Appendix 4C: ICT Strategy

2023-2027 Transmission Revenue Reset

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Position
Technology Leadership Team

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1 Table of Contents

2 Executive Summary

This Electricity Transmission Revenue Review (TRR) Technology Strategy outlines the strategic direction and forecast expenditure to deliver AusNet Services' information, communication and technology capabilities for the Electricity Transmission Network in the 2023-27 TRR period.

The technology strategy and program of work planned to be undertaken over the 2023-2027 regulatory control period have been prepared at a time in which the energy sector is going through unprecedented changes, in an environment of increasing uncertainty and complexity. The technology investments proposed are designed to enable AusNet Services to meet its regulatory obligations with regards to supplying fit-for-purpose electricity services to its Transmission customers. This includes making prudent investments to meet increasing demand on these services and to maintain the quality, reliability and security of supply of AusNet Services transmission network.

As well as ensuring AusNet Services complies with our changing regulatory obligations, this strategy considers the following key drivers:

- **Continue to respond to growing customer expectations** and implications for the transmission network, while improving and managing increasing customer service needs while still trying to reduce cost to serve.
- **Focus on new and emerging technologies** and how they will help solve issues and constraints which will exist in the transmission network. This includes utilising technology to maintain services sustainability during growth of our operations whilst supporting the adoption of new generation from renewables, batteries and two-way power.
- **Responding to increasing cyber threats** to maintain a safe and secure network and working environment, as new technologies enable increasingly sophisticated threats and heighten the risks of vulnerabilities in the transmission network.

In developing this TRR Technology Strategy, AusNet Services has considered how it performs in comparison to its peers with respect to technology costs, in alignment with AER expenditure criteria. The program of work aims to maintain our relative benchmarking position amongst our peers, particularly with respect to forecast capital expenditure with which AusNet Services aims to achieve our investment portfolio.

2.1 Priorities for the 2023-2027 regulatory period

What are our business priorities for the 2023 – 2027 period?

Our regulatory proposal[1] emphasises our priorities for the 2020 – 2027 regulatory period, which has been developed based on our review of both industry trends, regulatory requirements and business needs according to the direction provided by the Transmission Business Strategy (See section 4)

Through these collective sources, AusNet Services has identified several business drivers for the Transmission Business during the 2023-2027 period:

- Maintaining current service performance in a disrupted environment where risks are changing due to the increasingly complex nature of the grid;
- Updating and implementing new technologies to enable AusNet Services to respond to changes within the growing renewable generation market;
- Complying with new obligations; and
- Delivering improvements requested by our customers regarding sustainability and cost.

This will require us to:

- Implement solutions that will help maintain current services of managing the network as well as cater for increasing challenges such as congestion and reverse flows.
- Drive better value for our customers through effective technology solutions.
- Lower costs, and;
- Maintain reliability in a changing environment

What are our technology priorities for the 2023 - 2027 period?

Our Technology Strategy for the forecast regulatory period enables the business drivers above by focusing on the following technology priorities:

- **Improving customer outcomes** – investing in areas which will enable AusNet Services to best deliver tangible outcomes for customers across its business.
- **Cyber security enablement** – protecting our customers' and business information from cyber threats and attacks.
- **Leveraging and extending investments** – realising the full potential of investments by extending the life of core technology assets, working effectively with partners to reduce our ongoing costs and increase efficiency, and taking a cautious approach to prepare for the technology changes that are expected in the next period.
- **Be future ready** – cater for the increasing impact of renewable generation by investing prudently in solutions that enable network management, smart transformers and network operations optimisation.
- **Increasing digitisation and automation** – leveraging digital technologies such as cloud, automation, and mobility to increase agility and flexibility in the industry's increasingly disruptive environment.

What technology programs will deliver on our priorities for the 2023 - 2027 period?

Our goal for the forward period including the 2023 – 2027 regulatory period is to enable our transmission business to evolve and to respond to developments in the transmission space during the period. Our eight programs of work that span the regulatory period therefore reflect this required evolution and are split between two key categories:

- **Maintain Current Service levels** - These initiatives focus on investing in capabilities considering the disruptive environment to optimise and improve capabilities to maintain current service levels.
- **Enhance Capabilities** – These initiatives aim to enhance or build new capabilities for the organisation to address changes to the transmission landscape

Figure 2-1 Technology programs and key drivers

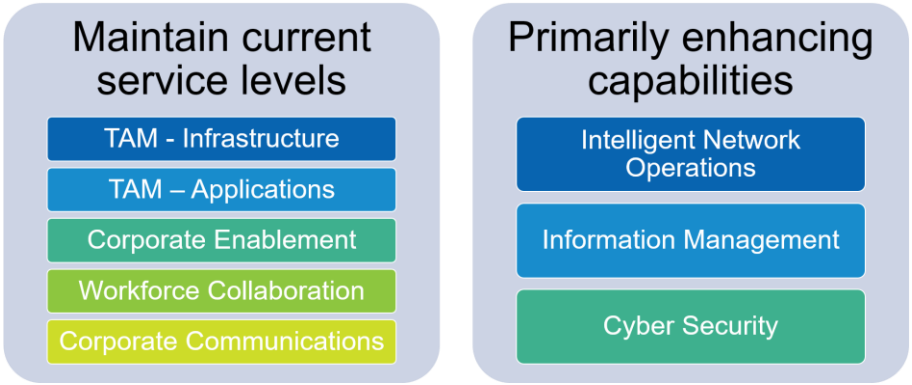


Table. 2-2 Technology programs & summary of outcomes to be delivered

Program	What will the Program achieve?	What are the anticipated outcomes?
Primarily maintaining current service levels in a changing environment		
Technology Asset Management (TAM) - Applications	Mitigate operational and security risks by ensuring AusNet Services completes lifecycle management activities on applications	Lifecycle management of applications including rationalisation and consolidation to maintain the overall integrity and stability of the network, optimise investment, mitigate risk and maximise efficient delivery of services and customer outcomes. i.e. Drawing Management and Protections Information
Technology Asset Management (TAM) - Infrastructure	Mitigate operational and security risks by ensuring AusNet Services completes lifecycle management and capacity management on infrastructure	Lifecycle management of Infrastructure in order to maintain up-to-date infrastructure, mitigating security risks and enabling more efficient Infrastructure performance to support AusNet Services solutions.
Corporate Enablement	Ongoing support and sustainability of core business systems for transmission and enabling an improved partner network across the enterprise	Continued refresh and extension of key systems which allow AusNet Services to complete business functions in an increasingly disrupted environment. e.g. payroll and HR functions
Workforce Collaboration	Enhance collaboration between AusNet employees and partners through modern technologies.	Enhance current employee capabilities making it easier to respond and deliver on customer requirements through enhanced Knowledge Management, an increase in automation and work collaboration and communication tools.
Corporate Communications	Mitigate operational and security risks to communication networks and resulting impacts on the ability to maintain reliable services in a more disruptive environment by mitigating O&S risks	Refresh communications capabilities and field mobility to leverage network and asset management investments, maintain service performance and reliability, and safety providing operational functions to the field.

Primarily enhancing capabilities		
Intelligent Network Operations	Maintain and develop current services for transmission in a changing environment	Increasing digitisation, automation and situational awareness – leveraging digital technologies such as cloud, automation, and mobility to enable our teams to 'do more with less' and focus on efficient delivery of services. This will enable transmission network oversight and operational management to effectively adapt to the more complex environment arising from numerous new generation being established in the network.
Information Management	Integrated enterprise asset information and analytics to support condition- and risk-based network investment and maintenance	Improved information management to increase access to information across critical processes. Given the expected increase information volume, this will support teams to manage information available to them to proactively and reactively complete their jobs.
Cyber Security	Proactively protect the organisation from cyber threats	Continued investment in information security to ensure the safety of customer information and to protect the electricity networks and business systems from cyber-attack. AusNet Services recognises that AEMO and industry guidelines indicate that compliance with level 3 of the Australian Energy Cybersecurity Capability Maturity Model ("MIL: 3") will become an obligation, which represents a significant investment in ensuring the security of our operations during the 2023 – 2027 regulatory period.

2.2 Forecast Technology expenditure for 2023-2027

Technology capex forecast

The forecast capex to deliver AusNet Services' technology program for the **2023-2027 regulatory period is $77.4M.** This represents a **3% decrease** compared to the approved allowance for the 2018-22 regulatory period.

Our forecast reflects a need to balance the expenditure associated with maintaining current operations, improving and protecting networking reliability with ensuring customer affordability.

The following figures detail the planned annual Technology capex in the upcoming regulatory period, broken down by initiative. The profile of total capex over the period reflects the underlying work plans, with many initiatives expected to commence in the first two years of the regulatory period, before settling to a reduced expenditure profile in the remaining years.

Figure 2-3 Proposed yearly capex by initiative for TRR 2023-2027

[C-I-C]

Figure 2-4 Proposed Technology capex by Initiative for TRR 2023-27

[C-I-C]

2.3 Building on the momentum from the current regulatory period

Our plans for the 2023 - 2027 regulatory period builds on the strategic direction and momentum from the current regulatory period, in which AusNet Services has focused on cautiously modernising our business capabilities in an uncertain and complex environment.

In the current 2018 – 2022 regulatory period, AusNet Services has:

- **Been cautious and prudent in technology investment -** AusNet Services has focused on reducing costs and improving effectiveness of technology, whilst establishing the foundations of a modern technology landscape.
- **Focused on the reduction of technology Opex** - We have implemented a new operating model which includes the outsourcing of major IT infrastructure and programs, with the objective of improving cost efficiency
- **Enhanced Information Management within the organisation** - Following increased internal business demand for improved data analytics, in conjunction with advancements in available technology, AusNet Services has enhanced existing capabilities and created opportunities to exploit data driven decision making.
- **Modernised the IT landscape** – By replacing the aged and end-of-life technologies such as ERP, data management, and other technology assets to reduce the likelihood of unplanned system downtime and outages and to provide new functionality to support process enhancement.
- **Maintained a secure environment –** AusNet Services has invested over the period to ensure the continued safety, resilience and reliability of the Transmission network. AusNet Services continues to consider security as a strategic imperative and is investing prudently to achieve MIL3 Compliance, which we expect will become a new obligation.

Technology OPEX forecast

In order to facilitate new capabilities for cyber security, as well as facilitate a transition to cloud- based systems in some areas and provide support and accommodate growth in data volumes associated with metering, we require three additional step changes.

Technology Step Change OPEX forecast

The following chart breaks down the step change required in Technology opex for the forecast regulatory period.

Figure 2-5 Proposed Opex Step Changes for TRR 2023-2027

[C-I-C]

Cyber Security opex step change

[C-I-C]

Table 2-6 Cyber Security opex step change

[C-I-C]

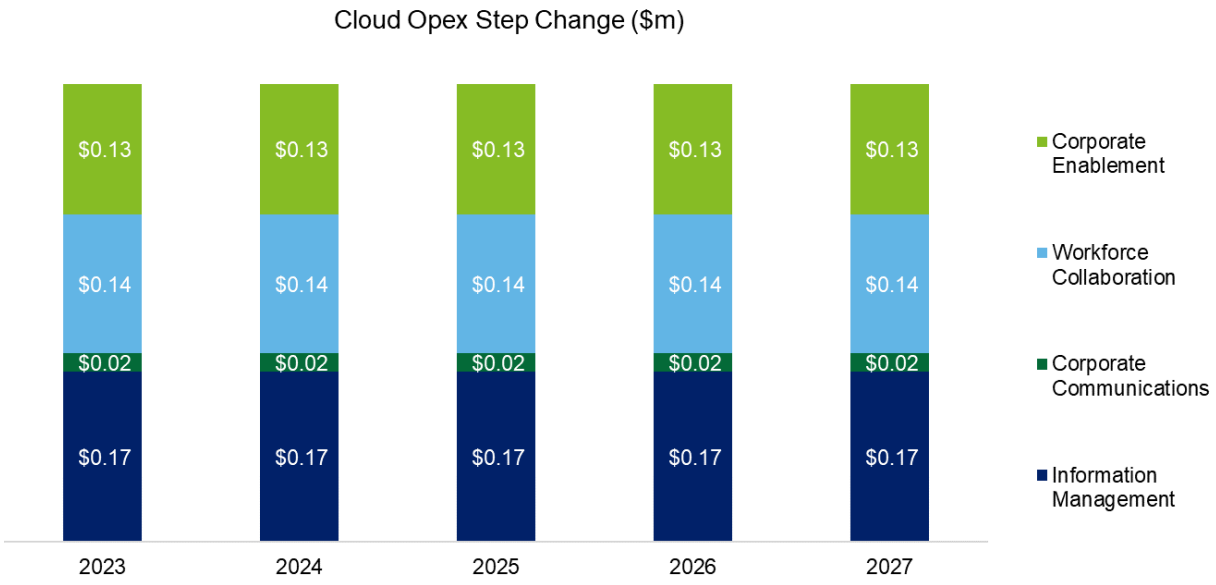
Cloud hosting opex step change

In preparing its plans for the forecast regulatory period, AusNet Services has undertaken analysis of transitioning its core systems infrastructure to cloud. As part of this, we have considered the relative costs of maintaining our current on-premise technology assets, compared to a fully cloud-hosted environment. It is AusNet Services' intention that the majority of existing infrastructure and data stores will not be retired or replaced by cloud solutions during the forecast period 2023-2027, to minimise costs for our customers. We will continue to evaluate how and when to take advantage of cloud services, particularly when our technology assets reach the end of their economic lives, to manage the risk and cost of transition.

In some cases, however, there are prudent opportunities to use cloud technology in specific areas to meet requirements for capacity, scalability or agility at lower cost than equivalent on-premise solutions. Our vendors also indicate that they will increasingly not support or maintain legacy on-premise solutions, and that all future versions of their applications will be cloud-based. This means that, to maintain currency and to enable cost effective decision making and risk mitigation especially in relation to vendor support for certain applications, AusNet Services needs to prepare for some transition to the cloud.

After a detailed review of affected applications, we have identified a need for $0.4M per annum of additional opex for cloud hosting. The following table outlines the specific systems and applications that are expected to require cloud hosting in the forecast regulatory period.

Figure 2-7 Forecast yearly Cloud Opex step change for 2023-2027 regulatory period



Corporate Enablement opex step change

AusNet Services continues to provide reliable service by ensuring ongoing supportability and sustainability of core business systems for transmission and enabling an improved partner network across the enterprise.

For the Human Resources and payroll management system, a requirement is for HR/Payroll Cloud Services as per vendor product roadmap. Our proposed opex step change includes $0.13M average per annum.

Table. 2-7 – Corporate Enablement opex step change

Technology Program	Cloud opex increase	Viable alternative solutions available	Justification
Corporate Enablement	Human Resources and payroll management	Only option is cloud-based as per vendor product roadmap.	It is more prudent and efficient to leverage the existing vendor product suite, by extending existing cloud-based capabilities implemented at AusNet Services, than invest in individual components of an alternative solution.

Workflow Collaboration opex step change

AusNet Services is to establish an integrated platform allowing for knowledge capture and transfer, improve mobility solutions to enable collaboration and remote and flexible work arrangements and improve automation and analytics capability across enterprise content management to enhance collaboration between AusNet employees and partners through modern technologies.

In alignment with our architectural principles, we will in most cases utilise our core ERP for business functions. In the case of knowledge management however, our ERP vendor only provides the service in cloud. By doing this it will be easier to respond and deliver on customer requirements through enhanced Knowledge Management, an increase in automation and work collaboration and communication tools. Our proposed opex step change includes $0.14M average per annum.

Table. 2-8 – Workflow Collaboration opex step change

Technology Program	Cloud opex increase	Viable alternative solutions available	Justification
Workforce Collaboration	Enterprise Knowledge Management Tool Project Portfolio Management	Only option is cloud-based. On-premise solution is cost prohibitive.	Collaboration products for organisations similar to AusNet Services are cloud-based. It is more prudent and efficient to leverage the existing vendor product suite, by extending existing cloud-based capabilities implemented at AusNet Services, than invest in individual components of an alternative solution.

Corporate Communications opex step change

AusNet Services is to uplift investment in corporate information and technology communication networks (OT and AMI comms networks are covered in their respective TRR submissions).

For Corporate Communications, Data Cloud Services is required to achieve outcomes to support cloud hosting for other applications and enhance communications capabilities to ensure network reliability and minimise customer impact. Our proposed opex step change includes $0.09M average per annum.

Table 2-9 – Corporate Comms opex step change

Technology Program	Cloud opex increase	Viable alternative solutions available	Justification
Corporate Communications	Communications required to support cloud hosting for other applications	Only option is cloud-based as per supplier service offering.	Extension to existing service provided by incumbent supplier, involving maintenance of links that connect AusNet Services' cloud presence to support applications. Additional costs are required for the full implementation processes including those of replacing the contact centre, type approval, reference designs and new technology integration development.

The increase in opex associated with cloud hosting will not be fully offset by capex reductions in the forecast regulatory period because of the decision to continue our on-premises infrastructure.

However, as the industry matures, we expect the proportion of on-premises and cloud applications to shift and future capex savings to be realised.

During the upcoming regulatory period, AusNet Services will assess the viability of cloud solutions and managed services to achieve desired business outcomes when it is prudent and efficient to do so.

There are also longer-term benefits of moving to the cloud, predominantly associated with increased agility and productivity. The key advantages with cloud-based systems as opposed to on-premises systems include:

- Greater back office effectiveness - provisioning on-demand means that it is faster to stand up new services for the business;
- Greater operational effectiveness - using more advanced development approaches, reduces complexity and streamlines processes; and
- Reduced expenditure on Technology infrastructure – taking advantage of the greater scalability and flexibility of cloud solutions.

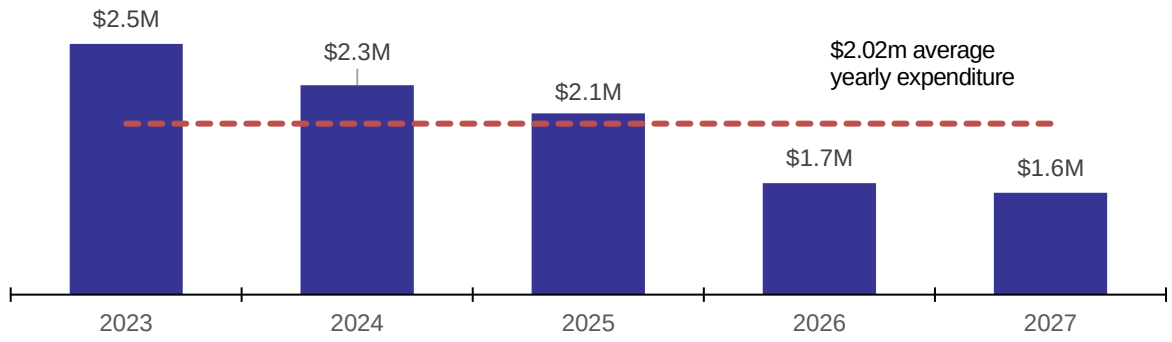
We will balance the risk and cost of transition to these services with these benefits over the next two to three regulatory periods as new cloud options emerge and our legacy technology fleet ages.

Technology project related OPEX forecast

For information, in the current regulatory period, the project related opex ('propex') forecast for Technology was approximately $1.8M per annum, which is the opex associated with implementing capital programmes, typically including data cleansing, data migration and change and training activities.

There is an increase in propex forecast over the 2023-2027 regulatory period, bringing the average yearly propex to $2.1M per annum. The following figure outlines forecast technology propex.

Figure 2-6 Forecast yearly propex for 2023-2027 regulatory period



3 Purpose of the document

The Electricity Transmission Technology Strategy sets the direction and defines an actionable technology program of work for the 2023 - 2027 regulatory period.

The Technology Strategy has been created to articulate and support the forecast technology expenditure required to manage AusNet Services' electricity transmission network for the forecast period and includes a discussion around the proposed capital expenditure (capex) and proposed operating expenditure (opex), as well as key drivers of this expenditure.

3.1 Scope of this document

The scope of this document is limited to:

- Technology solutions required to support AusNet Services' regulated electricity transmission business, including articulation of key programs and initiatives, their relevance to key drivers of expenditure, costs and benefits and key risks;
- Expenditure requirements in the 2023 – 2027 regulatory period; and
- AusNet Services' regulated electricity transmission business

This Technology Strategy is aligned to a number of other AusNet Services' internal and external documents, including:

- AusNet Services' Strategy;
- Digital Strategy and Technology Plan;
- Transmission Business Plan
- Technology Asset Management Policy;
- Forecasting, project delivery, operational services and cost allocation methodologies;
- Risk Management framework;
- Regulatory requirements
- Communications Strategy

All cost and benefit estimates provided in this document are, except where otherwise indicated:

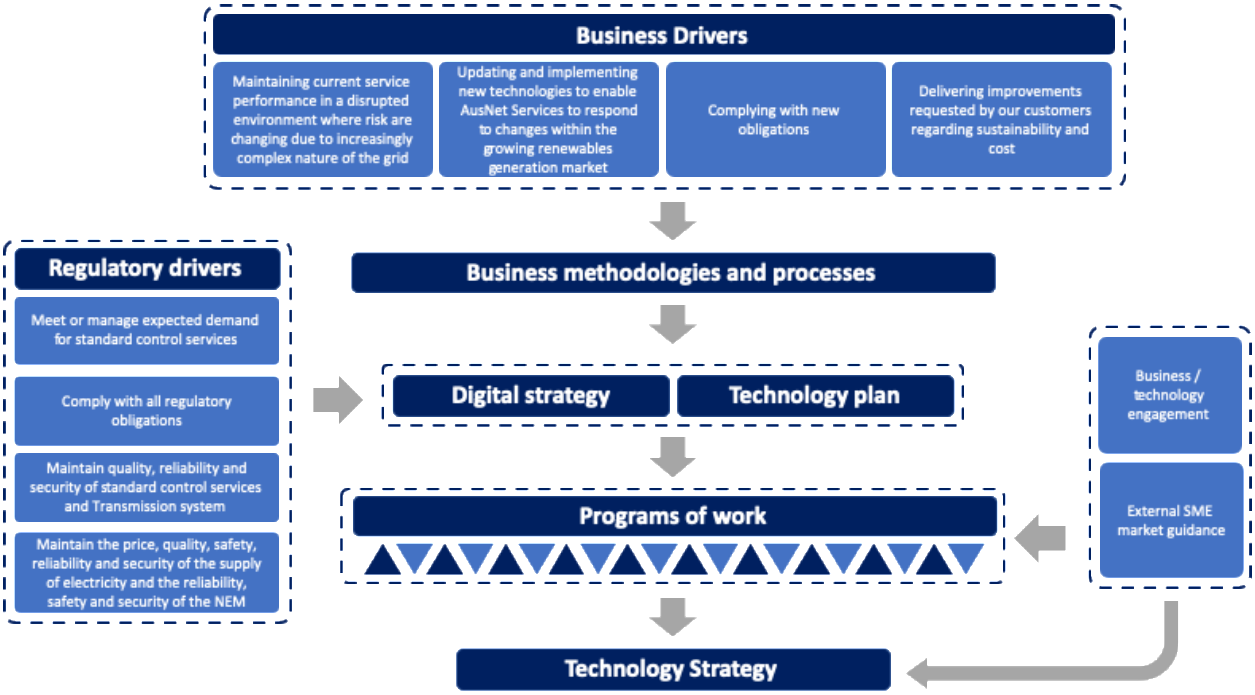
- Expressed in real 2020 Australian dollars and
- All dollar values refer to direct costs only (excludes overheads).

3.2 Approach to developing 2023-2027 expenditure forecasts

AusNet Services' Technology Division operates in a dynamic environment and is tasked with delivering technology to enable its business operations in a time where the utilities industry is experiencing significant disruption.

Developing robust forecasts for our investments over a five-year time horizon is therefore challenging and requires careful analysis.

Figure 3-1 Technology Strategy development methodology



To develop the specific programs of work and associated expenditure, the following steps were taken:

- Needs analysis to identify areas of the network and business processes that require investment over the upcoming regulatory period;
- Bottom up discussion with business and technology architects and delivery leads to develop options to address the investment need, including scope, key objectives, and drivers influencing the requirement for the programs;
- Consideration of different options to achieve the objectives of the program and analysis of their relative costs, benefits and risks; and
- Top down view to ensure that the Technology Strategy investment portfolio represents prudent and efficient expenditure for the upcoming period, relative to AusNet Services' previous expenditure and also benchmarked against other comparable transmission businesses.

AusNet Services has also ensured that costings across different programs of work have been consistently developed, for example, through using industry standard labour rates and applying consistent costing methodologies.

In developing our expenditure forecasts for 2023-2027, AusNet Services has considered:

- Macro industry and transmission trends;
- Key external drivers such as improved viability of alternative energy and digital technologies, new performance challenges and expectations;
- Key internal drivers including AusNet Services' corporate strategic objectives, business plans, needs and expectations, improving cyber security, cost efficiency and reliability;
- How transmission investment can be affected Customer expectations and how it can contribute to customer benefits;
- Changing role, importance and emergence of new technologies: AusNet Services is seeking to leverage digital technologies to improve its operational effectiveness in this increasingly complex environment. This includes but is not limited to smart devices, automation, data and

analytics, cloud computing, convergence of information and operational technology, and productivity tools for field and office workers;
- Cyber requirements: responding to increasing cyber threats to maintain a safe and secure network and working environment, and protect AusNet Services' information about its operations, customers and employees;
- Regulatory obligations: including the ability to comply with industry regulations and requirements in a timely and efficient manner, and to minimise current and future technology expenditure;
- AER Expenditure guidelines;
- The AER ICT capex assessment approach;
- Cost benefit analysis of solutions and options;
- Capital and operating expenditure requirements including the prudency and efficiency of these investments; and
- The expenditure across the current period.

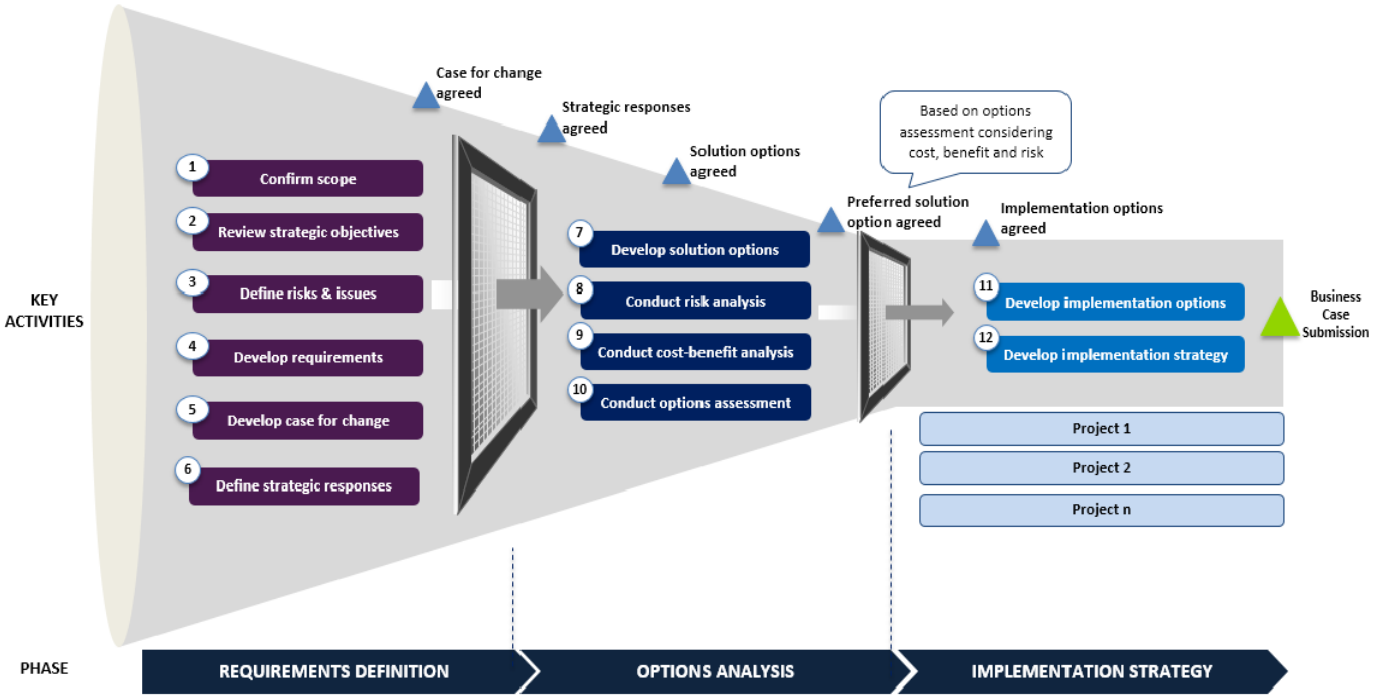
All relevant areas of the business have been consulted to obtain insight into key needs, trends and strategic direction. AusNet Services has also used external consultants, including Deloitte Touche Tohmatsu, and technology experts to provide industry benchmarks and budget estimates to validate the efficiency of our forecast technology expenditure. Our internal and external experts have also directly contributed to the development of this Technology Strategy.

Program Development

The methodology used to develop programs for the forecast 2023 – 2027 regulatory period is shown in the diagram below. The approach has involved three phases, each refining assumptions and challenging costs with the objectives of:

- Ensuring projects are correctly prioritised to ensure the business's ability to meet forecast demand for network services in this period, and
- Solutions have been described which deliver project outcomes in the most efficient way.
- Alternative options for each program have been considered and compared, and where the lowest cost solution is not preferred, the reasons for the choice documented. Options were developed and tested through workshops with AusNet Services' staff and Deloitte subject matter experts.
- The allocation of costs to transmission services follows AusNet Services' Cost Allocation Methodology and applies AusNet Services' established cost allocation principles in each technology program as reviewed by AusNet Services' staff and regulatory team.

Figure 3-2 – Program Development Process



Deliverability

The overall program of work for the period outlined in Section 6 ensures that the planned amount of project work at any one time is consistent with:

- Internal project management, architecture and management capability within AusNet Services' Technology organisation;
- Availability of third-party resources to supplement AusNet Services' capability; and
- Capacity of business users of Technology Services to contribute to requirements definition, and review and implement new tools.

This activity ensures deliverability of the overall work plan for the period.

Project management methodologies and processes have been revised during the current regulatory period and the successful delivery of programs, such as Transmission Intelligent alarms, to time and budget is evidence of our improved capability deliver our technology program to plan.

4 Drivers of technology expenditure 2023-2027

In the development of this Technology Strategy, AusNet Services has considered a number of key drivers including:

- Regulatory requirements
- Energy sector trends
- Technology and cyber security trends
- Business strategy, and
- Benchmarking.

Each of these drivers are explained in more detail below.

4.1 Regulatory requirements

AusNet Services' business and investment plans for how the transmission network is operated and maintained must reflect its regulatory obligations. This includes prudent and efficient management of the network. Achievement of the regulatory objectives ensures the long-term health and sustainability of the network.

These objectives are:

- Meet or manage the expected demand for network services over that period;
- Comply with all applicable regulatory obligations or requirements associated with the provision of network services;
- Maintain the quality, reliability and security of supply of network services; and
- Maintain the reliability, safety and security of the Transmission system through the supply of Prescribed services[2].

These objectives are in line with the capital expenditure objective and criteria under the National Electricity Objective (NEO) which is:

"…to promote efficient investment in, and efficient operation and use of, electricity services for the long term interests of consumers of electricity with respect to –

(a) price, quality, safety, reliability and security of supply of electricity; and

(b) the reliability, safety and security of the national electricity system."

Additionally, AusNet services investment during 2023 – 2027 will focus on maintaining quality and timeliness of data, as the amount of data AusNet Services collect increases significantly and may become important to the AER as a part of Regulatory Information Notices or other benchmarking activities required to regulate the market.

4.2 Energy Sector Trends

AusNet Services' acknowledges energy macro trends that are likely to affect technology investment in the 2023 – 2027 regulatory period. Three key trends that AusNet Services will need to respond to will be renewables becoming the 'new normal', the emergence of the Producing Consumer (Prosumer) and new transmission requirements.

[2] Australian Energy Market Commission (AEMC), (Feb 2015). National Electricity Rules Version 68 – Section 6.5.6

For transmission, this means tackling the problem of congestion due to increased two-way power flow, strategic planning of transmission infrastructure using the knowledge and learnings from COGATI and developments with the concept of renewable energy zones, and the implementation of smart technology to better manage assets, improve network performance and optimise the field force. The three key trends are described in further detail:

Renewables becoming the 'new normal'

By 2030, Victoria is targeting 50% renewable energy[3]. This significant increase in renewable generation will change the transmission landscape as AusNet Services move from large scale generation across a small number of sites, to new generation focused around renewables where the transmission lines was designed to serve load, rather than capability to support significant generation. With investment in the renewables space and a focus on decarbonisation, AusNet Services must plan to accommodate the change to network utilisation.

Additionally, batteries are poised to increase the attractiveness of variable renewable generation This will contribute to the efficient delivery of renewable generation. Batteries may also contribute to grid capability and stability.

New Transmission Requirements

Green energy is stretching Australia's outdated network of transmission lines. The renewable energy boom has resulted in electricity transmission infrastructure in regional Australia reaching capacity. In many cases, these areas are where the transmission network is at its weakest, with ageing power lines that were designed to transport electricity from centralised coal-fired power stations not distributed large-scale renewable generators. Australia's existing transmission infrastructure runs the risk of restricting renewable energy adoption and investment into the sector if new projects cannot connect to the grid. More generators than ever (especially renewables) are entering the market, changing the need to plan and build components of the network, creating new Transmission requirements for AusNet Services.

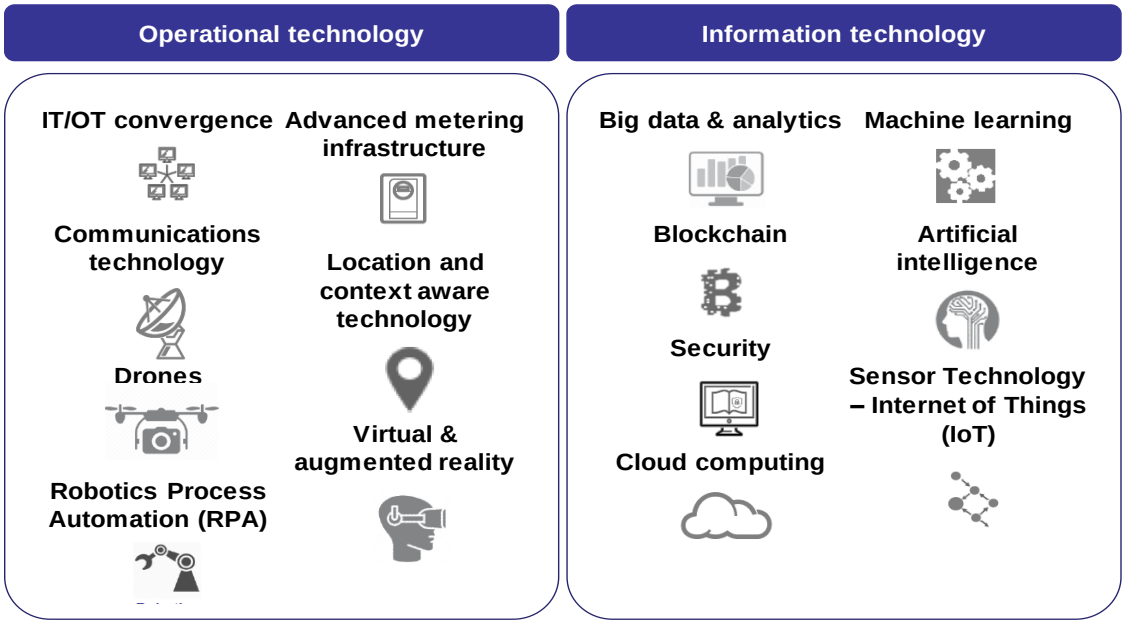
4.3 Technology Trends

Technology continues to evolve at a rapidly increasing rate and provides both new opportunities to increase customer satisfaction and improve the way AusNet Services operate, but also introduces heightened cyber security risks that need to be mitigated.

The figure below shows different types of technology trends categorised for both Operational and Information technology. Many of these technologies are not inherently new, but their application and/or widespread adoption has changed the way in which AusNet Services and others may leverage them.

[3] https://www.energy.vic.gov.au/renewable-energy/victorias-renewable-energy-targets

Figure 4-1 Different types of trends in technology[4]



We have identified a number of relevant trends to AusNet Services which, in combination with current pain points, will drive Technology investment going forward, including in the 2023 – 2027 regulatory period.

Automation

The profound increase in accessibility to data has drastically improved AusNet Services' ability to automate processes. Other industries have already begun investing heavily in automation as the benefits of automated processes result in significant process optimisation. During the 2023 – 2027 regulatory period, Automation will mature and become increasingly applicable to help optimise processes and reduce cost. Investing in advancing AusNet Services' technical maturity will bring new and improved benefits to the enterprise and customer segments as a whole through increased efficiency, reliability and reduced costs. For Technology, this means that our processes will increasingly shift to automation-based solutions, eventually resulting in more efficient, resilient, cost effective services.

In order to improve transmission network management, automation is a key enabler in achieving more efficient switching management as the network grows and becomes more complex. Automation also plays a key role in improving labour intensive tasks such as defects identification, line clearance requirements identification and asset identification, computer vision, LIDAR, photo capture and character recognition.

Cloud

Cloud hosted technologies are becoming more prevalent across all sectors of the economy, including the energy industry. Whereas in the past, technology systems were hosted on company premises in servers and other owned infrastructure, increasingly technology vendors are only making their products available via the cloud, or remote servers. Cloud hosting brings many benefits for technology systems, including greater scalability and flexibility, agility, and lower infrastructure costs. It can also drive greater

[4] FY19-23 AusNet Services Technology Plan.

staff productivity and reduce risks of owning infrastructure, through outsourcing. Migrating to the cloud comes with additional costs and risks. Ensuring AusNet Services is in a position to adopt cloud technologies means that AusNet Services can continue to maintain and refresh our Technology systems to incorporate new versions, and retain vendor support, critical bugs and patches, ensuring operations continue to run smoothly, with limited disruption supporting the continuity and reliability of supply. AusNet Services will time and sequence our migration to the cloud to balance the risks and costs of doing do against the benefits that it offers.

This trend is driving the need for AusNet Services to invest and implement cloud-based systems and services, such as networks, virtualisation, cloud security and new ways of working.

In the current regulatory period, AusNet Services embarked upon an Application Hosting Initiative (AHI) to address increasing maintenance costs for end of life equipment and increasing risks of equipment failure. Some of our data centre assets are at end of life and are no longer supported and maintained by vendors. These factors are contributing to an increasing cost of owning, operating and maintaining data centric infrastructure assets. The end of life assets must be refreshed in order to mitigate the potential business impact, security risks and to leverage more advanced software-as-a-service offerings. The AHI program will establish a pathway for AusNet Services to begin the journey to becoming cloud ready whilst also assessing likely candidates for cloud.

In the forecast 2023 – 2027 regulatory period, AusNet Services will continue the deployment of the AHI strategy and will move its services and data to the cloud where it makes sense, for example:

- Where costs are lowest;
- Where additional capability is needed (typically as a result of end of life of existing systems, or if there are additional regulatory requirements);
- Where vendors are only providing cloud solutions; or
- Where the cloud solution is a key enabler for other technologies such as analytics or automation (for example, our Information Management solution currently being developed is a cloud-based platform, detailed in this document within the workstreams section under Intelligent Operations).

For Technology, this means that our systems will increasingly shift to cloud-based solutions, eventually reducing our reliance on local data centres. Over the long term, as our data centres can be retired, it will also involve a shift from capex to opex when this demonstrates cost efficiency.

Information Management

The amount of data flowing through the organisation exponentially increases each year. Smart devices, switches and modern network assets deployed across the transmission network are creating larger, richer and more valuable data sources, which the business can leverage to better understand our operations, the proceeding diagram details many of the key advancements the business will leverage in the forecast regulatory period.

Figure 4-2 The implications of key focus areas for information management within energy transmission businesses[5]

Focus area	Impact	Implications
Future Grid	Asset protection	The business must upgrade distribution lines, transformers, and substations to include automatic switches and other intelligent devices. These technologies have many new advanced features. They can detect and report temperature, vibration, and more to evaluate asset health and capacity while anticipating maintenance requirements.
Assets	Create more value	Analytics supports more intelligent investments, when new assets are needed. Analytics technologies can help track asset performance. Detect operating conditions that could lead to failure. This allows the business to make smarter decisions on whether to repair or replace before a failure occurs.
Outage	Restore service and trust	AusNet Services performance during an outage has a major impact on relationships with customers and the regulator. Analytics can show how to deploy crews more efficiently on an as needs basis, anticipate storm activity, improve response to work orders, identify assets that are down and in need of intervention, etc.
Customers	Engage and understand	Analytics will help AusNet Services better understand end user demand, this will allow the business better manage, configure and optimise the network to ensure customer always have certainty of supply in line with their demand and prudently optimise expenditure on network upgrades and maintenance based on customer usage and network performance.
Finance	Meet business targets	Financial information is critical to shaping the direction of the business moving forward and ensuring prudent and efficient operations. Financial analytics combine internal financial information and operational data with external information to address critical business questions with ease, speed and accuracy. Finance at AusNet Services can leveraging analytics to anticipate revenue risk and optimise expenditure.

Cyber Security

AusNet Services' transmission network is a part of Australia's nationally critical infrastructure. The safety and reliability of electricity supply is integral to the lives of Victorians. As the complexity of the network and the scope of Technology to control and monitor the network grows, so too does the threat and impact of a cyber-attack. The proliferation, increasing decentralisation and interconnection of smart energy assets creates more entry points for malevolent actors to enter utility systems.

[C-I-C]

As a result, AusNet Services must ensure sufficient investment to comply with regulatory obligations under AEMO's Australian Energy Sector Cyber Security Framework (AES-CSF)[6],which will better protect critical assets and the ability to supply energy to customers, better protect critical data relating to customers and operations; and support ongoing development and measurement of cybersecurity capabilities within the organisation across People, Process and Technology.

[5] Deloitte power analytics, infographic, https://public.deloitte.com/media/power/power-analytics-infographic.html

[6] AEMO 2018 AESCSF Report

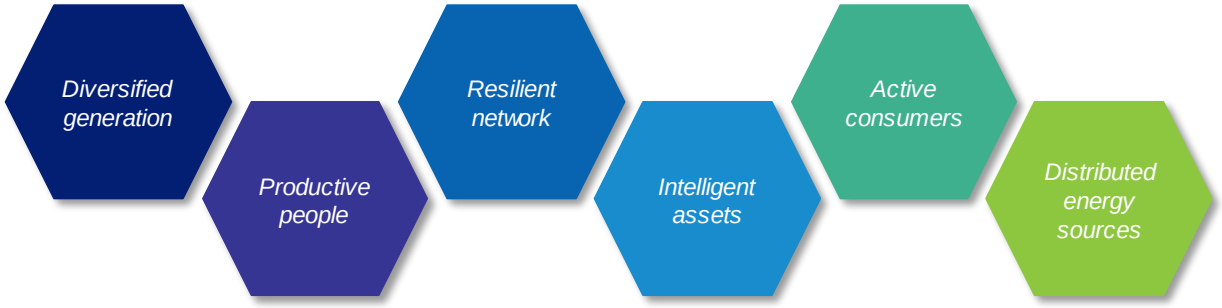
4.4 Business strategy

The development of this Technology Strategy aligns with AusNet Services' broader business strategy which focuses on three key pillars:

- Lead energy transformation, embracing change (e.g. through new generation management and smart technology devices utilising IOT)
- Drive efficiency and effectiveness throughout the portfolio (e.g. through workflow process automation and mobility enablement)
- Generate trust and respect with customers and partners (e.g. through personalised customer experience).

From a technology perspective, AusNet Services aims to transform into a modern, efficient and innovative organisation enabled through digital technology, becoming a utility of the future. This has been outlined in an internal strategy where six key attributes have been prioritised, as shown in the figure below.

Figure 4-3 – Six key attributes of a digitally enabled utility of the future



This transformation cannot be and is not limited to the Technology division of AusNet Services, so these attributes span across AusNet Services' broader business functions.

The transmission business plan aims to enable the "Transmission business to transition to a low-carbon energy future by establishing Victoria as the hub of the NEM, providing essential interconnection and security safe and reliable energy for Victorian customers and the NEM" It will achieve this through the Strategic Objectives outlined below in Figure 4-4. The AusNet Services' Transmission business has used these drivers to assess and ensure that technology investment is strategically aligned to the direction of the Transmission business.

Figure 4-4 Transmission Business Plan

[C-I-C]

4.5 Benchmarking

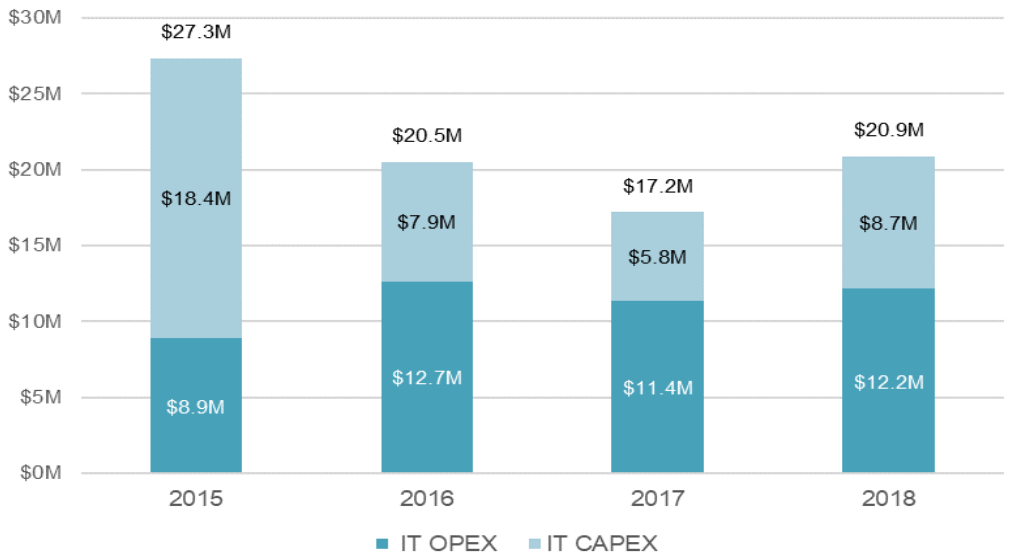
Benchmarking is typically used by regulators to assist with monitoring outcomes against the determinations of regulated businesses, developing performance reports and preparing for future determinations. For example, the Australian Energy Regulator (AER) collects and publishes Regulatory Information Notices (RIN) data to:

- Measure the relative efficiency of all electricity networks in the NEM; and
- To have regard to the benchmarking results when assessing capex and opex forecasts for network businesses.

We have included some key benchmarks as part of this Technology Strategy to provide additional context around AusNet Services' expenditure forecast for the upcoming regulatory period.

The Figure 4-5 presents AusNet Service's actual Prescribed Transmission Services Technology expenditure over the last four years.

Figure 4-5 – AusNet Services actual IT/Technology spend ($nominal)[7]



Source: Australian Energy Regulator

The figure above shows that AusNet Services' total technology costs (opex plus capex) fluctuate year on year with the cadence of different projects and priorities in the business.

In 2016, AusNet Services undertook a strategic review of its technology investment program, including a review of the current environment to determine areas for strategic and operational efficiencies. As part of the review, AusNet Services developed a new business-aligned Technology Plan, incorporating cross-functional views of our objectives. Balancing cost and risk against project outcomes are a key component of this work: AusNet Services deliberately acts to time and phase initiatives to smooth workload and minimise business disruption over time. As part of this strategic review, AusNet Services postponed some capital investment in 2016 and reduced expenditure to lifecycle refreshes and maintenance, and reprioritised the investments planned for the remaining years of the current regulatory period. AusNet Services have realigned our capex plans to invest in the areas that can

[7] AUSNET AER RIN data

provide the greatest value to deliver our business objectives – by optimising the technology investment portfolio to gain the greatest value for our customers.

In 2016, AusNet Services also commenced a review of our Technology operating model. Two key changes led to an increase in our Technology opex over 2015-16:

- Insourcing of technology functions, following changes in management and contract structure
- Review of the Technology operating model, which included:
  - Capability assessment, resulting in an uplift in capability across architecture, business engagement, project delivery, commercial and security services
  - Implementation of a cost reduction program, which included 'right-sizing' the division to align with the new strategy and rationalisation of technology facilitated by a new ERP system.

The short-term increase in opex to implement these changes (evident in our increased opex over the 2015-16 period) will be reversed from 2018, when our technology opex is forecast to reduce to stable, efficient ongoing costs, and well below the benchmark for the current regulatory period.

Comparison with other TNSPs

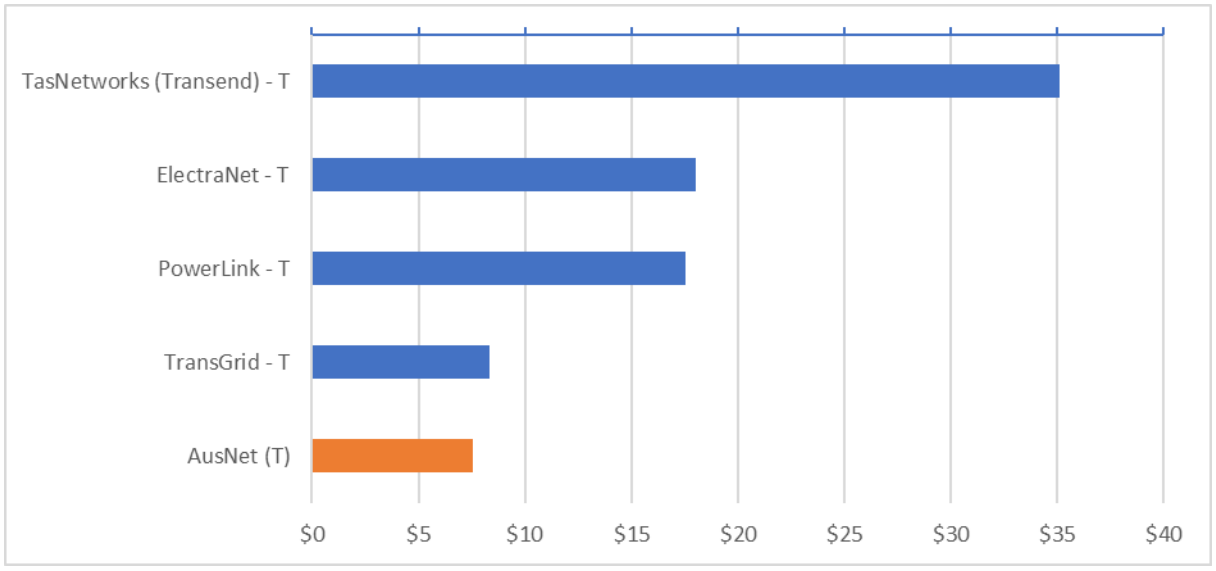
AusNet Services' Technology costs over the 2015-18 period benchmark favourably against other NEM DNSPs, with the average Technology cost per GWh Energy transmitted lower than the industry average of $352. The Figure 4-6 shows average Technology Totex per GWh energy generated for the NEM TNSPs.

Figure 4-6 – 2015-18 Average IT/technology Totex per GWh Energy Transmitted[8]

Source: Australian Energy Regulator

[8] AER RIN responses and Transmission performance data 2006-2018

Figure 4-7 CY2015-2018 Average IT/technology Totex per customer ($nominal)



Source: Australian Energy Regulator

AusNet Services has reduced its technology opex since 2016. This reduction in base opex is forecast to continue over 2019-21 and will further improve AusNet Services' benchmarking position.

5 Current and previous regulatory period capital expenditure

AusNet Services' Technology has evolved over time in response to the changing needs of the business as well as developments in the operating environment and technology.

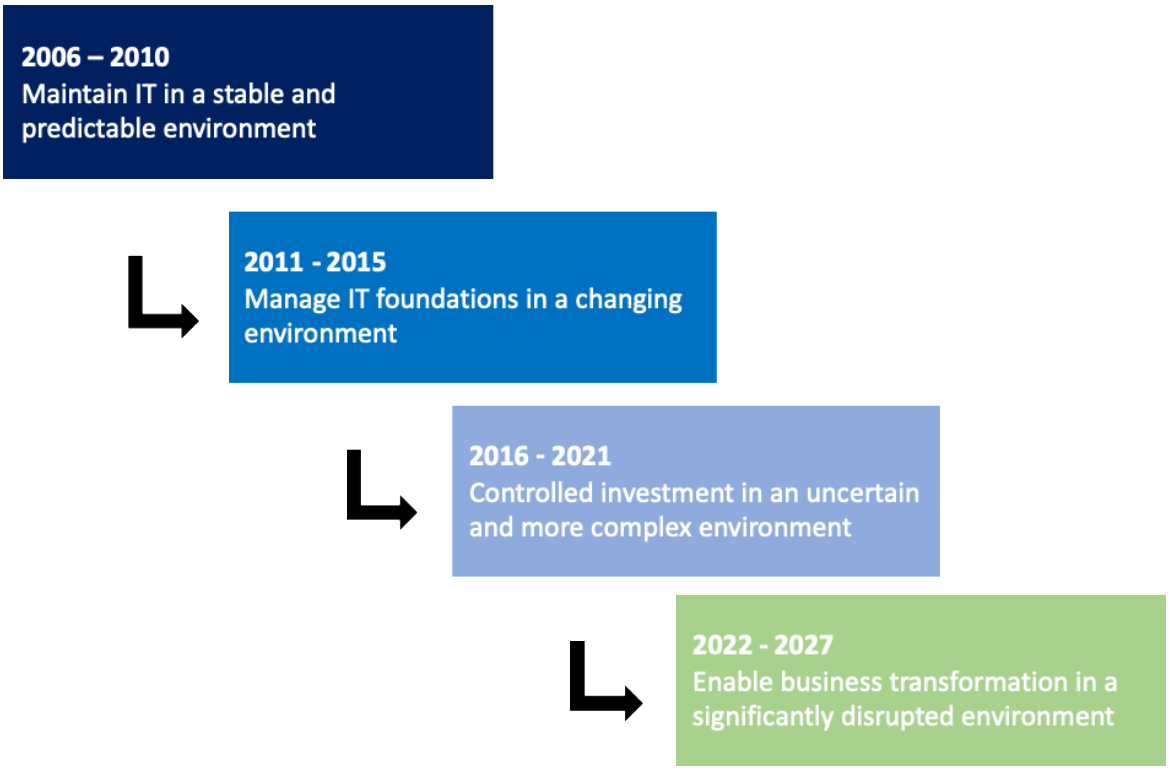
In the current regulatory period, AusNet Services has focused on understanding the changing business environment, realigning its Technology strategy towards core business goals, and leveraging, extending and improving our enterprise foundation to realise benefits for our customers.

The trends and drivers described in Section.4 are contributing to an increasingly complex environment and placing increasing demands on our Technology systems and services. AusNet Services has taken a conservative and prudent approach to its Technology expenditure, reducing capex (as compared to the previous regulatory period) and also controlling opex.

For the upcoming regulatory period, our proposed Technology programs have been designed to maintain our existing services in an increasingly complex environment, respond to evolving customer and regulatory drivers; and deliver future-ready services that will ensure AusNet Services' network remains resilient.

Figure 5-1 below summarise the changing environment in which AusNet Services has operated in over the last decade, as well as the upcoming regulatory period, and also provides an overview of how the relevant theme of expenditure has also evolved.

Figure 5-1 Transformation of AusNet Services' operating environment and Technology strategy



5.1 Expenditure in the current regulatory period

For the current 2018 – 2022 regulatory period, AusNet Services has focused on the modernisation of the ICT landscape, through the continued leveraging of enterprise solutions including EAM / ERP, the adoption of new technologies that utilise data to support network and ICT based decision making, and the replacement of ageing assets as aligned to the technology management lifecycles. AusNet Services undertook work that could be defined by the following domains:

Network Management: This domain focused on improving asset, network and service reliability in support of improving operational effectiveness and regulatory obligations

Works and Asset Management: By leveraging the existing enterprise asset and work management (EAM/ERP) solution AusNet Services is further consolidating and modernising asset and resource management functions with a focus on extending the scope to remaining back office and field mobility operations. End of life applications are being consolidated and migrated to current platforms, simplifying the ICT landscape and ensuring systems are more robustly supported and extendable with more efficient system backed by automation.

Corporate: This domain focuses on leveraging existing enterprise solutions (EAM/ERP) and enhancing a number of back office and employee management systems, whilst performing system refreshes in line with the technology lifecycle.

Customer and Market Services: This domain is focused on developing a business wide view of the customer and updating enterprise wide online platforms that interface with the internal and external stakeholders, to promote improved information dissemination and build on the established capabilities at AusNet Services.

Information Technology (Infrastructure): The domain aims to simplify the current ICT landscape, utilise advancements in cloud computing, and perform prudent refreshes of key infrastructure including storage, enterprise servers, desktop and laptop fleet, corporate network and communications.

Information Management: In an environment where the requirements for volume of data captured are increasing exponentially, this domain focused on building the relevant data storage and analytics capabilities to store, manipulate and present data to drive intelligent decision making and provide a consistent view of data across the organisation

Information Security: The key initiatives in this domain focus on implementing new technologies and capabilities to address cyber-risks posed to the business, extending the reach and capability of the Information Security Management System (ISMS), and maintaining the effectiveness of existing controls to protect the transmission networks against a dynamic and rapidly changing cyber-threat environment.

The following details some of the proposed programmes that have or are currently being implemented:

- Simplification of the Transmission SCADA database to provide controllers with more situational awareness to enable decision making with regards to alarms
- Lifecycle maintenance of critical network management systems to ensure continued operations of our network management solutions whilst maintaining supportability, reliability, security and performance
- Refresh of our systems to manage protection and control setting data and integrate this new solution with other key data sources including work management and outage management.

- Completing an enhanced drawing capability that supports the management of engineering drawings to support design and management decisions
- Continued investment in information security to ensure the safety of customer information and protect the electricity networks and business systems from cyber-attack;
- Application white-listing (creating a list of applications that are in AusNet Services' technology environment to protect it from potentially harmful applications), which has included:
    - Implementing measures to prevent targeted cyber intrusions through a software refresh, protecting supply, customer data, processes and core network business systems to mitigate and manage risk, underpinning the security and reliability of the network;
    - Centralising management of corporate applications, actively whitelisting authorised software; and
    - Preventing the use of unauthorised software including profile-based malware;
- Established an Information Management Platform, based on a business-use case approach, i.e. asset risk modelling;
- Refresh of storage, server and data centre, which has included:
    - Delivery of a number of end-of-life technology and capacity uplift refresh initiatives in the storage, server and data centre domains;
    - Maintenance of the currency of database platforms supporting a number of critical business systems; and
    - Delivered TAM improvements leading to technology and capacity uplift and efficient information management, such as enhanced security functionality, improvements to the employee experience and improved spatial capability
    - Reduction of the risk of business disruption and outages due to obsolete (end of life / out of support) infrastructure and/or constrained capacity thereby enabling AusNet Services to continue to meet its service and regulatory obligations; and
- Completing a Digital Workplace program that provides a secure, efficient and modern work environment to enable workforce collaboration, productivity and communications at sustainable cost levels
- Enhance the enterprise issue and risk management tool to ensure appropriate management of enterprise risk.
- Continuous improvements to Enterprise Asset Management (EAM) and Enterprise Resource Planning (ERP) which has delivered a number of business-initiated enhancements to improve the effectiveness of the EAM/ERP solution, including business systems and interfaces associated with network management.
    - Delivered an enhanced employee performance, recruitment and management tool designed to attract and retain our workforce at a sustainable cost basis
    - Enhanced employee capabilities making it easier to respond to customer queries through work collaboration and communication tools; and
    - Develop data and analytics capabilities through information management to better manage risk, providing the information required for business decision making, including an enterprise management platform, automated asset risk modelling reporting, and advanced analytics;
    - Lifecycle management of systems and platforms including rationalisation and consolidation to maintain the overall integrity and stability of the network, optimise investment, manage risk and efficiently maintain services to our customers.
    - Enhance communications capabilities and field mobility to leverage network and asset management investments, improve service performance and reliability, and improve safety providing operational functions to the field. This includes expanding mobility tools to our field force to support a broader range of field tasks and activities,

upgrading mobile devices and providing access to a broader range of applications and information.

5.2 Comparison of the AER's allowance to actual expenditure

The AER approved a total capex forecast for Prescribed Services Technology of $79.53 million ($2018) over the 2018 – 2022 regulatory period, as set out in the following table.

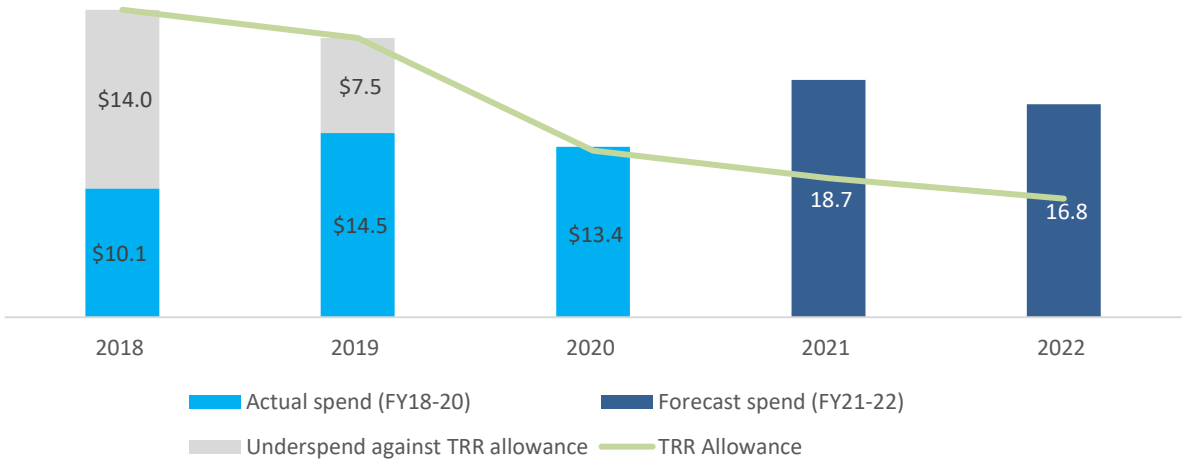
Table 5-2 Technology capex allowance for 2018-22 regulatory period ($M)

Capex	2018	2019	2020	2021	2022	Total
Total	$24.19	$21.96	$13.10	$10.95	$9.33	$79.53

As at the end of 2020, AusNet Services is forecast to spend $ 73.49 million ($2020) over the 2018-20 years of the regulatory period, which reflects an underspend of $6.04 million, or down 7.6% compared to the AER's forecast.

The AER's AusNet Services 2018 – 2022 transmission determination put new deliverability obligations and incentives on AusNet Services that needed to be considered. Considering these changes, we focused on overhauling our project management capability in 2018 and 2019 – deferring non-urgent initiatives until the revisions were fully in place. The figure below illustrates the historical and forecast capex over the current period compared to the AER's forecast.

Figure 5-3 – Comparison of the AER's allowance to actual and forecast capex $2020, million)



The chart shows that forecast expenditure in the final years brings the expenditure across the 5-year period to within 8% of the AER allowance. The table below, Figure 5-4, shows the variance from expenditure allowance across the technology domains.

Table 5-4 AER allowance and Ausnet forecast capex in 2018–2020 ($2018, million)

Technology Domain	Allowance 2018-2022	Current Period Spend (actual 2018-20 and forecast 2021-22)	Variance	Variance
Information Technology (infrastructure)	$27.3	$29.1	$1.8	7%
Information Management	$17.3	$9.7	-$7.7	-44%
Network Management	$12.6	$9.1	-$3.5	-28%
Works & Asset Management	$9.1	$9.0	$0.1	-0.3%
Information Security	$5.7	$10.2	$4.52	80%
Metering & Customer Services	$4.1	$3.2	-$0.9	-23%
Corporate	$3.5	$3.2	-$0.2	-7%
Total ($M)	$79.5	$73.5	-$6.1	-8%

The following paragraphs discuss the contributions to variance in those domains where this is most significant.

Changes within Information Security

[C-I-C]

Changes within Metering and Customer Service

During the period, we had also planned to implement an enterprise-wide customer information management (CIM) system, in order to provide a more robust environment to manage customer data, customer interactions and customer traceability. A CIM enables a single view of customer information to improve customer service levels, meet the increasing information needs of customers, and regulatory requirements for storage and availability of key customer information. Our approach to the

management of our customer information during this regulatory period has shifted to apply tactical solutions to address particular pain points, including a number of customer delivery and experience projects, while the major investment was deferred until there is more certainty on the future role of network operators (distribution and transmission) in a DER market environment. It is likely this future investment will be applicable to the role of distribution businesses and investment in CIM system for these purposes is unlikely to be incurred by transmission.

Changes within Information Management

During the period, the Information Management program of work was de-scoped to a foundation investment with a 'proof of concept' use case approach, to determine whether the anticipated benefits would indeed be realised, and to do so as efficiently as possible. Delivering an effective information lake encompassing key areas of siloed data has been a challenging exercise and this was a very important achievement to enable the capture, storage and management of data required to manage the information of the future. The learnings from this program have been used as inputs to the forecast work program.

During the period, we have also leveraged the data acquired and modelled, as part of the initial implementation, to delivery additional value such as supporting regulated reporting, and enabling bushfire management processes to enabler quick restoration of power to impacted customers. The information management foundation has also been utilised to enable readiness for five-minute and global settlement obligations which required technology resources during the same period.

The key focus areas for the 2023 – 2027 regulatory period will be on further incorporating and consolidating data sources and use cases utilised by the platform in areas to include repetitive faults and planned outages.

Changes within Network Management

The work program includes enhancements to key network management solutions including SCADA, management of alarms, improvements to enhance our transmission and switching instructions management and lifecycle management of key network management systems. These activities have either been completed or are planned to be completed before the end of the period.

Work on other elements has also progressed, including key refreshes of systems that manage protection settings (PACSIS), Site Hazard and Access and SDMT (GIS). However, prioritisation across the Technology portfolio has meant that there will remain further work to be completed on these systems.

Elements of Network Security have been addressed in the Information Security program rather than Network Management.

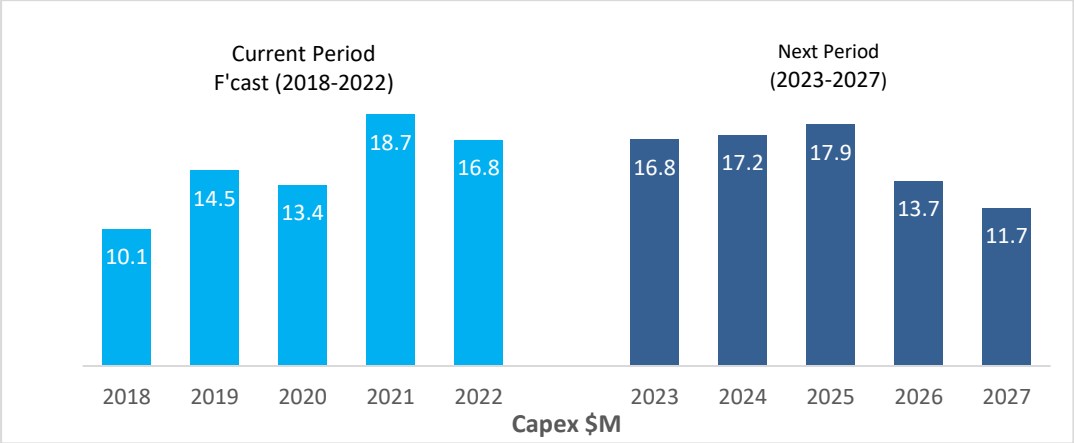
6 Technology expenditure forecast for 2023-2027

As has been discussed, the electricity industry is in the midst of a major transformation driven by climate change response, technological developments, particularly advances in relation to renewable generation, regulatory change and evolving customer expectations. The future grid is one that will need to be more intelligent and adaptable in order to continue to deliver a reliable, affordable, and safe services.

AusNet Services Technology expenditure forecast is built on our detailed Technology Plan which specifies how Technology will support the business by leveraging existing technologies and investing in new technologies to drive innovation, growth and effective operations.

Over the forecast 2023 – 2027 regulatory period, AusNet Services will extend capabilities incrementally across initiatives to enable new uses of our network in an increasingly dynamic environment whilst efficiently controlling costs. The following figure outlines the current and next regulatory periods capex.

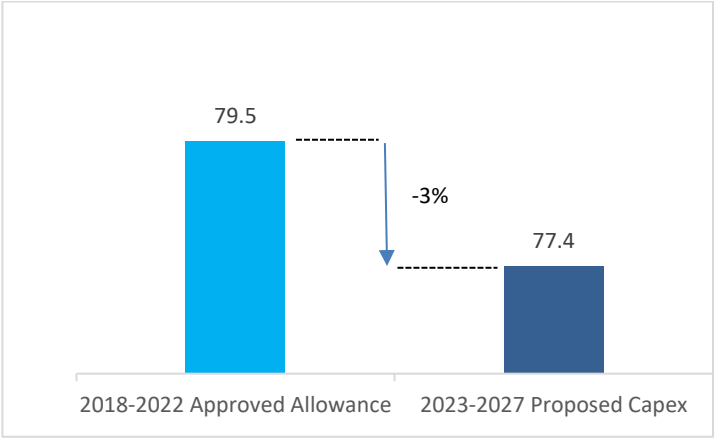
Figure 6-1 –Annual Technology capex, current & next period, ($2020, million)



The spike in spending in 23 and 24 is associated with several critical programmes of work commencing in the first year of the forecast regulatory period including Cyber Security and Intelligent Network Operations.

AusNet Services' proposed Technology capex for the **2023-2027 period is $77.4M** which represents a **3% decrease** compared to the approved allowance for the 2018-22 regulatory period.

Figure 6-2 – Comparison of current period Technology capex allowance and forecast for 2023 – 2027 period



6.1 Capex breakdown

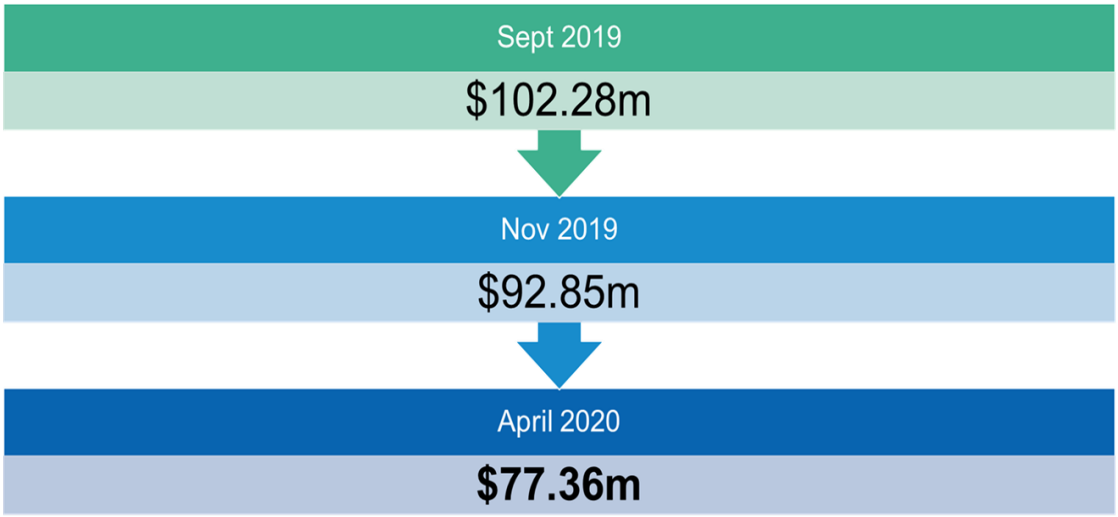
Capital expenditure is expenditure used to acquire, refresh, and maintain physical assets such as property, industrial buildings, or equipment as well as procuring new equipment, capabilities, and software. Capex is used to undertake new projects or investments by AusNet Services.

In forecasting Technology capex for the forthcoming regulatory control period, AusNet Services has:

- Considered our customers' expectations for electricity transmission network services over the next regulatory period
- Assessed the current performance of technology systems and infrastructure to inform to what extent our existing Technology systems and infrastructure can be utilised to support the strategy of the business and required customer outcomes through the upcoming regulatory period
- Engaged business units to understand the current technology landscape and usage to jointly assess requirements of technology to support deliverability of their relevant strategies
- Considered a range of alternate options where they are clearly identifiable
- Considered emerging technologies and trends that can be applied, where it is effective and efficient to do so
- Engaged experienced independent sources to provide research, benchmarks and/or cost estimates
- Assessed the risk of preferred options, identifying appropriate mitigation strategies and the resulting residual risk, and
- Completed cost and benefit assessment, incorporating all obtained inputs and key estimating assumptions. This includes the application of AusNet Services' technology cost allocation methodology, in recognition that AusNet Services is a multi-utility regulated business.

For this proposal, technology programmes have undergone four review cycles which has reduced Capex by 35% as shown in the table below.

Table Figure 2-1 – Development of Capex for TRR 2023-2027



The drivers of expenditure reflect reasonable business requirements in the current context of AusNet Services' Technology assets and system landscape and are directly linked to the provision of electricity distribution services. This was assessed through conducting workshops with AusNet Services' team members and assessing each component of the technology forecast against AusNet Services' current technology landscape and the current and anticipated regulatory requirements, vendor changes and customer needs.

The cost forecasts were developed with reference to the benchmark drivers and elements of expenditure. Deloitte has assisted AusNet Services to develop the assumptions underpinning the forecast costs for each program, by:

- assessing and analysing costs incurred by AusNet Services in previously delivering similar technology services
- identifying and having regard to industry benchmarks, including independent labour cost forecasts (for example, Hudson and Gartner)
- in some cases, seeking information from technology vendors
- drawing on Deloitte subject matter experts, who have experience in delivering and assessing similar programs of work in other organisations
- Alternative options for each program have been reasonably developed, considered and compared, and where the lowest cost solution is not preferred, the reasons for the choice were documented. These were developed and tested through workshops with AusNet Services' staff and Deloitte subject matter experts.

The allocation of costs to distribution services follows AusNet Services' Cost Allocation Methodology and applies AusNet Services' established cost allocation principles in each technology program as reviewed by AusNet Services' staff and regulatory team.[9]

As part of effective capital optimisation across the business, AusNet Services conducts a capital allocation and prioritisation process that aims to prioritise the following year's capital expenditure based on business need, identifying projects estimated to deliver the best value and aligned to the corporate and asset strategies. After projects are prioritised based on business needs, full business cases are completed, that assess in greater detail areas such as scope, methodology, costs, benefits, risk and timeline. The business owner of the project seeks required approval before project delivery is initiated, expenditure is only undertaken when there is a need to do so and all options have been assessed. As a result, while we develop detailed capex forecasts for each regulatory period, there are inevitably changes to our programme of work as priorities develop during the period.

Table 6-3 – Categories of Capex

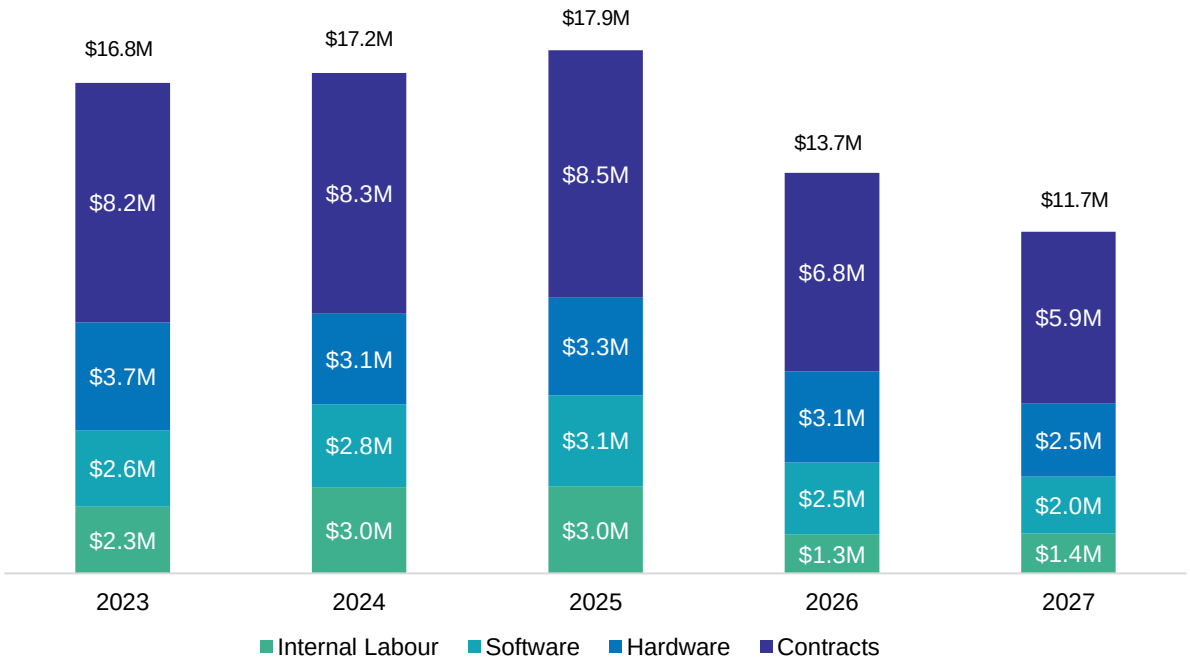
Category	Description
Labour	The cost of labour is the sum of all wages paid to employees as total wages. This cost is applied to each programme of work, based on the role of employees, the associated wage and estimate of the time commitment required for the programme of work and relates to internal AusNet Services teams. Estimates were based on the total time for each roll and not a specific person. Wages were derived based on industry

[9] Letter to Peter Caccaviello: *AusNet Services' technology expenditure proposal for the 2021-25 electricity distribution network regulatory period*, Deloitte Consulting Pty Ltd, 21/9/18.

Category	Description
	benchmarks from Hudson and Gartner 2018[10] and covered the following critical delivery roles, which is a sufficient cross section of the delivery team for a Technology project: • Business Analyst (Functional/Technical) • Architect (Solutions/Enterprise) • Programmer/Developer • Development Team Leader • Project Manager • Head of PMO • Testing Lead
Contracts	Due to the variable volume of work and the requirement to continue to operate the technology team efficiently, there is a requirement for third party contractors to augment the internal workforce. When costing each programme of work, the entire forecast spend, level of effort and time commitment from the business was compiled and where appropriate and efficient, the business matched the internal labour force to relevant projects and made an estimate of the volume and nature of contractors required to augment internal team to deliver the programme of work. This estimate is captured under contractors, in the supporting cost estimators.
Materials (software)	The expenditure associated with specific systems, applications, programmes and other operating information used by a computer, is captured under this category.
Materials (hardware)	Hardware estimates are based on the costs associated with the physical aspect of computers, telecommunications, and other technology devices, this includes storage and memory, circuits, switches and other technology apparatus.
Other	Any other costs not captured within the other primarily groupings are detailed in the other section.

[10] Hudson Project Services Salary Guide; Gartner Toolkit – 'Negotiate More Effectively Using Key Labour Rates for IT Application Outsourcing Deals' 2018.

Figure 6-4 – Proposed Yearly Capex by Cost Type



Based on previous experience of the Technology project delivery teams, AusNet Services is confident it can manage to successfully deliver business outcomes. As stated earlier, many initiatives are expected to commence in the first year of the regulatory period, before settling to a more stable annual expenditure profile in the remaining years.

Table. 6-5 – Annual Technology Forecast Capex ($2020, million, direct)

Program Name	2023	2024	2025	2026	2027	Total
Corporate Enablement	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Workforce Collaboration	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Information Management	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Cyber Security	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
TAM- Apps	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
TAM- Infra	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Intelligent Network Operations	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]

Program Name	2023	2024	2025	2026	2027	Total
Corporate Communications	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
					Total	$77.4

For further information related to each program of work, please refer to the Project Briefs where each program is described in detail; defining scope, options, costs, risks and benefits and NPV analysis to support the proposed future investment.

6.2 Opex breakdown

For the next TRR period, the Cyber Security program and programs forcasting a transition to cloud hosting have been identified for an Opex step change.

Security Opex step change

AusNet Services' proposes to significantly improve its cyber security capabilities due to anticipated regulatory requirements so therefore sees this is the area where the additional spend is required. Investment is required to uplift capabilities to MIL: 3. AusNet Services will have an established cyber security team to carry forward the initiatives to progress towards MIL: 3 and therefore we would expect this to result in an Opex step change of approximately $3.6m per annum.

Cloud hosting opex step change

Cloud hosting costs make up the other proportion of the proposed step changes in Technology opex. Cloud opex is split across four of the Technology workstreams:

- Workforce Collaboration;
- Corporate Communications;
- Corporate Enablement; and
- Information Management.

Impact of cloud and managed services on opex

Technology will continue its ongoing focus to reduce the total cost of ownership across its asset base. Costs of Cloud-based solutions that have been identified as the most efficient delivery mechanism for technology services in the forecast period, will be included as an opex step change.

In preparing for the next regulatory period, AusNet Services has undertaken high-level analyses of transitioning its core systems infrastructure to cloud. In doing so, we have considered the relative costs of maintaining our current on-premises technology assets, compared to a fully cloud hosted environment. The benefits of moving all services into the cloud during this period are not large enough to outweigh the risks and costs of doing so at such speed. At this stage, it is AusNet Services' intention that the majority of existing infrastructure and data stores will not be retired or replaced in lieu of cloud solutions during the period 2023-2027, to control costs and risks to service delivery for our customers.

In some cases, our vendors for certain applications are indicating that they will no longer support or enable legacy solutions, and all future versions of applications will be cloud-based. In these cases, to

maintain currency and vendor support for certain applications, AusNet Services needs to prepare for transition to the cloud.

After a detailed review of affected applications, we have identified a need for $1.39M of additional opex for cloud hosting over the 2023-27 period. The following table outlines the specific systems and applications that are expected to require cloud hosting in the next regulatory period.

Table. 6-6 - Cloud opex step change – breakdown by program

Technology Capex Program	Cloud hosting opex increase
Corporate Enablement	Human Resources and payroll management
Workforce Collaboration	Enterprise Knowledge Management Tool Project Portfolio Management
Corporate Communications	Communications required to support cloud hosting for other applications
Information Management	Information Management platform

The increase in opex associated with cloud hosting will not be offset by capex reductions in the next regulatory period because we share the hardware on which these application runs with other services and so are not able to decommission it yet. As the cost and performance of cloud services improve, we expect to be able to take increasing advantage of them and away from on-premise solutions.

During the next regulatory period, AusNet Services will be assessing the viability of cloud solutions and managed services to achieve desired business outcomes when it is prudent and efficient to do so.

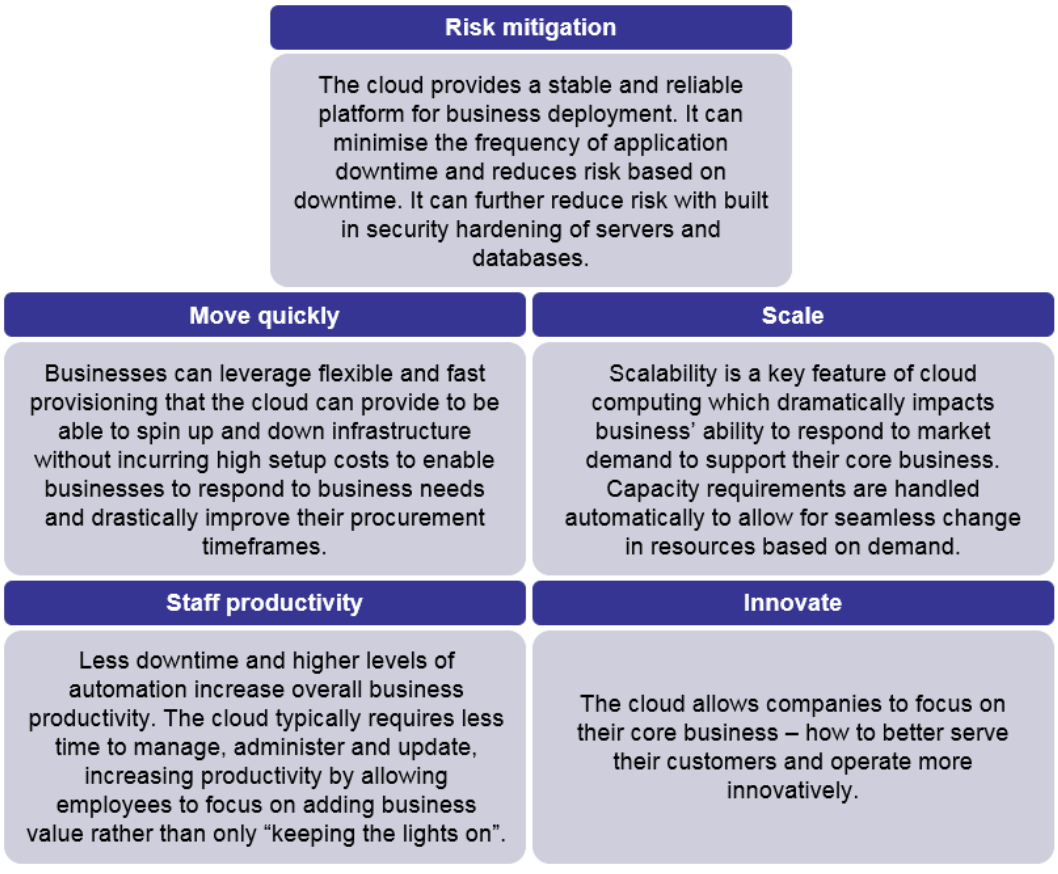
There are longer term benefits of cloud adoption and there are real costs and risks associated with migrating to the cloud, predominantly associated with increased agility and productivity. The table and following figure below summaries the vision that AusNet Services is working towards over the coming ten year period, but unlike our comparator networks, many of our core technology assets are quite young and therefore we do not anticipate migrating these assets to the cloud until the following regulatory period.

Table. 6-7 – Comparison of on-premise vs cloud-based systems

On-premises	Cloud	Customer outcome
Provisioning latency: currently provisioning environments requires going through a lengthy process with lots of configuration overhead managed by each individual business information officer.	**On-demand provisioning**: with a centralised resource management, can use pre-defined server images to set up isolated environments to rapidly support innovation experiments.	**Business responsiveness**: as increasing volumes of data are consumed, cloud's responsive provisioning will enable AusNet Services to expedite implementations and limit interruptions to supply
Inelastic infrastructure: run costs are inflated as business units continue with underutilised infrastructure, which is cumbersome to decommission.	**Flexible capacity**: provide the ability to scale up and down, and even decommission computing resources where necessary, by using elastic infrastructures (e.g. data lake).	**Control expenditure**: by being able to freely scale capacity in line with business requirements, AusNet Services can freely control expenditure, operating efficiently and reducing network charges for customers
Opaque metering: there is no clear visibility of infrastructure usage and associated costs, which inhibits real-time workload management and cost control.	**User-friendly analytics**: build API-based cloud analytics capability that provides access to backend database to produce actionable insights..	**Focus on customer outcomes**: the efficiency and simplification of cloud analytics will free up more time for key resources to focus on the analysis and generating insights to operate the network more efficiently and underpin improved customer outcomes
Lack of standardisation: heavy use of disparate components and lack of centralised source code repositories leads to diminishing reusability which constrains organic growth.	**Streamlined for agility**: establish a set of standardised offerings to reduce service catalogue complexity and streamline the ordering process that paves the way for the transition to DevOps.	**More efficient operations**: by facilitating the use of more advanced development approaches (i.e. DevOps) the business will operate increasingly efficiently and effectively, enabling the delivery of reliable, consistent supply to customers

The benefits of cloud computing are presented in the following figure:

Figure 6-8 – Benefits of moving to the cloud

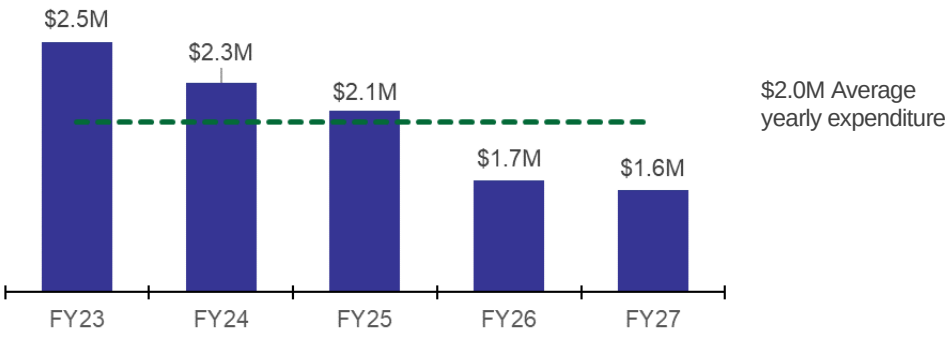


Technology project related Opex forecast

In the current regulatory period, the project related opex ('propex') forecast for Technology was approximately $1.8M per annum, which is the opex associated with implementing capital programmes, typically including data cleansing, data migration and change and training activities.

The following figure outlines forecast technology propex of $2.0M per annum for the next regulatory period.

Figure 6-9 – Proposed yearly Opex (propex) for 2023-2027 regulatory period



6.3 NPV analysis

As defined in its *Guidance Note - Non-network ICT capex assessment approach for electricity distributors*[11], the AER is refining its approach to ICT assessment, requiring a disaggregation of ICT expenditure into recurrent and non-recurrent ICT expenditure.

Consequently, program expenditure has been categorised as non-recurrent or recurrent in accordance with the framework outlined by the AER, in order to apply a consistent methodology across AusNet Services' distribution and transmission forecasts. Typical examples of this expenditure include:

- The costs associated with the ongoing refresh of ICT hardware – where hardware is refreshed on a cyclical basis for provision of substantially the same functions and ICT capabilities. Recurrence need not be annually but would be periodic in mature (i.e. A regular frequency of refresh);
- Software system upgrade costs – all costs associated with the periodic version update of existing systems that facilitate the maintenance of substantially the same services, functionalities, capabilities and/or market benefits. Again, recurrence need not be annual but should be periodic in nature; and
- Any other ICT expenditures that are incurred on a recurrent basis at least every five years[12]

Recurrent ICT is expenditure that is related to maintaining existing ICT services, functionalities, capability and/or market benefits, and occurs at least once every five years.

Non-recurrent ICT expenditure refers to "any ICT expenditure that is not 'recurrent' as per the definition above. For example, ICT expenditure that it is either of the following:

[11] Guidance Note - Non-network ICT capex assessment approach for electricity distributors, AER, 28 November 2019

[12] Guidance Note - Non-network ICT capex assessment approach for electricity distributors, AER, 28 November 2019, p. 8

- ICT expenditures related to maintaining existing services, functionalities, capability and/or market benefits that does not recur every five years. For example, upgrades or replacements of systems which may occur on a longer cycle (i.e. seven to twelve years)
- Any costs incurred as a result of a change in regulatory requirements/obligations
- The acquisition of new or expanded ICT functionality or capability[13].

NPV analysis is undertaken for non-recurrent expenditure in addition to the overall assessment of each program option. The overall assessment considers each option against the following criteria:

- Alignment to objective
- Costs
- Benefits
- Overall risk rating
- Alignment to customer related drivers of expenditure, and
- Alignment to business related drivers of expenditure.

NPV Methodology

Costs:

Program costs per option are defined relative to their percentage of:

- Allocation to Prescribed Transmission Services in the regulatory period
- Non-recurrent expenditure.

Costs included in the NPV analysis are proportionate to the percentage of program allocated to the transmission business (full program costs may be allocated to Distribution, Gas, Transmission and/ or AMI) and only non-recurrent expenditure is included in the NPV analysis. If an option's spend is deemed to be a BAU expense it is categorised as recurrent expenditure. In the instance an option includes BAU upgrades as well as non-recurrent expenditure, the BAU allocation is removed from NPV analysis.

Opex step changes are included in the NPV analysis (in addition to opex costs).

Benefits:

Where possible, benefits have been identified and quantified where data is available to do so. Benefits have been quantified specific to each option and outlined in detail in the program briefs. The benefits are those that are associated with improvements, or cost savings, due to the implementation of each option in each program. That is, the benefits capture only what is additional to what would have occurred under BAU.

As with costs, benefits have been allocated and included relative to their percentage of transmission business allocation and non-current expenditure.

Where no quantification is available, benefits have been described qualitatively. Qualitative benefits are aligned to program objectives and customer and business-related impacts. Specifically, AusNet

[13] Guidance Note - Non-network ICT capex assessment approach for electricity distributors, AER, 28 November 2019, p. 8

Services has identified benefits that directly and indirectly impact customers, such as benefits that reduce customer cost and time.

Sensitivity Analysis:

When developing the NPV, we have considered variable assumptions to ensure that we have contemplated alternative scenarios relative to the benefits defined. This allowed us to establish a level of confidence in quantifying the benefits described.

Three levels of sensitivity were considered, they are:

- A conservative level where some of the variables in the benefit calculations were halved from the moderate level
- A moderate level which became the basis for the calculated NPVs in the program briefs
- A bullish level where some of the variables in the benefit calculations were doubled from the moderate level

Below is an example of one of the program briefs demonstrating the three levels.

[C-I-C]

7 Appendix: ERP Strategic Direction and implications on future TRR Periods

[C-I-C]

[C-I-C]

Figure 7-1 ERP Options Analysis

[C-I-C]

8 Transmission Programs

The forecast regulatory period will seek to deliver on key strategic enablers with evolving customer expectations at the centre of these developments. Driving better outcomes for customers aligned to their expectations is the central focus of all investment in Technology at AusNet Services. This will always be balanced with delivering value for lower cost and effectively managing risk.

Each programme of work has an associated Programme Brief which outlines the drivers for investment, investment options, benefits, risks and a recommended option which forms the basis for the proposed capex and opex forecast for the 2023 – 2027 regulatory period.

For the upcoming regulatory period technology, our proposed investment will be divided into eight programmes of work, with each program grouped into a workstream which have been created to support the Technology Strategy for the upcoming regulatory period.

Themes	
Maintain current operations in a changing environment	Manages risks to the services delivered by core Technology systems by undertaking lifecycle refreshes of our storage, enterprise servers, desktop and laptop fleet, and corporate network and communications control technology.
Primarily enhancing capabilities	Improves asset and network reliability through improved data and analytics, automation, visualisation, modelling and risk management, to ensure we continue to efficiently provide reliable transmission network services, despite a disrupted and increasingly complex environment. This workstream also includes investments in our enterprise wide systems, extending solutions to the field, improving integration and collaboration, and meeting customer demand for greater information and communication on network operations through enhanced digital capabilities. The final outcome will be to protect the transmission network, and customer and business information and assets, through improvements to our cyber security capabilities, in line with MIL:3 compliance, industry standards and relevant practices from utilities around the world.

Maintain current services in a changing environment

Several systems, technology infrastructure and corporate communications widely used across AusNet Services are nearing end of life and require updates and refreshes in order to ensure they continue to run as expected and required by the business. The programmes in this workstream involve a refresh of these systems, where it is prudent and efficient to do so.

IT Asset lifecycle refreshes are important for a number of reasons including:

- Protecting critical assets from cyber security threats. Prudent lifecycle refreshes and ensuring the latest patches are applied are key components of recommendations provided by the Australian Signals Directive (which define and provide standards to all organisations for cyber security) on how to protect against cyber security threats.[14]
- Maintaining efficient operations. Keeping systems up to-date provides additional functionality for customers and employees, reduces the risks of IT failure e.g. laptop start to degrade, increasing amounts of data require larger computing power, and improves integration between applications (internal and external) to help with improving the customer experience
- Maintaining support costs. Many suppliers require updates to comply with licence and software maintenance requirements, with support costs increasing significantly for legacy systems that are no longer fully supported. Further, where significant upgrades in capability are required, the costs of doing so are lower where the organisation is up to date with the latest releases
- The ability to integrate and adopt newer technologies, e.g. cloud solutions, IoT, predictive analytics requires a certain level of technology maturity from existing systems to work. Without these, solutions to modernise the grid and improve customer services cannot be achieved without significant additional costs or risks.

[14] https://www.cyber.gov.au/publications/strategies-to-mitigate-cyber-security-incidents.

Objective Maintain Current Operations	Customer outcomes	Investment
Technology Asset Management (TAM) - Applications AusNet Services has ~200 systems, which require periodic patching and enhancements as aligned to the standard technology asset management policies. This ensures ongoing vendor support, patches and bug fixes, limits downtime, and ultimately underpins reliability of critical operations across the business. As outlined above these refreshes only occur where it is prudent to do so, prolonging the useful life of systems where the impact on the business and risk is limited.	By maintaining critical systems, infrastructure and corporate communications in line with their supplier lifecycle maintenance requirements, as is prudent, AusNet Services can manage the risks to the continuity of technology services, with limited disruption supporting the continuity and reliability of supply.	**TAM-Applications** [C-I-C]
Technology Asset Management (TAM) - Infrastructure Technology infrastructure comprises the hardware, software, network resources and services required to deliver IT and technology to the business. This programme of work ensures the business has sufficient capacity, performance and service levels to maintain Technology systems operations whilst optimising data centre infrastructure to operate more efficiently.	When lifecycle updates are applied, the systems receive new patches and critical bug fixes. Older versions of software often have gaps which expose the business to new threats and cyber intrusions. By performing critical lifecycle updates, new patches will be applied which will remedy these vulnerabilities and ensure the security and reliability of the network, ultimately underpinning fewer undue disruptions to supply.	**TAM-Infrastructure** [C-I-C]
Corporate Communications Corporate communications at AusNet Services, comprises Technology networking devices (i.e. Wi-Fi, routers), internet services provision and gateways, as well as data centre interconnectivity, covering both systems and assets. As is conducted for critical systems above, this programme expenditure on capacity management and like-for-like lifecycle refreshes ensures the network performance requirements are met for both existing and future business growth.	Maintaining systems and infrastructure in line with its lifecycle allows the business to continue to operate efficiently manage risk and limit system outages. System outages cause delays and increase the cost of operating the business. Appropriate and efficient maintenance allows the business to control expenditure.	**Corporate Communications** [C-I-C]

Workforce Collaboration As employees progress within organisations, they acquire knowledge which is specialised to the company's operations, structure and culture. This programme will make these unique insights more readily accessible regardless of workforce location or business area, creating productivity gains.	As more robust and comprehensive data sets on network assets are stored and accessed in a standardised way, this information will be more freely available to network controllers, allowing them to more readily and rapidly respond to disruptions in the network, improving the overall safety and reliability of the network for customers.	**Workforce Collaboration** [C-I-C]
Corporate Enablement AusNet Services run a number of enterprise applications to support day-to-day operations, the enterprise application landscape and related integrations underpin the continuity of all operational processes. As such, AusNet Services must ensure these core functionalities are adaptable in an increasingly changeable environment while also being robust, and reliable solutions, for all employees. In alignment with the business shift to cloud (where prudent), core business functions such as HR and Payroll systems will move to the cloud, where the ERP solution will commence the pre-work required to prepare for migrating to the desired future state platform, post 2025.	By ensuring all core enterprise systems and functions are supported and where prudent moved to newer versions with improved functionality and features, AusNet Services can minimise the risk of system failure and ensure the business is able to reliably distribute electricity to customers.	**Corporate Enablement** [C-I-C]

Primarily enhancing capabilities

Increasing distributed resources, weather and other network information create valuable sources of data, which can be leveraged by the business to maintain network reliability and efficiency. There is a need therefore, to continue to improve capabilities to ensure continuing grid availability, security, renewable energy, distributed generation, and other advanced technologies online.

Electricity Transmission Network – Technology Strategy

AusNet Services' transmission network is a part of Australia's nationally critical infrastructure. The safety and reliability of electricity supply is absolutely integral to the lives of all Victorians. As an electricity TNSP, AusNet Services is required to ensure the safe and reliable delivery of electricity. As the complexity of the network and the scope of Technology to control and monitor the network grows, so too does the threat and impact of a cyber-attack. The proliferation, increasing decentralisation and interconnection of generation creating more entry points for malevolent actors to enter utility systems. With ever increasing volumes of customer information, there is also a growing need to maintain the privacy and security of customer data

Objective	Customer outcome	Investment
Intelligent Networks Investment in network planning, management and operations to support the reliability and sustainability of the Transmission Network in increasingly distributed energy generation and supply market	Analytics capabilities underpinned by the information management platform and associated tools, systems and data sets will enable the business to more readily understand and manage the network.	**Intelligent Networks** [C-I-C]
Information Management Technology will continue to extend the IM platform, with the capability to analyse network performance, supported by advanced automation on near real time data, underpinning better decision making, more efficient operations and an increasingly reliable network.	By understanding and analysing network operations and asset performance, the information management platform will generate insights and analytics to operate and configure the network more effectively, as well as optimise maintenance and asset replacement. This will ultimately drive efficiencies, reducing network charges for customers.	**Information Management** [C-I-C]

Objective	Customer outcome	Investment
Cyber Security Investment in cyber security in the forecast period will ensure compliance to current and emerging regulations including sufficient investment to comply with regulatory obligations under AEMO's Australian Energy Sector Cyber Security Framework (AES-CSF); better protect critical assets and the ability to supply energy to customers, better protect critical data relating to customers and operations; and support ongoing development and measurement of cybersecurity capabilities within the organisation across People, Process and Technology.	As more advanced systems actively monitor and remotely control the network, the threat of malicious intrusion has broader implications and will have further reaching impact on the continuity of supply. Investment in information security in the current period will also focus on more advanced tools, systems and techniques which provide increased situational awareness to prepare the business for more advanced and modern cyber-attacks. Cyber intrusions are extremely costly, not only to identify the magnitude of the breach, but remedy it and prevent reoccurrence. Investing in cyber security will ensure AusNet Services' has suitable proactive cyber threat protection, which will inhibit attacks and in turn limit the costs associated with remediation. AusNet Services will continue to focus resources and intensify efforts to prevent cyber-attacks on the network, this includes a number of critical programmes of work to proactively detect and deter threats, as well as uplifting overall governance and access controls, whilst maintaining the security and privacy of customer data.	**Cyber Security** [C-I-C]

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10 Glossary

Term	Definition
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulatory
AHI	Application Hosting Initiative
AMI	Advanced Metering Infrastructure
AMP	Asset Management Plan
AMS	Asset Management Strategy
BAU	Business as usual
CAPEX	Capital Expenditure
CLCOE	Capacity, Lifecycle & Operational Enhancements
CRM	Customer Relationship Management
CY	Calendar Year
DENOP	Distributed Energy Optimisation
DER	Distributed Energy Resources
DOMS	Transmission and Outage Management System
DR	Demand Response
EA	Enterprise Architecture
EAI	Enterprise Application Integration
EAM	Enterprise Asset Management
TRR	Electricity Transmission Price Review
EPMO	Enterprise Project Management Office
ERP	Enterprise Resource Planning
FY	Financial Year
HR	Human Resources
ICT	Information Communications Technology
IM	Information Management
IT	Information Technology
IT/OT	Information Technology / Operational Technology In the context of the electric power industry: • Information Technology (IT): traditionally associated with back-office information systems used for conducting business-type transactions, such as cost and tax accounting, billing and revenue collection, asset tracking and depreciation, human resource records and time-keeping, and customer records. • Operational Technology (OT): typically associated with field-based devices connected to the Transmission system, and the infrastructure for monitoring and controlling those devices. This includes control centre based systems such as SCADA and DMS. Information Technology / Operational Technology (IT/OT) convergence refers to the increasing integration of IT and OT. The application of smart grid technologies in the electrical Transmission industry becomes more wide-spread and sophisticated, and IT is able to work

Term	Definition
	together with OT applications to increase Transmission system performance. For instance, IT/OT convergence is present when combining real-time and near-real-time data, system modelling, visualisation, simulation and integration to all major systems to provide a new platform for managing and operating electric Transmission systems.
LV	Low Voltage
NEO	National Electricity Objectives
NER	National Electricity Rules
NIST	National Institute of Standards and Technology
OPEX	Operational Expenditure
OT	Operational Technology
PMO	Project Management Office
SCADA	Supervisory Control and Data Acquisition
SCS	Standard Control Services