

AusNet Electricity Services Pty Ltd

Electricity Distribution Network: Technology Strategy FY2022-FY2026

October 2019

PUBLIC

Electricity Distribution Network – Technology Strategy

About AusNet Services

AusNet Services is a major energy network business that owns and operates key regulated electricity transmission and electricity and gas distribution assets located in Victoria, Australia. These assets include:

- A 6,574 kilometre electricity transmission network that services all electricity consumers across Victoria;
- An electricity distribution network delivering electricity to approximately 680,000 customer connection points in an area of more than 80,000 square kilometres of eastern Victoria; and
- A gas distribution network delivering gas to approximately 572,000 customer supply points in an area of more than 60,000 square kilometres in central and western Victoria.

AusNet Services' purpose is 'to provide our customers with superior network and energy solutions.'

For more information visit: www.ausnetservices.com.au

Our AusNet Services Values are the foundation
for how we achieve our objectives



Contact

This document is the responsibility of the Technology division of AusNet Services. Please contact the indicated owner of the document with any enquiries.

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

Electricity Distribution Network – Technology Strategy

Documentation Distribution

Name	Position	Reviewer / Approver
Mario Tieppo	Executive General Manager Technology	Approver
Peter Caccaviello	General Manager Technology Planning & Solutions	Approver
Megan Fisher	Head of Digital & Innovation	Approver
Kevin Shaw	Chief Information Security Officer	Approver
Mark Judd	Head of Digital Delivery Centre	Approver
Robert Fraser	Head of Technology Office	Approver

Version History

Date modified	Person responsible	Notes	Version
08/08/18	Emily Pong		0.1
21/08/18	Jess Young	Major updates	0.2
31/08/18	Jess Young and Zak Gottlieb	Major updates following feedback from Janine Perry and Sam Scanlon and finalisation of programme briefs and cost modelling	0.3
14/09/18	Jess Young and Zak Gottlieb	Major updates following feedback from Deloitte QA, Janine Perry and Sam Scanlon.	0.4
20/09/18	Jess Young and Zak Gottlieb	Updates to incorporate finalised metering capex and opex forecasts	0.5
28/09/18	Jess Young and Zak Gottlieb	Updated version received via Greg Snibson	0.29
26/10/18	Janine Perri, Tanya Schneider, Jess Young Sam Scanlon	Updates for Cloud Opex Step Change justification	0.30
13/11/18	Janine Perri, Priya, Mahdi, Craig Tooley	Metering changes. Removed Market Process & Connection Point Management from the EDPR as it is being taken up as Market Compliance Programme in FY20 5 Min & Global Settlement, Metering Lifecycle. Opex Step Changes.	0.31

Electricity Distribution Network – Technology Strategy

07/12/18	Janine Perri	Removed Technology's forecast share of the base opex on advice from the Regulatory Team. Capex and Propex updated. Opex step changes updated to include Cloud, Security & 5 Min only as agreed with the Customer Forum.	0.33
25/02/19	John Hancock	Technical peer review clarifications and expansion	0.34
05/03/19	Sam Scanlon	Updates post technical peer review	0.35
04/04/19	John Hancock	Clarifications from March 2019 project brief reviews	0.36
17/04/19	Janine Perri	Regulatory Team edits; Figure 3-1, Figure 3-2, Figure 4-4	0.37
01/05/19	Janine Perri, Samantha Scanlon	Updates post John Hancock review	0.38
06/05/19	Janine Perri, Samantha Scanlon	Further updates post John Hancock review	0.39
17/06/19	Janine Perri	Further updates post John Hancock review	0.40
20/06/19	Janine Perri	Financials updated to align with Final Cut Numbers (May 2019) prior to 6 month extension	0.41
02/08/19	Michael Black, Emily Pong, Cara Teoh	Updates following cost revisions	0.42
17/09/2019	Samantha Scanlon	Review and update change CY to FY	0.43
9/10/19	Samantha Scanlon	Final refinement & CLCOE to TAM	0.47
14/10/19	Samantha Scanlon	Draft version provided to Regulatory team	0.48
23/10/2019	Adrian Sharp	Updates Comparison, actual and forecast	0.49
12/11/2019	Adrian Sharp/Samantha Scanlon	Updated version provided to Reg team with current state analysis, 2019 \$	0.50
18/11/2019	Samantha Scanlon	Updated based on feedback	0.51
14/05/2020	A Sharp / S Scanlon	Correct Cyber security opex step change	0.52

Electricity Distribution Network – Technology Strategy

Table of Contents

1.	Executive Summary.....	6
1.1	Building on the momentum from the current regulatory period.....	7
1.2	Priorities for the FY2022-2026 EDPR period.....	9
1.3	Forecast Technology expenditure for FY2022-2026.....	15
2.	Purpose of the document	22
2.1	Scope	22
2.2	Approach to developing FY2022-2026 expenditure forecasts	23
3.	Drivers of technology expenditure FY2022-2026.....	27
3.1	Regulatory requirements	27
3.2	Customer expectations.....	27
3.3	Industry, Technology and Cyber Trends	29
3.4	Business strategy.....	35
4.	Benchmarking.....	37
4.1	Current and previous regulatory period capital expenditure	40
5.	Expenditure in the current regulatory period.....	42
5.1	Comparison of the AER's forecast to actual expenditure	45
6.	Technology expenditure forecast for FY2022-2026.....	48
6.1	Capex breakdown	49
6.2	Opex breakdown	53
6.3	NPV analysis	58
6.5	Technical work streams.....	59
7.	Glossary.....	68

1. Executive Summary

This Electricity Distribution Network Price Review Technology Strategy (EDPR Technology Strategy) outlines the strategic direction and forecast expenditure to deliver AusNet Services' information, communication and technology capabilities for the Electricity Distribution Network in the FY2022-26 EDPR period.

Above all, the Technology investments proposed are designed to enable AusNet Services to meet its regulatory obligations with regards to supplying standard control electricity services to its distribution customers. This includes ensuring that AusNet Services can meet expected demand, and maintain the quality, reliability and security of supply and its distribution network in doing so, while ensuring that the prices it charges customers for these services reflect both efficient costs and customer needs.

The forecast programme of work is prepared in a time when the energy sector is going through unprecedented changes and, as well as ensuring we comply with our changing regulatory obligations, takes into account key drivers including:

- **Customer expectations:** to 'deliver on the basics', 'keep me posted', 'make it affordable', 'be ready for the future', and 'always safe', which have been obtained from customer consultation forums;
- **Industry and Technology:** technology is playing an increasing role in electricity networks and AusNet Services relies on digital technologies to control expenditure and improve overall performance and reliability where our customers demand it. This includes smart devices, automation, data and analytics, cloud computing, convergence of information and operational technology, and productivity tools for field and office workers which enable more precise targeting of resources to meet needs;
- **Cyber threats:** responding to increasing cyber threats to maintain a safe and secure network and working environment and protect customers' privacy.

In developing this EDPR Technology Strategy, AusNet Services has also had regard to how it performs against its peers with respect to Technology costs, in alignment with AER expenditure criteria. The forecast programme of work aims to improve our relative benchmarking position amongst our peers, particularly with respect to capital expenditure, by achieving continued efficiencies.

1.1 Building on the momentum from the current regulatory period

Our plans for the FY2022-26 regulatory period build 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.

We note that the Minister for Energy, Environment and Climate Change stated that the National Electricity (Victoria) Act 2005 was to be amended to have electricity prices adjust on a financial year basis, as per her letter to the AER.¹ As a result, and noted by the AER's letter to the Victorian electricity distribution businesses, AusNet Services is submitting its regulatory proposal for the period between 1 July 2021 and 30 June 2026.²

In the current regulatory period CY2016-20, and the additional 6-month period before the FY2022-26 regulatory period, AusNet Services has:

- *Been cautious and prudent* – AusNet Services has focused on reducing costs, improving efficiency, whilst establishing the foundations of a modern technology landscape, planning and preparing for the investments that it needs to respond effectively to the changing environment;
- *Underspent on its technology capital forecasts* – AusNet Services has taken opportunities to consolidate, leverage existing infrastructure, reduce costs and prudently invest to meet customer and regulator expectations on network services. This is currently forecast to result in a [C-I-C] (\$2019) underspend compared to the CY2016-20 regulatory forecast;
- *Reduced its technology opex* – We have implemented a new operating model which includes the outsourcing of major IT infrastructure and programmes. The associated opex savings will be shared with customers through our prices from 2021; and
- *Commenced modernisation of its technology* – major initiatives that have been delivered during this period include:
 - Refreshed customer communication channels (customer portal), which has enabled improved communication through the refresh of a web platform with mobile capabilities
 - Refreshed spatial systems to more accurately reflect network configuration, enabling improved outage remediation and limiting downtime for customers
 - Delivered compliance programmes such as Power of Choice and Ring-Fencing, which has involved analysis and modifications to systems and processes in order to meet new regulatory requirements
 - Established an Information Management Platform, based on a business-use case approach, as the basis for the company-wide capability proposed in the forecast period which will enable the business to leverage increasing volumes of data associated with modern network devices to improve customer services

¹ D'Ambrosio, Lily. "Intention to change the timing of Annual Victorian Network Price changes". Received by Conboy, Paula, 12/04/2019. Available at: https://www.aer.gov.au/system/files/VIC%20DELWP%20letter%20to%20AER%20re%20intention%20to%20change%20the%20timing%20of%20annual%20Victorian%20network%20price%20changes%20-%20April%202019_3.pdf.

² Conboy, Paula W. "Re: Victorian Government intention to change the electricity distribution regulatory year from a calendar to financial year". Received by Ficc, Nino, 30/05/2019. Available at: https://www.aer.gov.au/system/files/Letter%20from%20AER%20to%20Vic%20DBs%20re%20intention%20to%20change%20the%20timing%20of%20annual%20Victorian%20network%20price%20charges%20-%2030%20May%202019_1.pdf.

Electricity Distribution Network – Technology Strategy

and reduce cost, including the modernisation of management of meters and meter data

- Refreshed 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
- 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
- Completed the AMI Remediation programme, a major business workstream to ensure the robustness and reliability of metering assets, systems and data. These costs were not recovered from our customers.

1.2 Priorities for the FY2022-2026 EDPR period



Our regulatory proposal³ emphasises our priorities for the forecast regulatory period: maintaining current service performance in a disrupted environment where risks are changing, complying with new obligations; and delivering improvements requested by our customers (including through the Customer Forum).

This will require us to:

- Reflect consumers' expectations
- Provide a better customer experience with better information and faster response
- Lower costs; and
- Balance costs and reliability.

Our Technology Strategy for the forecast regulatory period enables these outcomes by focusing on the following priorities:

- **Improving relationships with and outcomes for customers** – investing in customer information services that will deliver real, tangible outcomes for customers;
- **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 taking a cautious approach to prepare for the changes that are expected in the next period;
- **Cyber Security enablement** – protecting our customers' and business information from cyber-attacks;
- **Increasing digitisation and automation** – leveraging digital technologies such as cloud, automation and artificial intelligence, and mobility to maintain customer services and reduce costs in the field and back office;
- **Information enablement** – extending data and analytics capabilities to further develop business-led and contextual decisions that are predictive rather than reactive; and
- **Be future ready** – cater for the increasing impact of Distributed Energy Resources (DER) by investing prudently in new systems such as network management, energy trading, demand management, and network operations optimisation.

³ AusNet Services, *Draft Electricity Distribution Regulatory Proposal 1 January 2021 to 31 December 2025* (published February 2019)

Electricity Distribution Network – Technology Strategy

Major work streams

To achieve these priorities, five major workstreams are proposed:

- **Cyber Security** – aims to protect the distribution network, and customer and business information and assets through improvements to our cyber security capabilities, in line with the highest level of the Australian Energy Sector Cyber Security “Maturity Indicator Level”- MIL: 3 compliance⁴, industry standards and relevant practices from utilities around the world;
- **Metering Compliance** – aims to efficiently maintain our metering Technology systems while reducing system lifecycle costs, and meet new regulatory compliance requirements;
- **Intelligent Operations** – aims to improve asset and network reliability and operational efficiency through improved data and analytics, automation, visualisation, modelling and risk management, to ensure we continue to efficiently provide reliable electricity network services, despite the 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 (particularly outages) through enhanced digital capabilities;
- **Distributed Energy Resources (DER)** – aims to integrate and manage solar PV, batteries and other new customer technologies effectively and efficiently to meet growing customer requirements for these new services, whilst maintaining a resilient and secure network that is managed in a cost-effective manner; and
- **Lifecycle** – aims to undertake targeted technology refreshes to address risks, including operational and cyber security risks, to the services delivered by our core Technology systems. The workstream efficiently balances these risks against the cost of refreshes and support over time by undertaking prudent lifecycle refreshes of our storage, enterprise servers, desktop and laptop fleet, and corporate network and communications control technology.

Unlike our technology initiatives in EDPR CY2016-2020 which provided new capabilities for the core business, the focus for our work in the forecast period is to maintain services in a changing business environment and adapting them to meet requested customer and regulatory outcomes. The table below links the programmes of work to these categories and defines the resulting customer benefit.

⁴ Australian Energy Sector Cyber Security Framework - Frequently Asked Questions, FINAL V1-0, October 2018

Electricity Distribution Network – Technology Strategy

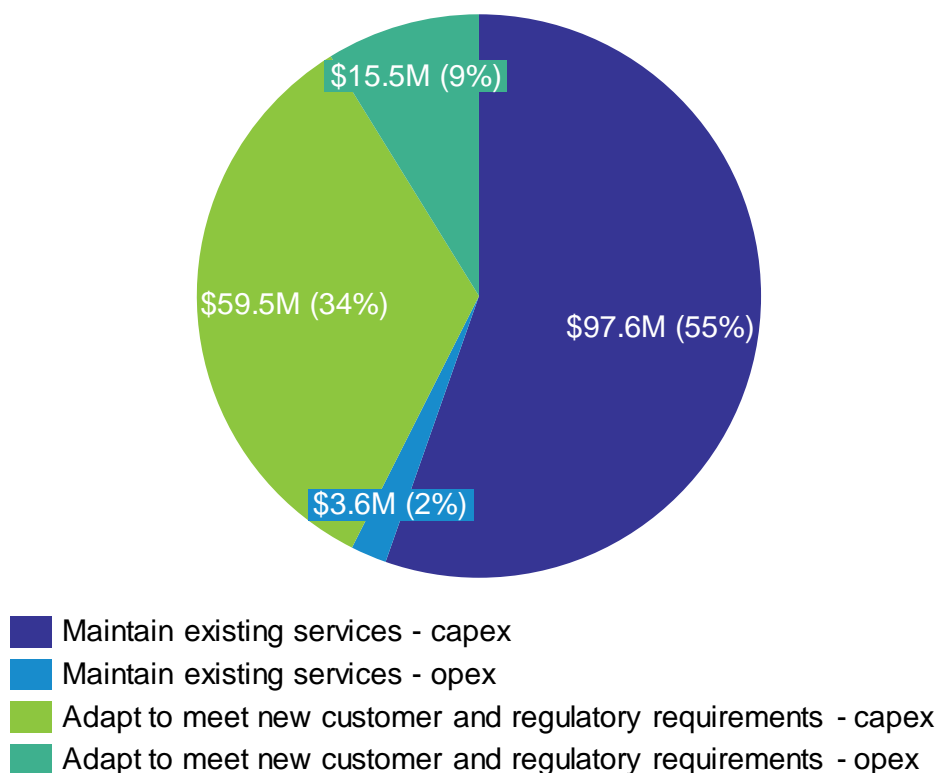
Table 1-1 – Programmes and customer benefit

Category	Workstream	Programme	Customer benefit
Maintain existing services	Lifecycle	Corporate Enablement TAM Applications TAM Infrastructure Corporate Communications Metering Lifecycle	Manage service (i.e. cyber security) risks and cost risks by targeted renewal of assets within vendor support windows (lifecycle refresh)
	Distributed Energy Resources	Future Distribution Network Management	Meet expected demand for “standard control services” where operating environment is more complex than in the past (new capabilities to do the same job)
	Intelligent Operations	Workforce Collaboration	
Adapt to meet new customer and regulatory requirements	Cyber Security	Cyber Security	Meet new regulatory obligations (new capabilities to do a new job)
	Metering Compliance	5 Minute & Global Settlement	
	Distributed Energy Resources	Integration of DER	Addressing the concerns of electricity consumers (new capabilities to do the same job better and new jobs)
	Intelligent Operations	Customer Information Services Outage Management	
	Intelligent Operations	Information Management	To allow DNSP to further develop decision making and condition based asset management (new capabilities to support AusNet Services' Asset Management strategy)

Over half of our proposed expenditure for the period is directed to maintaining current levels of service. The remainder is required to meet requested customer and regulatory outcomes.

Electricity Distribution Network – Technology Strategy

Figure 1-1 – Proposed EDPR technology spend by category (includes capex and opex)



Outcomes to be delivered from the programs

We have proposed thirteen programmes of work in order to maintain services in a changing business environment and adapt them to meet new requested customer and regulatory outcomes as shown in the table below.

Table 1-2 – Summary of outcomes to be delivered

Programme	Outcome	Benefits to customers
Integration of DER	Forecasting and management of DER impact on network	Maintain unconstrained network to allow third party DER deployment (i.e. to allow more customers to be able to connect their DERs, examples including generation, battery discharging or EV charging on the network)
Future Distribution Network Management	Real-time monitoring and control of LV network and embedded DER	Maintain reliability of network services for all customers including those with new and dynamic DER load flows

Electricity Distribution Network – Technology Strategy

Programme	Outcome	Benefits to customers
Customer Information Services	Company-wide coordination of customer communication and history	More rapid and accurate resolution of customer requests and issues
Information Management	Integrated company-wide asset information and analytics to support condition- and risk-based network investment and maintenance	Enable decision making and avoid costs of deterministically planned capital investment and maintenance, allowing more efficient delivery of services to customers
Outage Management	Improved forecasting, coordination and management of supply restoration	More accurate and timely communication with affected customers about restoration times
Workforce Collaboration	Extend AusNet Services digital resources to all workers, regardless of location	Manage staff and contractor costs, and risks in constrained labour market, improving cost efficiencies to customers
Corporate Enablement	Ensure ongoing supportability and sustainability of core business systems and enabling an improved partner network across the enterprise	Continue to provide reliable service to customers by maintaining support and functionality of core enterprise systems, improved decision making and collaboration with partners
Cyber Security	Monitor and control new and changing cyber threats	Provide new capabilities to meet compliance requirements and reduce incidence risks as a result of increasingly sophisticated cyber security attacks
Technology Asset Management (TAM) - Applications	Mitigate operational and security risks by ensuring AusNet Services' meets lifecycle management obligations	Continue to deliver safe and reliable services with the least possible disruption
Technology Asset Management (TAM) - Infrastructure	Mitigate operational and security risks by ensuring AusNet Services' meets lifecycle management and capacity obligations	Continue to deliver safe and reliable services to customers with the least possible disruption
Corporate Communications	Mitigate operational and security risks to communication networks and resulting impacts on the ability to deliver reliable services	Lowering the total costs of delivering like-for-like services and efficient prices for customers

Electricity Distribution Network – Technology Strategy

Programme	Outcome	Benefits to customers
5 Minute & Global Settlement	5-minute collection, verification and submission of NMI-level meter data	Demand data to enable near real-time settlement and demand response to meet regulatory requirements
Metering Lifecycle	Periodic refreshes and patching to metering technology assets to ensure supported, compliant Meter Management Systems and Monitoring and Compliance Reporting Systems	Ensure a continued, safe operation of the metering assets with the least possible disruption. This includes maintenance of compliance with regulatory requirements and providing continuous metering services to the customer.

The broader productivity savings that AusNet Services is proposing for EDPR FY2022-2026 relative to the current period are, in part, a result of the improved information and tools that enable more targeted and efficient business decisions about asset investment and maintenance expenditures. In summary, AusNet Services is delivering:

- **Enhanced customer interactions and experiences** through easy to access and value-added information and services including enhancement of customer communications and notifications around maintenance and delivery of asset works
- Low voltage **network management capability** to cater for increased DER, including impact analysis modelling and tools to monitor and manage two-way energy flows across the distribution network in order to optimise network safety, resilience and reliability and ultimately **enhance customer service delivery**
- Enhanced energy demand forecasting to understand and better manage continuing changes in energy demand due to **DER**, in order to increase network reliability at peak times
- Enhanced Network billing capabilities to support Customer Demand Participation, Market settlement reforms and to provide greater **benefits for customers** who respond to demand peaks
- Enhanced **employee capabilities** making it easier to respond and deliver on customer requirements through automation, work collaboration and communication tools
- Enhanced capabilities to accurately identify the location of various types of faults that could cause **safety** issues
- **Compliance** with **metering** regulatory requirements
- Extended enterprise capabilities such as **field mobility** and reporting to drive further productive efficiencies and innovation
- Enhanced **communications capabilities** and field mobility to leverage network and asset management investments, improve service performance and reliability, and

Electricity Distribution Network – Technology Strategy

improve safety providing operational functions to the field

- Extend data and analytics capabilities through **information management**
- Improved **knowledge management** capabilities to leverage expertise across the organisation, increase productivity and accelerate delivery to customers
- Continued investment in **information security** to ensure the safety of customer information and to protect the electricity networks and business systems from cyber-attack, and
- **Lifecycle management** of systems and platforms including rationalisation and consolidation to maintain the overall integrity and stability of the network, optimise investment, mitigate risk and maximise customer outcomes.

1.3 Forecast Technology expenditure for FY2022-2026

Technology capex forecast

AusNet Services' proposed Technology capex for the **FY2022-2026 period is \$157.1M** which represents a [C-I-C] compared to the forecast for the CY2016-20 regulatory period.

Our forecast reflects a continuation of the trend of lower actual expenditure in the current regulatory period, taking account of AusNet Services' progress in reducing annual spend to ensure customer affordability and balancing our delivery capability against our capacity.

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

Electricity Distribution Network – Technology Strategy

Figure 1-2 – Proposed yearly capex by Workstream for EDPR FY2022-2026

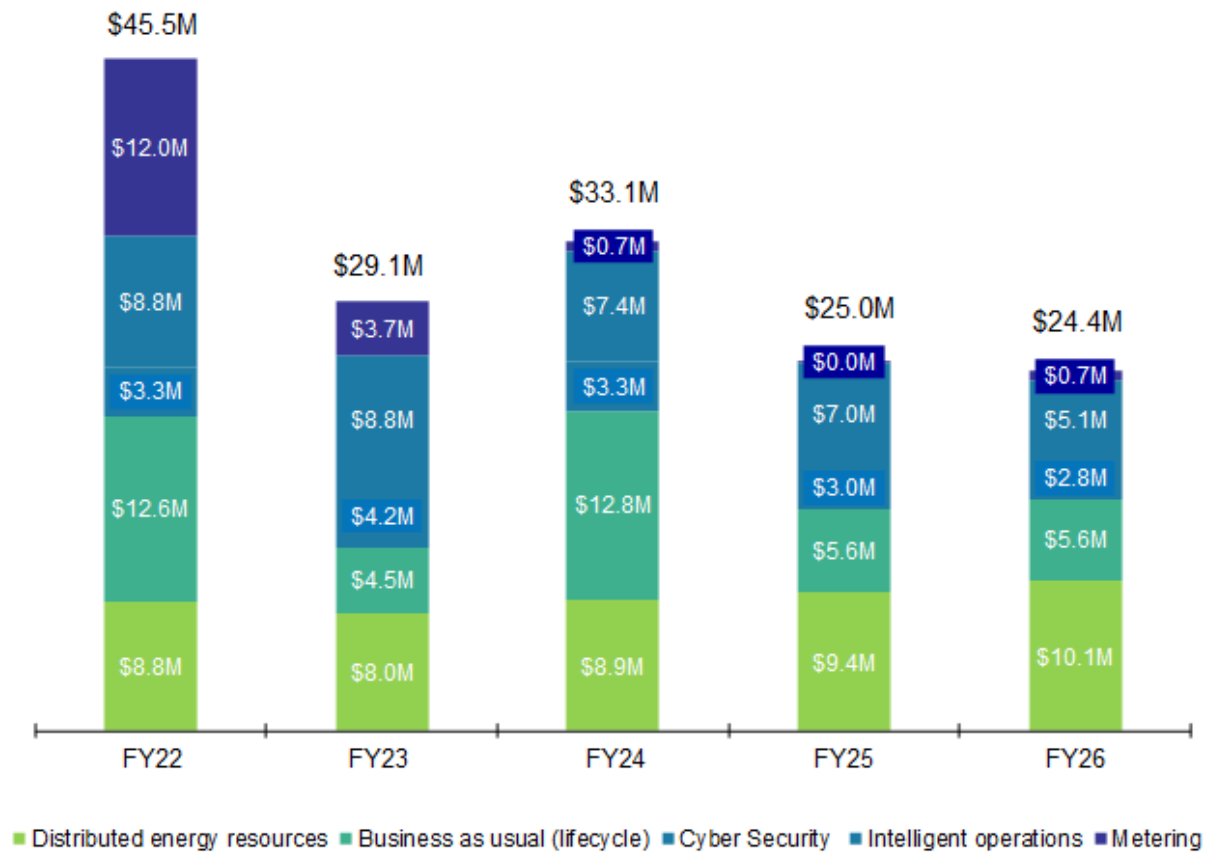
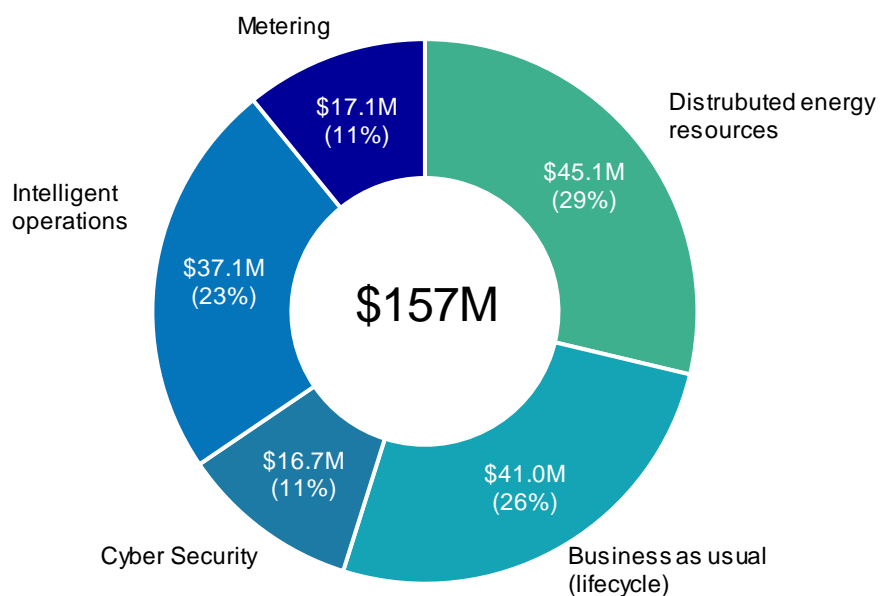


Figure 1-3 – Proposed Technology capex by Workstream for EDPR FY2022-26



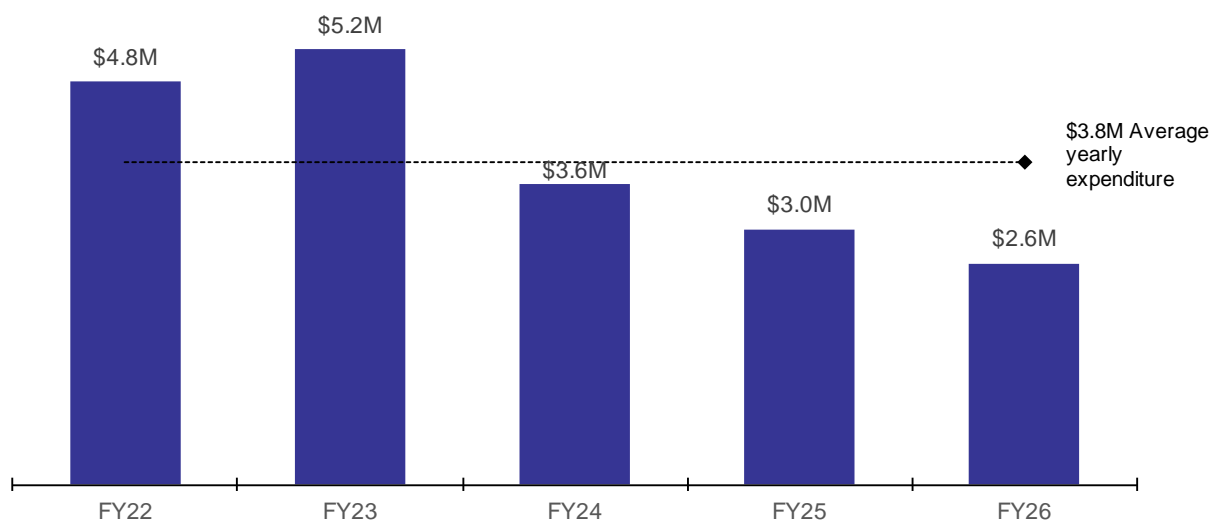
Electricity Distribution Network – Technology Strategy

Technology opex forecast

In the current regulatory period, the project related opex ('propex') forecast for Technology was approximately \$3M 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 over the regulatory period FY2022-2026, bringing the average yearly propex to \$3.8M per annum. The following figure outlines forecast technology propex for Standard Control Services.

Figure 1-4 – Proposed yearly propex for EDPR FY2022-2026 (Standard Control Services, \$2019, millions)

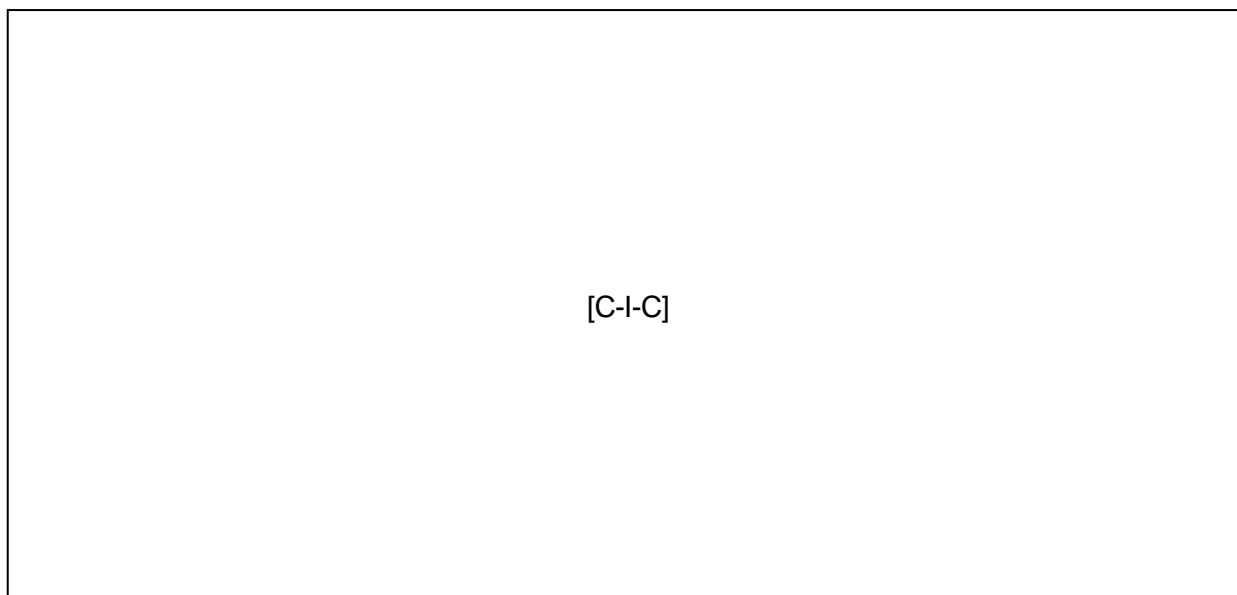


In order to facilitate new capabilities for cyber security, as well as facilitate a transition to cloud based systems in some areas and provide support and accommodate growth in data volumes associated with metering, we require three additional step changes.

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

Electricity Distribution Network – Technology Strategy

Figure 1-5– Proposed Opex Step Changes for EDPR FY2022-2026 (Standard Control Services, \$2019, millions)



Whilst we will continue our ongoing focus to reduce the total cost of ownership across our asset base, an increase in opex will be required in the forecast period to deliver cost effective Technology solutions, including cloud solutions.

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 EDPR period FY2022-2026, 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 \$[C-I-C] 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.

Electricity Distribution Network – Technology Strategy

Figure 1-6 - Cloud opex step change – breakdown by programme

Technology Program	Cloud opex increase	Viable alternative solutions available	Justification
Outage Management	Cognitive automation subscription	No viable alternative to cloud. On-premise solution is cost prohibitive.	New capability to minimise the impact of planned outages to customers by using cognitive automation across the outage management workflow. Cognitive automation components are available via cloud subscription. The only alternative would be to custom build the capability in-house which is not prudent as it is cost prohibitive and not in line with AusNet Services' architectural principles or industry standard practices.
Customer Information Services	Customer Relationship Management System	Only option is cloud based. On-premise solution is cost prohibitive.	Customer information market products for organisations similar to AusNet Services are cloud based. ⁵ These systems are mature and proven in the industry to improve communication and customer service through information, insights and accessibility. ⁶ The speed and quality of customer communications will be improved through a cloud based solution which is accessible from any device with an internet connection and is therefore not limited to the office but extends across teams and locations e.g. to field crews. Other benefits include scalability and agility as capacity requirements are handled automatically to allow for seamless change in response to demand.
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.
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.

⁵ Market Definition/Description, Magic Quadrant for the CRM Customer Engagement Centre, Gartner

⁶ Magic Quadrant, Magic Quadrant for CRM Customer Engagement, Gartner

Electricity Distribution Network – Technology Strategy

Technology Program	Cloud opex increase	Viable alternative solutions available	Justification
Information Management	Information Management Platform	Only option is cloud based. On-premise solution is cost prohibitive.	Extension of capacity to existing cloud based capabilities at AusNet Services to enable rapid access to timely, accurate data across all critical systems, assets, processes, and support more advanced analytics and reporting.
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.

Electricity Distribution Network – Technology Strategy

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.

Security opex step change

AusNet Services proposes to significantly improve its cyber security capabilities in the next seven years. Consistent with changing AEMO obligations, the growing complexity of the security environment, increasing volumes of data and higher threat levels for our organisation (as National Critical Infrastructure) additional staff will be required from mid-2022 to maintain our cyber security. Our proposed opex includes approximately \$[C-I-C] per annum.

The business will be focused on improving overall cyber maturity, as is outlined in the detailed work stream section, Cyber Security.

5 Minute Settlement opex step change

At present, AusNet Services is required to provide energy consumption data for market settlement on a thirty-minute basis. However, a recent change to the National Electricity Rules will require energy consumption data to be provided every five minutes, constituting a six-fold increase in data to be collected, stored, protected, managed and reported. This new requirement will effectively commence from December 2022. Our proposed capex programme of work for the forecast FY2022-2026 period includes investments in 2021 and 2022 to enable AusNet Services to become compliant with the changed regulations. Some expenditure will also be incurred in the current regulatory period.

AusNet Services' AMI meters transmit data wirelessly and incur carrier costs based on the volume of data transmitted. The transition to five-minute settlement significantly increases our data carriage costs, which are an operating cost. The increase in data requirements is expected to require an opex step change of \$[C-I-C] Total from January 2023 to December 2025, once these regulations and the associated meters are transmitting data in five-minute intervals.

2. Purpose of the document

The Electricity Distribution Network Technology Strategy (EDPR Technology Strategy), sets the direction and defines an actionable technology programme of work for the FY2022-2026 regulatory period.

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

2.1 Scope

The scope of this document is limited to:

- Technology solutions required to support AusNet Services' regulated electricity distribution business, including articulation of key programmes and initiatives, their relevance to key drivers of expenditure, costs and benefits and key risks;
- The Electricity Distribution Price Review (EDPR) period FY2022-2026; and
- Metering (lifecycle and five-minute settlement costs).

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

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

The EDPR Technology Strategy excludes:

- In-field Network Operations infrastructure such as SCADA terminal units and dedicated SCADA serial network (described in the document AMS Electricity Distribution – Network Submission);
- Communications strategy (described in detail in the document AMS 10-81 Electricity Distribution - Communications Systems); and
- Technology in support of AusNet Services' electricity transmission and gas distribution networks and unregulated business activities.

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

- Expressed in real 2019 Australian dollars and
- All dollar values refer to direct costs only (excludes overheads).

2.2 Approach to developing FY2022-2026 expenditure forecasts

AusNet Services' Technology Division operates in a dynamic environment as the utilities industry experiences an era of significant disruption.

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

We note that on the 12 April 2019, the Minister for Energy, Environment and Climate Change stated that the National Electricity (Victoria) Act 2005 was to be amended to have electricity prices adjust on a financial year basis, as per her letter to the AER.⁷ As a result, and noted by the AER's letter to the Victorian electricity distribution businesses, AusNet Services is submitting its regulatory proposal for the period between 1 July 2021 and 30 June 2026.

In developing our expenditure forecasts for FY2022-2026, we have considered:

- Key drivers;
- Customer expectations: To 'deliver on the basics', 'keep me posted', 'make it affordable', 'be ready for the future', and 'always safe', which have been summarised from customer research and validated through the Customer Forum⁸;
- Customer benefits;
- Industry and Technology: Technology is playing an increasing role in electricity networks and AusNet Services is seeking to leverage digital technologies to improve its operational effectiveness in this increasingly complex environment. This includes smart devices, automation, data and analytics, cloud computing, convergence of information and operational technology, and productivity tools for field and office workers;
- Cyber: Responding to increasing cyber threats to maintain a safe and secure network and working environment, and protect customers' privacy;
- Regulatory: Including the ability to comply with industry regulations and requirements in a timely and efficient manner, and to minimise current and future technology expenditure; and
- Internal factors: Including AusNet Services' corporate strategic objectives, business plans, business needs and expectations;
- Expenditure guidelines;
- The Australian Energy Regulator's (AER) assessment criteria;
- Net Present Values (NPV of individual projects, in cases where benefits and costs can be appropriately quantified);
- Capital and operating expenditure requirements including the prudence 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. We have also used external consultants, including Deloitte Touche Tohmatsu, and technology experts to provide industry benchmarks and budget estimates to validate the efficiency of the technology expenditure. Our internal and external experts have also directly contributed to the development of this Technology Strategy.

⁷ D'Ambrosio, Lily. "Intention to change the timing of Annual Victorian Network Price changes". Received by Conboy, Paula, 12/04/2019. Available at:

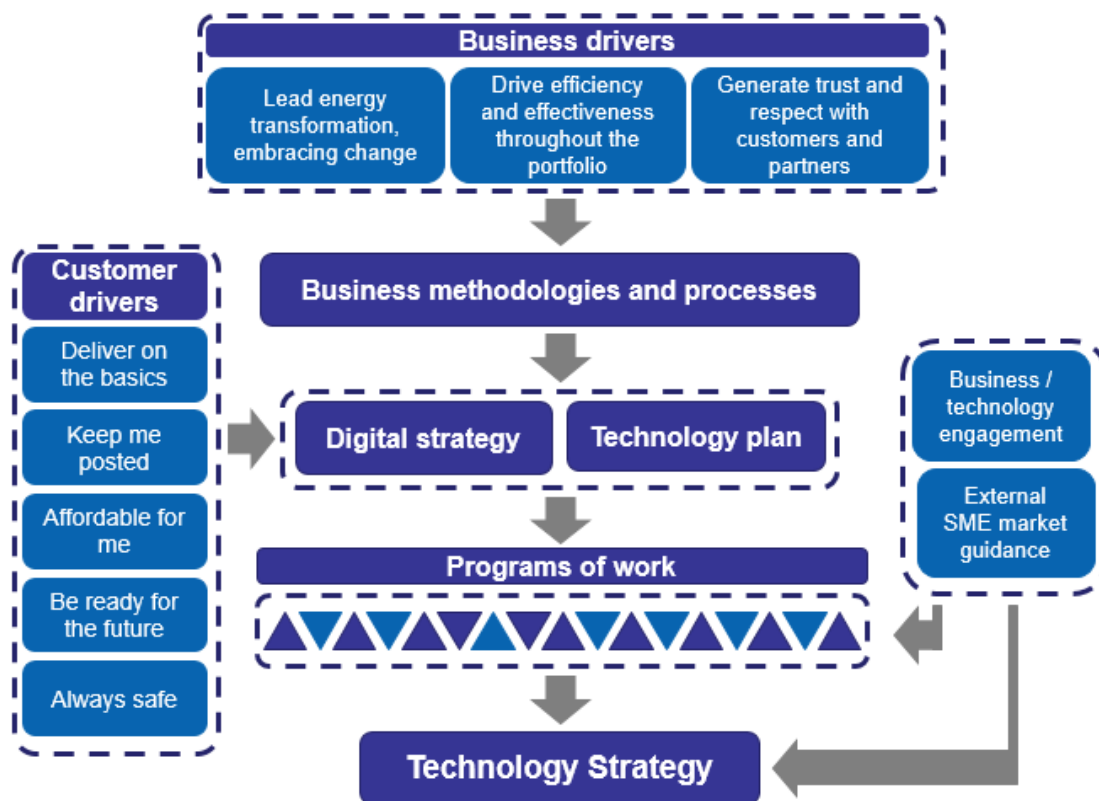
https://www.aer.gov.au/system/files/VIC%20DELWP%20letter%20to%20AER%20re%20intention%20to%20change%20the%20timing%20of%20annual%20Victorian%20network%20price%20changes%20-%20April%202019_3.pdf.

⁸ Customer Forum - <https://www.ausnetservices.com.au/Misc-Pages/Links/About-Us/Charges-and-revenues/Electricity-distribution-network/Customer-Forum>

Electricity Distribution Network – Technology Strategy

The figure below provides an overview of our approach to developing the forecasts.

Figure 2-1 Technology Strategy development methodology



In terms of the approach to developing the specific programmes of work and associated expenditure, the following steps were taken:

- Bottom up discussion with business and technology architects and delivery leads to develop scope, key objectives, and drivers influencing the requirement for the programmes;
- Consideration of different options to achieve the objectives of the programme and analysis of their relative costs, benefits and risks; and
- Top down view to ensure that the Technology Strategy investment portfolio represents prudent expenditure for the upcoming period, relative to AusNet Services' previous expenditure and is also benchmarked against other comparable distribution businesses.

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

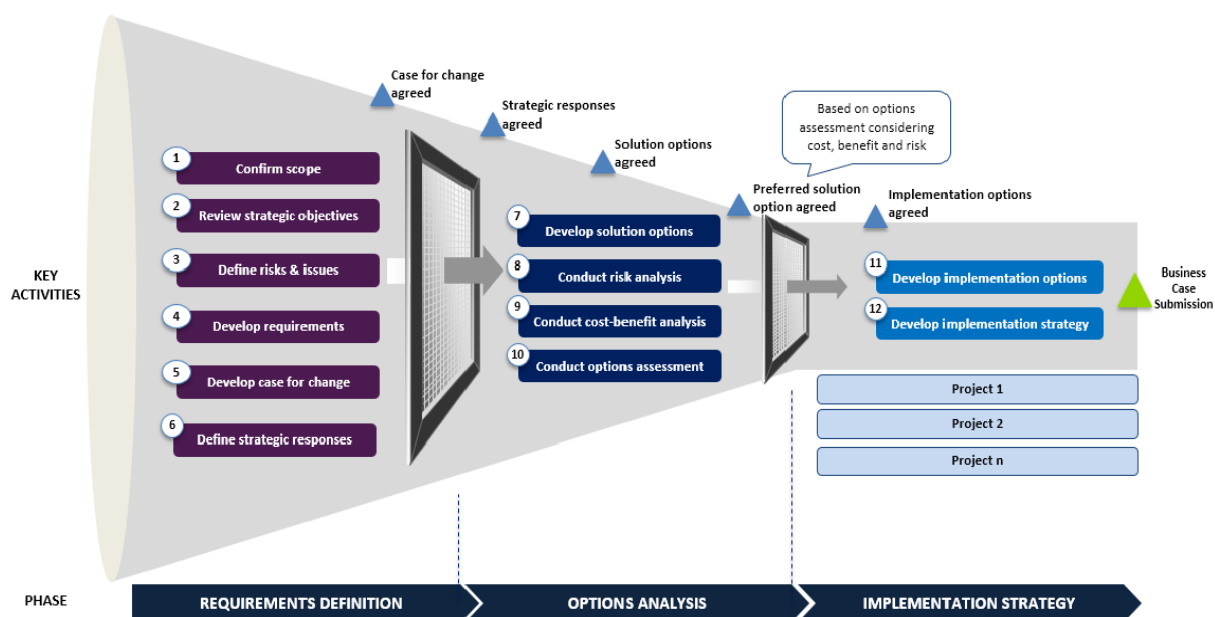
Programme Development

The methodology used to develop programmes for the forecast EDPR period FY2022-2026 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 standard control services in this period, and
- Solutions have been described which deliver project outcomes in the most efficient way.

Electricity Distribution Network – Technology Strategy

Figure 2-2 Programme development process



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

Table 2-1 – Development of Totex for EDPR FY2022-2026

Review	Capex \$m	Opex \$m	Totex \$m
May 2018	255	9	264
June 2018	216	24	240
Sept 2018	187	17	204
May 2019	157	13	170
August 2019	157	19	176

Electricity Distribution Network – Technology Strategy

Deloitte has verified this approach, and is satisfied that:

- *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 standard control services (i.e. core distribution services). Each Technology expenditure program is required in order to enable AusNet Services to deliver 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 program objectives are aligned to AusNet Service's broader business objectives, based on analysis of historical program delivery and capability, and subject to underpinning assumptions being met, could be delivered during the 2021-25 regulatory period.*
- *The cost forecasts were developed with reference to the benchmark drivers and elements of expenditure. In particular, 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, from sector analysts Hudson⁹ and Gartner¹⁰)*
 - *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 team¹¹.*

Deliverability

The overall programme of work for the period outlined in Section 1.3 above 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 EDPR period and the successful delivery of large and complex programmes, such as Power of Choice, to time and budget is evidence of our improved capability deliver our technology programme to plan.

⁹ <https://au.hudson.com/it-salary-guide-2019>

¹⁰ <https://www.gartner.com/en>

¹¹ 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.

3. Drivers of technology expenditure FY2022-2026

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

- Regulatory requirements
- Customer expectations
- Industry, technology and cyber security trends
- Business strategy, and
- Benchmarking.

Each of these drivers is explained in more detail below.

3.1 Regulatory requirements

AusNet Services' business and investment plans for how the Electricity Distribution Network is operated and maintained must reflect its regulatory obligations. This includes prudent, efficient and sustainable management of the Electricity Distribution 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 standard control services over that period;
- Comply with all applicable regulatory obligations or requirements associated with the provision of standard control services;
- Maintain the quality, reliability and security of supply of standard control services; and
- Maintain the reliability, safety and security of the distribution system through the supply of standard control services¹².

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

“...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 –

- *Price, quality, safety, reliability, and security of supply of electricity; and*
- *The reliability, safety and security of the national electricity system.”¹³*

3.2 Customer expectations

As part of developing our broader Electricity Distribution Regulatory Proposal, AusNet Services consults with customers to ensure that we understand and continue to meet their needs and priorities.

Customer engagement has always been part of our Regulatory Proposal process; however, the current regulatory period has involved significantly increased customer engagement, developed through consultation in various forms.

Multiple qualitative and exploratory stakeholder interviews were undertaken by a number of third-party research firms on behalf of AusNet Services. These studies were used to gain an external point of view

¹² Australian Energy Market Commission (AEMC), (Feb 2015). National Electricity Rules Version 68 – Section 6.5.6.

¹³ Australian Energy Market Operator (AEMO), (1996). National Electricity (South Australia) Act 1996 (public version).

Electricity Distribution Network – Technology Strategy

of what matters most to customers, as well as identifying the nature of the relationship they have and would like to have with AusNet Services¹⁴. These studies utilised a statistically significant and diverse cross section of AusNet Services' footprint. Including both residential and commercial customers. The interviewed stakeholders included local councils, large businesses, and small to medium businesses, customer advocates and community energy groups¹⁵. Qualitative data extracted from the interview transcripts was used to develop the customer drivers detailed below, which are at the core of any technology investment proposed in the upcoming regulatory period.

As part of developing the EDPR Technology Strategy, AusNet Services also conducted a series of consultation forums to better understand the needs and priorities of its customers. This includes the newly created Customer Forum, led by ex-Consumer Affairs Minister for Victoria, [C-I-C], which continues to engage with AusNet Services to ensure its plans to deliver the services that its customers most value. Its goal is to reach agreement on AusNet Services' plans for the years FY2022-2026 before they are lodged for formal assessment by the Australian Energy Regulator (AER) under the Electricity Distribution Price Review (EDPR) process. The outputs and comments from the Customer Forum supplement the ongoing customer consultation work outlined above.

Through its engagement with customers, including the Customer Forum, AusNet Services has listened to a broad range of views on customer needs and priorities. AusNet Services has distilled these views into a succinct list of key priorities:

- Delivering basic services – “deliver on the basics”;
- Keeping customers informed – “keep me posted”;
- Affordable services – “affordable for me”;
- Adaptability – “be ready for the future”; and
- Safety – “always safe”.

The proceeding figure provides some examples of the range of statements that AusNet Services has heard from customers, and how they fit into the five key customer priorities.

Figure 3-1 Summarised examples of customers' statements

Deliver on the basics	Keep me posted	Affordable for me	Be ready for the future	Always safe
Ensure customers have a consistent and reliable supply of electricity	Any changes to supply must be preceded by clear and simple communication and delivered in a timely manner	Make the necessary upgrades to the network to meet my expectations and control expenditure and charges	Make sure customers can connect DER and apply modern technologies to manage their usage efficiently	Ensure that the network always operates without any undue risk to the safety of the community

These customer values and priorities are at the forefront of AusNet Services' decision making in regard to its proposed investments in technology. The technology investment programmes have been developed to target these customer priorities.

¹⁴ AusNet Services 2021-2025 EDPR Customer Research, Qualitative Research Report, Newgate Research, August 2018.

¹⁵ UNDERSTANDING THE ELECTRICITY RELATED NEEDS AND WANTS OF CUSTOMERS: A STAKEHOLDER PERSPECTIVES (FULL PAPER), Stephanie Judd, Customer Research and Insights Advisor, AusNet Services, 2018.

3.3 Industry, Technology and Cyber Trends

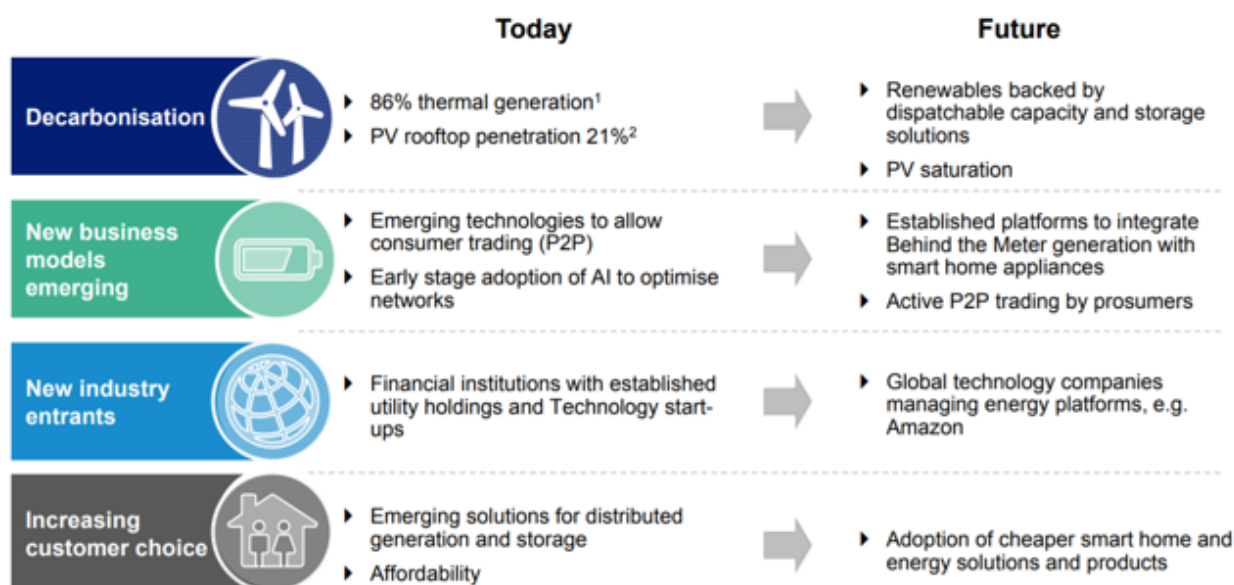
The utilities sector is going through a major period of change, driven by increasing customer demand for renewables (distributed energy resources, DER), the emergence of community grids, price pressure, new regulatory requirements, and a strengthened commitment to boost the resilience of the network following recent highly publicised outages in the NEM. AusNet Services continues to find new ways to deploy technologies to address these challenges and harness new opportunities to reduce its costs and ensure the reliability and continuity of supply.

There are many external changes occurring that will affect the way that AusNet Services uses its technology to deliver distribution services to customers over the next regulatory period. It is important to understand the trends that underlie these external changes when considering what investments are required to deliver the outcomes our customers and other stakeholders are seeking.

Industry Trends

The energy industry is undergoing significant disruption, which is creating a period of substantial uncertainty and increasing complexity for the business. Trends such as the ones discussed in the figure below, are changing the operational environment and are affecting relationships with stakeholders and regulators, customers' needs, and the ability for AusNet Services to provide secure and cost-efficient services.

Figure 3-2 Trends affecting AusNet Services' operational environment¹⁶



¹⁶ Corporate Strategy Overview in AusNet Services' 2018 Investor Day Presentation.

Electricity Distribution Network – Technology Strategy

AusNet Services not only needs to respond to these trends in regards to their direct impacts on the business, but also needs to anticipate where these trends are also affecting other market participants' behaviours (e.g. with new business models emerging, regulators and stakeholders are seeking innovative business solutions that can leverage these new models and technologies).

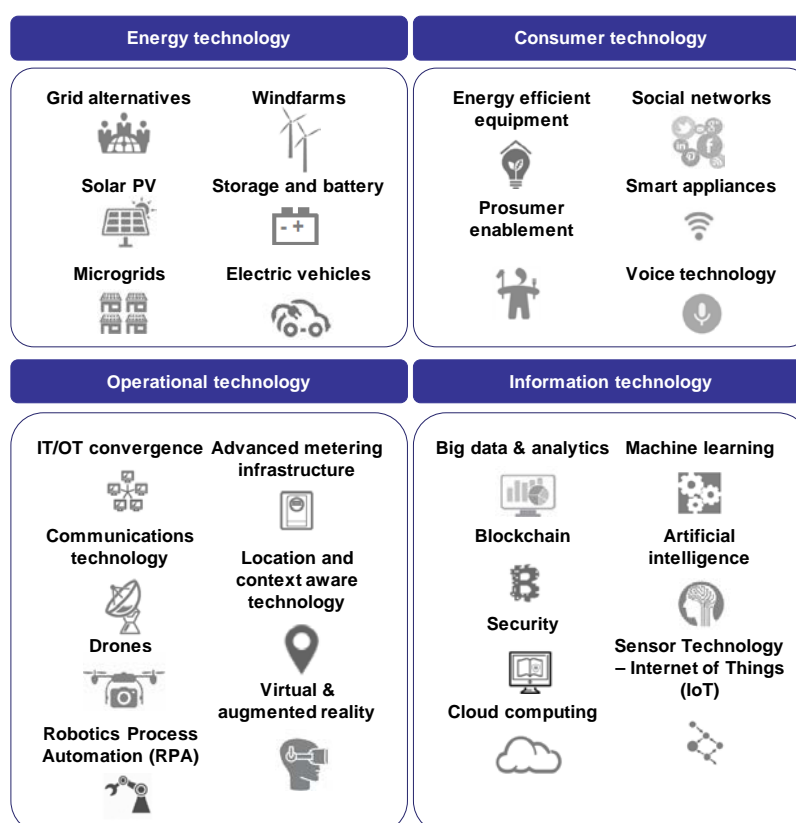
In developing the proposed investments outlined in this EDPR Technology Strategy, AusNet Services has taken a prudent approach to invest to manage the impact of these trends without overinvesting ahead of the curve. We have done this by ensuring that the customer outcomes are at the centre of our investment plans – prioritising to deliver first on what customers are telling us and leveraging technology and opportunities to reduce our ongoing costs wherever possible. This balances the needs of customers for AusNet Services to be 'ready for the future' whilst being 'affordable for me'.

Technology and cyber trends

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

The figure below presents different types of technology trends categorised under the headings of energy technology, consumer technology, operational technology 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 interact with them.

Figure 3-3 Different types of trends in technology¹⁷



Due to their disproportionate impact on the EDPR Technology Strategy, four technology trends are explained in more detail below.

¹⁷ FY19-23 AusNet Services Technology Plan.

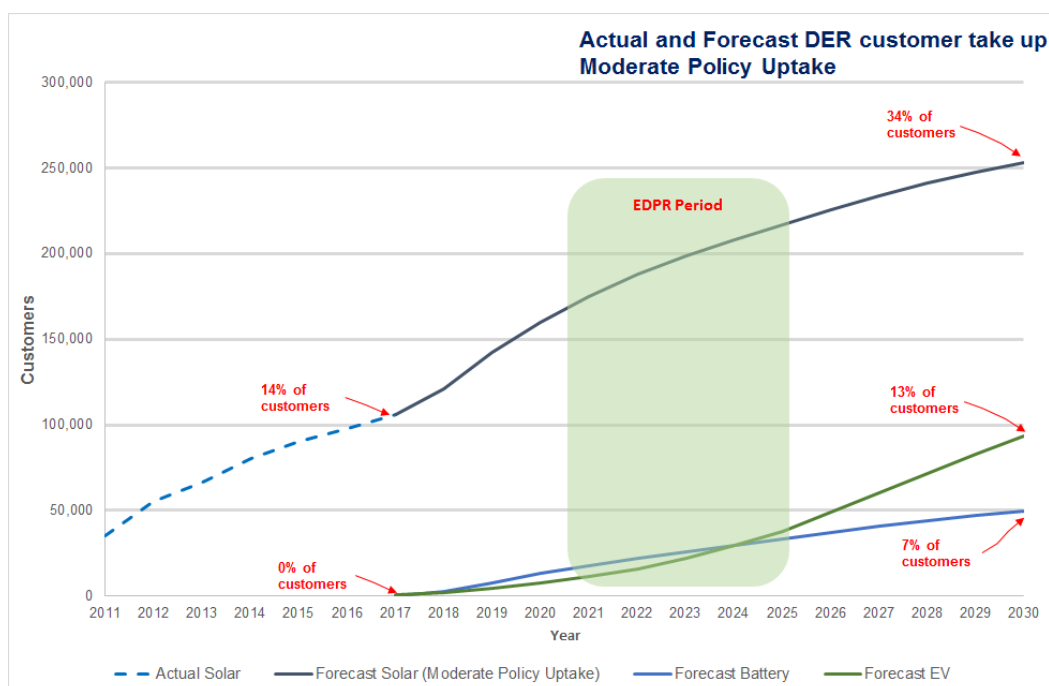
Electricity Distribution Network – Technology Strategy

Distributed Energy Resources (DER)

Distributed Energy Resources (DER) are growing rapidly in the National Electricity Market (NEM), including within AusNet Services' network area, driven by cost reductions and shorter payback periods, increased consumer awareness and uptake, and new government policy incentives around solar.

In July 2019, the Victorian Government launched a \$1.3 billion programme to incentivise 770,000 households to install solar panels, providing a rebate on the installation costs per household, plus low cost finance for the remaining costs.¹⁸ AusNet Services expects that this subsidy will lead to a significant increase in solar panel installations within its network area.

Figure 3-4 AusNet Services' forecast of solar PV uptake¹⁹



DER includes distributed electricity resources, for example, rooftop solar PV systems, batteries, as well as demand response to manage load, for example hot water systems, pool pumps, smart appliances and air conditioning control.

AusNet Services and the broader industry recognises that these resources will be aggregated and actively managed, leading to an increasingly decentralised energy system. The emergence of community grids and virtual power plants continues to gain momentum and will further grow over the next regulatory period.²⁰

Although there are a number of opportunities and benefits associated with a decentralised energy system, such as having a more diverse generation portfolio which improves the security of supply, there are also challenges arising, particularly for electricity distributors.

For example, the connection of DER (such as solar PV) changes the daily magnitudes and direction of power flow on our network, which results in voltage variation and places pressure on infrastructure.

¹⁸ Victoria's Rooftop Solar Revolution Kicks Off Today, Minister for Solar Homes 1 July 2019, <https://www.premier.vic.gov.au/victorias-rooftop-solar-revolution-kicks-off-today/>.

¹⁹ AusNet Services Network Planning Team.

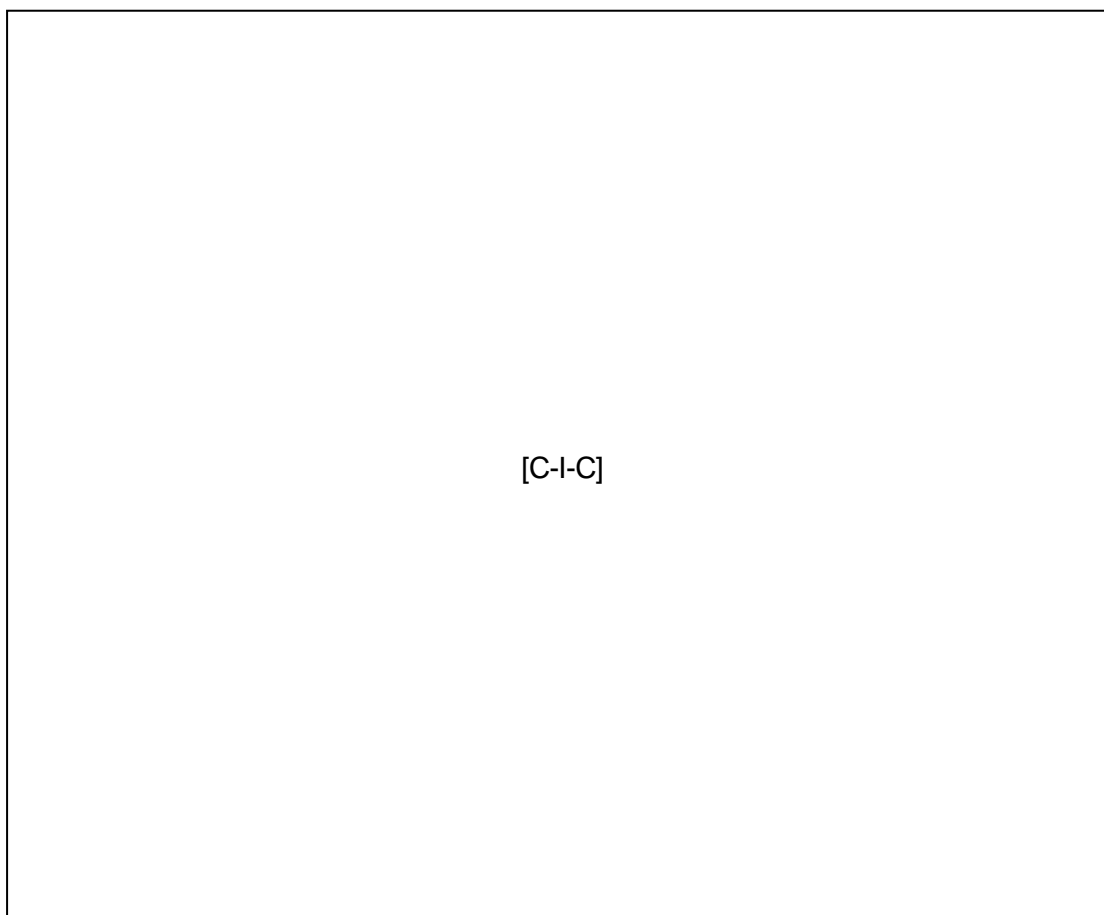
²⁰ See, for example, Energy Networks Australia, Electricity Network Transformation Roadmap: Final Report, April 2017.

Electricity Distribution Network – Technology Strategy

Because our technology systems currently hold only limited real time information about actual power flow on the LV network, and because we don't have the capability to remotely manage these voltage changes across our network, we currently restrict customers from connecting their DER to our network, based on high-level, and necessarily conservative, capacity constraints. With better information on LV network power flow and system stability, which would be delivered by investing in the new technology we have proposed for the next regulatory period, we can be more confident that the impacts of DER can be managed and reduce the risks posed by uncontrolled DER. Therefore, we can make it easier for customers to connect their DER to our network.

We have highlighted a number of opportunities and challenges associated with DER that are relevant to AusNet Services' and our customers in the table below.

Figure 3-5 Risks, challenges and opportunities associated with DER²¹



While DER are located within the distribution network, there are system wide opportunities and challenges to other network participants (customers, other distribution businesses and other stakeholders in the energy market) that are part of the broader electricity system.

Furthermore, as the uptake of DER continues to grow, these risks and challenges also increase so the need for AusNet Services to position itself to respond to such a rapidly changing environment is imperative. To this effect, AusNet Services' objectives for the next period are to be able to better facilitate efficient investment in DER to better serve the needs of customers, and to better understand and manage the increasing impacts of DER on the network.

²¹ AusNet Services' DER Impacts and Opportunities 'Scope 2' presentation at the Future of the Networks Forum (2017).

Electricity Distribution Network – Technology Strategy

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 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 we 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. We will time and sequence our migration to the cloud to balance the risks and costs of doing so 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 [C-I-C] to address increasing maintenance costs for end of life equipment and increasing risks of equipment failure. Some of AusNet Services 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 [C-I-C] programme 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 FY2022-2026 period, AusNet Services will continue the deployment of the [C-I-C] 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.

Electricity Distribution Network – Technology Strategy

Information Management

The amount of data flowing through the organisation exponentially increases each year. Smart meters and smart devices, switches and modern network assets deployed across the distribution 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 3-6 The implications of key focus areas for information management within energy distribution businesses²²

	Focus area	Impact	Implications
	Smart Meters	Real time intelligence	Smart meters relay real-time usage data that can provide insights into how to anticipate and change consumption patterns, design innovative products for customers, predict peak demand, level consumption to avoid new infrastructure investment, detect fraud, etc.
	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.

AusNet Services Technology is developing an enhanced information management platform, which will enable many of the functions outlined in the preceding table. This programme of work is detailed in this document as a part of Intelligent Operations.

²² Deloitte power analytics, infographic, <https://public.deloitte.com/media/power/power-analytics-infographic.html>.

Cyber Security

AusNet Services' distribution network is a part of Australia's nationally critical infrastructure. The safety and reliability of electricity supply is absolutely integral to the lives of many 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. With ever increasing customer interactions, there is also a growing need to maintain the privacy and security of customer data.

To address these challenges and be better prepared for the future, AusNet Services has benchmarked its cyber security maturity level of capability against the Australian Energy Sector Cyber Security Framework (AESCSF). The framework led by the Australian Energy Market Operator (AEMO), was developed through collaboration with industry and government stakeholders including the Australian Cyber Security Centre (ACSC), Critical Infrastructure Centre (CIC), and the Cyber Security Industry Working Group (CSIWG) which includes representatives from Australian energy organisations. AusNet Services has been deemed by AEMO to be in a 'High Critical' group and therefore the highest level of maturity, Maturity Indicator Level, **MIL: 3 must be reached by 2024**.

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)^{23, 24}; 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.

3.4 Business strategy

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

- Lead energy transformation, embracing change (e.g. through DER management)
- 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.

²³ AEMO 2018 AESCSF Report.

²⁴ AEMO and NCSA AESCSF 2019 Close Out Letter – AusNet Services.

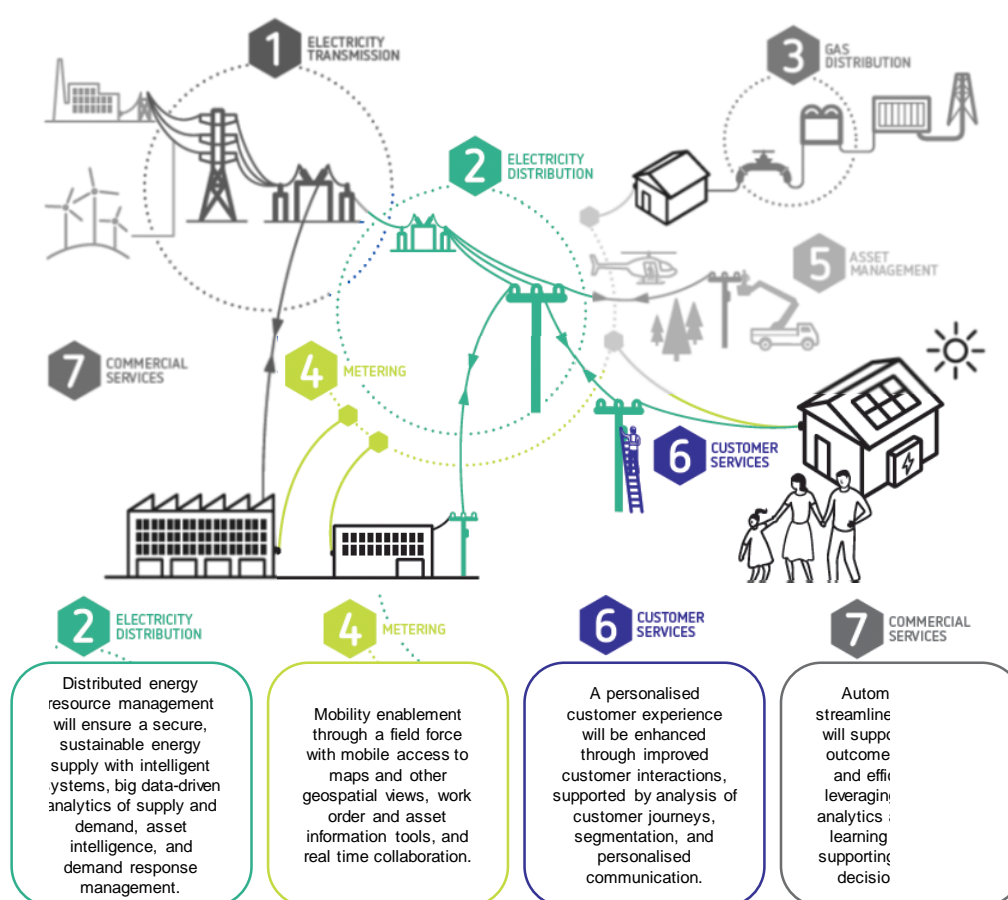
Electricity Distribution Network – Technology Strategy

Figure 3-7 - Six key attributes of a digitally enabled utility of the future²⁵



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 proceeding diagram provides an overview of AusNet Services' broader business functions and highlights the areas relevant to this Technology Strategy where we are driving outcomes through insights and innovating to enable network and customer growth.

Figure 3-8 - Transformation into a digitally enabled utility of the future²⁶



²⁵ FY19-23 AusNet Services Technology Plan.

²⁶ FY19-23 AusNet Services Technology Plan.

4. Benchmarking

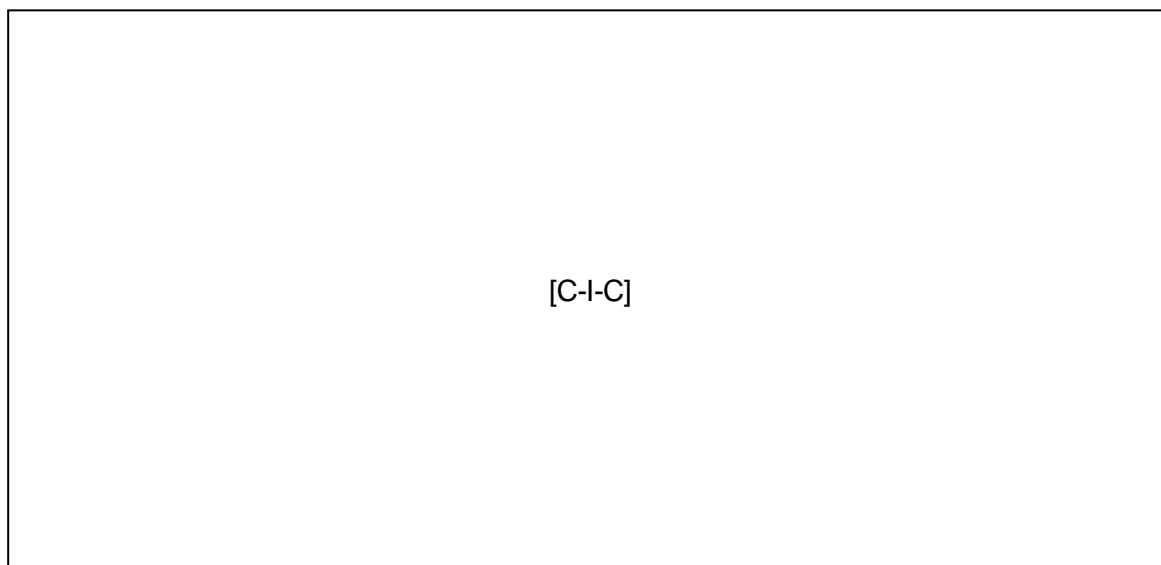
Benchmarking is typically used by regulators to assist with monitoring outcomes against the determinations of regulated businesses, developing performance reports and preparing for future determinations. For example, the Australian Energy Regulator (AER) collects and publishes Regulatory Information 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' spend for the upcoming regulatory period, as well as understanding AusNet Services' historic performance against other comparable businesses.

The following figure presents AusNet Service's actual Standard Control Services Technology expenditure over the last four years. We note that this excludes Technology costs allocated to Alternative Control Services or the AMI Remediation Programme (which was not recovered from our customers).

Figure 4-1 AusNet Services actual IT/technology spend (Standard Control Services, \$nominal)



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 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, we 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: we deliberately time and phase initiatives to smooth workload and minimise business disruption over time. As part of this strategic review, we 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. We have realigned our capex plans to invest in the areas that can provide the greatest value to deliver our business objectives – by optimising the technology investment portfolio to gain the greatest value for our customers.

Electricity Distribution Network – Technology Strategy

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 2015-17:

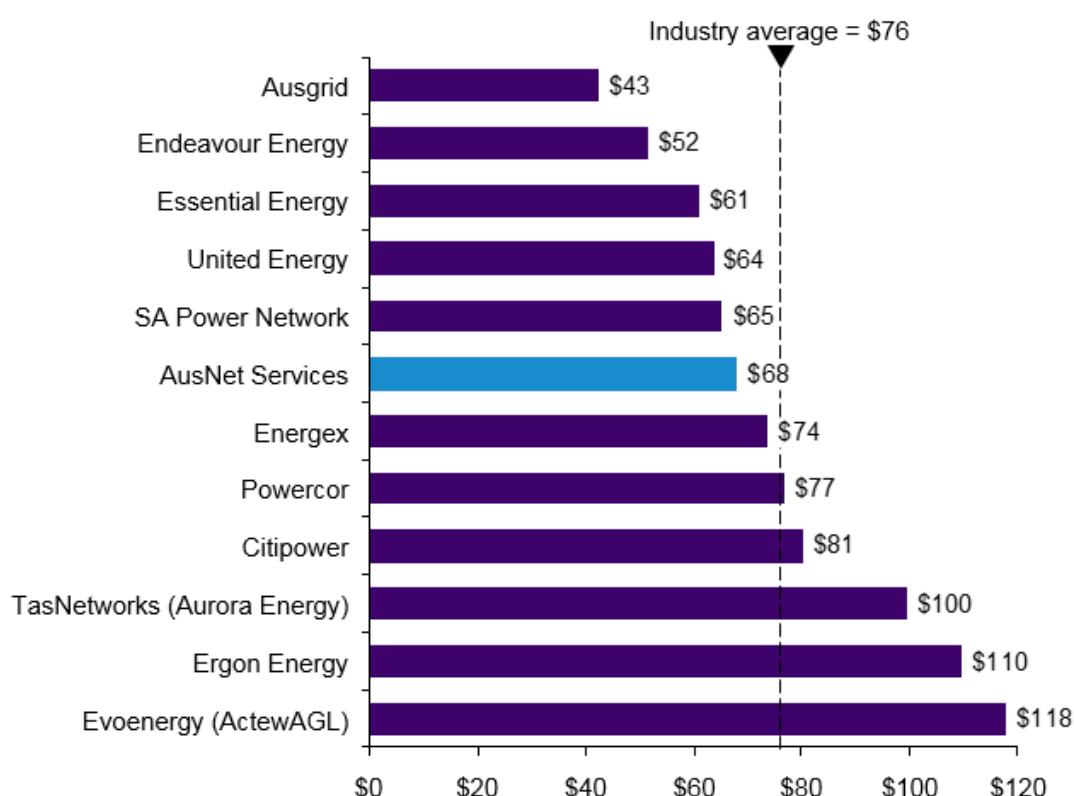
1. Insourcing of technology functions, following changes in management and contract structure
2. Review of the Technology operating model, which included:
 - Capability assessment, resulting in an uplift in capability across architecture, business engagement, project delivery, commercial and security 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 2014-16 period) will be reversed from 2019, 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 DNSPs

AusNet Services' Technology costs over the 2014-17 period benchmark favourably against other NEM DNSPs, with the average Technology cost per customer lower than the industry average of \$76. The following figure shows average Standard Control Services Technology Totex per customer (excluding Technology allocated to Alternative Control Services or the AMI Remediation programme which was not recovered from customers).

Figure 4-2 - CY2014-2017 Average IT/technology Totex per customer (Standard Control Services, \$nominal)²⁷



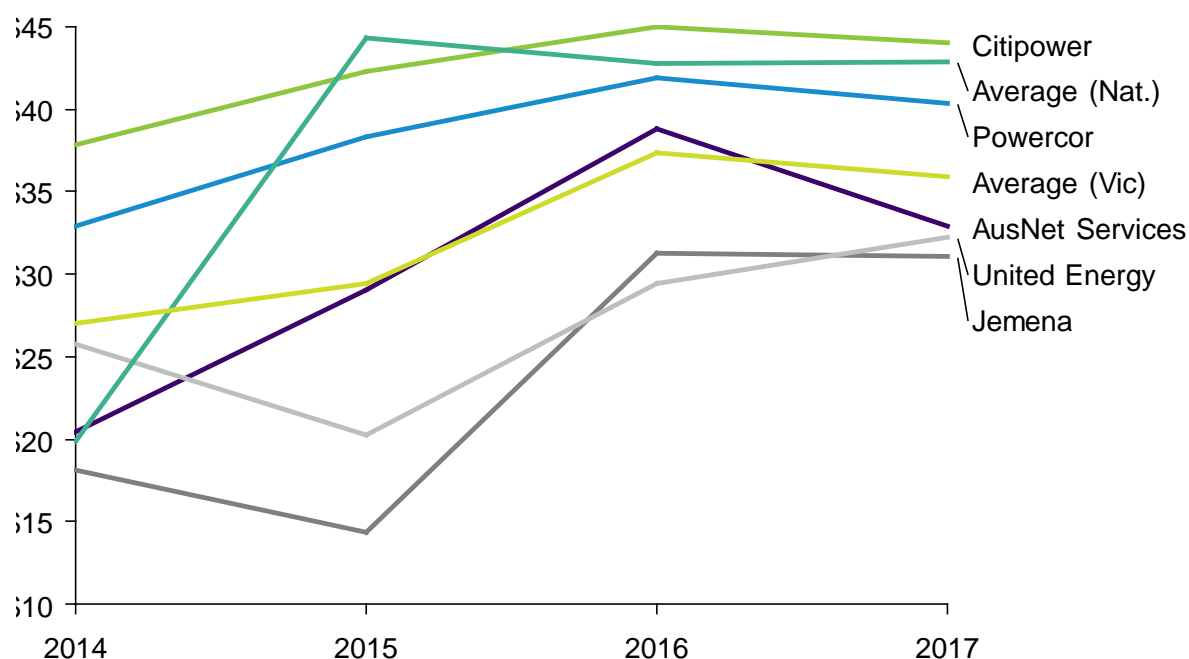
²⁷ AER RIN data. Note that Jemena costs not shown as capex data unavailable.

Electricity Distribution Network – Technology Strategy

AusNet Services' Technology Totex per customer is not expected to significantly change over the FY2022-2026 period, as our total Technology expenditure forecast is trending down. Totex per customer is expected to be [C-I-C] (\$2019) per customer at the end of the forecast regulatory period (FY2026).

AusNet Services has actively sought and has in alignment with new operational models, reduced its technology opex since 2016. This reduction in base opex is forecast to continue over 2019-20, and will further improve AusNet Services' benchmarking position. The following figure shows Standard Control Services Technology opex per customer for the Victorian distributors and excludes Technology costs allocated to Alternative Control Services.

Figure 4-3 - IT/technology opex per customer (Victorian businesses) (Standard Control Services, \$nominal)²⁸



²⁸ AER RIN data.

4.1 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.

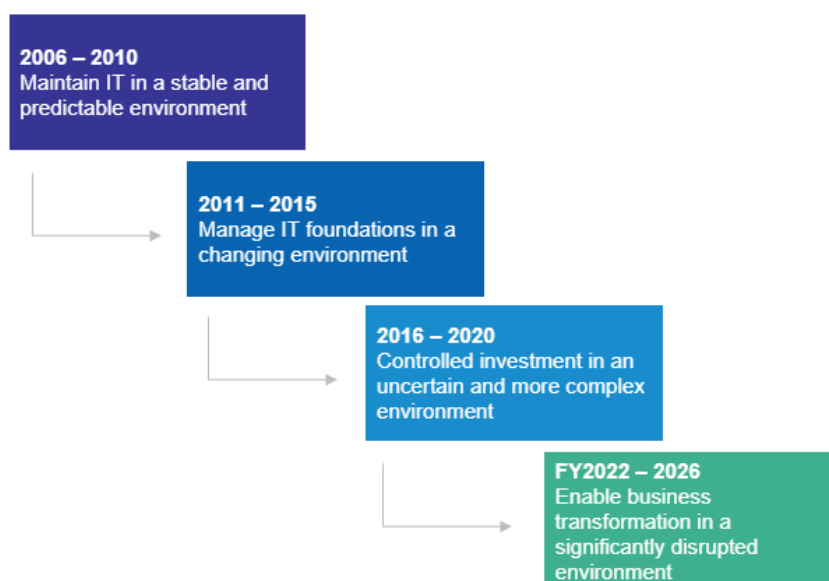
In the current regulatory period, AusNet Services has focused on understanding the changing business environment, realigning its Technology strategy towards core business goals, and leveraging, extending and improving our enterprise foundation to realise benefits for our customers.

The trends and drivers described in Chapter 3 are contributing to an increasingly complex environment and placing increasing demands on our Technology systems and services. AusNet Services has taken a conservative and cautious approach to its Technology expenditure, reducing capex (as compared to the CY2011-15 regulatory period) and also controlling opex.

For the upcoming regulatory period, our proposed Technology programmes 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 4-4 and 4-5 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 4-4 - Transformation of AusNet Services' operating environment and Technology strategy



Electricity Distribution Network – Technology Strategy

Figure 4-5 – Qualitative explanation of the outcomes Technology delivered in each of the most recent and planned EDPR regulatory periods

Calendar year	2006-2010	2011-2015	2016-2020	FY2022-2026
Business environment	Stable and predictable	Changing	Uncertain and more complex	Major disruption
AusNet Services IT themes	Maintain IT	Manage IT	Controlled investment	Enable business transformation
Key Initiatives	<ul style="list-style-type: none"> Support inherited (fragmented) IT environment Limited IT infrastructure consolidation and modernisation 	<ul style="list-style-type: none"> Formal service management IT infrastructure modernisation Initial IT application modernisation AMI roll out commenced 	<ul style="list-style-type: none"> Realign IT strategy Develop Information management foundations Pilot business deployment of new capabilities Retire legacy IT environment AMI remediation 	<ul style="list-style-type: none"> Complete rollout of new IT-enabled business model Electricity network management to facilitate DER Optimised electricity business decision making
Benefits	<ul style="list-style-type: none"> Continuity of IT services 	<ul style="list-style-type: none"> Risk-managed IT Secure IT Reliable IT Improved access to network data 	<ul style="list-style-type: none"> Manage data and information Flexible IT Controlled IT cost 	<ul style="list-style-type: none"> Enhanced customer services Controlled business costs Dynamic business environment managed Cyber security risks managed

5. Expenditure in the current regulatory period

During the CY2016-2020 regulatory period and six-month period before the forecast period from FY2022, AusNet Services has focused on cost reduction and re-prioritisation of expenditure towards our business drivers.

Our ongoing and planned investments for this period are also aimed at readying AusNet Services to evolve in response to the expected business environment post FY2022; that is, a more uncertain and complex electricity environment with consumers' investment in technologies such as local solar PV generation and battery storage significantly impacting the business. For example, AusNet Services is developing an enhanced forecasting model to improve its ability to anticipate the increased Distributed Energy Resources (DER), discussed in greater detail below.

Sound information technology is critical to supporting AusNet Services' increased and increasing role in balancing residential generation and supply of electricity with residential demand. The modernised technological environment being established in CY2016 – 2020 intends to provide the basis to enable the business to deal with the uncertain future.

AusNet Services' key outcomes of this current period are to:

- Deliver core business outcomes for customers and realise the benefits of the foundational enterprise investments;
- Reduce capex (relative to CY2011-2015) and cap and control opex in alignment with our risk appetite;
- Optimise the Technology operating model and sourcing strategies, developing capabilities and upgrading our assets to improve our maturity as a business enabler; and
- Ensure the robustness and reliability of metering assets, systems and data.

The planned Technology investments enable business strategies and have built on the foundational enterprise capabilities delivered in CY2011-15, focusing on customer service, customer safety, security of the distribution system, and technology that support the distribution network (assets, work, people, field mobility).

The following details some of the proposed programmes currently being implemented:

- Comply with metering regulatory requirements, including:
 - Life Support Customer Registration Changes
 - Unmetered Supply sites compliance
 - Joint Online Tracker website
 - DER National Register
 - 5-minute settlement (over both the current and upcoming FY2022-26 regulatory period);
- Develop low voltage network management capability to cater for increased Distributed Energy Resources (DER), including impact analysis modelling and the development of tactical tools to monitor and manage two way energy flows across the distribution network in order to optimise network safety, resilience and reliability and ultimately enhance customer service delivery;
- Develop enhanced energy demand forecasting to understand and better manage the changes in energy demand due to Distributed Energy Resources, in order to increase network reliability in peak times, through the development of tactical models of DER take up and hosting capacity;
- Drawing on meter data to enhance capabilities and enable us to accurately identify the location of various types of faults that could cause safety issues to the public, damage to either AusNet Services or customer's assets or parts of the network;

Electricity Distribution Network – Technology Strategy

- Manage and enhance customer interactions and experiences through the provision of easy to access and value-added information and services including enhancement of customer communications and notifications around maintenance and delivery of asset works, including:
 - Online customer service order tracking
 - Improvement in identification of customers impacted by outages to enable timely and accurate notification
 - Online connection cost calculation for electricity connections
 - Improvement in determination and communication of Estimate Time of Return and
 - Online tools to enhance solar connection process for 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;
- Develop data and analytics capabilities through information management to better manage risk and provide the information required for business decision making, including an enterprise management platform, automated asset risk modelling reporting, and advanced analytics;
- Continued investment in information security to ensure the safety of customer information and protect the electricity networks and business systems from cyber-attack;
- Enhanced employee capabilities making it easier to respond to customer queries through work collaboration and communication tools; and
- 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.

To date (mid 2019), key improvements in this period have included:

- Delivery of compliance programmes such as Power of Choice and Ring-Fencing, which has involved modifications to systems and processes in order to meet new regulatory requirements;
- Completed the AMI Remediation program, which commenced in 2014. The costs of this programme were borne by Ausnet Services - not recovered from our customers. The Technology components of this programme included:
 - Refresh of metering network management system
 - Refresh of mesh network management system
 - Refresh of meter data management system
 - Refresh of key application infrastructure interfaces i.e. Enterprise Application Integration

The maintenance of the described applications and supporting infrastructure was undertaken in alignment with asset management policies to ensure currency of systems and to ensure alignment to AusNet Services' risk appetite
- Delivered Life Support Compliance capability to ensure compliance to new regulatory obligations
- Refresh of customer communication channels (customer portal), which has enabled improved communication through the refresh of a web platform with mobile capabilities;
- Completed the Customer Delivery and Experience Program that has evaluated customer service-related pain points and implemented solutions to improve the customer experience. i.e. customer access to data, case management
- Established an Information Management Platform, based on a business-use case approach, i.e. asset risk modelling;

Electricity Distribution Network – Technology Strategy

- Application whitelisting (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;
- Regulatory information notice reporting, which has included:
 - Leveraging existing software to provide integrated regulatory reporting and compliance capabilities to support the effective production of annual regulatory reporting; and
 - Providing AusNet Services with data quality information allowing data to be proactively updated;
- 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
 - 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.
- Delivered an enhanced asset inspection tool that captures enhanced asset information and integrates into key asset and work management platforms
- Completing an enhanced drawing capability that supports the management of engineering drawings to support design and management decisions
- 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

5.1 Comparison of the AER's forecast to actual expenditure

The AER approved a total capex forecast for Standard Control Services Technology of [C-I-C] million (\$2019) over the 2016-20 regulatory period, as set out in the following table. This included [C-I-C] million for implementing the changes associated with the Power of Choice regulatory changes.

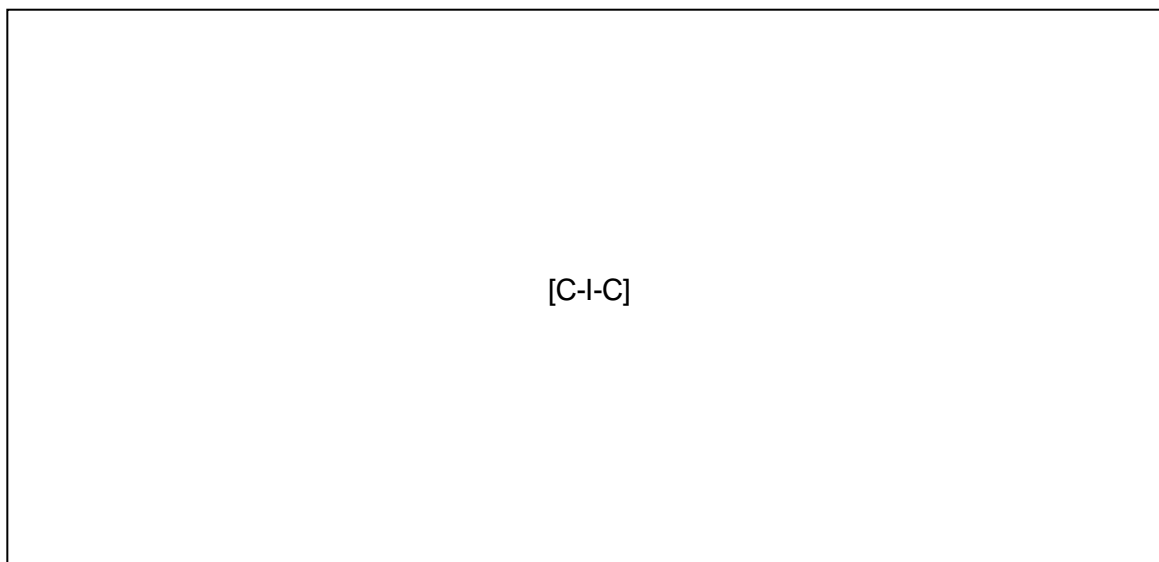
Table 5-1 – Technology capex forecast for 2016-20 (Standard Control Services, \$2019, million, direct)²⁹

[C-I-C]

As at mid-2019, AusNet Services is forecast to spend [C-I-C] million (\$2019) over the 2016-20 regulatory period, which reflects an underspend of [C-I-C] million, or [C-I-C] compared to the AER's forecast.

The underspend was mainly experienced in the first two years of the period, as AusNet Services was undergoing an extensive organisational transformation at that time. During this period, it was prudent to defer or de-scope some projects to ensure that the technology capex was consistent with the new structure and achieve desired project outcomes. The figure below illustrates the historical and forecast capex over the current period compared to the AER's forecast.

Figure 5-1 – Comparison of the AER's forecast (including Power of Choice) to historical and forecast capex (Standard Control Services, \$2019, million)



Despite the expected increase in capex relative to CY2016-2018, overall AusNet Services expects to underspend on the forecast for Technology capex over the current 5-year period.

The underspend is due to a combination of project efficiencies, deferrals and reprioritisations. The table below provides an overview of the forecast, actual spend and variance per programme, for costs allocated to Standard Control Services.

²⁹ AER final decision, escalation adjustments excluded.

Electricity Distribution Network – Technology Strategy

Table 5-2 – AER forecast and forecast capex in CY2016–2020 (Standard Control Services, \$2019, million)

[C-I-C]	
---------	--

The Power of Choice program of work achieved its outcomes, under budget (19% lower than forecast) and on time, due to project management efficiencies. The same project management and benefit realisation approach was used across all technology projects. The remaining underspend is a result of a combination of deferrals and reprioritisations, discussed in more detail below.

Changes within Metering and Customer Services

A new regulatory rule change has been approved during the period relating to the Australian Energy Market Commission (AEMC) Final Determination to implement Five-Minute Settlement (5MS) in the National Electricity Market (NEM). On 6 December 2018 the AEMC also made a final rule that requires a move to a Global Settlement (GS) framework for the demand side of the wholesale electricity market.

AusNet Services response to these obligations was to formulate a program that seeks to prudently address these obligations to maintain compliance to our distribution network obligations. This expenditure will also undertake necessary lifecycle upgrades, to ensure systems are in a position to be scalable and modifiable to meet the new regulatory compliance requirements. This includes lifecycle management of the Meter Data Management platform which will be capable of processing the required five-minute meter data. Compliance with the five-minute settlement requirement commences (in part) from 1 July 2021. From 1 July 2021, capability to receive and process the five-minute data is required for all contestable meters Type 1-4 and the provision of network billing information to the retailer.

Additional expenditure is required during the 6-month period from Jan 2021 to complete the extension of existing systems to meet the regulatory compliance obligations.

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

Electricity Distribution Network – Technology Strategy

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 further certainty on the future role of distributors in a DER environment.

The Metering and Customer Services Programme approved for the CY2016-20 regulatory period did not include the costs of upgrading and maintaining our metering Technology systems. These costs were included in the AMI Remediation Program, which was not recovered from our customers. Some metering Technology costs were also allocated to Alternative Control Services.

Changes to 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.

Changes within Work and Asset Management

The focus of this current period in the works and asset management areas has been to deliver key prioritised capabilities to enable the safe and efficient operations of our business. Key outcomes have included dial before you dig, a drawing management system refresh, site hazard management and asset inspection mobility solutions. The prioritisation of these capabilities in alignment with other major programs has limited the level of investment in this area during the period.

Changes within Network Management

In the regulatory proposal for the current period, [C-I-C] million (\$2019) was forecast for refreshes to our Distribution and Outage Management System (DOMS). Since the forecast was developed, this project has been revised to account for changes in our environment and network management strategy to account for DER, and changes in the technology environment. While some refreshes to DOMS have been (and will be) implemented in the current period, our forecast for the next regulatory period includes investment in an advanced network management system, which is part of our DER programme of work (Future Distribution Network Management System).

Changes within Corporate

Key capabilities delivered during the period, relate to employee management, governance risk compliance, internet and other dedicated programs designed to improve the sustainability, efficiency and effectiveness of corporate processes. Prioritisation of the technology portfolio has determined the level of spend in these capabilities.

6. Technology expenditure forecast for FY2022-2026

As AusNet Services prepares its plans for the next regulatory period, the business and broader electricity industry is in the midst of a major transformation driven by customers' evolving expectations and technological and regulatory change.

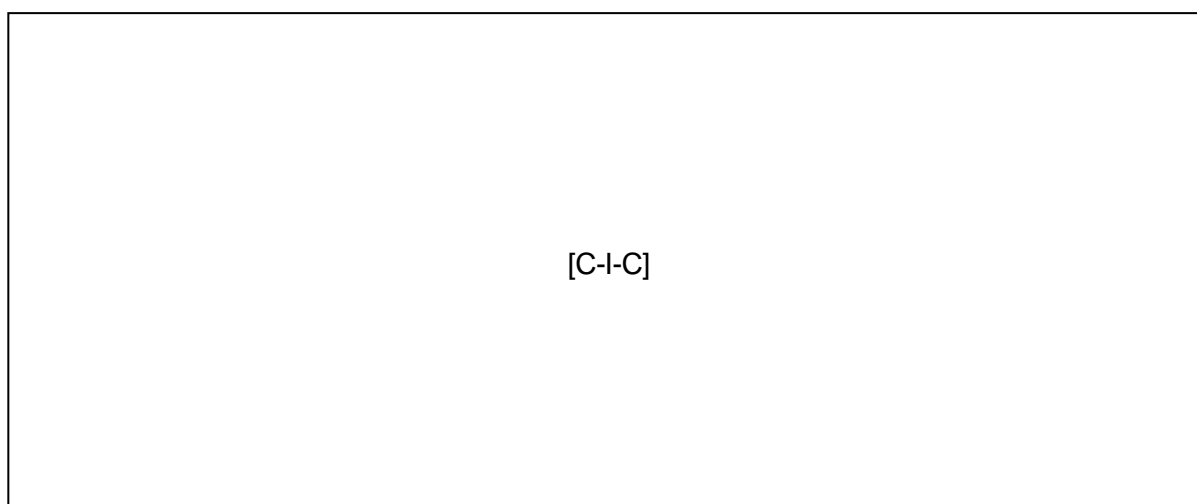
The future grid is one that will need to be more intelligent and adaptable in order to meet customers' expectations for a reliable, affordable, and safe network.

AusNet Services has a 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 regulatory period FY2022-2026, AusNet Services will extend capabilities incrementally across five work streams to enable new uses of our network in an increasingly dynamic environment whilst also efficiently controlling costs.

The following figure outlines the current/next regulatory periods actual, estimated and proposed capex and propex. AusNet Services will spread the actual expenditure across both the regulatory period and also the additional six-month period between the current and upcoming regulatory periods, and as such, actual expenditure will differ slightly from this forecast.

Figure 6-1 – Actual and Forecast annual Technology expenditure, current & next period, Standard Control Services (\$2019, million)



As outlined earlier, the spike in spending in [C-I-C] is associated with a number of critical programmes of work commencing in the first year of the forecast regulatory period. More details of this programme and all other programmes within each work stream are explained within the work streams section.

6.1 Capex breakdown

Capital expenditure, or capex, 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:

- Gathered and considered our customers' changing expectations for electricity 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.

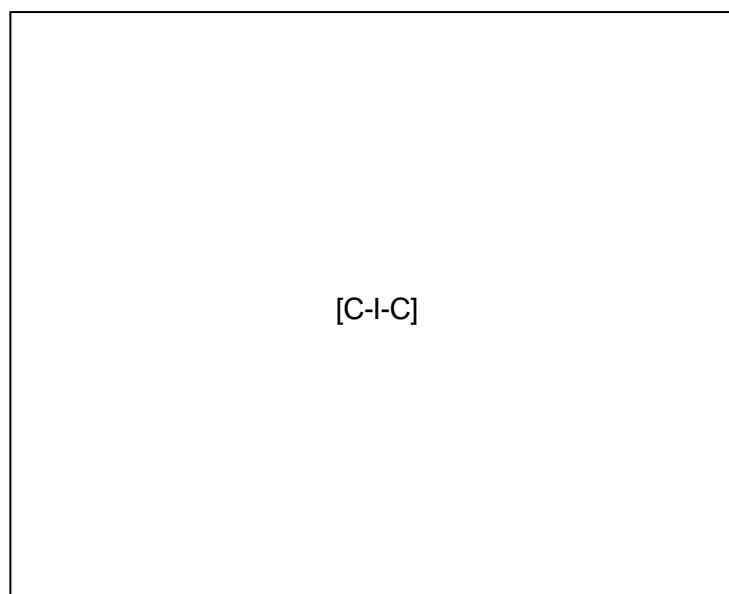
As part of effective capital optimisation across the business, AusNet Services conducts a capital allocation and prioritisation process that aims to prioritise the following year's capital expenditure to projects estimated to deliver the best value, aligned to the corporate and asset strategies. After projects are prioritised, 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. 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.

With the conclusion of the metering remediation program, and in preparation for this EDPR Technology Strategy, we have carried out a review of our metering Technology systems and cost allocation. We have concluded that some systems previously allocated only to Alternative Control Service in the AER's final determination for the CY2016-2020 regulatory period are in fact associated with Standard Control Services. In addition, some systems which were replaced and maintained under the metering remediation program are associated with Standard Control Services and therefore included in the forecast Standard Control Services Technology capex for the FY2022-2026 regulatory period.

Overall capital expenditure in the current period is expected to be less than was allocated in the prior period. The following figure details the forecast capex for the forecast regulatory period FY2022-2026 against the budget for the current period CY2016-2020. This overall reduction in spending, represents an efficient spend based on prior submission, it reflects continuing the current period projected spend, and still ensures there is sufficient investment to be ready for the future, as outlined in the proceeding section detailing the Technology Workstreams.

Electricity Distribution Network – Technology Strategy

Figure 6-2 – Comparison of approved Technology EDPR forecast from the current period CY2016-2020 to the forecast period FY2022-2026 (Standard Control Services, \$2019, million)



As outlined, capital expenditure within Technology at AusNet Services is split across thirteen programmes of work. Each programme was costed in detail and broken down into five categories:

Figure 6-3 – Categories of Capex

Category	Description
Labour	<p>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 benchmarks from Hudson and Gartner 2018³⁰ and covered the following critical delivery roles, which is a sufficient cross section of the delivery team for a Technology project:</p> <ul style="list-style-type: none"> • Business Analyst (Functional/Technical) • Architect (Solutions/Enterprise) • Programmer/Developer • Development Team Leader • Project Manager • Head of PMO • Testing Lead
Contracts	<p>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.</p>

³⁰ Hudson Project Services Salary Guide; Gartner Toolkit – 'Negotiate More Effectively Using Key Labor Rates for IT Application Outsourcing Deals' 2018.

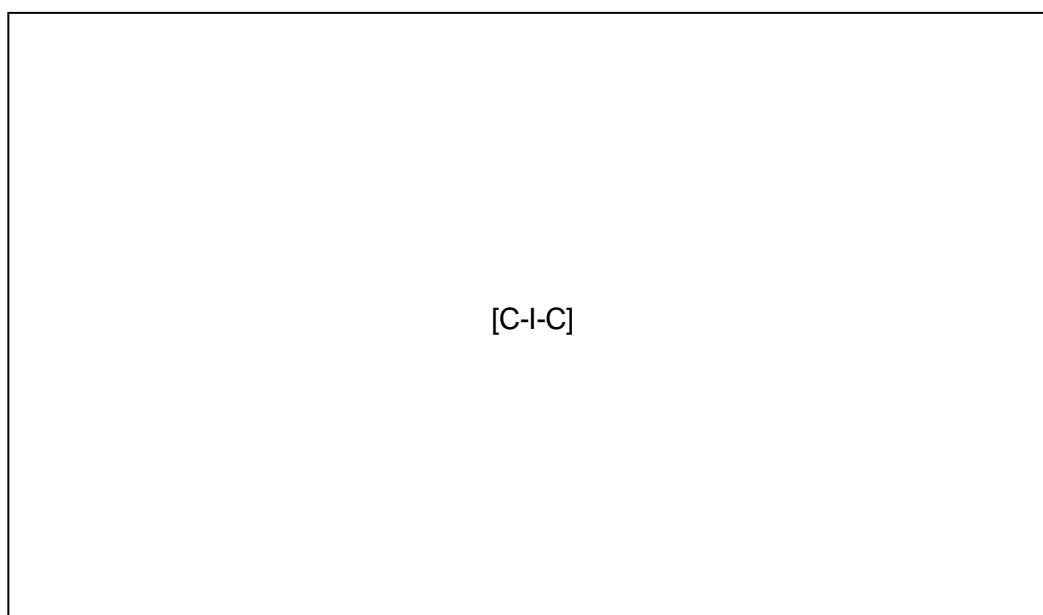
Electricity Distribution Network – Technology Strategy

Category	Description
	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 primary groupings are detailed in the other section.

Throughout the forecasting process identifying and managing project dependencies were considered to ensure the programmes of work were costed prudently and efficiently. As part of the Technology EDPR submission process, individual projects were analysed to identify project interdependencies and ensure alignment across the programme and avoid double counting of spend. Areas of dependency include process, data, infrastructure resource, and various internal and external drivers. Resource and infrastructure availability will be therefore sourced and managed through a mix of internal and external providers to ensure flexibility, scalability and prudence in our program.

The diagram below demonstrates the proposed breakdown of costs; internal labour, materials and contracts on an annual basis across the program.

Figure 6-4 – Proposed Yearly Capex by Cost Type (Standard Control Services, \$2019, million)

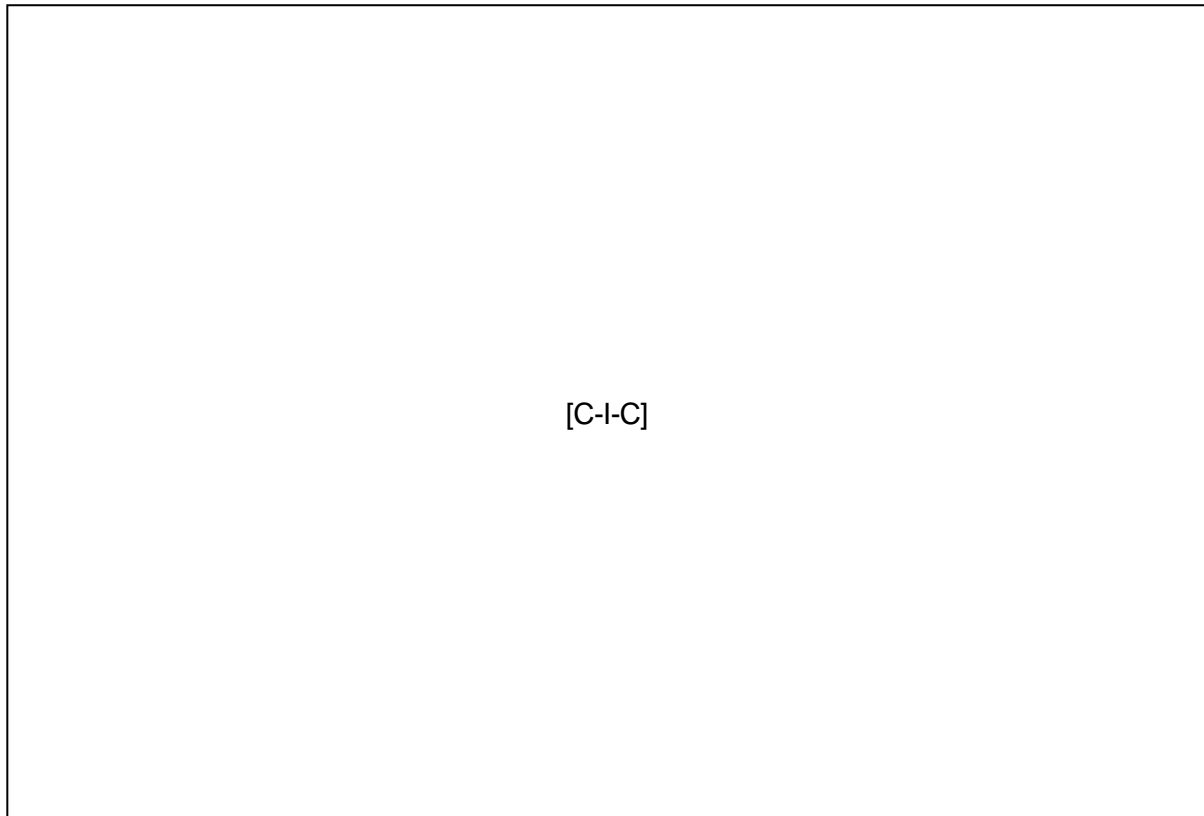


Electricity Distribution Network – Technology Strategy

Note: Cyber Security capex costs are represented separately as they are unable to be split out into capex cost components due to smoothing of financial model.

Based on previous experience of the Technology project delivery teams and especially relative to spend in the previous periods, the average planned annual spend of \$[C-I-C] or a total of \$[C-I-C] is a portfolio that 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.

Figure 6-5 – Annual Technology Forecast Capex (\$2019, million, direct)

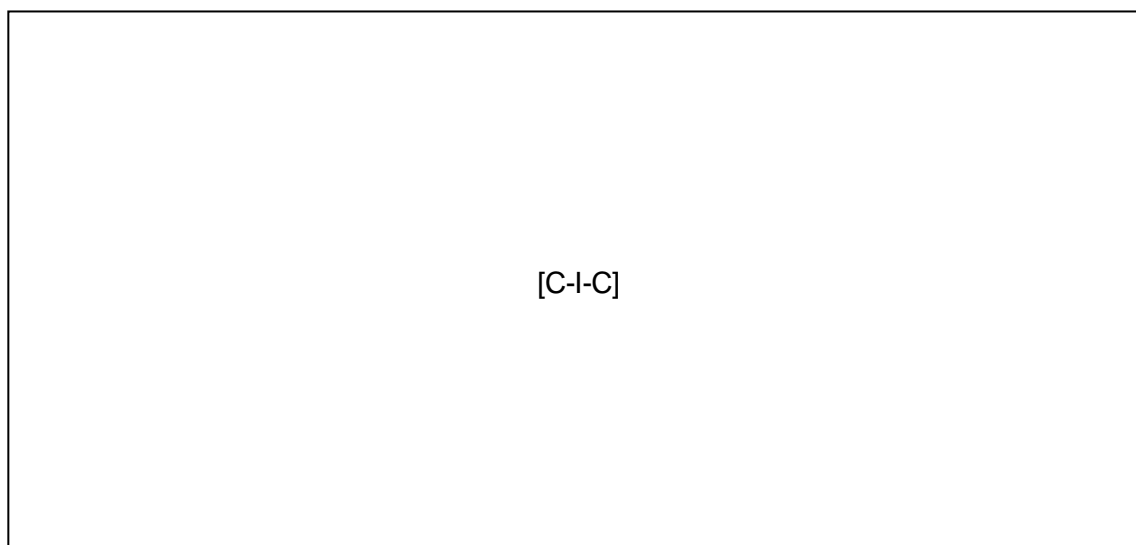


6.2 Opex breakdown

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.

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

Figure 6-6 – Proposed Opex Step Changes for EDPR FY2022-2026 (Standard Control Services, \$2019, millions)



Security opex step change

AusNet Services' proposes to significantly improve its cyber security capabilities in the next seven years and therefore this is the area where the largest spend is required. Investment is required to uplift capabilities to MIL:3. It is expected that 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 \$[C-I-C] per annum.

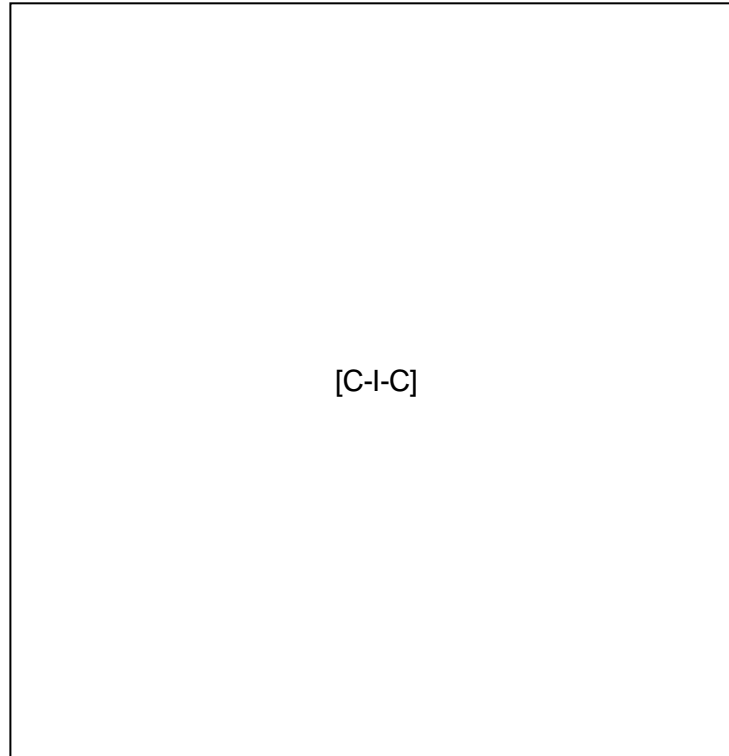
The business will be focused on improving the overall cyber maturity, as is outlined in detail in the detailed workstream section, Cyber Security.

Cloud hosting opex step change

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

- Intelligent operations
- Distributed energy resources (DER)
- Business as usual (lifecycle)

Figure 6-7 – Breakdown of new cloud opex by workstream for EDPR FY2022-2026



Electricity Distribution Network – Technology Strategy

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. Where we have identified cloud solutions are the most efficient delivery mechanism for technology services in the forecast period their costs are a step change increase in opex.

In preparing its plans for the next regulatory period, AusNet Services has undertaken a high level analysis of transitioning its core systems infrastructure to cloud. As part of this, 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 FY2022-2026, to control costs and risks to service delivery for our customers. D

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 [C-I-C] 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 next regulatory period.

Figure 6-8 - Cloud opex step change – breakdown by program

Technology Capex Program	Cloud hosting opex increase
Outage Management	Cognitive automation subscription
Customer Information Services	Customer Relationship Management System
Corporate Enablement	Human Resources and payroll management
Workforce Collaboration	Enterprise Knowledge Management Tool Project Portfolio Management
Information Management	Information Management Platform
Corporate Communications	Communications required to support cloud hosting for other applications

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, predominantly associated with increased agility and productivity. The table below summaries some of the key differences between on-premises systems with cloud-based systems.

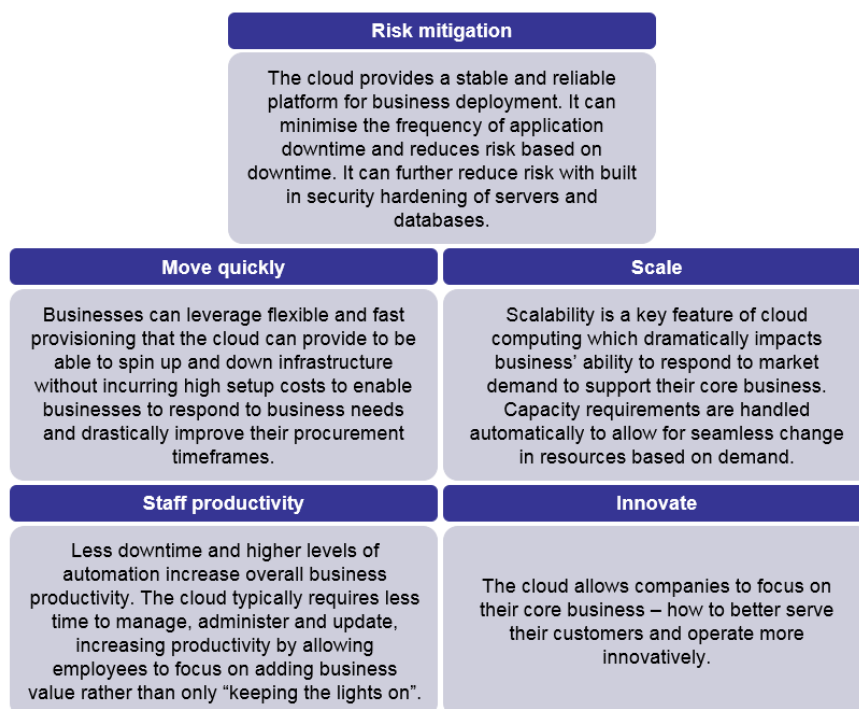
Electricity Distribution Network – Technology Strategy

Figure 6-9 – Comparison of on-premise vs cloud-based systems³¹

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 6-10 – Benefits of moving to the cloud³²



³¹ Deloitte Touche Tohmatsu analysis for AusNet Services.

³² Deloitte Touche Tohmatsu analysis for AusNet Services.

5 Minute Settlement opex step change

At present, AusNet Services is required to provide energy consumption data for market settlement on a 30-minute basis. However, a recent change to the National Electricity Rules will require energy consumption data to be provided every five minutes, constituting a six-fold increase in data to be collected, stored, protected, managed and reported. This new requirement will effectively commence from December 2022. Our proposed capex programme of work for the FY2022-2026 period includes investments to enable AusNet Services to become compliant with the changed regulations. Most of the expenditure will be incurred in the current regulatory period.

AusNet Services' AMI meters transmit data wirelessly and incur carrier costs based on the volume of data transmitted. The transition to five-minute settlement significantly increases our data carriage costs, which are an operating cost. Support costs for the increase in data requirements is expected to require \$[C-I-C] total opex step change from FY2023-2025, once these regulations and the associated meters are transmitting data in five-minute intervals.

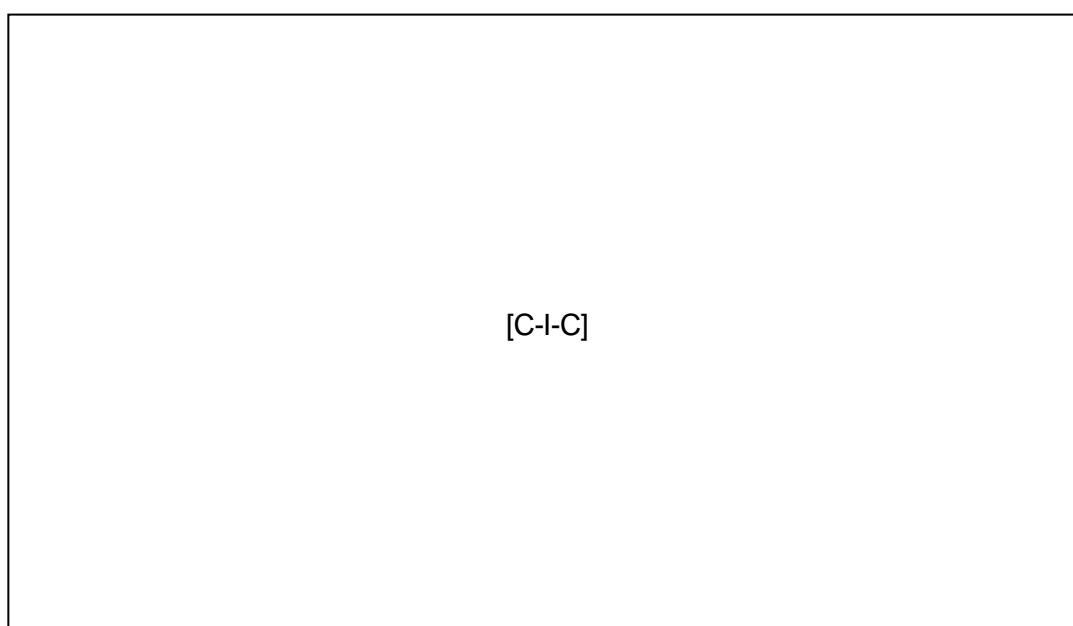
Opex

Opex, or more specifically, project opex (propex), primarily includes the non-recurrent opex associated with the delivery of capital programmes. It is largely made up of data cleansing and migration, as well as change management and training costs.

For the upcoming EDPR period FY2022-2026, forecast Technology propex varies from year to year in line with the capex forecast. Technology propex forecast is \$[C-I-C] over EDPR FY2022-2026 or an average of \$[C-I-C] per annum.

The following figure outlines the yearly propex across all Technology workstreams. It reflects the increased capital investment expected in the first year of the forecast regulatory period, with a number of workstreams commencing in 2021.

Figure 6-11 – Yearly propex for EDPR FY2022-2026 (Standard Control Services, \$2019, millions)



6.3 NPV analysis

As defined in the AER Consultation Paper – ICT Assessment Approach, 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. Recurrent ICT expenditure is expenditure associated with maintaining existing ICT functions and capacity, including those that are made on a periodic basis. Recurrent expenditure includes lifecycle replacement and investment functions; and all business-as-usual expenditure. It also includes expenditure for any investment related to meeting regulatory compliance requirements, for example the AEMO's cyber security requirements.

Non-recurrent ICT expenditure refers to major, infrequent or non-period investments to replace existing ICT assets or the acquisition of new ICT assets, functions and capability. Non-recurrent expenditure includes direct investments in AusNet Services' network infrastructure for defined purposes. The Consultation Paper states that the AER will undertake a review of business cases that support each individual non-recurrent ICT investment, including the NPV analysis. AusNet Services has undertaken NPV analysis for each program option to examine the cost effectiveness and value of each option for its non-recurrent programs of work.

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:

- EDPR allocation
- Non-recurrent expenditure.

Costs included in the NPV analysis are proportionate to the percentage of program allocated to EDPR (full program costs may be allocated to EDPR, 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

Electricity Distribution Network – Technology Strategy

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 EDPR 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; we have identified benefits that directly and indirectly impact customers, such as benefits that reduce customer cost and time.

6.5 Technical work streams

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 FY2022-2026 regulatory period.

For the upcoming regulatory period technology, our proposed investment will be divided into thirteen programmes of work, with each programme grouped into one of the following work streams, which have been created to support the Technology Strategy for the upcoming regulatory period.

Figure 6-12 - Technology Strategy development methodology

Themes	Distributed Energy Resources (DER)	Aims to balance costs of integrating and managing solar PV, batteries and other new customer technologies to meet growing customer requirements for these new services, with the risks these technologies pose to network resilience, reliability and security
	Intelligent Operations	Aims to balance risks to asset and network reliability with the cost of managing those risks through improved data and analytics, automation, visualisation, modelling and risk management, to ensure we continue to efficiently provide reliable electricity network services, despite the disrupted and increasingly complex environment. Also includes investments in our enterprise wide systems, including extending solutions to the field, improving integration and collaboration, and to meet customer demand for greater information and communication on our network operations (particularly outages) through enhanced digital capabilities
	Cyber Security	Aims to balance the risks and costs of protect the distribution network, and customer and business information and assets through improvements to our cyber security capabilities, in anticipation of new compliance requirements
	Business As Usual (BAU)	Aims to efficiently manage the risks and costs of maintaining our core ICT systems by undertaking prudent lifecycle refreshes of our storage, enterprise servers, desktop and laptop fleet, and corporate network and communications control technology, to create opportunities for lower like-for-like expenditure in future periods
	Metering	Aims to balance the risks and costs of maintain our metering ICT systems and meeting new regulatory compliance requirements by maintaining a robust communications network in the context of changes in our vendor environment,

Electricity Distribution Network – Technology Strategy

Distributed Energy Resources (DER)

The electricity sector is undergoing significant transformation driven by the growing uptake of Distributed Energy Resources (DER). With increasing DER, energy flows on the distribution network are becoming increasingly volatile and unpredictable. AusNet Services must integrate and manage DER efficiently during the next regulatory period, to progress on the path to a digitally optimised utility to support increased customer choices in DER connection options.

Objective	Customer outcome	Investment
<p>Integration of DER Across the electricity industry, energy networks are trying to identify the most efficient ways to manage our new customer requirements in an uncertain environment, while also continuing to provide customers the more traditional network services they require. During the upcoming period AusNet Services will drive improvements in forecasting and modelling capability, to more accurately forecast DER uptake and better understand the impact of DER to the network and existing connected customers. This will underpin more accurate monitoring and understanding of the constraints arising from network and DER operations. Ultimately the business will also be able to support efficient interaction and data exchange with third parties seeking to aggregate customers' DER and facilitate peer-to-peer trading.</p> <p>Future Distribution Network Management As the network continues to evolve, core technology platforms must support, orchestrate and manage the growth in DER. There are also rising customer expectations for improved network performance, service delivery, reduced outages, quicker restoration, and smart control/integration and information systems, as well as the ability to proactively manage customers demand. This programme of work will ensure AusNet Services has the appropriate systems and controls in place to manage these new customer and network requirements.</p>	<p>Keep me posted AusNet Services' new customer information management system will ensure it has the ability to share information with customers, in line with proposed regulatory rule changes to improve customer access to data.</p> <p>Be ready for the future By setting up the business to readily integrate and manage many forms of DER, AusNet Services' customers will have increased choices in DER connection options, and improved opportunities to use DER to reduce their electricity costs.</p> <p>Deliver on the basics By better managing the impact of DER on the network, there will be fewer disruptions to supply and greater reliability. Without the investment in this program, there is a risk of declining network reliability, increasing costs, reduced service levels, declining customer satisfaction, and potentially reduced safety for customers and field staff driven by uncontrolled bi-directional flows.</p> <p>Affordable for me The DER programme includes work to develop demand response mechanisms which will enable more customers to respond to price signals and reduce peak demand driven expenditure and bills.</p>	<div style="border: 1px solid black; padding: 10px; text-align: center; margin-bottom: 10px;">[C-I-C]</div> <p>Delivered over the regulatory period</p> <p>-</p> <p>5-years</p> <p>-</p> <p>FY22-26</p>

Electricity Distribution Network – Technology Strategy

Customer Information Services

This programme will enable AusNet Services to better track and understand evolving interactions with our customers as the network is increasingly used for two-way energy flows. Implementing an effective Customer Information Management solution will enable AusNet Services to provide appropriate advice to both assist customers in maximising their generation (if they are connected with DER) and ensure the network is protected and the risk of outage is lower, or alternatively invest in a refreshed network if necessary. Another objective is to ensure the business is well placed to meet upcoming regulatory rule changes, which require increasingly sophisticated data management capabilities, for example third-party access to data and related changes around DER.

Always safe

This programme of work will underpin the business' ability to safely and efficiently integrate new energy sources and practices.

Intelligent Operations

Many advanced sensors and smart meters create valuable sources of data, which can be leveraged by the business to improve network reliability and efficiency and reduce customer bills. There is a need therefore, to continue to improve use of data to improve grid availability, security, renewable energy, distributed generation, and other advanced technologies online

Objective	Customer outcome	Investment
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.	Keep me posted Analytics capabilities underpinned by the information management platform and associated tools, systems and data sets will enable the business to more readily understand which customers are impacted by outages. This in turn will allow the business to improve its ability to notify customers effected by outages, keeping customers informed of the impact of changes to the network	<div style="border: 1px solid black; width: 100px; height: 100px; margin: 0 auto; text-align: center; line-height: 100px;">[C-I-C]</div>
Outage Management The business will integrate disparate sources of asset, maintenance and interconnectivity data required to plan	Affordable for me By understanding and analysing network operations and asset performance, the information management platform will	

Electricity Distribution Network – Technology Strategy

Objective	Customer outcome	Investment
<p>outages and augment the network. This programme will simplify outage management, optimising field crews with automated reports/live data/dashboards, and support network controllers with advanced automation and analytics.</p> <p>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.</p> <p>Corporate Enablement AusNet Service 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. Corporate enablement costs are allocated as 30% to Intelligent Operations.</p>	<p>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.</p> <p>Always safe 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.</p> <p>Deliver on the basics 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.</p>	<p>-</p> <p>5-years</p> <p>-</p> <p>FY22-26</p>

Cyber Security

AusNet Services' distribution 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 DNSP, 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.

Electricity Distribution Network – Technology Strategy

The proliferation, increasing decentralisation and interconnection of smart energy assets creates 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
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.	Be ready for the future 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. Affordable for me 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. Always safe 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.	<div style="border: 1px solid black; padding: 10px; text-align: center; margin: 10px auto; width: 150px;">[C-I-C]</div> Delivered over the regulatory period - 5-years - FY22-26

Lifecycle

A number of 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.

Electricity Distribution Network – Technology Strategy

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.³³
- 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.

³³ <https://www.cyber.gov.au/publications/strategies-to-mitigate-cyber-security-incidents>.

Electricity Distribution Network – Technology Strategy

Objective	Customer outcome	Investment
<p>Technology Asset Management (TAM) - Applications AusNet Services has ~200 systems, which require periodic patching and enhancements as aligned to the standard technology lifecycle. 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.</p> <p>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.</p> <p>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.</p> <p>Corporate Enablement As outlined above in Intelligent Operations. 70% of corporate enablement costs are allocated to Lifecycle.</p>	<p>Deliver on the basics 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.</p> <p>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.</p> <p>Affordable for me 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.</p>	<div style="border: 1px solid black; padding: 10px; text-align: center;">[C-I-C]</div> <p>Delivered over the regulatory period</p> <ul style="list-style-type: none"> - 5-years - FY22-26

Electricity Distribution Network – Technology Strategy

Metering

Advanced metering infrastructure (AMI) is an integrated system of smart meters, communications networks, and data management systems that enable communication between utilities and customers. It underpins the supply/demand of electricity to customers, enabling automatic and remote measurement of electricity use, connect and disconnect service, detect tampering, identify and isolate outages, and monitor voltage. It is essential that metering systems are maintained, controlling lifecycle expenditure, reliability of the communications network, and continue to meet and manage regulatory requirements.

Objective	Customer outcome	Investment
<p>5 Minute & Global Settlement</p> <p>There is a requirement from AEMO to provide consumption data at the meter level on specific time intervals. Currently this interval is thirty minutes. In the upcoming regulatory period this will shift to five minutes, creating the need to store and manage a six-fold increase in the volume of data from meters within the AusNet Services network. There are a number of critical meter data management and customer data bases and systems which must be modified and refreshed to meet this new regulatory requirement. From 1 July 2021, all contestable type 1 - 4 meters must be capable of 5-minute settlement of meter data. This is a significant and transformative variation from current systems and processes.</p> <p>Metering Lifecycle</p> <p>AusNet Services has Technology systems which operate and coordinate metering functions with the rest of the distribution business. In the upcoming regulatory period these systems will require periodic refreshes and patching to ensure they remain supported and well maintained, maintaining ongoing vendor support, patches and bug fixes, limiting downtime, underpinning reliability of critical operations across the business. There are also new market compliance rules that will require capabilities extensions of these systems to ensure compliance. These refreshes will achieve both the compliance and lifecycle activities to achieve lowest possible costs. Compliant metering solutions also underpin AusNet Services' smart network capabilities, providing timely delivery of the necessary consumption, supply quality and exceedance data, and enabling key functions in the monitoring of the electricity distribution network.</p>	<p>Deliver on the basics</p> <p>By maintaining both the lifecycle currency of critical metering systems and ensuring the relevant communications network (3G) is on an active platform, the business is able to achieve market compliance; communicate with the Customers meter and provide control and Metering data back to the consumer as required for billing and usage information.</p> <p>Always safe</p> <p>Maintaining the reliability of metering assets and systems in line with their lifecycle requirements, ensures the business can continue to detect outages and surges, which enables a rapid response to outages and underpins the reliability and safety of the network</p>	<div style="border: 1px solid black; width: 100px; height: 100px; margin: 0 auto; text-align: center; line-height: 100px;">[C-I-C]</div> <p>Delivered over the regulatory period</p> <p>-</p> <p>5-years</p> <p>-</p> <p>FY22-26</p>

Electricity Distribution Network – Technology Strategy

As outlined previously in this document there were a number of critical metering projects in the current period where costs were borne by the business. In the upcoming regulatory period FY22-26, these systems will require lifecycle refreshes as a part of this Technology EDPR. In addition, wherever metering systems will be used by the distribution business more widely to support network management activities, metering systems costs have been apportioned to the business accordingly.

7. 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 (up to 2019)
CIM	Customer Information Management
CY	Calendar Year
DENOP	Distributed Energy Optimisation
DER	Distributed Energy Resources
DOMS	Distribution and Outage Management System
DR	Demand Response
EA	Enterprise Architecture
EAI	Enterprise Application Integration
EAM	Enterprise Asset Management
EDPR	Electricity Distribution 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	<p>Information Technology / Operational Technology</p> <p>In the context of the electric power industry:</p> <ul style="list-style-type: none"> 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 distribution system, and the infrastructure for monitoring and controlling those devices. This includes control centre based systems such as SCADA and DMS.

Electricity Distribution Network – Technology Strategy

Term	Definition
	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 distribution industry becomes more wide-spread and sophisticated, and IT is able to work together with OT applications to increase distribution 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 distribution 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
TAM	Technology Asset Management (from 2020, formally CLCOE)