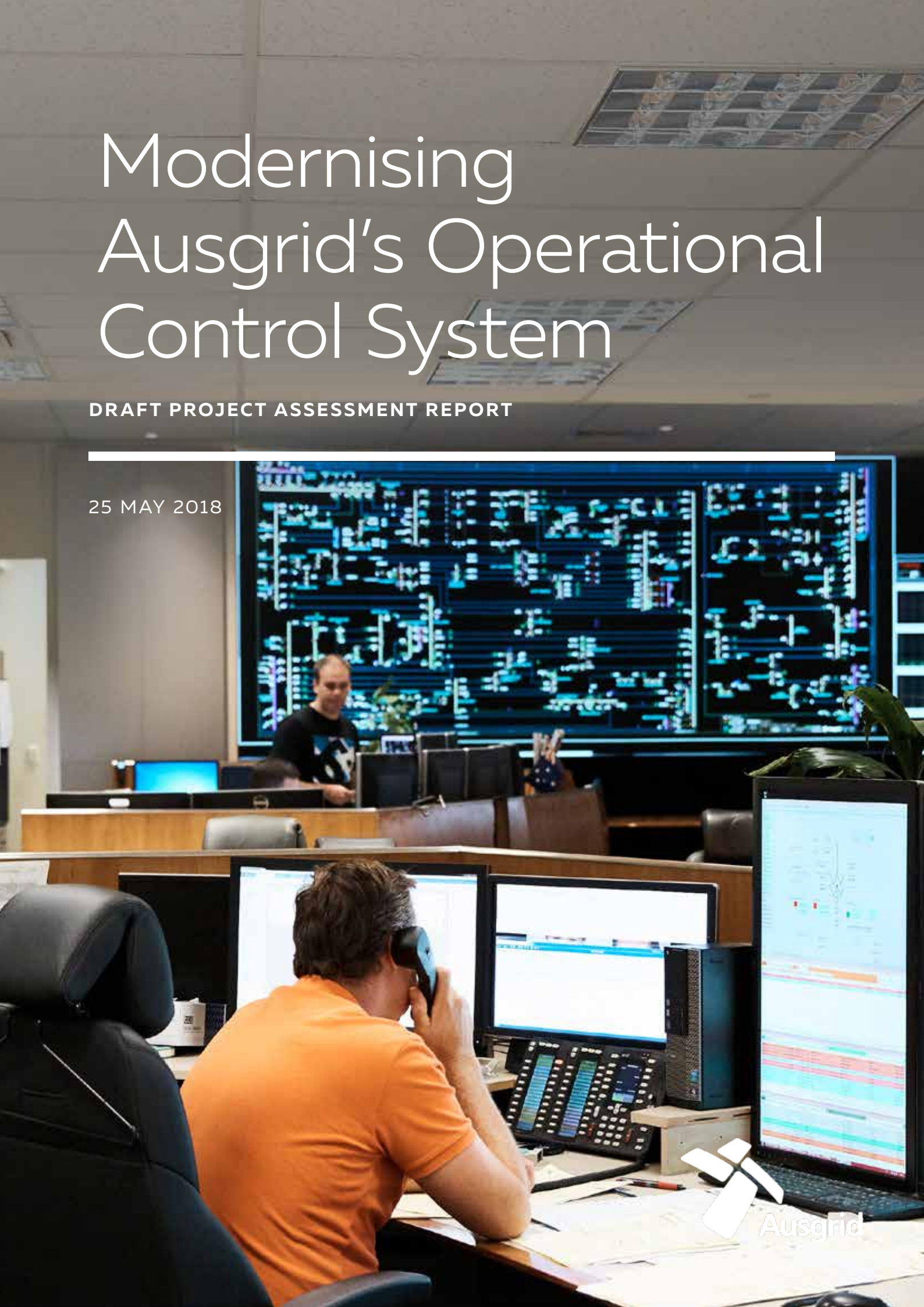
Modernising Ausgrid's Operational Control System

DRAFT PROJECT ASSESSMENT REPORT

25 MAY 2018



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OT systems required to manage the network

Draft Project Assessment Report – May 2018

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Executive Summary

This report investigates modernising Ausgrid's operational control system

This Draft Project Assessment Report (DPAR) has been prepared by Ausgrid and represents the first step in the application of the Regulatory Investment Test for Distribution (RIT-D) to implement an Advanced Distribution Management System (ADMS) in order to replace Ausgrid's existing Control System (Distribution Network Management System - DNMS), Outage Management System (OMS), and consolidate a range of supporting legacy systems.

Ausgrid's current DNMS is a bespoke vendor and in-house developed hybrid system dating from the 1990s. It incorporates network Supervisory Control and Data Acquisition (SCADA) and visualisation components. The product is obsolete, with limited support, no roadmap for development and limited knowledge of the underlying software code. This is likely to result in difficulties in resolving data & functionality issues when they arise.

It also lacks the functionality required to deliver the operational management in a modern utility environment, a critical shortcoming considering the need to have the flexibility and sophistication to respond to the significant advances in industry benchmarks enabled by more recent technology. The current system is unable to make the transition to deliver support for the core functions required by modern distribution utilities.

An ADMS provides an integrated set of tools to remotely monitor and control the network, manage system outages, improve planned and emergency event management, optimise power-flow management and provide fault location analysis, fault isolation and restoration capabilities. It is a key enabling tool for the integration of distributed energy resources and network optimisation capabilities. An ADMS enables digitised field operations to streamline day-to-day management of the network, including intelligent field crew dispatch. It is a platform to integrate core, ancillary network and corporate systems to deliver best practice asset management.

This system will reduce the risks associated with the existing systems and enable Ausgrid to take advantage of future industry and technological developments in order to better serve its customers and stakeholders. The replacement of the existing system with an ADMS will, over time, permit the rationalisation and integration of a number of legacy ancillary systems which support operations, planning and design. This will lead to more efficient and effective processes, service improvement and reduction in future expenditure requirements.

An ADMS is a necessary platform for delivering the services expected by customers and stakeholders in a rapidly changing industry, with increasing levels of distributed generation, customer engagement and the need to keep downward pressure on energy prices. The ability to support and integrate new generation, storage and network technologies is a driving need to have a modern and adaptive control system.

Ausgrid has prepared this report in response to recent Rule changes requiring the RIT-D to be applied to replacement expenditure

Since early-2017, Ausgrid has been planning to replace components of its current control system infrastructure and has already undertaken a significant pre-implementation phase. This process has narrowed down two suitable vendors who are currently in the process of submitting final offers. Ausgrid is now seeking to select an experienced and dynamic vendor, capable of working with Ausgrid as it transforms its Operational Technology (OT) environment, utilising proven, current and adaptable, ADMS capable of providing required services throughout the contract term. Ausgrid expects that a preferred vendor will be identified in June 2018.

Rule changes to the National Electricity Rules (NER) in July 2017 have meant that the replacement plan for the existing OT systems is now subject to a RIT-D. Accordingly, Ausgrid has initiated this RIT-D for replacing the identified OT Control Systems in order to investigate and consult on options to ensure Ausgrid is able to satisfy the reliability and performance standards that it is obliged to meet (and for which the OT systems covered by this RIT-D are crucial to providing).

Under the new rules, this type of replacement expenditure is now subject to a RIT-D, however we note that there are no feasible non-network solutions for this system. Investment efficiency is achieved through a competitive proposal and tender process for an ADMS. This was discussed at the recent AER Public Forum on the RIT-T and RIT-D and we understand the issue of applying the RIT-D (and RIT-T) to these types of programs is being considered as part of the AER updating its Application Guidelines.

Replacing legacy systems with an ADMS is the only credible option

Ausgrid considers there to be only one credible option to address the identified business requirements within the identified timeframes. This option involves replacing Ausgrid's DNMS and other supporting legacy systems within the control system environment with a proven, current and adaptable ADMS product.

This option enables the simplification, standardisation and modernisation of the OT and control system environment to comply with our regulatory obligations, including management of escalating cyber security threats to critical infrastructure as required by our distribution licence conditions and anticipated federal legislative requirements.

Whilst our initial strategy was to maintain the existing system and prepare for replacement, recent changes in customer expectations, product support, regulatory requirements and emerging security issues required a reassessment of the strategy. Critical risks emerged with the existing system, namely:

- low native cyber security capabilities to manage emerging threats and compliance with state and federal legislative requirements;
- significant risks for legacy software and hardware without on-going vendor support; and
- limited ability to undertake enhancements to the DNMS to leverage and support the transformative changes in the electricity industry such as Distributed Energy Resources (DER), automation and smart metering.

The core features of a modern network management system address these risks with an integrated application framework operating on current operating systems and vendor supported hardware. It should also utilise contemporary testing, maintenance and patching processes. The ADMS does this and will result in key benefits such as:

- a standardised and modern OT environment to comply with our regulatory obligations, including management of cyber security threats to critical infrastructure which is required by our distribution licence conditions and anticipated federal legislative requirements;
- streamlined and standardised processes that will improve efficiency;
- aligned data between corporate and operational systems to maximise operational and capital delivery efficiencies; and
- an adaptable platform with advanced capability to support the needs of a rapidly changing network and technology landscape as expected from our customers.

Overall, an ADMS enables Ausgrid to:

- streamline and standardise our OT systems to achieve improvements in business processes;
- ensure continued compliance with our distribution licence conditions imposed by the NSW government;
- align data between corporate and operational systems to maximise operational and capital delivery efficiencies;
- implement an adaptable platform with advanced capability to support the needs of a rapidly changing network and customer technology landscape as expected from our stakeholders;
- reduce support costs and platform risks through a standard implementation;
- increase cyber security and the ability to better detect and respond to threats;
- enhance business and systems capabilities, including the ability to monitor and detect operational issues;
- deliver improvements in safety, quality and reliability of the network; and
- make the most of opportunities to reduce operational expenditure in the longer term with more efficient processes and technology.

This option involves the replacement and consolidation of current SCADA, DNMS, OMS and dispatch and scheduling systems into a new ADMS that integrates and performs the functions of the previous four broad systems. Associated implementation, integration, governance and reporting services will be required for successful delivery of the ADMS, with support and maintenance of the implemented systems over the longer term.

While it is not appropriate to provide a breakdown in estimated costs across these categories on account of the tender process still being finalised the capital expenditure (capex) is estimated to be approximately $86.6 million over a six year period, of which approximately half will be invested in the next regulatory period (2020-2024). The capex comprises direct labour, indirect labour, contracted services (i.e. the amount paid to the yet-to-be-determined preferred vendor), material and contingency costs. The total operational expenditure (opex) is estimated to be approximately $7.3 million over a six year period, which comprises of costs associated with running the current suite of OT applications until replaced by the ADMS, and relevant ADMS opex costs once implemented. Please note that both cost estimates are in real $17/18.

It is expected that the new ADMS will be fully commissioned and operational by June 2021. Ausgrid assumes work on commissioning the ADMS commences in 2018/19.

At this point in time no commercial offer has been negotiated, nor agreed. The initial offers were only provided to establish an initial pricing view. The intent is to negotiate the commercial offer as part of the final solution plan and offers, which have now been submitted by vendors. Ausgrid expects that a final offer will be available and presented in the Final Project Assessment Report (FPAR) for this RIT-D.

Ausgrid considers that implementing an ADMS is consistent with a key finding of the 2017 Electricity Network Transformation Roadmap developed jointly between the Commonwealth Scientific and Industrial Research Organisation and the Energy Networks Australia. In particular, a key element of this roadmap is a pivot to a customer focused and intelligent network – enabled by advanced network management systems to facilitate a distributed energy resources market, network optimisation, and further real time communication and control.

While non-network options are not considered viable for this RIT-D, an ADMS will in-fact help facilitate the development and deployment of these solutions in the future

Ausgrid has also determined that non-network solutions are unlikely to form a standalone credible option or form a significant part of a potential credible option, since the ADMS performs critical functions[1] at a network-wide level that non-network solutions are not able to provide. This is set out in the separate notice released in accordance with clause 5.17.4(d) of the NER.

While Ausgrid considers that non-network options are unable to provide the functions of the OT systems covered by this RIT-D, it notes that an ADMS will greatly assist non-network alternatives in providing network support going forward. Initially, the investment in ADMS would focus on core capabilities to ensure operation of the distribution network is safe, reliable and effective. Once the implementation of the ADMS is complete, Ausgrid will be able to increase its capacity for network management and expand opportunities for non-network providers to integrate their solutions into Ausgrid's OT systems, which would improve data provision and co-ordination of non-network solutions.

How to make a submission and next steps

Ausgrid welcomes written submissions on this DPAR. Submissions are due on or before 06 July 2018. Submissions and queries should be addressed to:

Matthew Webb
Head of Asset Investment
Ausgrid
GPO Box 4009
Sydney 2001

Or

email to: assetinvestment@ausgrid.com.au

Submissions will be published on the Ausgrid website. If you do not want your submission to be publicly available please clearly stipulate this at the time of lodgement.

[1] Critical functions refer to control, data, distribution, outage management, scheduling and coordination functions that OT systems provide.

1 Introduction

This Draft Project Assessment Report (DPAR) has been prepared by Ausgrid and represents the first step in the application of the Regulatory Investment Test for Distribution (RIT-D) to implement an Advanced Distribution Management System (ADMS) in order to replace Ausgrid's existing Distribution Network Management System (DNMS), Outage Management System (OMS), and consolidate a range of supporting legacy applications. This grouping of applications is referred as Operational Technology (OT) applications throughout this document.

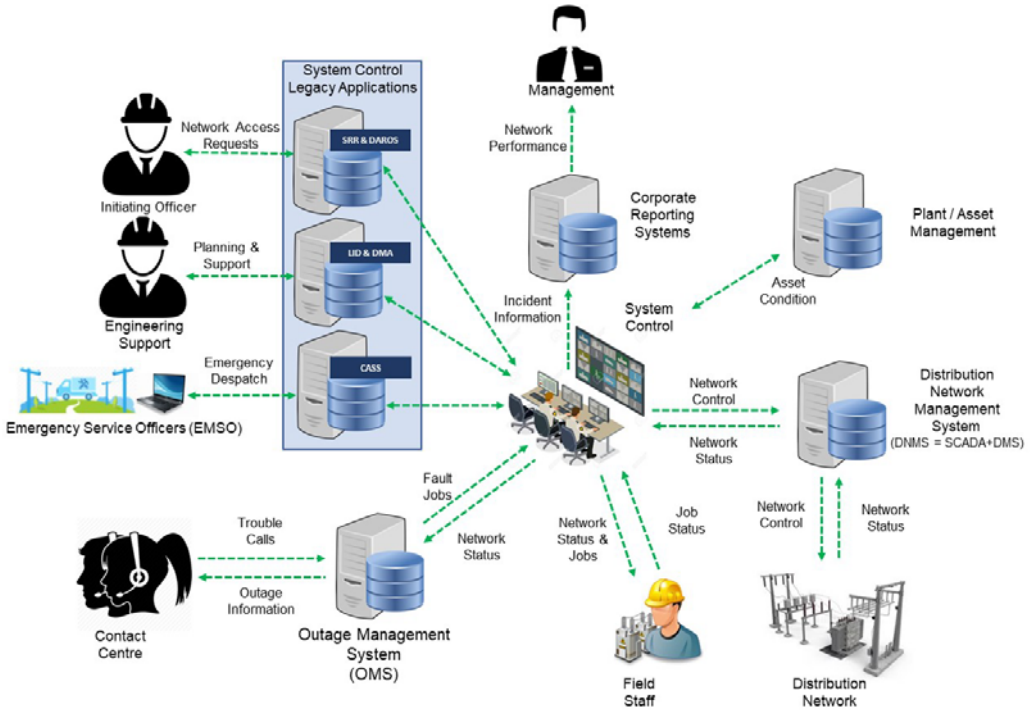
Ausgrid's network control rooms utilise a key application commonly referred to as the DNMS to remotely monitor and operate the electricity network. The DNMS, in conjunction with other supporting applications, enables Ausgrid's Sydney and Wallsend control rooms to safely manage the delivery of planned augmentation, maintenance and unplanned work resulting from events such as faults or storms, as shown in Figure 1. It also facilitates inter-control room communication with external parties such as TransGrid and AEMO.

Ausgrid currently utilises a range of additional supporting applications including:

- Supervisory and Data Acquisition Systems (SCADA) Master Station – manages two-way communication between field devices through a variety of communication networks (forms part of the DNMS);
- Outage Management System (OMS) – records known network outages by the control room operators and captures customer outage and trouble call information from the contact centre;
- Network Access Request Systems (SRR and DAROS) – for creation of access requests to have the network switched and enable work to be undertaken safely on the network;
- Emergency Despatch System (CASS) – manages emergency response for single customer supply interruptions and network hazards, through to dedicated field compute devices; and
- Other legacy systems – a group of other legacy systems for managing additional functions and reporting where the functionality is not currently available in the main systems.

Control Room staff currently move data between various systems to maintain a consistent situational view for outage management, network reconfiguration or management of maintenance and repair works.

Figure 1 – Key OT application interactions



Electricity network operators began to utilise Distribution Management Systems (DMS) in the 1990s to supplement basic SCADA systems. Ausgrid's DNMS control system started development in the 1990s and has been in use with limited change for over a decade. The DNMS has:

- high escalating costs to maintain the necessary contemporary cyber security protections as required by our Licence Conditions for Critical Infrastructure;
- low native resilience to cyber-related attack, noting mitigating controls have been applied in line with industry best practice and aligned with Ausgrid's License Conditions requirements;
- limited functionality that cannot be easily developed or extended;
- inhibits the efficient connection of new types of network equipment;
- high development and support costs, solely funded by Ausgrid; and
- difficulty integrating new applications and technologies to support the evolving network and customer needs.

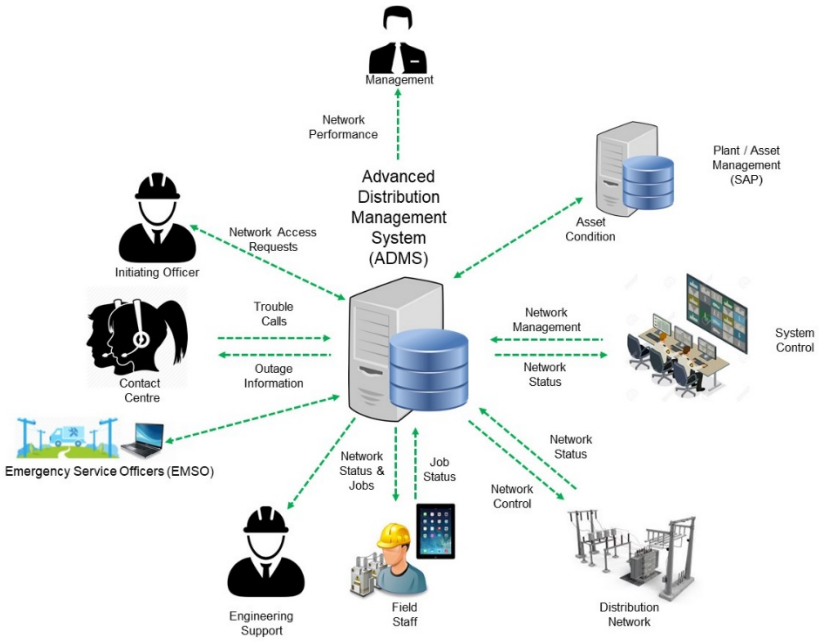
The control system market has matured by way of consolidating to several suppliers that offer significantly improved ADMS products since the development of Ausgrid's DNMS. In addition, the industry is changing and will continue to do so going forward with customers' needs changing and expecting more information about their supply and wanting to use their own distributed resources more intelligently.

ADMS provides a software platform that can enable a comprehensive set of distribution management tools and optimisation. An ADMS addresses the challenges Ausgrid face with the DNMS and includes the following functionality:

- remote monitoring and control of the network;
- management of system outages and restoration works;
- planned and emergency event management;
- power-flow optimisation;
- network fault location analysis, automated isolation and restoration capabilities; and
- provision of a platform for integration of distributed energy resource management systems and other corporate systems.

An ADMS changes the network management operating model from one where the operators are the single point of integration for information from multiple systems, to a model where employees interact with one integrated system, as shown in Figure 2. The ADMS and associated integration with Ausgrid's enterprise systems will ensure a consistent real time situational view that is not dependant on staff entering and updating information in multiple systems.

Figure 2 – ADMS application interactions



The core benefits of an ADMS implementation are as follows:

- risk Mitigation – mitigates legacy-system risk to as low as reasonably practical;
- operational Efficiency – drives significant operating efficiencies across the major operational groupings;
- enabling Platform – provides a platform for existing capability integration and enables simple integration of future capabilities;
- safety – aligned data and greater visibility of the operational state of the network will improve safety by providing all personnel operating on the network with improved situational awareness; and
- customer – helps meet increasing customer expectations with accurate and timely outage information provided by the ADMS in real-time between field operations and customers.

An ADMS facilitates a transition from manual processes and siloed software systems to integrated systems with real-time and near-real-time data, automated processes.

Since early-2017, Ausgrid has been planning to replace components of its current control system infrastructure and has already undertaken a pre-implementation phase. This pre-implementation phase has identified two suitable vendors who are currently in the process of submitting final offers. Ausgrid anticipates that a preferred vendor will be identified in June 2018.

Rule changes to the National Electricity Rules (NER) in July 2017 have meant that the replacement plan for existing OT systems and applications are now be subject to the RIT-D. Accordingly, Ausgrid has initiated this RIT-D for replacing the identified OT applications in order to investigate and consult on options to ensure Ausgrid is able to satisfy the reliability and performance standards that it is obliged to meet (and for which the OT systems covered by this RIT-D are crucial to providing).

Under the new rules, this type of replacement expenditure is now subject to a RIT-D, however we note that there are no feasible non-network solutions for this system. Investment efficiency is achieved through a competitive proposal and tender process for an ADMS. This was discussed at the recent AER Public Forum on the RIT-T and RIT-D and we understand the issue of applying the RIT-D (and RIT-T) to these types of programs is being considered as part of the AER updating its Application Guidelines.

Ausgrid has determined that non-network solutions are unlikely to form a standalone credible option, or form a significant part of a credible option, as set out in the separate notice released in accordance with clause 5.17.4(d) of the NER.

1.1 Role of this draft report

Ausgrid has prepared this DPAR in accordance with the requirements of the NER under clause 5.17.4. It is the first stage of the formal consultation process set out in the NER in relation to the application of the RIT-D.

The purpose of the DPAR is to:

- describe the identified need Ausgrid is seeking to address, together with the assumptions used in identifying it;
- provide a description of the credible options available (in this case the credible option available);
- quantify relevant costs and market benefits for each credible option;
- describe the methodologies used in quantifying each class of cost and market benefit;
- provide reasons why Ausgrid has determined that classes of market benefits or costs do not apply to a credible option(s);
- present the results of a net present value analysis of each credible option and accompanying explanation of the results; and
- identify the proposed preferred option.

The next stage of this RIT-D involves publication of a Final Project Assessment Report (FPAR). The FPAR will update the assessment of the investment options, in light of any submissions received on this DPAR.

The entire RIT-D process is detailed in Appendix B. The next steps for this particular RIT-D assessment are discussed further below.

1.2 Submissions and queries

Ausgrid welcomes written submissions on this DPAR. Submissions are due on or before 06 July 2018. Submissions and queries should be addressed to:

Matthew Webb
Head of Asset Investment
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GPO Box 4009
Sydney 2001

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2 Description of the identified need

This section provides a description of the reason Ausgrid considers investment in an ADMS is necessary, before presenting a number of key assumptions underlying this 'identified need'.

2.1 Electricity distributors rely on a number of OT applications to ensure the safe, reliable and affordable distribution of electricity to customers

Electricity distribution businesses rely on a number of key OT applications to safely and efficiently manage the day-to-day delivery of planned augmentation, maintenance and unplanned work resulting from events such as faults or storms. These applications also facilitate inter-control room communication with external parties such as TransGrid and AEMO. These applications are integral to performing key network functions and are summarised below in terms of their functions in ensuring the distribution of electricity to Ausgrid's customers.

In Ausgrid's current control system environment these functions are provided by discrete applications which are not integrated.

Overall, these applications ensure that core platforms and capabilities of Ausgrid as a DNSP are maintained and compliance with all reliability standards and obligations are met.

Table 1 – Summary of key OT applications relied on by Ausgrid

System	Key roles and sub-systems
SCADA – 'Supervisory Control and Data Acquisition' systems'	• Maintains a real-time set of measurements from the field which represents the current state of the electrical network. • This data is used in real time by control rooms (via DMS) to manage the network and remotely control devices on the network. • This data is used by planners in determining appropriate investments. • This data is used by specialists to recover and diagnose in the event of issues, reporting and analysis.
DMS – 'Distribution Management System'	• Ausgrid refers to this as the DNMS – 'Distribution Network Management System' • Provides Ausgrid control rooms with a visual representation of the real time data collected by the SCADA system linked to an electrical connectivity model representing the distribution and sub-transmission network. This is vital to ensuring that reliable electricity supply is provided to customers.
OMS – 'Outage Management System'	• The OMS is a computing application that predicts network fault locations based on a combination of customer outage calls and network device operations. • This system is used across Ausgrid at the time of an outage to process customer outage calls, provide feedback to customers for known outages, and to assist with managing outage identification and restoration. • Data sourced from OMS is then used by claims groups to process any customer claims resulting from outages and also for internal and external regulatory reliability reporting. • Primary users of OMS and OMS data include the Contact Centre, Control Room, Despatch, Field Services, Network Security, Network Reliability and Network Claims.
Dispatching and scheduling/coordination systems	• DAROS & SRR– 'Disconnect & Reconnect Order System' and 'Switching Request Register' are separate systems which manages requests for switching of the network to allow access to disconnect, reconnect, and alter the electricity network. • CASS – 'Computer Aided Service System' dispatching and mobile computing application that enables the electronic issue of customer premise jobs to the field, such as reconnect orders and single premise outage jobs. CASS is used by System Control Dispatch and Emergency Service Operators.

2.2 Aligning control system applications with industry best practice

Ausgrid is bound by its distribution licence conditions, as well as prudent business practice, to align its OT systems with industry best practice.

The table below outlines the four sets of key requirements Ausgrid must meet in terms of its OT systems.

Table 2 – Summary of key requirements of Ausgrid's OT systems

Key requirement	Overview
Security requirements	IEC62443 and similar standards define industry best practices for industrial control system security. Ausgrid's current DNMS is a bespoke vendor/Ausgrid hybrid which started development in the 1990s. Core parts of the system have not been updated since its inception and as such cannot easily or cost effectively be integrated with the security tooling provided by current operating systems. Ultimately this situation will result in future difficulties and complexity in complying with licence conditions and industry best practice. Current best practices provide transitionary ability for legacy systems, however over time these standards are refreshed and the transitionary arrangements become non-compliant.
Support requirements	Contemporary systems draw on commodity hardware. These components are then used in a manner which is consistent with a control system environment. This use of commodity hardware and systems increases the pool of skilled resources who are available with a lower overhead of training. The DNMS is unique to Ausgrid. This means that the support options are limited to a very small number of people. The current vendor has advised Ausgrid that they regard the DNMS as a legacy Beta system and have no future roadmap or plans for this application. This support arrangement is an intrinsic and growing risk with the DNMS – the support options are reducing over time as people with the requisite knowledge are no longer available. The current support arrangement has been extended which has increased the requirements on Ausgrid for the support of the system particularly in knowledge retention due to the limited capabilities remaining with the vendor. 2021 represents the technical end of system life after which system support at the appropriate level of reliability for a critical infrastructure control system becomes unsustainable. It follows that Ausgrid considers maintaining the current DNMS is not a credible option given the absence of support from 2021 onward.
Reporting and audit requirements	Contemporary systems provide native reporting tools and interconnections to dedicated external systems. The DNMS has proprietary interfaces and limited reporting and audit tools. This limits the ability to provide input into audits both self-audits and external audits (required by licence) along with growing requirements by stakeholders for information.
Functionality Requirements	The network of the future requires a system which can integrate with new technologies efficiently, effectively and safely. Doing this is foundational to servicing Ausgrid's customer needs as they evolve. Ausgrid's current system was conceived at a time when it was considered that the network conditions and device additions could be estimated accurately in advance for five years and remained static in functionality. Under these assumptions, a source code change to cater for this increase along with a system design change for new devices and a system restart is required for the DNMS. For current needs this approach to the changing needs of the electrical network is a significant limitation – particularly when looking forward and meeting the expectations of our customers for the interconnection and management of new devices and services.

Going forward, Ausgrid considers that advanced forms of network system architecture will be employed to reengineer the overall system to incorporate the diversity of future connected equipment and to provide the platforms for effective customer interaction. This was identified as a key finding in Electricity Network Transformation Roadmap developed in 2017 jointly between the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and the Energy Networks Australia (ENA).

In particular, the CSIRO and ENA Roadmap highlighted a number of examples where this is likely to occur in the near future[2].

- Active network management – far greater levels of monitoring and control will be required to allow active management of the distribution network to meet its increasingly complex operational needs.
  - This will require consistent, open and flexible systems, with suitable communications and open standards to permit new market entrants to participate; and
  - This decentralised intelligence should be developed to operate as an integral component of a hierarchical control scheme that facilitates effective control, functionality at higher voltage levels and assists in providing additional flexibility and control functionality at the interface with the transmission network and the wholesale market.
- Network visibility – all future scenarios investigated by CSIRO and the ENA indicate the involvement of third parties in a variety of roles interacting with the grid in real time, responding to price signals or operational incentives.
  - This functionality requires real time access to monitoring data, giving rise to the requirement for an affordable, reliable and open data, monitoring and communications platform; and
  - This platform can be used to provide various data, including operational data that may assist in providing more transparent information to AEMO on the real time and forecast operation of the distribution network interface.

The CSIRO and ENA Roadmap outline a series of milestones that provide markers of progress over the coming decade toward a more resilient 2027 future state. Milestone 2 states that, by 2019, a basic set of Advanced Network Optimisation functions are performed where networks with very high distributed energy resources levels progressively implement:

- advanced network planning tools;
- distributed grid intelligence; and
- control and advanced network operation techniques.

This milestone introduces more sophisticated techniques for the utilisation of distributed energy resources. It is used as part of a coordinated and automated process for network management, for example, assisting in managing voltage excursions, responding to loading unbalance in real time or managing short term constraints, perhaps as part of an automated and intelligent control scheme to achieve integrated system operation.

2.3 This RIT-D therefore focusses on replacing these systems with a cost-effective modern equivalent

It is against this background that Ausgrid proposes the replacement of the DNMS and supporting OT applications with an ADMS to ensure that the legacy and siloed set of applications are replaced by one coherent system that is well-placed to assist Ausgrid handle the changes afoot in the energy industry. In particular, this RIT-D has been initiated to continue to progress options and solutions to modernise and replace Ausgrid's DNMS and OT applications and implement a contemporary and enhanced capability across the organisation.

This RIT-D is aimed at delivering a long term strategic initiative to transform and simplify the control environment, systems, process and technology to enable Ausgrid to continue to be reliable and reduce operational risk to an acceptable level. This will result in key benefits such as:

- a simplified and modernised OT application environment to comply with our regulatory obligations, including management of cyber security threats to critical infrastructure, which is required by our distribution licence conditions and anticipated federal legislative requirements;
- streamlined and standardised industry best practice processes;
- aligned data between corporate and operational systems to maximise operational and capital delivery efficiencies; and
- an adaptable platform with advanced capability to support the needs of a rapidly changing network and technology landscape as expected from our customers.

The Ausgrid replacement strategy is also aligned with the overall industry and to the following compliance requirements:

[2] CSIRO and Energy Networks Australia 2017, *Electricity Network Transformation Roadmap*, Final Report, pp. 58-59 – available at: http://www.energynetworks.com.au/sites/default/files/entr_final_report_web.pdf

- Ausgrid's distribution network is part of the National Critical Infrastructure list defined by the Australian Government[3] – as part of this, Ausgrid is required to maintain its infrastructure operating safe from security risks;[4]
- Ausgrid needs to maintain the performance, reliability, security, reporting and customer service standards of its network as part of Ausgrid's license conditions to operate a distribution system;[5] and
- the CSIRO and ENA 2017 Roadmap to focus on customer oriented electricity, power system security, intelligent networks and markets and incentivise efficiency and innovation as foundation elements and until 2027.[6]

Overall, ADMS is the software platform that supports the full suite of distribution management and optimization. An ADMS includes functions that facilitate automation of outage restoration and optimize the performance of the distribution grid. ADMS functions being developed for electric utilities include fault location, isolation and restoration; volt/volt-ampere reactive optimization; conservation through voltage reduction; peak demand management; and support for microgrids and electric vehicles. In effect, an ADMS transitions DNPS operations from relying on paperwork, manual processes, and siloed software systems to systems with real-time and near-real-time data, automated processes, and integrated systems.

An ADMS software platform will also serve to 'futureproof' Ausgrid's OT systems by enabling the option of adding modules or add-ons to ADMS core capabilities required by customers in the future.

2.4 Key assumptions underpinning the identified need

The identified need to replace the existing systems is predicated on two key assumptions/facts – namely:

- Ausgrid's distributor licence conditions that set out sets out requirements that Ausgrid is obligated to meet; and
- availability of long term support and Vendor roadmap for Ausgrid's existing DNMS going forward.

Each of these are discussed in detail below.

2.4.1 Ausgrid's distributor licence conditions

Ausgrid operates assets that constitute 'critical infrastructure' being those physical facilities, supply chains, information technologies and communications networks which, if destroyed, degraded or rendered unavailable for an extended period, would significantly impact on the security, social or economic wellbeing of NSW and other states and territories which are from time to time electrically interconnected.

Consequently, in recognition of the critical importance of the its network, Ausgrid's distributor licence imposed by the NSW government contains conditions with respect to OT infrastructure that obliges Ausgrid to certain conditions, including that it:[7]

> *must, by using best industry practice for electricity network control systems, ensure that operation and control of its distribution system, including all associated ICT infrastructure, can be accessed, operated and controlled only from within Australia, and that its distribution system is not connected to any other infrastructure or network which could enable it to be controlled or operated by persons outside Australia.*

In practice, this condition imposes responsibility on Ausgrid to:[8]

- deliver the SCADA capability required to safely and reliably operate the distribution system;

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[3] On 21 February 2017, the federal government's Department of Home Affairs Critical Infrastructure Centre released a discussion paper outlining the complex and evolving national security risks of sabotage, espionage and coercion to our critical infrastructure.

[4] Conditions 9, 10 and 11 of Ausgrid's Distributor Licence sets out a number of conditions relating to having a substantial presence in Australia (condition 9), Data security (condition 10), and compliance with critical infrastructure provisions (condition 11).

[5] *Ministerially imposed licence conditions for Ausgrid Operator Partnership to operate a distribution system. (effective from 1 December 2016)*

[6] *Electricity Network Transformation Roadmap - FINAL REPORT from CSIRO and Energy Networks Australia (April 2017) - http://www.energynetworks.com.au/electricity-network-transformation-roadmap*

[7] Ministerially imposed licence conditions – Ausgrid to operate a distribution system, Condition 9.2(a). Available at: https://www.ipart.nsw.gov.au/Home/Industries/Energy/Energy-Networks-Safety-Reliability-and-Compliance/Electricity-networks/Licence-Conditions-and-Regulatory-Instruments/Ministerially-imposed-licence-conditions-Ausgrid-to-operate-a-distribution-system

[8] Condition 9.3

- develop and implement strategies to manage cyber security and other threats affecting the network operational technology environment; and
- develop systems for effectively managing assets remotely, including but not limited to network switches, condition monitoring and remote interrogation or operation of protection systems and relays.

Ausgrid's current DNMS was developed in the 1990s as a bespoke product customised to Ausgrid's needs at the time. Since then, best industry practice has evolved as OT technologies advanced but Ausgrid's DNMS has not. Core parts of the system have not been updated since its inception, preventing implementation of best practice security tooling and appropriate access management. Furthermore, modern OT systems provide capabilities to safely and reliably operate the distribution system, manage cyber security and other threats and remotely manage assets more effectively and efficiently than Ausgrid's DNMS.

Transitionary arrangements for OT systems provide some accommodation for legacy systems such as Ausgrid's DNMS, but transitionary arrangements will eventually end as industry best practices standards are refreshed, which will cause Ausgrid to become non-compliant with best industry practice and its licencing conditions. It follows that there is an identified need to undertake action and invest in an ADMS to ensure future compliance with its distributor licence conditions.

2.4.2 Availability of support for Ausgrid's existing DNMS

The DNMS requires continued support from the current vendor to ensure the distribution network can be accessed, operated and controlled safely and reliably. Without vendor support, Ausgrid cannot guarantee it can operate its distribution network safely and reliably over time given the critical nature of OT in modern distribution systems.

The bespoke nature of this solution means that it is unable to meet ongoing requirements with regards to Ausgrid's critical infrastructure licence conditions. Condition 9 of Ausgrid's critical infrastructure licence conditions requires Ausgrid to follow best industry practice for its control system environment including appropriate vendor support, access and security (including cyber security) is aligned with industry best practice. The vendor supporting the current system has advised Ausgrid that they regard the DNMS as a legacy 'Beta' product and this places hard constraints on what can be achieved. Hence there are no expectations that the current DNMS can enable Ausgrid to continue to achieve full compliance as required by our obligations. The support model for the DNMS determines a practical end of life for the DNMS of 2021.

It follows that there is an identified need to undertake corrective action in the form of implementing a new ADMS to ensure Ausgrid's OT applications remain supportable and compliant with its distribution licence conditions.

3 Vendor engagement undertaken to-date

Ausgrid has been planning to replace components of its current OT environment since early 2017. This has included a significant pre-implementation phase, which began in June 2017 and is expected to last until June 2018.

The pre-implementation phase of the project is aimed at:

- conducting a robust requirements driven procurement process to recommend a suitable ADMS vendor (i.e. the preferred vendor);
- completing the documentation of the current 'as-is' business processes;
- undertaking core preparatory tasks to enable Ausgrid to be able to accept an ADMS (i.e. data alignment activities); and
- refining and reducing assumptions and 'unknowns' with vendors regarding the implementation costs and risks of an ADMS.

In June and July 2017, Ausgrid undertook a substantive scoping exercise of the requirements for replacement systems. A key requirement was that a 'Commercially Off The Shelf' ADMS product utilised by other utilities that can be configured to meet Ausgrid's requirements with minimal customisations. This work culminated in a Pre-Qualification Questionnaire (PQQ), this engagement with the market was a closed tender process commencing with six vendors, all whom have had a local Australian presence.

All six vendors were assessed/evaluated at this stage and Ausgrid down-selected to three potential vendors to progress to a proof of concept (PoC) and Initial Solution Plan & Offer (ISPO) stages over November to December 2017. In January 2018, Ausgrid assessed/evaluated both PoC and ISPO material provided by vendors to-date and down-selected potential vendors list to two vendors.

Ausgrid conducted a week-long Joint Solution Design (JSD) workshop with these two that focused on multiple layers and supported by two work-streams.

The JSD achieved:

- confirmation of required functionality – the JSDs generated broad confidence that both solutions will fulfil Ausgrid's functional requirements;
- reduction of 'submission' risk – the reduction of risks to which both Ausgrid and the vendors would have been exposed were selection of the preferred vendor based on written submissions (this assertion is supported by both vendors); and
- exposure to each vendors 'way-of-doing business' – the program and broader Ausgrid teams were also exposed to the culture and way-of-doing-business of each vendor, which can only effectively be understood in a face-to-face environment.

Following the JSD's, both vendors have submitted a Final Solution Plan and Offer (FSPO), which is a refined ISPO by the vendors based on the JSD session, allowing vendors to remove assumptions and any identified risk. Both vendors have committed to almost full compliance with Ausgrid's requirements with no material non-compliances identified.

This market engagement and process to refine the vendors proposal in a collaborative manner has resulted in a refined and de-risked proposal from vendors removing core assumptions for both parties, enabled the forecast project costs to be further refined.

It is anticipated that at the end of June 2018, Ausgrid will have identified a preferred vendor.

4 Potential credible options to address the identifed need

Ausgrid considers that there is only one credible option to address the identified need, ie, replacing the existing systems with an 'off the shelf' ADMS, as is currently being refined with potential vendors (as outlined in section 3 above).

Ausgrid has also determined that non-network solutions are unlikely to form a standalone credible option or form a significant part of a potential credible option, since the ADMS performs critical functions[9] at a network-wide level that non-network solutions are not able to provide. This is set out in the separate notice released in accordance with clause 5.17.4(d) of the NER.

While Ausgrid considers that non-network options are unable to provide the functions of the OT systems covered by this RIT-D, it notes that an ADMS will greatly assist non-network alternatives in providing network support going forward. Initially, the investment in ADMS would focus on core capabilities to ensure operation of the distribution network is safe, reliable and effective. With continued investment, Ausgrid will be able to increase its capacity for network management and expand opportunities for non-network providers to integrate their solutions into Ausgrid's OT systems, which would improve data provision and co-ordination of non-network solutions.

This section outlines the ADMS option Ausgrid is currently refining with potential vendors. It also outlines why a 'contemporised' DNMS option is considered not credible for meeting the identified need. Section 5.1 below outlines why a 'do nothing' option is also not considered credible.

4.1 Option 1 - Replacement of legacy systems with an ADMS

This option involves replacing Ausgrid's DNMS and other supporting legacy systems within the control system environment with a commercially available off the shelf ADMS product.

This option will enable the simplification and modernisation of the Operational Technology and control system environment to comply with our regulatory obligations, including management of escalating cyber security threats to critical infrastructure as required by our distribution licence conditions and anticipated federal legislative requirements.

Whilst our initial driver for an ADMS was to maintain the existing system and prepare for replacement, changes in recent years to customer expectations, product support, regulatory requirements and emerging security issues required a reassessment of the strategy. Critical risks emerged with the existing system, namely:

- low native cyber security capabilities to manage emerging threats and compliance with state and federal legislative requirements;
- significant risks for legacy software and hardware at end of life and without on-going vendor support; and
- limited ability to undertake enhancements to the DNMS to leverage and support the transformative changes in the electricity industry such as Distributed Energy Resources (DER), automation and smart metering.

The core features of a modern network management system to address these risks require an integrated application framework which runs with current operating systems and operates on vendor supported hardware. It should also utilise contemporary testing, maintenance and patching processes. The ADMS does this and will result in key benefits such as:

- a simplified and modernised Operational Technology environment to comply with regulatory obligations, including management of escalating cyber security threats to critical infrastructure as required by Ausgrid's distribution licence conditions and anticipated federal legislative requirements;
- streamlined and standardised industry best practice processes;
- aligned data between corporate and operational systems to maximise operational and capital delivery efficiencies; and
- an adaptable platform with advanced capability to support the needs of a rapidly changing network and technology landscape as expected from customers.

[9] Critical functions refer to control, data, distribution, outage management, scheduling and coordination functions that OT systems provides.

Overall, Option 1 enables Ausgrid to:

- streamline and standardise our OT systems to achieve industry best practice processes;
- ensure compliance with our distribution licence conditions imposed by the NSW government;
- align data between corporate and operational systems to maximise operational and capital delivery efficiencies;
- implement an adaptable platform with advanced capability to support the needs of a rapidly changing network and customer technology landscape as expected from our stakeholders;
- reduce support costs and platform risks through a standard implementation;
- increase cyber security and the ability to detect and respond to threats;
- enhance business and systems capabilities, including the ability to monitor and detect operational issues;
- deliver improvements in safety, quality and reliability of the network; and
- make the most of opportunities to reduce operational expenditure in the longer term with more efficient processes and technology.

Option 1 involves the replacement and consolidation of current SCADA, DMS (i.e. the current DNMS), OMS and dispatch and scheduling systems into a new ADMS that integrates and performs the functions of the previous four broad systems. Associated implementation, integration, governance and reporting services will be required for successful delivery of the ADMS, with support and maintenance of the implemented systems over the longer term.

While it is not appropriate to provide a breakdown in estimated costs across these categories on account of the tender process still being finalised the total capital expenditure (capex) of Option 1 is estimated to be approximately $86.6 million over a six year period, of which approximately half will be invested in the next regulatory period (2020-2024). This capex comprises direct labour, indirect labour, contracted services (i.e. the amount paid to the yet-to-be-determined preferred vendor), material and contingency costs. The total opex cost of Option 1 is estimated to be approximately $7.3 million[10] over a six year period, which comprises of costs associated with running the current suite of OT applications until replaced by the ADMS, and relevant ADMS opex costs once implemented. Please note that both cost estimates are in real $17/18.

It is expected that the new ADMS will be fully commissioned and operational by June 2021. Ausgrid assumes work on commissioning the ADMS commences in 2018/19.

The initial offers from the vendors, subject to further validation following the JSD workshops, include the licence fees, implementation cost and the support cost, however they exclude any optional investment costs (i.e. extra cost later with configuring the system for more intelligent operation of the network, as outlined above).

At this point in time no commercial offer has been negotiated, nor agreed. The initial offers were only provided to establish an initial pricing view. The intent is to negotiate the commercial offer as part of the final solution plan and offers, which have now been submitted by vendors. Ausgrid expects that a final offer will be available and presented in the FPAR for this RIT-D.

4.2 One additional option was considered but not progressed

Ausgrid considered the option of retaining the current DNMS and other associated legacy bespoke systems that support the control system environment. In particular, this involves developing and contemporising the existing DNMS system to be consistent with the minimum industry standard, incorporating cyber security controls to meet basic industry best practices and establishing maintenance arrangements for the existing base code.

Having assessed this option in-detail, Ausgrid considers that retaining the existing DNMS has a number of key drawbacks, relative to a complete ADMS roll out (Option 1) – namely:

- a longer time required to meet minimum industry standards and increasing risk of non-compliance with Ausgrid's critical infrastructure license conditions;

[10] Ausgrid note that the opex figure above is calculated out to 2023/24 and that operating costs would also be incurred after this.

- misalignment with industry best practice regarding use of commercial off the shelf products and system support model;
- a high risk (to both timing and costs associated with uplifting existing system to minimum modern standards);
- extremely limited functionality compared with a modern ADMS, including lack of switching;
- reduced management functionality and integration between OMS and DNMS functions;
- increased risk of catastrophic failure of applications due to diminishing support;
- no improvements in safety, quality and reliability of the network;
- a compromised ability to monitor and detect operational issues with the DNMS network and application and increased risk of successful cyberattack due to the inability to apply remedies to newly discovered security issues; and
- no improvements in systems capabilities such as the ability to monitor and detect operational issues, consolidate other systems supporting the control system environment, and opportunities to reduce operational expenditure in the long term with more efficient processes and technology.

In addition, this option is expected to be similar in costs to Option 1.

Ausgrid considers this option to be non-credible, when considered alongside Option 1, and has consequently discontinued assessing it. This is driven by the elevated risk and uncertainty of pursing this option, also noting this is inconsistent with industry best practice.

5 Description of the modelling methodologies applied

This section outlines the methodologies and assumptions Ausgrid has applied to undertake this RIT-D assessment.

5.1 Option 1 has been treated as the 'base case credible option'

Ausgrid considers that a 'do nothing' base case is not relevant in for this RIT-D since, not taking action (and consequently not having the suitable and reliable OT applications to run the network) is not realistic and would likely lead to escalated risks of significant network outages and related safety incident outcomes across Ausgrid's network (and possibly other networks).

A 'do nothing' option would lead to escalating risks associated with operating a legacy control system beyond obsolescence and without appropriate vendor support. This option would result in unacceptable security and compliance risks, embeds operational inefficiencies and does not deliver the service capability that our customers and stakeholders in the transforming electricity market expect us to provide.

Specifically, while networks are typically resilient to isolated equipment faults, the assumption of not having the requisite backend OT applications and infrastructure to run the network could lead to multiple concurrent systemic faults that can overwhelm Ausgrid's capacity to undertake corrective maintenance or replacement projects and, in a worst-case scenario, could lead to cascading blackouts across the network and beyond. Ausgrid therefore does not consider that this would be a credible base case against which to conduct the RIT-D assessment, as it is far removed from prudent business philosophy.

A 'base case credible option' approach has therefore been adopted for this RIT-D assessment, rather than adopting a 'do nothing' base case, because strictly doing nothing would implicitly assume to breaches of the NER requirements and potential future breaches of Ausgrid Licence Conditions.

Ausgrid note that the use of a 'base case credible option' is allowed for under the RIT-D.[11]

5.2 Approach to estimating costs and the discount applied

The current high-level implementation plan for the ADMS has multi-phases of delivery with different capabilities and benefits being deployed and realised. The current implementation schedule has identified the replacement functionality of the DNMS delivered in approximately two years and subsequent functionality deployed over subsequent years allowing retirement of legacy OT applications.

The three high-level phases are as follows:

- Phase 1 – DNMS replacement will introduce contemporary support arrangements, modernise functionality and improve cybersecurity of the system;
- Phase 2 – Replacement of OMS will achieve support and integration efficiencies; and
- Phase 3 – Deployment of advanced functionality will increase the utilisation of the electricity network, improve safety of operations and improve customer reliability through the introduction of dynamic ratings and switching, greater use of centralised control and coordination, and introduce automated network fault location, isolation and restoration.

The current high–level implementation schedule and cost forecast will be further developed during detailed engagement with the preferred vendor in June 2018. It is expected this activity in combination with the current vendor tender response will feed into a revision of the business case and affirm the schedule, including the concurrency of the three phases.

At this stage of the project planning, the total estimated cost of Option 1 over a six-year period (starting in FY19) is approximately $86.6 million, which comprises direct labour, indirect labour, contracted services (ie, the amount paid to the yet-to-be-determined preferred vendor), material and contingency costs. This current estimate has been used as the central estimate for this RIT-D.

[11] AER, *Regulatory investment test for distribution application guidelines*, 18 September 2017.

Ausgrid has adopted a real, pre-tax discount rate of 6.13 per cent as the central assumption for the NPV analysis presented in this report. Ausgrid considers that this is a reasonable contemporary approximation of a 'commercial' discount rate (a different concept to a regulatory WACC), consistent with the RIT-D.[12]

Ausgrid has also tested the sensitivity of the results to changes in this discount rate assumption, and specifically to the adoption of a lower bound real, pre-tax discount rate of 4.19 per cent (equal to the latest AER Final Decision for a DNSP's regulatory proposal at the time of preparing this DPAR[13]), and an upper bound discount rate of 8.07 per cent (i.e., a symmetrical upwards adjustment).

5.3 Description of reasonable scenarios

RIT-D assessments are required to be based on cost-benefit analysis that includes an assessment of 'reasonable scenarios', which are designed to test alternate sets of key assumptions and whether they affect identification of the preferred option.

Ausgrid has elected to assess three alternative future scenarios – namely:

- low cost scenario – Ausgrid has adopted a number of assumptions that give rise to a lower bound NPV estimate for Option 1 with respect to potential costs;
- baseline scenario – the baseline scenario consists of assumptions that reflect Ausgrid's central set of variable estimates, which, in Ausgrid's opinion, provides the most likely scenario; and
- high cost scenario – Ausgrid has adopted a number of assumptions that give rise to a upper bound NPV estimate for Option 1, in order to represent a conservative future state of the world with respect to potential costs.

Table 3 – Summary of the three scenarios investigated

Variable	Scenario 1 – low cost	Scenario 2 – baseline	Scenario 3 – high cost
Option 1 costs	$76.5 million (ie, 20 per cent lower than the baseline)	$93.9 million	$111.2 million (ie, 20 per cent higher than the baseline)
Commercial discount rate	8.07 per cent	6.13 per cent	4.19 per cent

Ausgrid considers that the baseline scenario is the most likely, since it based primarily on a set of expected/central assumptions. Ausgrid has therefore assigned this scenario a weighting of 50 per cent, with the other two scenarios being weighted equally with 25 per cent each. However, Ausgrid notes that the identification of the preferred option is the same across all three scenarios, i.e. the result is insensitive to the assumed scenario weights.

5.4 Estimating 'market benefits' is not relevant for this RIT-D

For the purpose of this RIT-D, Ausgrid has not quantified the relative reliability or safety outcomes from this proposed. There is only one credible option and that this option has been assessed as the 'base case credible option' (as outlined in section 5.1 above).

[12] Ausgrid notes that it has been sourced from the discount rate recently independently estimated as part of the Powering Sydney's Future RIT-T. See: TransGrid and Ausgrid, *Project Assessment Conclusions Report*, Powering Sydney's Future, November 2017, p. 62 – available at: https://www.transgrid.com.au/news-views/lets-connect/consultations/current-consultations/Documents/Powering%20Sydney%27s%20Future%20-%20PACR.pdf

[13] See TasNetworks' PTRM for the 2017-19 period, available at: https://www.aer.gov.au/networks-pipelines/determinations-access-arrangements/tasnetworks-determination-2017-2019/final-decision

6 Economic assessment

The table below shows the present value of the costs of Option 1 under both the central scenario (i.e. central cost estimates and a discount rate of 6.13 per cent), as well as the other two scenarios outlined above. The present value costs reported include the present value of capital costs and six years of operational costs. Please note that the present value of the costs is presented in absolute terms, as opposed to relative to the base case credible option.

Table 4 – Estimated net market benefit for Option 1, PV $m

Scenario	Net market benefit
Central assumptions – central cost estimates and a discount rate of 6.13 per cent	-$82.1
Low cost assumptions – low cost estimates and a discount rate of 8.07 per cent	-$64.2
High cost assumptions – high cost estimates and a discount rate of 4.19 per cent	-$101.3

As there is one credible option assessed, Option 1 is found to be the preferred option.

Ausgrid notes that the preferred option is not required to have a positive net market benefit under the RIT-D since the identified need for this RIT-D is a reliability corrective action.[14]

[14] For clarity, since 'reliability corrective actions' are undertaken to meet externally imposed obligations, the preferred option can have *negative* net market benefits under the RIT-T. See: NER clause 5.16.1(b).

7 Proposed preferred option

The preferred option is Option 1, which involves replacing Ausgrid's DNMS and other supporting legacy systems within the control system environment with a commercially available off the shelf ADMS product. Ausgrid is the proponent of Option 1.

This option enables the simplification and modernisation of the Operational Technology applications and control system environment to comply with our regulatory obligations, including management of escalating cyber security threats to critical infrastructure as required by our distribution licence conditions and anticipated federal legislative requirements.

This also enables Ausgrid to:

- streamline and standardise our OT applications and achieve industry best practice processes ongoing;
- ensure ability to meet future compliance with our distribution licence conditions imposed by the NSW government;
- align data between corporate and operational systems to maximise operational and capital delivery efficiencies;
- implement an adaptable platform with advanced capability to support the needs of a rapidly changing network and customer technology landscape as expected from our stakeholders.
- reduce support costs and platform risks through a standard implementation;
- increase cyber security resilience and the ability to detect and respond to threats;
- enhance business and systems capabilities, including the ability to monitor and detect operational issues
- deliver improvements in safety, quality and reliability of the network; and
- make the most of opportunities to reduce operational expenditure in the longer term with more efficient processes and technology.

Option 1 involves the replacement and consolidation of current SCADA, DMS (i.e. the current DNMS), OMS and dispatch and scheduling systems into a new ADMS that integrates and performs the functions of the previous four broad systems. Associated implementation, integration, governance and reporting services will be required for successful delivery of the ADMS, with support and maintenance of the implemented systems over the longer term.

While it is not appropriate to provide a breakdown in estimated costs across these categories on account of the tender process still being finalised the total capital expenditure (capex) of Option 1 is estimated to be approximately $86.6 million over a six year period, of which approximately half will be invested in the next regulatory period (2020-2024). This capex comprises direct labour, indirect labour, contracted services (i.e. the amount paid to the yet-to-be-determined preferred vendor), material and contingency costs. The total opex cost of Option 1 is estimated to be approximately $7.3 million over a six year period, which comprises of costs associated with running the current suite of OT applications until replaced by the ADMS, and relevant ADMS opex costs once implemented. Please note that both cost estimates are in real $17/18.

It is expected that the new ADMS will be fully commissioned and operational by June 2021. Ausgrid assumes work on commissioning the ADMS commences in 2018/19.

At this point in time no commercial offer has been negotiated, nor agreed. The initial offers were provided to establish an initial pricing view. The intent is to negotiate the commercial offer as part of the final solution plan and offers, which have now been submitted by vendors. Ausgrid expects that a final offer will be available and presented as appropriate in the FPAR for this RIT-D.

Ausgrid considers that this DPAR and that the proposed preferred option satisfies the requirements of the RIT-D.

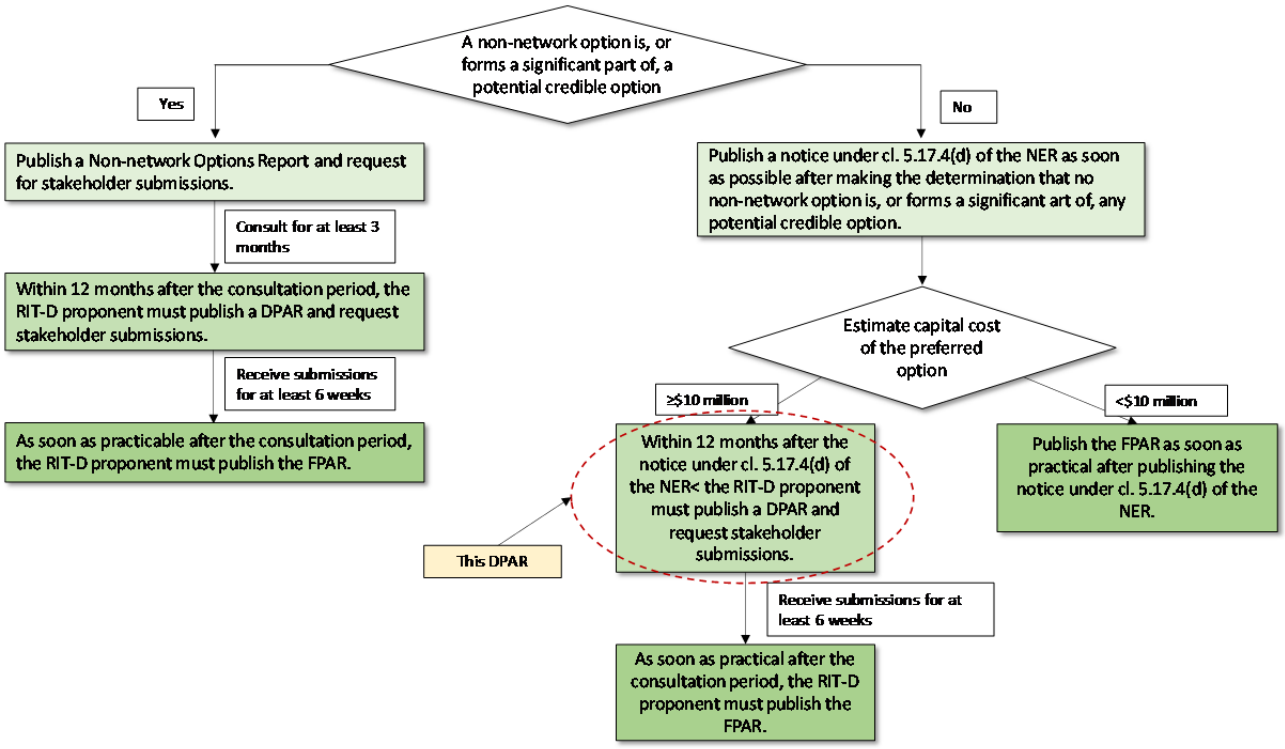
Appendix A – Checklist of compliance clauses

This section sets out a compliance checklist that demonstrates the compliance of this DPAR with the requirements of clause 5.17.4(j) of the National Electricity Rules version 107.

Rules clause	Summary of requirements	Relevant sections in the DPAR
5.17.4(j)	(1) a description of the identified need for the investment	2
	(2) the assumptions used in identifying the identified need	2.4
	(3) if applicable, a summary of, and commentary on, the submissions on the non-network options report	NA
	(4) a description of each credible option assessed	4
	(5) where a DNSP has quantified market benefits, a quantification of each applicable market benefit for each credible option;	NA
	(6) a quantification of each applicable cost for each credible option, including a breakdown of operating and capital expenditure	4
	(7) a detailed description of the methodologies used in quantifying each class of cost and market benefit	5
	(8) where relevant, the reasons why the RIT-D proponent has determined that a class or classes of market benefits or costs do not apply to a credible option	5
	(9) The results of a net present value analysis of each of credible option and accompanying explanatory statements regarding the results	6
	(10) the identification of the proposed preferred option	7
	(11) for the proposed preferred option, the RIT-D proponent must provide: (i) details of technical characteristics; (ii) the estimated construction timetable and commissioning date (where relevant); (iii) the indicative capital and operating cost (where relevant); (iv) a statement and accompanying detailed analysis that the proposed preferred option satisfies the regulatory investment test for distribution; and (v) if the proposed preferred option is for reliability corrective action and that option has a proponent, the name of the proponent	7
	(12) Contact details for a suitably qualified staff member of the RIT-D proponent to whom queries on the draft report may be directed.	1.2

Appendix B – Process for implementing the RIT-D

For the purposes of applying the RIT-D, the NER establishes a three stage process: (1) the Non-Network Options Report (or notice circumventing this step); (2) the DPAR; and (3) the FPAR. This process is summarised in the figure below.

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