Technology Document ICT Program Brief Intelligent Network Operations

2023-27 Transmission Revenue Reset

PUBLIC

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1 Document Background

1.1 Purpose of this document

The purpose of this document is to outline a business case for a proposed program of work that will form part of AusNet Services' Technology TRR submission.

1.2 References

Document	Version	Author
Digital Utility Strategy	V1.2	Samantha Scanlon
2021 Electricity Transmission Business Plan	V0.03	Adrian Hill
TRR Technology Strategy	V1	Samantha Scanlon

1.3 Document History

Date	Version	Comment	Person
19/02/2020	V1.7	Feedback	Irwin Proud / Sally Jacobs
04/03/2020	V2	Incorporated Feedback	Samantha Scanlon
23/04/2020	V3	Update benefits	Samantha Scanlon
24/042/2020	V3.1	Minor updates	A Sharp
2/06/2020	V3.2	Review	John Bragaglia
19/06/2020	V3.3	Revised costs	A Sharp
20/6/2020	V3.5	Referenced key reg references	S Scanlon
18/008/2020	V3.6	Incorporated feedback	S Scanlon
3/09/2020	V3.7	Update benefits and NPV	S Scanlon
16/09/2020	V3.8	Update benefits and NPV	A Sharp
14/10/2020	V4.0	Update benefits and NPV, review by networks	S Scanlon

1.4 Approvals

Position	Date
Technology Leadership Team	

2 Executive summary

Table 2-1 Summary table

Program objectives	In order to continue to support regulatory obligations as defined by the NEM to ensure minimum fault levels, this program will deliver enhanced capabilities designed to meet the power system security obligations intended to avoid potential Black System[1] events and aid Contingency Management.[2]. The Intelligent Network Operations program therefore seeks to support the secure operations of the power system, maintaining stability, reliability and resilience of the transmission network as generation becomes more de-centralised and complex, coupled with increasing customer and environmental requirements.
Key objectives of program	To support safety, stability and reliability of the transmission network in an environment that is increasingly complex by: • Strengthening the network to fulfil our role in the transition to a low-carbon energy future by connecting renewable generation. This means improving asset and network reliability through improved data and analytics, automation, visualisation, modelling and risk management. This will ensure we continue to efficiently provide reliable transmission network services, despite a disrupted and increasingly complex environment; • Provide enhanced capabilities in meeting the power system security obligations designed to avoid potential Black System[3] events and aid Contingency Management.[4]. The increased data availability will enable enhanced support for Operators to work with AEMO in the event of a Black System through better simulating a Black System event as well as improving the planning of a contingency event and system restoration related to severe weather through utilising weather analytics; • Undertake performance improvements in cost and network outcomes by strengthening people and digital capabilities to operate and help shape the transforming Victorian network.
Key risk drivers	• Lifecycle management of technologies which are vulnerable to potential security threats which if breached, would compromise the security of the network; • Mitigate knowledge loss as key people who operate the transmission network leave the organisation or retire, through enhancements of technology which will refine, and digitalise manual processes; • Digitalisation and optimisation of key system processes to reduce manual processes that increase the rate of errors and effort required to maintain safe and reliable operations. This is particularly relevant in an environment of distributed generations and increasingly complexity of network management.
Key benefits	• Support new regulatory obligations established in the NEM to ensure minimum fault levels; • Minimise the impact of network outages and constraints through improvement Outage and Planned work management; • Decreased risk of system failure and subsequent productivity loss. • Reduced time to train control centre operators

[1] SO_OP_3715 Power System Security Guidelines: 23 April 2019, Section 7, page 15
[2] SO_OP_3715 Power System Security Guidelines: 23 April 2019, Section 10, page 15
[3] SO_OP_3715 Power System Security Guidelines: 23 April 2019, Section 7, page 15
[4] SO_OP_3715 Power System Security Guidelines: 23 April 2019, Section 10, page 15

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Cost allocation	Electricity Distribution*	0%	Electricity Transmission	**100%**	
	Gas Distribution	0%			
Program Type	**Recurrent**		☒		
	Non-Recurrent		☒		
	Client Devices		☐		
Program timings	Program duration:		5 years		

	($m)	**2023**	**2024**	**2025**	**2026**	**2027**	**Total**
Expenditure Forecast	**Capex**	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
	Opex	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
	Total program cost	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]

Estimated life of system	The solution should expect to be current for approximately 5 years.
Customer Engagement	This information has been presented to the Customer Advisory Panel (CAP) and at a "Deep Dive" session with various stakeholders as part of AusNet Services Transmission Revenue Reset submission. This proposal describes the importance and need for ICT expenditure to meet our customers' evolving needs and, to support compliance with regulatory and legal obligations.

Alignment to AER ICT expenditure assessment framework

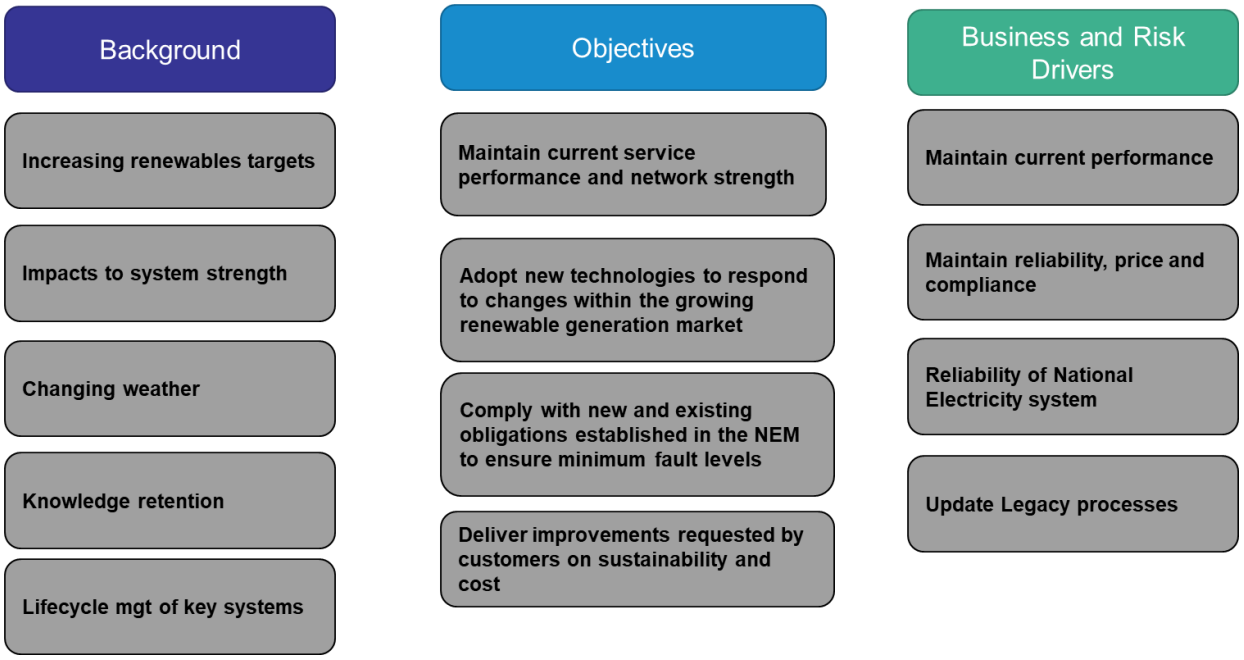
We have categorised this program as 63% recurrent expenditure, on the basis that it relates to ongoing refresh of AusNet Services' core business systems, a cost that must be incurred periodically. The remainder of this program (37%) is non-recurrent, on the basis that a portion involves new investment to enhance existing Network Operations and uplift capabilities to network operational planning, real-time operations and maintenance of the network (see Section 4.3, which includes the scope of the recommended option, for more details).

We have also undertaken NPV analysis in support of the project, as well as developed a detailed business case. See Section 5 for the options assessment and NPV analysis.

3 Context

This chapter provides context for the program of work and the figure below lists key areas to be discussed.

Figure 3-1 Key areas of the context to be discussed



3.1 Background

Renewable energy targets, reducing technology costs and the retirement of aged coal generation plant are radically changing the generation mix in Victoria and the wider NEM. This transformation in the electricity supply system has significant implications for the transmission network. The changes that are occurring, and implications for the transmission network are discussed in detail in Chapter 2, Transmission Services Environment, of AusNet Services Revenue Proposal to the AER for 2023 – 2027 regulatory control period.

As new generation is established across the network, operation of the network becomes increasingly complex. Planning for outages of network elements (lines and transformers) for maintenance activities is a prime example. In the past the potential impact on the market from taking specific network elements out of service was readily recognised, however there is a growing need for more sophisticated analysis to understand these effects, so that outages for maintenance can be planned for the most appropriate windows. A further critical activity is real time situational awareness, also subject to increasing significant complexity.

This project will provide the tools and systems for control centre analysis and operations to be able to perform its functions to the required level of service in this transforming environment.

The transmission network is undergoing a period of unprecedented change as renewable energy targets, decreased energy technology costs and generation retirements radically change the generation mix in Victoria and the wider NEM.

Appropriately managing risks and ensuring the continued provision of safe and reliable energy in an increasingly complex environment aligns to National Electricity power system security rules that requires us to keep AEMO informed as to the state of our power system:

4.3.3(e) A System Operator must, to the extent that the System Operator is aware or ought reasonably to have been aware, keep AEMO fully and timely informed as to:

> *(1) the state of the security of the power system;*
> *(2) any present or anticipated risks to power system security; and*
> *(3) any action contemplated or initiated to address a risk to power system security or to restore or maintain the power system in a satisfactory operating state.*[5] and

4.3.4(a) Each Network Service Provider must use reasonable endeavours to exercise its rights and obligations in relation to its networks so as to co-operate with and assist AEMO in the proper discharge of the AEMO power system security responsibilities.[6] and

4.8.1 A Registered Participant must promptly advise AEMO or a relevant System Operator at the time that the Registered Participant becomes aware, of any circumstance which could be expected to adversely affect the secure operation of the power system or any equipment owned or under the control of the Registered Participant or a Network Service Provider.[7]

With an historically stable transmission business, our existing skills and expertise have been mature relative to the responsibilities needed to deliver efficiency and reliable network performance. But these capabilities will need to evolve to better respond to the energy transformation. This problem is further complicated by a small group of very experienced but ageing personnel. With retirements expected for the majority of transmission controllers with decades of experience, replacement of these resources and the knowledge they possess creates future challenges. There is a need therefore to utilise systems and automation to ensure knowledge retention and manage more complex processes:
This will mean improving our capabilities to manage operations in an increasingly complex energy eco-system while maintaining network performance.

Key areas that therefore require enhanced capabilities to continue to support these obligations will include:

- Mitigating knowledge risks to ensure that specialist process and system knowledge is digitalised and shared across critical processes and teams
- Mature technology integrations to introduce new systemised processes, reduce duplicate data across systems and maintain single source of truth to aid contextual decision making
- Enhanced use of data and intelligence to enable the situational awareness required to make effective intelligent decisions

In summary, investment is required to provide enhanced tools, technologies, and solutions to enable AusNet Services to continue to meet regulatory obligations in this increasingly complex environment.

Our key strategic objectives to deliver our customer commitments therefore are to:

- Strengthen the regulated network to fulfil our role in transitioning to a low-carbon energy future by connecting renewable generation. This means maintaining network resilience, innovating to maximise generation access and improving operations and system controls

- Undertake performance improvements in cost and network outcomes by strengthening people and digital capabilities to operate and shape the transforming Victorian network

3.2 Program

AusNet Services' Intelligent Network Operations initiative seeks to respond to the arising network control challenges by:

[5] National Electricity Rules V143. Chapter 4 Power System Security, p. 315
[6] National Electricity Rules V143. Chapter 4 Power System Security, p. 315-6
[7] National Electricity Rules V143. Chapter 4 Power System Security, p. 331

- **Enhance existing planning technologies** to strengthen operational planning capability and practice, and provide systems and tools that enhance control centre situational awareness to deliver on power system security obligations in the challenging operating environment that is rapidly developing

- **Upgrade the control centre and network operations technologies** to utilise the increasing volumes of data, empowering better contextual decision support and situational awareness and remove manual processes

- **Improve predictive maintenance** and greater co-ordination of field teams to better manage network planning and switching and be able to proactively respond to required transmission asset maintenance and events

- **Enhance field operations** to create efficiencies and provide data for ongoing asset management works.

- **Ensure key control, operational and performance data is captured in digital forms** to improve operational efficiency and interoperability. This will also mitigate the risks of knowledge loss through specialist information being stored in peoples' heads instead of corporate artefacts.

The Intelligent Network Operations program describes capability uplift across plan, operate and field delivery functions to meet ongoing regulatory obligations and future business capabilities:

- **Plan:** plan operations by applying smart technology to network control functions to adapt operational processes to rapidly changing network topography and operating envelope.
- **Operate:** Network controllers are dealing with an increasingly complex environment as more intermittent generation is added to the network, back feed from the distribution network and more data points to monitor. In parallel, there is a generational shift in the workforce requiring AusNet Services to codify processes and streamline knowledge repositories so that the next generation of controllers can continue to manage the network safely. The improvements made to operating the network will also ensure continued compliance under the power system security obligations.[8]
- **Field:** Safe and reliable network operations requires field crews to have fit for purpose systems. This program seeks to provide field crews with asset information to preform work safely, optimised schedules for efficient deployment and mechanisms to feed data back from the field to inform ongoing asset maintenance considerations.

3.3 Objectives

The Intelligent Network Operations program focuses on maintaining the reliability and efficiency of the transmission network cognisant of the decentralised generation environment and AusNet Services constraints. Based on the focus areas described in section 3.1, the key objectives of this initiative are to:

To maintain safety, stability and reliability of the transmission network in an environment that is increasing in complexity by:

- Continuing to **maintain the stability and reliability of the transmission network**

[8] SO_OP_3715 Power System Security Guidelines: 23 April 2019

- Supporting **new regulatory obligations established in the NEM to ensure minimum fault levels**
- Providing **enhanced capabilities in meeting the p**ower system security obligations.
- Ensuring **Lifecycle maintenance for key systems** to reduce risks and ensure a supported technology solution to maintain current services
- **Consolidating and orchestrating technology systems** to enable a single view of the network that provides the most appropriate information when it is needed, to enable better monitoring and operating of the network
- **Enhancing the use of available data to support contextual decision making** related to operations of the transmission network
- **Reducing manual handling of information** to increase the auditability of processes
- **Improving data collection to enable proactive and predictive operations** such as maintenance and equipment
- **Enhancing network modelling** to increase network resilience through planning
- **Optimising the field force and resource co-ordination** to ensure prioritised activities are managed efficiently and effectively.

3.4 Risk drivers

In designing the program, we have considered how TRR investment can support AusNet Services' need to maintain compliance with the transmission network obligations. As the network becomes more complex, our programs must continue to improve and enhance our capabilities to ensure we remain compliant and can meet the growing energy demands. The selected option must be aligned to the transmission network rules and enable AusNet Services to meet the needs of all Victorian communities and regulation.

The below Risk Drivers are a mix of our ability to operate and the technology that supports that operation:

#	Risk Driver	Details	Consequence	Likelihood	Risk Rating
D1	Meet Demand	Ability to meet or manage the expected demand for network services over the regulatory period.	Major	Likely	B
D2	Regulatory Compliance	Compliance with all applicable regulatory obligations or requirements associated with the provision of network services	Major	Likely	B
D3	Maintain Current Performance	Maintaining current quality, reliability and security of supply of network services	Moderate	Possible	C
D4	Maintain Reliability	Maintaining the reliability, safety and security of the transmission system through the supply of network services.	Moderate	Possible	C

#	Risk Driver	Details	Consequence	Likelihood	Risk Rating
D5	Maintain Price	Price, quality, safety, reliability, and security of supply of electricity	Moderate	Almost Certain	B
D6	Reliability of National Electricity System	The reliability, safety and security of the national electricity system	Moderate	Possible	C
D7	Knowledge Loss	There is a risk of knowledge loss as key people who operate the transmission network leave the organisation or retire, prior to the programs ability to optimise and/or automate management processes	Moderate	Possible	B
D8	Aging Platforms	There is a risk that old technology platform architecture will inhibit the ability of the organisation to respond to new technologies, including batteries, solar and two-way power flows. Many of the technologies used to manage the network are limited in their ability to respond to these trends.	Moderate	Likely	B
D9	Cyber Security	There is a risk that older technologies are vulnerable to security threats which would compromise the security of the network.	Catastrophic	Possible	A
D10	Legacy Processes	There is a risk that manual processes will increase the rate of errors as more generation is added to the network, increasing the need for transmission management	Major	Almost Certain	A

3.5 Business Drivers

In the face of significant industry disruption resulting in a period of substantial uncertainty and increasing complexity, AusNet Services has identified four key business drivers:

- Maintain current service performance and network strength;
- Adopt new technologies to respond to changes within the growing renewable generation market;
- Comply with new and existing obligations established in the NEM to ensure minimum fault levels; and
- Deliver improvements requested by customers on sustainability and cost.

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In addition to these business drivers, AusNet Services' customer research has identified the following customer priorities:

- Deliver basic services – "deliver on the basics"
- Keep customers informed – "keep me posted"
- Affordable services – "affordable for me"
- Adaptability – "be ready for the future"
- Safety – "always safe"

Additional information on these customer priorities is provided in the overarching Technology TRR submission 2023-2027.

The Intelligent Network Operations program seeks to address both business and customer priorities. This program of work targets the '**affordable for me'** priority as maintaining the efficiency of the network will send to reduce transmission related constraints, that has the potential to impact electricity spot prices. The solutions being proposed are to **deliver the basic of services** of managing and maintaining an effective transmission network. This investment also considers the changing energy environment, increasing penetration of renewables and the subsequent impacts this has on the complexity of the network. This program underpins the **safe,** secure and reliable obligation of a TNSP.

3.6 Approach to developing expenditure forecast

For each program brief, a consistent approach is used to develop programs of work and the associated expenditure forecast for the regulatory period 2023-2027.

A full overview of the approach can be found in section 3.2 of the "*AusNet Services – Transmission Revenue Review – Technology Strategy Document*".

To develop each program of work and associated expenditure, the following steps were taken:

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

4 Options

4.1 Overview

This section provides an overview of the investment options to address ongoing regulatory and customer requirements, considered against current limitations. The options represent an increasing suite of technologies with associated costs and benefits.

Table 4-1 Brief overview of the options

Brief overview of each of the options	
Option 1	**Lifecycle Management -** The rationale for this option is to address refreshes and critical capabilities required in planning and operations including SCADA modules. This option does not deliver any uplifted capabilities outside of iterative product enhancements to transmission systems
Option 2 (Recommended)	**Lifecycle + Data + Analytics + Weather + TOSM** – This option includes all scope from option 1, which represents a baseline, then enhances existing functions and introduces new capabilities including load management, outage management and scheme automation in addition to key systems integrations
Option 3	**Extend Transmission Planning and Field Capabilities**- This option incorporates all initiatives described above and also provides additional components including network modelling enhancements, and field automation and mobility

4.2 Option #1 Lifecycle Management and enhanced insights

Option 1 addresses the immediate need to refresh critical network management systems and invest in capability to forecast the impact of adverse weather events on network operations. This option proposes: Lifecycle management of existing SCADA EMS systems, and refreshes of outage and switch management capabilities that will begin to drive better operational management from predictive insights management.

This option has intentionally excluded scope which is not critical to maintain a lower cost. The key drivers for determining this capability was to focus on key risk areas and capabilities that will mitigate these threats, namely:

[C-I-C]

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In order to deal with greater levels of congestion and increased data requirements due to extreme weather events, the option must begin to address the challenges relating to the continuing operations of the core business processes in this complex environment. Without further integration of data and optimisation of these capabilities' growth and variability of the network, there will be a resultant increase in complexity and potentially prohibit the ability of AusNet Services to continue to meet its regulatory obligations.

Alignment to objectives

This option will align with key outcomes sought by this program of work. However, as a result of the focus on critical areas, there is a lack of alignment across all objectives sought by this program

Table 4-2 Objectives analysis of Option 1

Objective	Outcome
Maintain the stability and reliability of the transmission network	✓
Meet new and existing regulatory obligations established in the NEM to ensure minimum fault levels	✗
Enhance capabilities to meet the power system security obligations	✗
Provide lifecycle maintenance for key systems	✓
Consolidate and orchestrate technology systems	✗
Enhance the available data to support contextual decision making	✗
Reduce manual handling of information	✗
Improve data collection to enable proactive and predictive operations	✗
Enhance network modelling	✗
Optimise the field force and resource co-ordination	✗

This option has **Low** alignment to the program objectives.

Costs

Table 4-3 Costs of option 1

($m)	2023	2024	2025	2026	2027	Total
Capex	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Opex	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Total program cost	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]

Benefits

This option will deliver the following benefits:

- Refreshing ICT assets will maintain current operating capabilities, ensure full vendor support of core transmission systems, and reduce the risk of system failure. These costs relate to the potential total failure of mission critical systems where people would need to be dispatched to manually monitor the transmission Network.
- Updating operational systems such as SCADA will minimise risk of cyber-attack by ensuring the technology is on the latest security patches and hardware.

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- Reduction in Risk of System Failure – as the generation mix transitions, the complexity to operate and maintain the network increases. Maintaining the SCADA and associated network systems will provide continuity and minimise productivity loss.
- This option will maintain the current operability of the network ensuring current compliance.

Mitigation of key risk drivers

This option will partially mitigate some risk drivers, however, as its scope is limited compared to other options, not all risks will be mitigated. Where we consider that a risk driver is not directly affected by the option or irrelevant, 'N/A' is applied.

#	Risk Driver		Mitigation	Consequence	Likelihood	Risk Rating
D1	Meet Demand	✗	N/A	Major	Likely	B
D2	Regulatory Compliance	✓	This option will maintain the current operability of the network ensuring compliance	Major	Unlikely	C
D3	Maintain Current Performance	✗	N/A	Moderate	Possible	C
D4	Maintain Reliability	✓	This option partially mitigates this risk driver through the product lifecycle upgrades of SCADA and will minimally maintain reliability	Moderate	Unlikely	D
D5	Maintain Price	✗	N/A	Moderate	Almost Certain	B
D6	Reliability of National Electricity System	✓	This option partially mitigates this risk driver through the product lifecycle upgrades of SCADA and will minimally maintain reliability of the National Electricity System	Moderate	Unlikely	D
D7	Knowledge Loss	✗	N/A	Moderate	Possible	B
D8	Aging Platforms	✓	This option partially mitigates this risk driver as product lifecycle upgrades to key systems (e.g. SCADA) will reduce this risk. However, it does not address the capability gaps in the technology which will comprehensively enable renewable technology rollout.	Moderate	Likely	B
D9	Cyber Security	✓	[C-I-C]			B

#	Risk Driver		Mitigation	Consequence	Likelihood	Risk Rating
D10	Legacy Processes	✖	N/A	Major	Almost Certain	A

This option has moderate **alignment** to mitigating key risk drivers.

Risks

There are several risks associated with implementation of this option, as highlighted in the table below. Based on the consequence and likelihood of each risk, we have rated each of the individual risks blue, green, yellow, orange or red (order of severity). See

Attachment 1 – Risk level matrix
The figure below shows the risk level matrix to which we have assessed each of risks within the options. Risks of highest concern are rated red, whereas those of lowest concern are rated blue.

Figure 6-1

Likelihood	Consequence 1	2	3	4	5
Almost Certain	C	C	B	A	A
Likely	D	C	B	B	A
Possible	E	D	C	B	A
Unlikely	E	D	D	C	B
Rare	E	E	D	C	C

for additional information on this rating system.

Table 4-4 Risks of option 1

ID	Risks	Consequence	Likelihood	Risk rating
R1.1	Key people availability for subject matter expertise in delivering this option	Moderate	Likely	B
R1.2	Product vendor commitment and resource availability	Major	Unlikely	C
R1.3	Reduced or loss of employee productivity and business functions.	Moderate	Unlikely	E
R1.4	Risks associated with solution design, implementation, budgeting, planning, integration, future maintenance, refreshes and support.	Moderate	Unlikely	E

This option has a **moderate-high risk** rating

Alignment to business related drivers of expenditure

As discussed in Section **Error! Reference source not found.**5, AusNet Services focusing on four transmission business drivers over the next regulatory period. The table below highlights how this option will input into the initiatives where relevant. Where we consider that a business driver is not directly relevant to the option, 'N/A' is applied.

Table 4-5 Business related drivers of option 1

Transmission business drivers	How this program achieves this

Maintaining current service performance in a disrupted environment where risks are changing due to the increasingly complex nature of the grid	This program will maintain the current service performance by ensuring systems currency
Updating and implementing new technologies to enable AusNet Services to respond to changes within the growing renewable generation market	This program will update network management systems which will begin to establish capabilities required to respond to changes in the renewable generation market and address evolving cybersecurity measures
Complying with new obligations	N/A – maintain current obligations
Delivering improvements requested by our customers regarding sustainability and cost.	N/A

This option has **low alignment** to business drivers

4.3 Option #2 Extend Transmission Management System (Recommended Option)

Option 2 will include the scope from Option 1 to invest to refresh our critical network management systems. This option also includes scope that will improve capability for network operations, outage and switch management through assisted decision making, advanced analytics, load management and new and enhanced schemes in SCADA.

This will allow AusNet Services to be better placed to respond to the increasing demand and complexity of the transmission network in maintaining system strength.

"The knowledge, tools, and market frameworks of the past are becoming less effective, and operators must adapt processes and tools, and train operators to be able to keep the system of the future secure".[9]

This will be critical as we face challenges with Renewable Generation (such as implications from weather and climate in network planning), and the increase in data generated from devices, events and issues on the network. System strength is a complex concept, and an area of emerging understanding internationally. Definitions vary across jurisdictions and continue to evolve as the international power system community's collective understanding of power system phenomena continues to grow.

The Australian Energy Market Operator has recently released the first stage of a multi-year plan to maintain system security coupled with a high share of renewable resources. One of the key findings of AEMO's international review was that "**Australia is at the forefront of challenges in connecting wind and solar generation in areas with low system strength, and therefore has had to implement world-leading regulations in response.**

For Bulk power system to support the network during periods of low synchronous generation, new regulatory obligations were established in the NEM to ensure minimum fault levels.

- AEMO is required to determine the fault level requirements across the NEM and identify whether a fault level shortfall is likely to exist now or in the future. The projected fault levels for each node are listed in the Draft 2020 ISP[10]. The System Strength Requirements Methodology defines the process AEMO must apply to determine the system strength requirement at each node.
- **The local TNSP is required to provide system strength services to meet the minimum three phase fault levels at relevant fault level nodes if AEMO has declared a shortfall.**

[9] AEMO, Renewables Integration Study, April 2020, p. 60
[10] AEMO, 2020 Integrated Systems Plan, July 2020.

- Based on the regulatory obligations, to date AEMO has already declared system strength gaps at fault level nodes in South Australia, Tasmania, Victoria, and Queensland. Detailed EMT studies are also being used to refine the minimum unit combinations of synchronous generators for operating the current system. The studies have determined a minimum of four synchronous units for South Australia and five for Victoria to maintain sufficient system strength."[11]

Further to these observations, AusNet Services has also received a letter from the AER stating with regards to the Power System Security (PSS) Guidelines compliance review... "*we observe that TNSPs have identified a wide range of potential risks to power system security due to environment and other conditions. We note that whether a potential issue poses a risk to power system security is evolving over time and we expect participants to take a dynamic approach to assessing and managing such risks*".[12]"

Mindful of these requirements, and the imperative to maintain system security and challenges related to frequency and voltage control in this more complex environment, this option seeks to address these challenges through the following scope:

- **Product lifecycle refreshes** (as listed in option.1)

- **Integration and convergence of key data sources:**
  - Integration between multiple systems in the Lines and Ratings Flow (SAP, Radar and SCADA) ensuring single source of truth
  - Convergence of control centre systems to increase situational awareness and provide a single view of the network
  - Management of convergence and data between DNSP and TNSP. This will also include enhanced distribution data sources to manage reverse flows
  - Knowledge Management Portal enhancement to provide more contextual network management information
  - Ensuring key information is provided to field staff to enable ongoing operations and transfer of critical status information

- **Enhanced capabilities:**
  - Enhanced weather monitoring
  - The enhancement and automation of schemes (runback and load shed)
  - New modules including real time system restoration management, real time renewable energy forecast
  - Enhanced Transmission Outage Management systems

- **Enhanced insights and analytics:**
  - The use of analytics driven by network related data to enable greater decision making with regards to outage and switch management
  - Implementing insights to help drive better operations

This option has been designed to enhance existing Network Operations and provide uplift in capabilities to operations and maintenance of the network. This will support better decision making for outage and switch management and result in an increased ability to maintain network reliability in the increasingly complex transmission network.

[11] AEMO, Renewables Integration Study, Stage 1: Report. Enabling secure operation of the NEM with very high penetrations of renewable energy. April 2020

[12] Australian Energy Regulator: Joanna Gail, Director, Compliance and Enforcement Branch Re: Power System Security Guidelines compliance review. Ref 60978-D19/189232 20/12/2019

Other outcomes that will be achieved include:

- Increases to the visibility of all work currently scheduled on the Transmission network
- Enhanced visibility of outages and maintenance requirements so maintenance work can be planned and coordinated more efficiently and avoid unnecessary customer impacts
- A more secure network, with a reduction in outage cancellations
- Improvements to the customer experience in relation to planned outage notifications
- New technology to better manage renewable integration into the network
- Improved visibility of key data sources to enable decision making on the transmission network
- Better provision of critical data to enable studies of the network to enable scenario planning
- Minimising the double handling and key person dependencies through a digital experience utilising key systems data
- The ability to provide advance warning to emergency preparedness personnel, enhanced abilities to mobilise resources based on predicted impact to restore supply to customers and provide customer groups with more targeted and specific information on upcoming weather events
- Where emergencies present, an ability to create and manage contingency/response plans and ensure success re-start of critical processes
- The creation of a logical platform for future automated decision-making in key processes

While this increases cost from Option 1, it minimises risk associated with new network technologies impacting AusNet's ability to manage the network.

Alignment to objectives

The focus of this program of work is to enhance control centre operations.

Table 4-6 Objectives analysis of Option 2

Objective	Outcome
Maintain the stability and reliability of the transmission network	✓
New regulatory obligations established in the NEM to ensure minimum fault levels	✓
Enhanced capabilities in meeting the power system security obligations	✓
Lifecycle maintenance for key systems	✓
Consolidate and orchestrate technology systems	✓
Enhanced use of available data to support contextual decision making	✓
Reduction of manual handling of information	✓
Improved data collection to enable proactive and predictive operations	✓
Enhance network modelling	✗
Optimise the field force and resource co-ordination	✗

This option has **high alignment** to the objectives

Costs

Table 4-7 Costs of option 2

($m)	2023	2024	2025	2026	2027	Total
Capex	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Opex	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Total program cost	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]

Benefits

This option will deliver the following benefits on top of the benefits defined in Option 1:

- **Minimised Impact of Network Constraints** – minimising the number and duration of network element outages in addition to improving network forecasting of demand. This option includes renewable integration and module upgrades which can help prevent the likelihood of network constraints. Benefiting consumers through optimal market outcomes occurring more frequently with a decrease in constraints.
- **Provide enhanced capabilities in meeting the power system security (**obligations designed to avoid potential Black System[13] events and aid Contingency Management.[14] The increased data availability will enable enhanced support for Operators to work with AEMO in the event of a Black System through better simulating a Black System event as well as improving the planning of a contingency event related to severe weather through utilising weather analytics.
- **Further Reduction on Risk of System Failure –** as the generation mix transitions, complexity to operate and maintain the network increases. Therefore, improved operational analytics are required to minimise the risk of system failures that directly affect the continuity of supply of electricity to customers. This option involves new modules for real time system management, enhancing capabilities to manage and maintain the network as network complexity increases.
- **Time to competency for control centre operators** – updated systems and centralised system for operations decreases training time for control centre operations and drives an increase in operational productivity.
- **Reduction in cancelled maintenance works** – more efficient planning of operational processes drives a reduction in cancelled or rescheduled maintenance works, leading to cost savings to maintenance crews.
- **Better provision of key network status and quality information** to enable AEMO in making decisions to manage supply and demand.
- **Enable digitalisation of key processes and information** that removes manual processes and increases the accuracy and quality of process outcomes.
- **Enhanced abilities and information to manage scenarios that are expected to increase due to the changing renewables mix,** including real time system restoration and better information to better understand and manage processes impacted by weather and reverse flows**.**

[13] SO_OP_3715 Power System Security Guidelines: 23 April 2019, Section 7, page 15
[14] SO_OP_3715 Power System Security Guidelines: 23 April 2019, Section 10, page 15

Mitigation of key risk drivers

#	Risk Driver		Mitigation	Consequence	Likelihood	Risk Rating
D1	Meet Demand	✓	This option will bring in new capability to better meet the demand through improved insights and forecasting.	Major	Unlikely	C
D2	Regulatory Compliance	✓	This option will improve on the current operability of the network through analytics ensuring enhanced compliance	Moderate	Unlikely	D
D3	Maintain Current Performance	✓	This will improve on performance through the use on analytics, forecasting, and easier operating interfaces.	Moderate	Unlikely	D
D4	Maintain Reliability	✓	This option will bring in greater reliability using analytics and forecasting demand.	Moderate	Unlikely	D
D5	Maintain Price	✓	This option will enable better planning of the network and outages and reduce the constraints imposed when taking outages on the network.	Moderate	Possible	C
D6	Reliability of National Electricity System	✓	This option mitigates this risk driver through the product lifecycle upgrades of SCADA and will maintain reliability of the National Electricity System	Moderate	Unlikely	D
D7	Knowledge Loss	✓	This will reduce this risk through the introduction of systems, rules and documented insights and rely less on people's built up knowledge.	Moderate	Possible	C
D8	Aging Platforms	✓	This option mitigates this risk driver as product lifecycle upgrades to key systems (e.g. SCADA) will reduce this risk. The integration will address any technical debt through the separation of core system capability and user interfaces.	Moderate	Unlikely	D

#	Risk Driver		Mitigation	Consequence	Likelihood	Risk Rating
D9	Cyber Security	✓	[C-I-C]	Catastrophic	Unlikely	B
D10	Legacy Processes	✓	This will reduce the paper-based process within the control centre where more capability will be exposed through front end interfaces. This will not address all legacy processes present in field activities.	Moderate	Possible	C

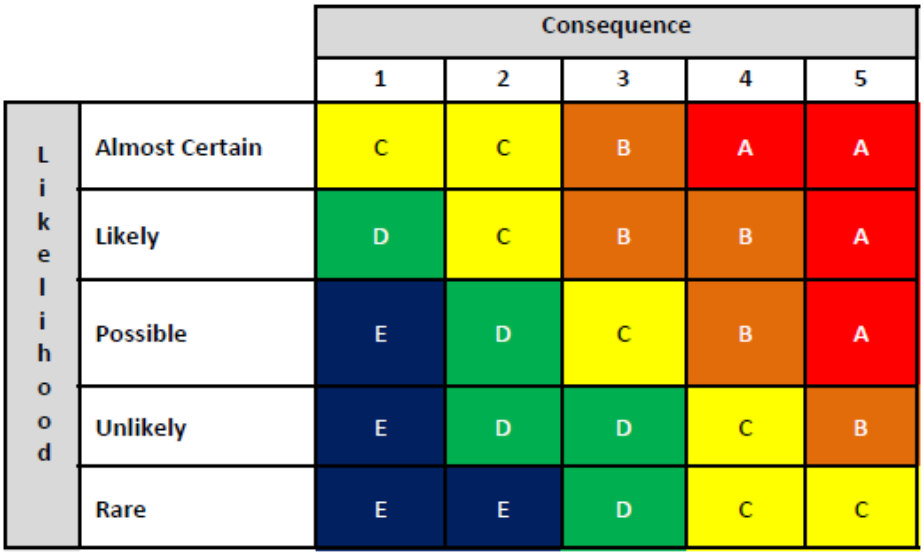
This option has **high alignment** to mitigate risk drivers

Risks

There are risks associated with implementation of this option, as highlighted in the table below. Based on the consequence and likelihood of each risk, we have rated each of the individual risks blue, green, yellow, orange or red (order of severity). See

Attachment 1 – Risk level matrix
The figure below shows the risk level matrix to which we have assessed each of risks within the options. Risks of highest concern are rated red, whereas those of lowest concern are rated blue.

Figure 6-1



for additional information on this rating system.

Table 4-8 Risks of option 2

ID	Risks	Consequence	Likelihood	Risk rating
R1.1	Key people availability for subject matter expertise in delivering this option	Moderate	Likely	B
R1.2	Product vendor commitment and resource availability	Major	Unlikely	C
R1.3	Product availability and ability to easily integrate with existing IT platform	Major	Likely	B
R1.4	Data scientist availability to build insights and analytics	Moderate	Likely	B

As we have identified low risks, we consider that overall, this option is rated **Moderate**.

Alignment to business related drivers of expenditure

Table 4-9 Business related drivers of option 2

Transmission business drivers	How this program achieves this
Maintaining current service performance in a disrupted environment where risks are changing due to the increasingly complex nature of the grid	• Upgrades to key systems to ensure service performance is maintained • Enhanced data to support decision making and optimise network management. • Increased capabilities to provide insight into weather management, restoration and load shedding

	• Contextual information due to integrated systems providing line of sight information • Better management of renewables integration • Improve knowledge management through improved systematisation of processes
Updating and implementing new technologies to enable AusNet Services to respond to changes within the growing renewable generation market	• Enhancements to increase ability to support renewables through enhanced renewable management capability • Enhanced connection management capability • Enhanced weather monitoring • Automation of runback and load shed schemes • Enhancements to enable real time system restoration management
Complying with new obligations	• Support new regulatory obligations established in the NEM to ensure minimum fault levels • Provide enhanced capabilities in meeting the power system security obligations
Delivering improvements requested by our customers regarding sustainability and cost	• Inclusions of scope to address changes required to enable renewable generation connection and management through the transmission network, while also optimizing our technology so that as the network becomes more complex, there is not significant requirements and costs associated with increased headcount to support it.

This option has **high alignment** to the business drivers

4.4 Option #3 Extend field Capabilities

This option incorporates all initiatives described in option 1 and 2 and provides additional components including network modelling enhancements, and field automation and mobility.

Implementation of this option will enhance the ability Network Modelling teams have to automate basic modelling and deliver faster studies through distributed and scalable computational resources. It will also enable proactive, real time decision making; both in the control centre and the field. The field will also experience enhanced situational awareness of their environment, assets and other key data input required to enable increased efficiency of processes and better decisions. This option will also enable better preparation and allocation of field personnel based on a contingency event or black system event under the PSS guidelines.

This option aims to uplift further capabilities through:

- Introduction of automation into network modelling and an increase of computational capability to deliver more models rapidly
- A focus on real-time data to support faster, more informed decision-making pertaining to planning, operations and decision making required for network management
- Greater connectivity to the field force through enhanced mobility
- Enhancements to network mobility and spatial data through new and improved imaging and on-device availability

By delivering these capabilities, this option will further enhance the capabilities required to manage an increasingly complex network through greater modelling capabilities, more real-time data points, and

enhanced field support. Field staff will have access to similar data available to Operators and as such will be able to respond more effectively in a contingency[15] or black system event.[16]

Alignment to objectives

The focus of this program of work is to enhance control centre operations to optimise network control and management and provide key contextual data to the field to enable proactive and efficient field processes.

Table 4-10 Objectives analysis of Option 3

Objective	Outcome
Maintain the stability and reliability of the transmission network	✓
New and existing regulatory obligations established in the NEM to ensure minimum fault levels	✓
Enhanced capabilities in meeting the power system security obligations	✓
Lifecycle maintenance for key systems	✓
Consolidate and orchestrate technology systems	✓
Enhanced use of available data to support contextual decision making	✓
Reduction of manual handling of information	✓
Improved data collection to enable proactive and predictive operations	✓
Enhance network modelling	✓
Optimise the field force and resource co-ordination	✓

This option has **high alignment** to the objectives

Costs

Table 4-11 Costs of option 3

($m)	2023	2024	2025	2026	2027	Total
Capex	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Opex	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Total program cost	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]

Benefits

This option will deliver the additional benefits on top of the benefits defined in Option 1 & 2:

- **Improved Decision Making for Network Augmentation, Replacement, and New Connections –** using data in network modelling, this option delivers greater data and tools to more effectively and efficiently model new connections and equipment on the network.
- **Reduce Field Works Cost and Improve Output –** This option delivers data models and tools to better co-ordinate and inform field resources when working on the network. It will reduce the cost of field work by increasing the number of work-orders a crew member can deliver and reduce the training time needed for crew members by ensuring more information is systematically available rather than learnt.

[15] SO_OP_3715 Power System Security Guidelines: 23 April 2019, Section 7, page 15
[16] SO_OP_3715 Power System Security Guidelines: 23 April 2019, Section 10, page 15

Mitigation of key risk drivers

As discussed in Section 3.4, this option is fully aligned in respect to reducing technology risk and providing a stable environment.

#	Risk Driver		Mitigation	Consequence	Likelihood	Risk Rating
D1	Meet Demand	✓	This option will bring in new capability to better meet the demand through improved insights, forecasting and field capabilities.	Minor	Unlikely	D
D2	Regulatory Compliance	✓	This option will improve on the current operability of the network through analytics ensuring compliance and more capable field teams.	Minor	Rare	E
D3	Maintain Current Performance	✓	This will improve on performance through the use on analytics, forecasting, and easier operating interfaces. It will also improve ability for planning teams to complete studies of the network.	Minor	Unlikely	D
D4	Maintain Reliability	✓	This option will bring in greater reliability using analytics and forecasting demand. It will also improve ability for planning teams to complete studies of the network.	Minor	Unlikely	D
D5	Maintain Price	✓	This option will enable better planning of the network and outages and reduce the constraints imposed when taking outages on the network. It will also reduce the cost in mobilising field team to perform work.	Moderate	Unlikely	D
D6	Reliability of National Electricity System	✓	This option mitigates this risk driver through the product lifecycle upgrades of SCADA and will maintain reliability of the National Electricity System.	Minor	Rare	E
D7	Knowledge Loss	✓	This will reduce this risk through the introduction of systems, rules and	Minor	Unlikely	D

#	Risk Driver		Mitigation	Consequence	Likelihood	Risk Rating
			documented insights and rely less on peoples built up knowledge.			
D8	Aging Platforms	✓	This option mitigates this risk driver as product lifecycle upgrades to key systems (e.g. SCADA) will reduce this risk. The integration will address any technical debt through the separation of core system capability and user interfaces.	Moderate	Unlikely	D
D9	Cyber Security	✓	[C-I-C]	Catastrophic	Unlikely	B
D10	Legacy Processes	✓	This will reduce the paper-based process within the control centre where more capability will be exposed through front end interfaces. This will also address all legacy processes present in field activities.	Minor	Unlikely	D

This option has **high alignment** to mitigate risk drivers.

Risks

There are several risks associated with implementation of this particular option, as highlighted in the table below. Based on the consequence and likelihood of each risk, we have rated each of the individual risks blue, green, yellow, orange or red (order of severity). See

Attachment 1 – Risk level matrix
The figure below shows the risk level matrix to which we have assessed each of risks within the options. Risks of highest concern are rated red, whereas those of lowest concern are rated blue.

Figure 6-1

Likelihood	Consequence 1	2	3	4	5
Almost Certain	C	C	B	A	A
Likely	D	C	B	B	A
Possible	E	D	C	B	A
Unlikely	E	D	D	C	B
Rare	E	E	D	C	C

for additional information on this rating system.

Table 4-12 Risks of option 3

ID	Risks	Consequence	Likelihood	Risk rating
R1.1	Key people availability for subject matter expertise in delivering this option	Moderate	Likely	B
R1.2	Product vendor commitment and resource availability	Major	Unlikely	C
R1.3	Product availability and ability to easily integrate with existing IT platform	Major	Likely	B
R1.4	Data scientist availability to build insights and analytics	Moderate	Likely	B
R1.5	Complexity in delivering change management for such a complex platform modernization	Major	Likely	B

This option has **moderate** risk.

Alignment to business related drivers of expenditure

As discussed in Section 3.5, there are four business drivers that AusNet Services has identified and is focussing on over the next regulatory period 202023-27. The table below highlights how this option will input into the initiatives where relevant. Where we consider that a business driver is not directly relevant to the option, 'N/A' is applied.

Table 4-13 Business related drivers of option 3

Transmission business drivers	How this option achieves this
Maintaining current service performance in a disrupted environment where risks are changing due to the increasingly complex nature of the grid;	• Upgrades to key systems ensure service performance is maintained • Enhanced data to support decision making and optimise network management. • Increased capabilities to provide insight into weather management, restoration and load shedding • Contextual information due to integrated systems providing line of sight information • Better management of renewables integration • Improve knowledge management through improved systematisation of processes • More agile transfer of information from control centre to the field to enable better decision making
Updating and implementing new technologies to enable AusNet Services to respond to changes within the growing renewable generation market;	• Upgrades to key technologies will allow AusNet Services to respond to, despite potential increases in requirements for transmission as renewables impact the grid • Enhancements to increase ability to support renewables through enhanced renewable management capability • Enhanced connection management capability • Enhanced weather monitoring • Automation of runback and load shed schemes • Enhancements to enable real time system restoration management • Automation of network modelling to deliver more rapid, high quality models • Increased ability for field operator decision making through greater information pertaining to asset imagery and location
Complying with new obligations	• Support new regulatory obligations established in the NEM to ensure minimum fault levels • Provide enhanced capabilities in meeting the power system security obligations
Delivering improvements requested by our customers regarding sustainability and cost.	This option includes scope to address changes required to enable renewable generation connection and management through the transmission network.

This option has **high alignment** to the business drivers.

5 Assessment and recommended option

5.1 Assessment of the options

To identi20 a recommended option for this program of work, we have selected several criteria to assess each of the options. We consider that these criteria represent a comprehensive view of each option, in achieving AusNet Services' objectives as well as requirements of the AER in ensuring that expenditure is both prudent and efficient.

The table below summarises our assessment of each of the options against the criteria.

Table 5-1 Summary table of the assessment of the options

	Option 1	Option 2 (Preferred)	Option 3
Alignment to objectives	Low alignment *(4/9)*	High alignment *(8/9)*	High alignment *(9/9)*
Costs	[C-I-C]	[C-I-C]	[C-I-C]
Alignment to technology risk drivers	Moderate alignment *(3/4)*	High alignment *(4/4)*	High alignment *(4/4)*
Overall risk rating	Moderate-High risk	Moderate risk	Moderate Risk
Alignment to business related drivers of expenditure	Low alignment *(1/4)*	High alignment *(3/4)*	High alignment *(4/4)*

5.2 Benefits of new capability

The AER - Guidance Note - Non-network ICT capex assessment approach for electricity distributors (28 November 2019) requires that for non-recurrent expenditures that deliver "*New or expanded ICT capability, functions and services*" justification must be made through demonstrating that benefits exceed costs (a positive NPV).

For Intelligent Network Operations, Option 1 delivers a refresh of current capability and mitigates risk and is therefore deemed recurrent. Option 2 includes 32% non-recurrent expenditures related to new capabilities, while Option3 includes 38% of non-recurrent expenditures.

Table 5 -2 below shows the NPV for the three options.

Table 5-2 NPV analysis of new capability-related expenditure ($2020m)

	Costs (PV)	Benefit (PV)	Net benefit (NPV)
Option 1	[C-I-C]	[C-I-C]	[C-I-C]
Option 2 (recommended)	[C-I-C]	[C-I-C]	[C-I-C]
Option 3	[C-I-C]	[C-I-C]	[C-I-C]

Program Brief

We have captured five primary benefits for this program in our NPV analysis:

- The time productivity savings associated with training a control centre operator (speed to competency)
- Productivity savings associated with risk of system failure
- Network Operations improvements in Outage Management
- Market Impact of Major Outage
- Improvements in network operation reducing the likelihood of a Reliability and Emergency Reserve Trader (RERT) event activation

Option 1 involves the minimum level of spend across the Program Scope items. Option 1 will address the lifecycle management of mission critical systems to maintain delivery of current services. This option would be considered recurrent as the benefits of this program relate to maintaining currency of current systems. Productivity savings in training and maturing control centre operators to a competent skill level, and through improved planned outage scheduling, i.e. a reduction in the amount of scheduled field maintenance works cancelled and rescheduled, are unlikely to be captured, in Option 1.

The first benefit relates to mitigating reliance on the knowledge and experience held by very few staff. As the workforce ages, the potential of knowledge loss increases as people with years of specialist experience leave the organisation and new resources need to be trained and equipped with similar experience.

By implementing new digital artefacts and increasing the use of systems to manage processes with enhanced information this will provide greater contextual information for operations planning and real time operations situational awareness. These enhanced capabilities reduce the number of training scenarios required to teach new employees and improves their abilities to effectively operate in their new roles. The benefits associated this program looks at the reduction percentage of training required for each new operator and the cost savings associated with this activity being [C-I-C] for Option 2 and [C-I-C] for Option 3.

The second benefit category relates to the risk of system failure of our IT systems if we do not invest in key network system capabilities. The benefit assumes a scale of increasing incidents if we do not invest in capability to ensure the stability and continued operations of our mission critical systems. The costs assumed impacted employees, average resolution time and average hourly rate of employee to measure the cost relative to the failure. We have assumed in the case of Option 2 and 3 a [C-I-C] risk avoidance benefit.

The third benefit considers the impact of more efficient conduct of control centre functions from the implementation of the options described in the solution. These benefits are derived from better organisation of planned maintenance work and outage processes that results in improved completion of planned work, less cancellations and re-scheduling and therefore fewer outages, resulting in less costs to both AusNet Services and customers. This benefit will be driven by higher quality information and subsequent planning processes that enables better logical grouping of assets due to type and/or geography and thus less associated constraints on the network. The benefit is expected to lower the total cost of planned work by [C-I-C] for Option 2 and Option 3.

The fourth benefits highlight the market impact of major outage (planned) on the network and can be described as avoiding the increasing market impact from network outages. The changing energy landscape from simple-centrally-located heavy spinning machines to inverter-based generation (such as solar and wind), that is dispersed throughout the network is causing new challenges in the National Electricity Market. Often the new generators connect in weak areas due to the abundance of sun or wind, but this is causing challenges additional challenges for operations. The improved situational planning is required to maintain performance of the network for power system security and market impacts while constraining the increase in the cost of taking outages.

The benefits of these new tools have been calculated based on the impact on the NEM taking outages that constrain the interconnector. The inter-connected NEM is becoming more important as a result of the changing energy mix. South Australia and Victoria are facing minimum demands that require the interconnectors to export excess energy in the off peak and conversely cannot meet its own peak demand without the support of the interconnectors. Constraining the interconnector increases the pool price of electricity in a state and consequently the prices are also affected in other states. For example, a constraint on the VIC-SA interconnector removes up to 550MW of cheap wind power from Victoria. While at the same time driving prices negative in South Australia due to the overabundance of generation.

The final benefit category relates to AusNet Services and AEMO benefits from AusNet Services control centre having developed improved situational awareness of the network operating point, and how contingencies, such as storms or bushfires, might impact. This allows the control centre to prepare for and respond to AEMO directions such as asset switching, system restart, and load shedding in order to support AEMO in its function to maintain power system security [NER 4.3.4 (a)] and for the Access Planning team to plan outages that limit market constraints.

Advanced situational awareness can reduce the need or length of market directions (load shedding, generation support or RERT) and/or the impact and length of constraints on the network. Similarly, advanced situational awareness can benefit the operation of the Reliability and Emergency Reserve Traders (RERT) mechanism. Via this mechanism AEMO contracts with parties who have unscheduled load or generation capacity that can be curtailed or brought online on request. During peak periods of demand AEMO may activate a RERT event, to ensure supply, incurring a cost to the end customer.

By implementing the changes described, through the availability of better information and insight, AusNet Services will be better able to inform AEMO on the network implications of potential impacts of events such as bushfire or storm, giving AEMO other tools to address a risk, and reducing the need for or quantum of a RERT activation. We have estimated a slight improvement of 5% in the first year increasing and levelling out at 20% by the fourth year within the TRR period. Based on an average cost to activate a RERT over the 2019-20 summer, we have multiplied the event cost by the percentage improvement which results in an estimated cumulative saving of [C-I-C] for both Option 2 and Option 3.

We have estimated more conservative savings for Option 2 relative to Option 3. We believe the real time focus in Option 3, will drive increase efficiencies particularly on network operations and field delivery.

Given that Option 2 has the highest NPV, or in other words creates the most value to customers, it is the recommended option.

5.3 Sensitivity Analysis of Benefits

When developing the NPV, we have considered variable assumptions to ensure that we have contemplated alternative scenarios relative to the benefits defined. This allowed us to establish a level of confidence in quanti20ing the benefits described.

Three levels of sensitivity were considered, they are:

- A *conservative* level, where some of the variables in the benefit calculations were halved from the values used in the NPV stated in this brief. Or in the case of the RERT event activation, we took the cost of the lowest event i.e. December 2019 Victorian Activation RERT event
- A *moderate* level, which is the best estimate for each variable and the basis for our choice in the program brief.

- A *bullish* level, where some of the variables in the benefit calculations were doubled from the values used in the NPV stated in this brief. Or in the case of the RERT event activation, we took the cost of the highest event i.e. January 2020 Victorian Activation RERT event,

Our NPV decision based on the sensitivity range explained above in choosing Option 2 is shown below.

	Conservative	Moderate	Bullish
Option 1	[C-I-C]	[C-I-C]	[C-I-C]
Option 2	[C-I-C]	[C-I-C]	[C-I-C]
Option 3	[C-I-C]	[C-I-C]	[C-I-C]

5.4 Recommended option

Based on this assessment, Option 2 is the recommended option as it achieves the majority of the intended outcomes for the program at lower cost. This option not only reflects the most prudent level of expenditure to deliver the outcomes sought it also limits the scope to reduce the delivery risk of the program over the TRR period. It improves overall security through current patches and updates, whilst introducing new systems, limiting the need for the business to depend on manual processes and make decisions without all available data.

6 Attachment 1 – Risk level matrix

The figure below shows the risk level matrix to which we have assessed each of risks within the options. Risks of highest concern are rated red, whereas those of lowest concern are rated blue.

Figure 6-1

Likelihood	Consequence 1	2	3	4	5
Almost Certain	C	C	B	A	A
Likely	D	C	B	B	A
Possible	E	D	C	B	A
Unlikely	E	D	D	C	B
Rare	E	E	D	C	C

Consequence Rating	
5	Catastrophic
4	Major
3	Moderate
2	Minor
1	Insignificant

Overall Risk Rating	
A	Extreme
B	High
C	Medium
D	Low
E	Very Low