTU's
3G	Telstra	62
GPRS	Telstra	0
Total Leased Services		**62**

There has been a growth in leased services (of approximately 24 sites since 2011) throughout the western region of Melbourne and Victoria (see Figure 6), reflecting the growth of the gas network and associated RTU devices and monitoring applications to the wider regions of state. Leased services continue to provide a valid alternative to private radio, particularly where (lack

of) existing AusNet Services communications infrastructure and/or coverage make private alternatives not economically feasible.

Figure 6: Leased 3G service locations



3.4 Backhaul Network

Backhaul networking provides communication links between the radio access network, which provides last mile communications to remote devices, and the hosting location of the back end applications, usually located in a data centre(s) (see Figure 2). AusNet Services data centres are located in two locations (Richmond and Rowville), enabling (site) redundancy and high availability. This typically necessitates backhauling of the network to the two data centre locations to enable failover capability.

For private radio backhaul, existing networking infrastructure provides dedicated backhaul channels, typically multiples of 64kbps capacity, from the radio base-station infrastructure back to the core data network which routes the channel(s) to either data centre location. The backhaul network consists of a range of technologies, including:

- P2P (narrowband) private radio
- TDM/Packet (wideband) P2P radio
- SDH/PDH multiplexers
- WDM multiplexers
- Terminal Servers
- Routers/Switches

Most private backhaul components in the core data network consist of existing network infrastructure that is for the prime use of the electricity energy network(s), but where feasible has been leveraged for gas network purposes to maximise efficiencies. There are 3 P2P private radio backhaul links that are solely for the use of the gas network, one at Bayview and two at Arthurs Seat, as outlined in :

Table 5: Backhaul network assets

Technology	Link	'A' end site ID	'B' end site ID	Spectrum	Freq	B/W	No. of
Narrowband P2P Private Radio	Bayview-MLTS	48074	47904	Licenced	450MHz	25kHz	1
	Arthurs Seat-TBTS	12122	305385	Licenced	450MHz	25kHz	2

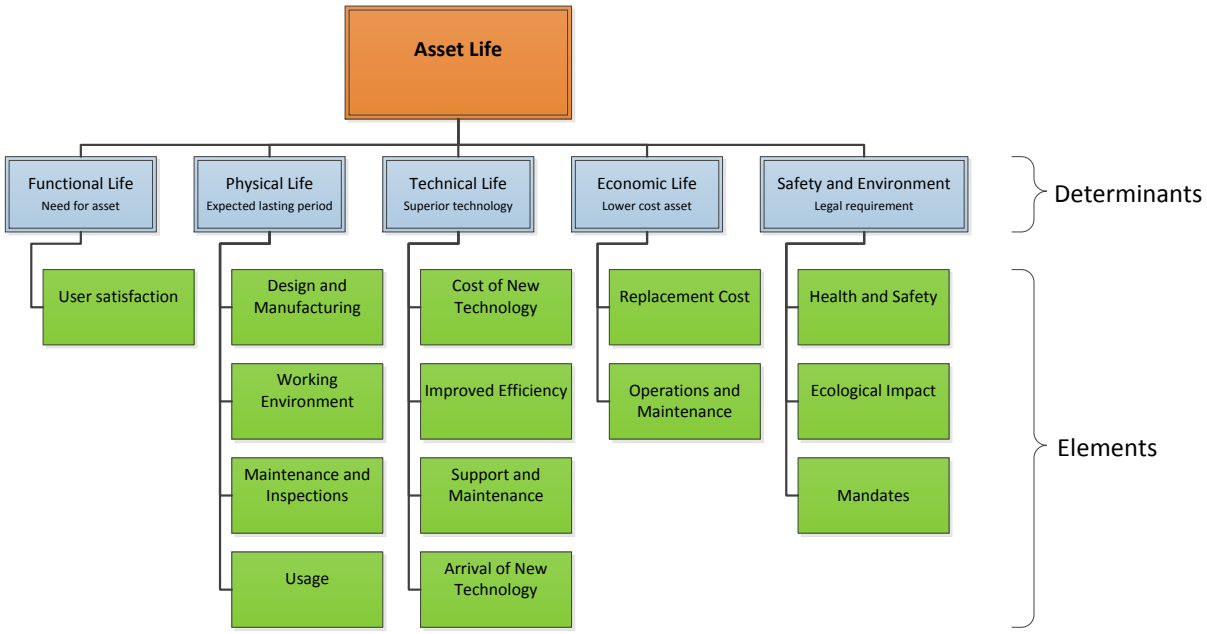
Leased IPMAN/WAN services into data centre gateway routers (e.g. routers) provide backhaul for the leased (3G) services, enabling routing of traffic to/from 3G end-devices/modems via a APN (Access Point Name) gateway to a dedicated virtual private network (VPN) for Gas SCADA devices (see Figure 4). The APN enables all end-devices to securely authenticate and access the VPN and the master station application.

4 Asset Condition

There are five determinants that govern the life of an asset; functional life, physical life, technological life, economic life, and safety and environmental life. Each determinant is represented by a set of elements as shown in Figure 7.

The condition score rating provides an indication of proximity to end-of-life (EOL) for individual assets as opposed to degradation that can be dealt with by maintenance. The Asset Condition Score (ACS) rating is calculated using values derived from individual elements.

Figure 7 Determinant and Elements of Asset Life



4.1 Determinants and Elements

Functional Life
Functional life is defined as the period over which the need for the asset is anticipated. User satisfaction is the element used to measure functional life.

Physical Life
Physical life is viewed as the period over which an asset is expected to physically last from the time of operating as new to a status in which it can no longer be used in the normal operating state. The elements that influence the physical life of an asset include; design and manufacturing, working environment, maintenance and inspections, and utilisation.

Technical Life
Technical life is the period until technological changes driven by innovation and product development dictates replacement to an alternative. The elements of this determinant include cost, efficiency, asset support, and introduction of new technologies.

Economic Life
End of economic life is reached when the cost of maintaining an asset becomes greater than getting a new asset. The elements of economic life include acquisition cost, and operating and maintenance cost.

Safety Ecological and Legislation
This is the period after which legal requirements stipulate end-of-life due to safety, ecological obligations or government legislation. Safety, ecological, and legislation are external factors which directly affect asset life.

Table 6 Description of Condition Scores

Condition	Description	Expected Lifetime
C1	– Some aging or minor deterioration of a limited number of components – Normal maintenance	More than 10 years
C2	– No trends of deterioration in condition or performance recorded – Normal maintenance	7 – 10 years
C3	– Asset showing signs of deterioration in performance – Manufacturer support is becoming limited – Asset typically requires increased maintenance and monitoring	5 – 7 years
C4	– Serious deterioration of asset performance – Manufacturer support and spares is typically not available – Start planning process to replace considering risk and consequences of failure	Less than 5 years
C5	– Extensive serious deterioration of asset performance – Manufacturer support not available – Depleted stocks of spares – Lack of experience and skills required to maintain asset – Immediately assess risk and replace based on assessment	End-of-life

4.2 Radio Access Network

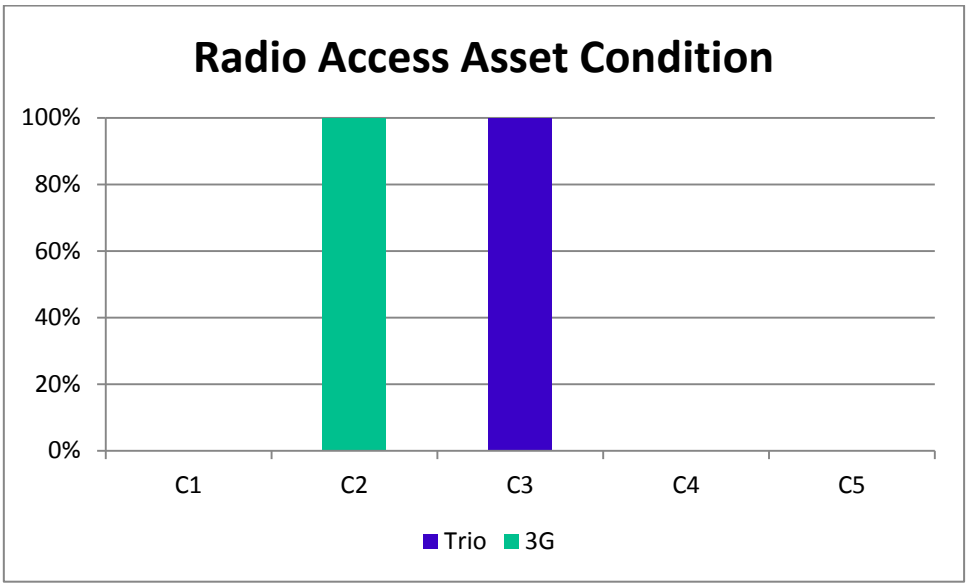
4.2.1 Narrowband P2MP Private Radio

The AusNet Services Point-to-Multipoint (P2MP) radio equipment is manufactured by Schneider Electric (Trio). The model currently in service at remote locations is the E-series ER45x, while the base-station units are E-series EB450. All E-series devices have gone end-of-sale (EoS) as of late 2015. The vendor will provide fix/repair support for the E-series for another 7 years after EoS, taking vendor support to approximately 2022. There are currently no significant population failures or other asset condition concerns, or associated spectrum changes or constraints.

The Trio Q-series was released by the vendor in 2014, and has been recommended by the vendor as the next generation replacement. The Q–series are backward compatible with E-series base-station (in backwards compatibility mode), with initial Q series spares being purchased to enable ongoing field fix/repair when required. Q-series features and capability cannot be run concurrently from the base-station when running in backward compatibility mode (for E-series end-points), meaning any feature uplift would require an uplift of the entire end-device population (to Q-series) to enable capability.

The current E-series end-devices are categorised condition C3 (average) given the end-of-supply status and the compatibility of later generation Q-series devices in the event of increased E-series population failures (see Figure 8). It is expected that a wider population replacement program will be required (prior to 2023) to replace the remaining population of E-series end-devices and base-station(s), and to enable the leveraging of improved capability and performance of next generation technology.

Figure 8: P2MP Radio Access Asset Condition Summary



4.2.2 Leased Services

The lifecycle management of leased service is largely dependent upon telecommunications service provider (service) termination dates, and AusNet Services' relies on timely notification of service termination dates/plans from the Telco provider. For more forward planning, service termination is estimated based on typical and/or historical (mobile) service lifecycles. Previous

planning estimates of GPRS service termination (announced by Telstra in 2014) provide some validation of this methodology.

Since the migration of GPRS services to 3G, all current gas related (field device) leased services utilise (Telstra) 3G technology. The end–devices are 3G compatible Wavecom or Cybertec modems. There are currently no short to medium term concerns for the service life of 3G or the end-device (3G modem) assets. However, given the introduction and uptake of 4G (LTE) technology, and the likely future (3-5 year) introduction of 5G technologies to support growing bandwidth demand in the (mobile) network, the 3G network is likely to become end-of-life within 5-7 years. 3G services/assets are currently categorised as C2 (good) for these reasons (see Figure 8).

There is expected to be a growing uptake of 4G services in the network, in parallel with private and 3G network devices, in line with the growth of the Telco 4G network(s) as GPRS services are replaced and new 700MHz spectrum is more widely utilised. 4G services utilising the 700MHz spectrum (marketed as 4Gx by Telstra) are expected to provide coverage benefits over higher frequency alternatives, thus potentially providing access to previous communications “black hole” regions. The utilisation of more recent network technologies (e.g. 4G) will likely also maximise the future supportability of the services/devices.

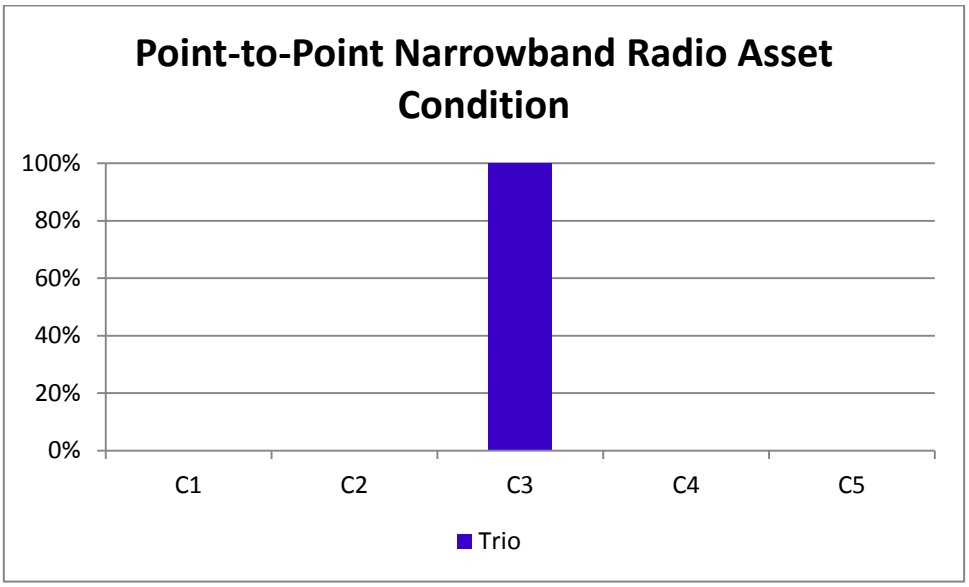
4.3 Backhaul Network

4.3.1 Point-to-Point Narrowband Radio

The Point-to-point narrowband backhaul links utilise similar E-series radios from Schneider Electric (Trio) – EB series for Bayview-Moorabool, and ER series for Arthurs Seat-Tyabb. The EB and ER series P2P radios are the same units as used for remote end-point and base-stations in radio access (as above), but used in point-to-point backhaul mode, These units have similar end-of-sale and support constraints that apply to all Trio E series radios (as articulated above).

These radios have also been classified as condition C3 (see Figure 9), similar to other E-series devices currently in use. Fix and repair will be based on leveraging existing E-Series spares and/or leveraging current generation Q-Series devices and their backwards compatibility (with E-Series devices). These devices are expected to be replaced with current generation alternatives, in line with a complete E-Series upgrade/replacement program.

Figure 9: P2P Narrowband Radio Asset Condition Summary



4.3.2 Other backhaul infrastructure

Other backhaul networking components and systems leveraged (but not owned) by the Gas network, including TDM/Packet (wideband) P2P radio, SDH/PDH and WDM multiplexers, will be incorporated under other network asset management strategies and programs.

5 Asset Management Drivers

Asset management 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 Technology issues and drivers

5.1.1 Technology/Service Lifecycle

Due to advancements in the communications capability of technology and the vendor cost for maintaining multiple products, vendor product lines are replaced from time to time with more modern equivalents to support newer capabilities and functionalities. It is typical for vendors to provide a staged approach to product obsolescence, with a period of on-going vendor service/support post end-of-sale (last buy) announcements, the length of which may differ dependent on the technology and/or vendor. Similarly, for telecommunications services (e.g. 3G), service discontinuation is typically announced to customers between 12-24 months prior to service disconnection/discontinuation.

Vendor product end-of-support is seen as a key influencing factor in communications asset condition and lifecycle management. Adequate and satisfactory support and supply of spare parts from vendors and manufacturers on an ongoing basis is deemed as critical to the communications network in order to guarantee the required level of serviceability, availability and security.

Trio E-Series devices are end-of-supply (as of 2015), with the vendor specifying an on-going 7 years of service/support for those devices. Their replacement has to factor in any additional growth and capability that may be required in the network as more devices become communications capable (see below).

Similarly, the 3G network is projected to be decommissioned between 2020-2022, as 4G “Long Term Evolution” (LTE) and other technologies mature, requiring the transition of services and replacement of end-devices/modems prior to service disconnection.

5.1.2 New applications, growth

On-going growth in communications capability to remote field-devices and assets is expected as asset replacements and organic network growth introduce inherent embedded technology and inter-communicating capability, enabling new functionality and asset/network intelligence.

Specifically, the gas network would benefit from greater visibility and control of network pressures and asset condition to improve network performance, system control and maintenance. Other network drivers include:

- Greater penetration of distributed generation (e.g. cogeneration) to support customer energy demands;
- More extensive use of remote metering;

The relative ease and cost in enabling communication to smart devices will be paramount in fully realising and leveraging the value of information/capability embedded in intelligent devices within the gas network.

5.1.3 Coverage

The dispersed nature of remote devices over a wide (and sometimes remote) geographical area presents some coverage challenges for reliable and consistent wireless communications capability. This is a particular challenge as network intelligence extends more to the fringes of the (gas) network where wireless network coverage is not as accessible.

While private narrowband radio can provide a means to economically establish network coverage to (a low density of) devices over a relatively large geographical area (up to 40km in radius), wireless signals and propagation are still impacted by environmental factors and obstructions that can impact coverage and performance within a given area.

3G (and until recently 2G) services have been used as an alternative, particularly where private radio cannot be reasonably justified and where Telco mobile coverage is quite extensive. The Telco rollout of LTE (4G) networks, and the more recent 700 MHz (spectrum) network (marketed as “4Gx” by Telstra) has introduced further service alternatives (over 3G and private radio) that could provide enhanced coverage capability to remote field devices.

Satellite services can provide the extended coverage required in some instances, but challenges associated with higher upfront and ongoing (service) costs limit its viability for large scale use and uptake.

5.1.4 Cyber Security

Security threats to critical infrastructure may arise from “hostile governments, terrorist groups, disgruntled employees, malicious intruders, complexities, accidents, natural disasters as well as malicious or accidental actions by insiders”[1] according to the US National Institute of Standards and Technology (NIST). Recent reports indicate that Cyber-attacks on Industrial Control Systems (ICS) are increasingly prevalent, with a high proportion targeting the energy sector. In 2012, ICS-CERT (Industrial Control Systems Cyber Emergency Response Team) reported that 41% of cyber-security incidents across critical infrastructure sectors involved the energy sector.[2]

For AusNet Services this poses the challenge of building sufficient resiliency to withstand cyber-attacks that may impact the integrity of systems and services required for the transmission and distribution of energy and/or power in an increasingly threatened and sophisticated information security environment. Threats targeting personally identifiable information present similar challenges in maintaining the confidentiality of customer information and securing communication with customers appropriately to protect financial and reputational interests of AusNet and its customers.

[1] National Institute of Standards & Technology, Cyber Security Framework for Critical Infrastructure, USA, 2014
[2] Industrial Control Systems Cyber Emergency Response Team, ICS-CERT Monitor (Oct-Dec 2012), USA, 2012

6 Asset Strategies

6.1 Radio Access Network Strategy

- Where feasible and economic, leverage existing assets and communications network(s) to extend service coverage in line with gas network requirements and growth;
- Develop new 4G service technology solution(s) to best leverage next generation (wireless) capability, coverage and service/asset life;
- Manage end-device (modem) failures/replacements (Trio E-Series, 3G) with either (dependent on network coverage and performance):
    - backwards compatible Q-series devices;
    - 4G modems;
- New end-devices should, where feasible, leverage next generation 4G or private radio (e.g. Q-Series) services/devices (dependent on network coverage and performance) to maximise future supportability and capability;
- Replace (remaining) population of E-series radios (end devices and base-stations) prior to end-of-support date (2022) to minimise risk of technology disruption and leverage newer generation technology capability;
- Transition (remaining) 3G services to next generation service alternatives (e.g. 4G or private radio) prior to service discontinuation;
- Establish security incident and event logging capability into the SIEM platform for (new and existing) end-devices at time of replacement;

6.2 Backhaul Network Strategy

- Where feasible and economic, leverage existing assets and communications network(s) for data backhaul to enable inter-networking of remote (gas) network devices (e.g. SCADA, remote monitoring etc.);
- Manage device failures/replacements of Trio E-Series P2P narrowband radios with existing (or reclaimed) E-series spares;
- Replace Trio E-Series P2P narrowband radios prior to end-of-support date (2022), in line with E-series end-device replacement program;

7 Alignment with Network Objectives

This section provides an overview of the alignment of the programs proposed in the Communication Systems Strategy with the gas network objectives which govern how the network is operated and maintained.

Table 7: Alignment of Communication Systems Strategies with Gas Network Objectives

Communications Systems Programs	Gas Network Objective			
	Maintain network Safety	Maintain operating efficiency	Undertake prudent & sustainable investment	Deliver valued services to customers
PTMP Radios	●	●	●	
TRIO Remote Modems	●	●	●	
NextG Modems	●	●	●	

Gas Network Objectives

Maintain network safety in accordance with the Gas Safety Case;

Maintain network safety in accordance with the Gas Safety Case;

- The proactive replacement of end of life of equipment reduces the possibility of asset failure, reducing the risk from a potentially unsafe environment.

Maintain top quartile operating efficiency;

- Maintaining a functional communication network ensures data from remote devices is delivered accurately and consistently which ensures that decisions regarding network operations are being made with accurate data.

Undertake prudent and sustainable network investment;

- End of life replacement eliminates assets that are expensive and difficult to maintain.

8 Detailed CAPEX requirements

8.1 Phasing and Financial Disclosure

All programs within the Communication Systems Strategy are defined in calendar years, consistent with the requirements of the GDSC, and the reporting requirements of the Australian Energy Regulator (AER)[3].
All financial figures quoted within this document, including all historic and forecasted expenditure - unless otherwise specifically stated - have the following characteristics:

Real Expenditure / Cost (reference year = 2016);
Direct Expenditure only (i.e. excludes overheads and corporate finance costs); and
In units of $1,000 (i.e. '000).

8.2 Program Overview

PROGRAM	Replacement of equipment on communications network
SERVICE DATE	On-going throughout period 2018 – 2022
LOCATION	Various areas of Gas Network
VALUE	$ 1,921k

2018	2019	2020	2021	2022	Total
$0	$0	$0	$960.45k	$960.45k	1,921k

This program of works addresses technologies related to multipoint (PTMP) radios, remote modems and third party wireless connection modems.

The Asset Health Report, which captures a snapshot of the condition of assets, identified that the communication network assets are in, general, good health. The assets fall in the C3 condition which means a remaining life of 5 – 7 years. It is proposed to initiate a program to replace the assets towards the end of the regulatory period 2018 – 2022.

To maintain the current level of availability and given the volume of assets on the network, this program proposes to replace the following group of assets:

PTMP Radios

- There are 14 base stations installed on the communication network
- 100% are in condition C3

TRIO Remote modems

- 158 modems installed
- The condition is not assessed in AHR-?? but change is driven by the change of base station

NextG Modems

[3] The AER requires notification of the outcomes of in-service compliance testing by 30 September each year. Both in-service compliance testing and meter replacement programs are defined, tracked and reported on a calendar year basis.

- 62 modems installed
- The condition is not assessed in AHR-?? but change is influenced by 3rd Party provider

8.3 Scope

The works will include:-

- Equipment design, installation and commissioning
- Transfer of services
- Update asset management systems with new asset data as part of completion of works

8.3.1 PTMP Radios

Replace radios at sites

- 14 new radios
- Decommission and remove old equipment

8.3.2 TRIO Remote modems

TRIO remote sites

- 158 new modems
- Decommission and remove old equipment

8.3.3 NextG modems

3rd party wireless sites

- 62 new modems
- Decommission and remove old equipment

8.4 Project Budget

	Quantity	Amount $
PTMP Radios	14	946,400
TRIO Remote modems	158	716,500
NextG Modems	62	258,000
Total		**$1,920,900**