PWC Asset Class Management Plan

SCADA

January 2023

PowerWater

Version control

This document has been approved in accordance with the Delegation of Authority (DoA) as evidenced by signatures and dates contained herein.

Rev	Date	Description	Author	Endorsed	Approved
1	17/01/2023	Revised and moved to new template	M Van Doornik Asset Engineer	B Kaye Manager Asset Strategy and Risk	S Eassie Senior Manager Asset Management

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1. Introduction

ISO 55000 defines an Asset Management Plan (AMP) as documented information that specifies the activities, resources and timescales required for an individual asset, or a grouping of assets, to achieve the organisation's asset management objectives.

1.1 Purpose and context

The purpose of this Asset Management Plan (AMP) is aligned to the requirements specified in ISO 55000. This AMP:

- Defines what is included and exclude from its scope
- Describes the asset class being managed
- Defines how this asset class will contribute to achieving the Asset Management Objectives that are defined in the Strategic Asset Management Plan (SAMP)
- Identifies the challenges we are expecting to encounter over the AMP planning horizon
- Sets out the projects and programs that we will invest in to ensure we achieve the AM Objectives and address the identified challenges
- Quantifies the risk posed by this asset class with and without the proposed projects and programs of work

By reviewing this AMP and reassessing asset performance on an annual basis, we will ensure that any emerging issues are identified and can be addressed prior to becoming a significant risk. The outcome of the annual review will support the annual update of the Statement of Corporate Intent (SCI) and provide an input into the annual Transmission and Distribution Annual Planning Report (TDAPR).

1.2 Scope of the AMP

This AMP covers all supervisory control and data acquisition (SCADA) assets located throughout Power and Water's power network.

The AMP excludes:

- Non-regulated or Indigenous Essential Services (IES) assets that are managed by Power and Water
- Management of 3rd party software and analytics applications utilised by System Control that are part of the Energy Management System (EMS) suite of applications.

This AMP will avoid, as far as practicable, repeating information that is contained in other documentation. Instead, it will provide a reference to the relevant document or data source.

1.3 Timeframe of the AMP

This AMP is focused on a 10 year planning horizon, with respect to expenditure forecasts, that aligns with the requirements of the SCI and TDAPR. However, when assessing future challenges and emerging trends we may consider longer timeframes and will comment by exception if any longer term issues are expected to arise.

1.4 Asset management framework

Power and Water has a Strategic Asset Management System[1] which sets out the framework for asset management and the hierarchy of documents. This provides line of sight from the corporate objectives through to the asset objectives and how management of this asset class will contribute to achieving those objectives. Figure 1 highlights how the AMP fits in with the overall asset management system.

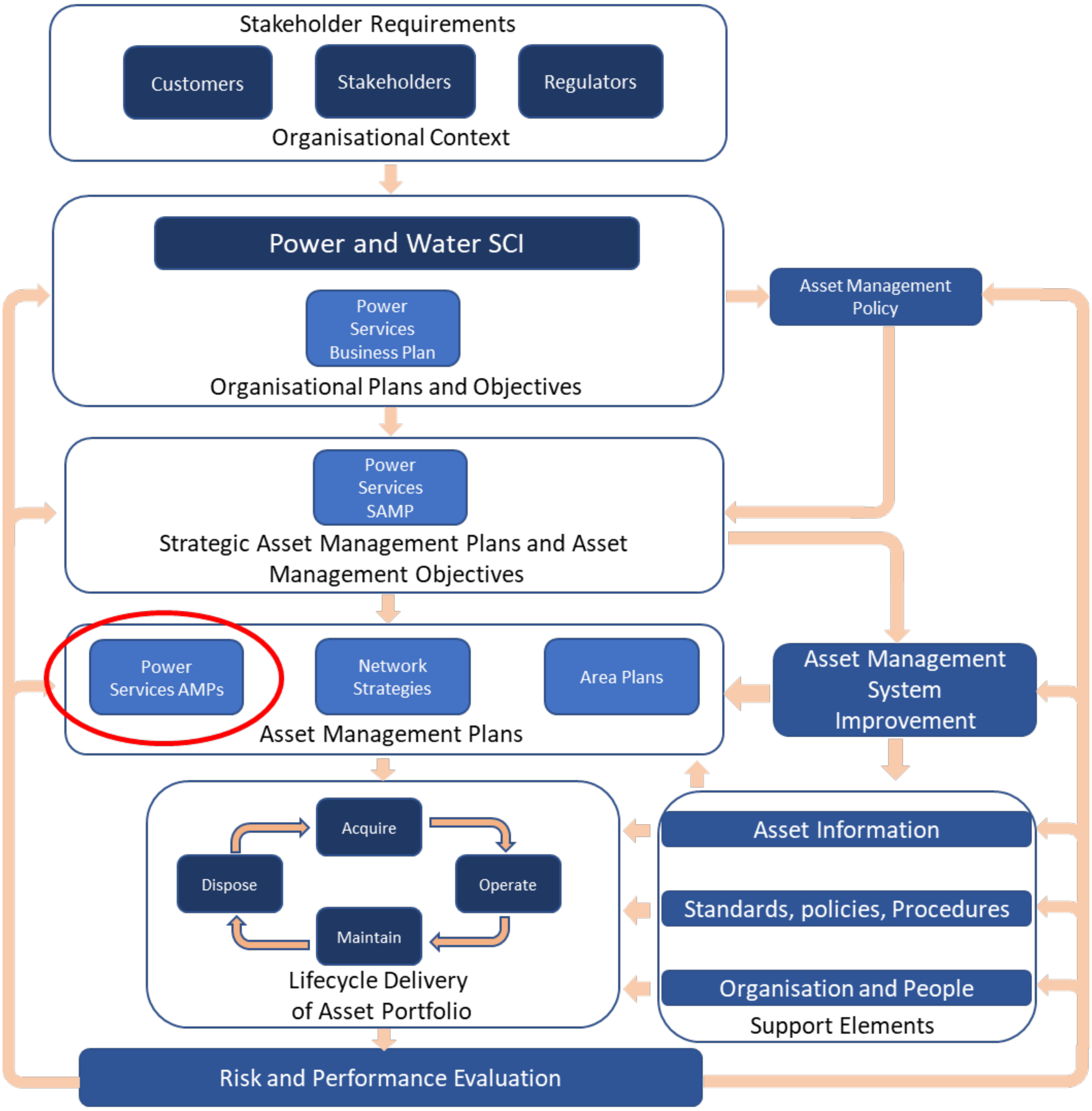

Figure 1: The AMP within the context of the Asset Management System

[1] CONTROL0548

1.5 Document structure

This document has been structured to align with the Power and Water Asset Management Standard and fits under the SAMP in the hierarchy of documentation. The document has been designed to be concise and provide the outcomes of detailed analysis with references, and not repeat the analysis in this document.

The purpose of each section is described below:

- **Asset profile** provides an overview of what the asset is to provide context to the reader of the asset's role in the electricity transmission and distribution network. It provides a breakdown by asset characteristics and volumes as well as the age profile which is an important input to asset management.
- **Asset objectives and performance** sets out the asset objectives and how they apply to this asset class. Any gaps or emerging trends are identified and linked to a project or program, if relevant, to address the issue and ensure the asset objectives are achieved.
- **Asset challenges and emerging issues** outlines any existing or emerging challenges that may impact the performance of the asset class or may otherwise impact the management of, or need for, the asset class.
- **Implementation plan** sets out the project and programs with expenditure per year for the 10 year planning horizon. This is a point in time assessment that is updated periodically so it may not align fully to the SCI and TDAPR if additional analysis has been completed subsequent to the AMP update.'
- **Risk quantification and mitigation** describes the approach to risk-based investment decision-making and demonstrates the risk mitigated by the proposed implementation plan.
- **Asset lifecycle management** describes the asset management approach at each stage in the asset lifecycle.
- **Continuous Improvement** outlines the improvement plans related to the asset class.

2. Asset Profile

SCADA assets perform the critical function of providing visibility and control of the network to System Control which allows Power and Water to efficiently and safely operate the network. SCADA assets include Remote Terminal Units (RTUs) installed in the field as well as the Energy Management System (EMS) assets installed in control rooms.

2.1 Fleet characteristics

Table 1 provides an overview of the in-scope asset fleet separated into their respective asset categories. Our EMS replacement project has moved our EMS to a virtual server topology, aside from the ICCP servers, and our asset data and hierarchy is currently being reviewed and updated. Therefore, Table 1 is indicative only and will be updated in the next revision of the AMP.

Asset category	Asset description	Quantity
Field devices	C2025	13
	C50	10
	SCD5200	89
	SCD6000	4
Master station assets	EMS and Server/equipment room (TBC)	20
	ICCP server	4
Other	Substation LAN	11

Table 1 - Overview of in-scope assets

Power and Water's SCADA assets vary by type, model, function, age, location and many other factors within the network. This variety results in unique risk profiles, and thus unique expenditure and management implications. Descriptions of SCADA asset types are outlined below.

2.2 Age profile

The age profiles provide an early indication of expected asset condition and potential life extension or renewal investment requirements. The asset age profile for SCADA assets is shown in Figure 2.

It is important to note that electronic/digital SCADA assets have relatively short functional lives of typically 15 years. The functional lives are typically dictated by the availability of support from the manufacturer and compatibility with technology used by associated assets.

Since 2010, Power and Water has carried out a number of zone substation renewals. These substations typically contained old SCADA and communications assets that were at, or approaching, end of life. Therefore, Power and Water aligned the replacement of the SCADA equipment with the substation renewal. This approach has two key benefits; it ensures both asset compatibility and cost-efficiency.

Table 2 provides an overview of how many assets have reached end of life. This includes those that have reached or exceeded their serviceable life, as well as any that have been issued an End of Support notice from the manufacturer. The C2025 and C50 are old assets that are currently identified for replacement. The

SCD5200 has recently been superseded by the SCD6000, however the SCD5200 has not yet reached its expected 15 year serviceable life.

Asset category	Asset description	Functional life (yrs)	Percentage at end of life
Field devices	C2025	15	100%
	C50	15	100%
	SCD5200	15	-
	SCD6000	15	-
Master station assets	EMS	10	100%
	Server/equipment room	15	-
Other	Substation LAN	15	58%

Table 2 – Summary of SCADA asset fleet age

The age profile shown in Figure 2, demonstrates a relatively young asset group, with relatively few assets currently exceeding the nominal life of 15 years, which reflects the recent focus on replacement of the C2025 and C50 RTUs and zone substation renewal programs.

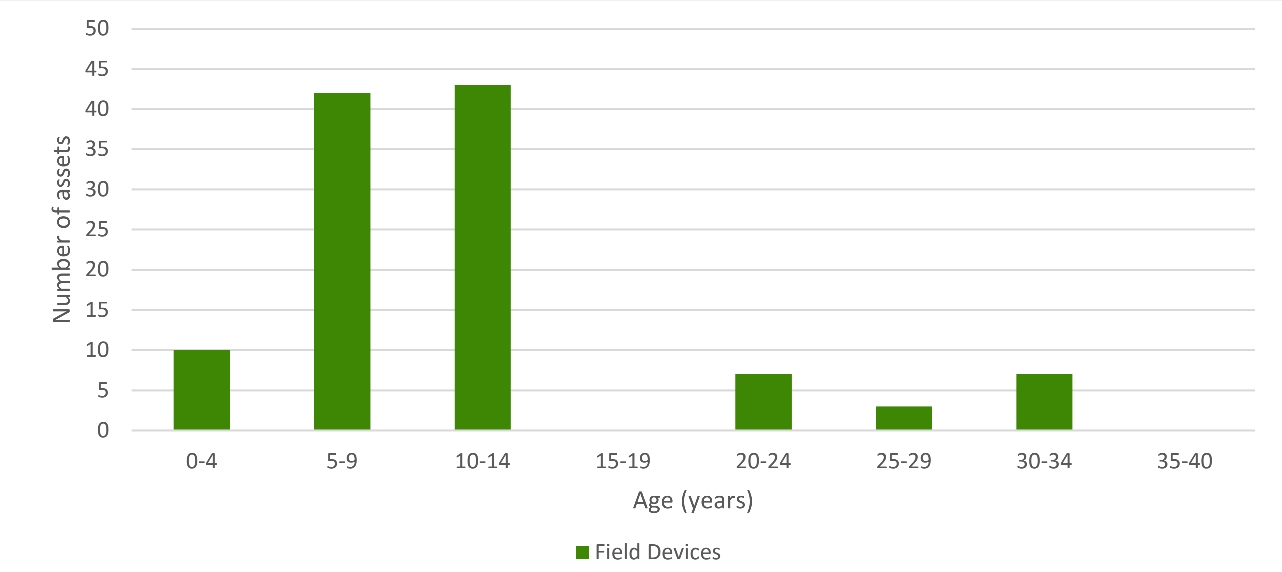

Figure 2 – Age profile for SCADA assets

2.3 Criticality

Power and Water has established a Risk Quantification Procedure for Investment Decision Making to assess the overall risk posed by the asset fleet. However, when undertaking detailed scheduling and prioritisation of assets within the fleet for specific tasks, such as testing and inspection or replacement, we consider the localised characteristics of individual assets to account for relative criticality within the fleet.

The criticality assessment considers the diversity of the network including impact on public safety, service disruption (reliability) or environmental incidents. The location of an asset has a significant impact on the likelihood and severity of the consequences.

Details of the criticality assessment approach can be found in our Health and Criticality Method (D2018/72550).

3. Asset objectives and performance

The Strategic Asset Management Plan (SAMP) defines the Asset Objectives and how they support Power and Water achieving the corporate objectives. This section shows how the Asset Objectives are supported by this asset class by establishing the measures and targets to assess if the Asset Objectives are being achieved, and any gap in performance that needs to be addressed.

Table 3 states the asset management objectives from the SAMP, identifies whether they are relevant to this asset class, and defines the measures of success, targets and performance gaps. This provides a 'line of sight' between the discrete asset targets and Power and Water corporate Key Result Areas.

The performance shown here represents the historical performance of the asset class to date. It is expected that benefits from investments proposed in the next regulatory period will manifest as benefits in these key objectives.

Objectives	Measures	Targets	Performance
Ensure appropriately skilled and qualified staff are employed to meet the current and future needs of the network. Embed a fit for purpose Asset Management System across the business that is consistent across Regulated, Non-Regulated and IES.	A capability development plan will include the requirements to ensure each asset class has defined capability requirements to enable effective management and performance. The development of our Capital and Operational Works Plan (COWP) will define capacity requirements across different capabilities to achieve asset management objectives.		
Maintain the safety of customers, community and staff demonstrated by reducing worker and public safety incidents and implementing public incident reporting metrics into asset plans.	Public injuries	0	0
	Worker injuries	0	0
Reduce by 50% the number of feeders and communities exceeding performance targets by more than 100% by 2025. Enable greater visibility of planned and unplanned interruptions to customers through improved online services for all networks and improve accuracy and transparency of	SAIDI and SAIFI targets.	Target by feeder type as set by the Utilities Commission.	Targets achieved. Refer to section 3.1

reliability performance metrics for isolated remote communities.			
Implement risk quantification for all regulated network (system) capital investment decisions by Jan 2023, and extend for remote generation and networks by 2025.	Implementation of risk quantification for decision making.	Use of Risk Quantification to assess investment needs for all aspects of the asset fleet.	Partly achieved, qualitative assessment only.
Implement by EOFY 2023 asset criticality process to support granular prioritisation of corrective works based on public safety, reliability, security and other factors, and implement in the AMS and supporting systems by 2025	A quantitative criticality assessment criterion that can be integrated into defect management processes and supported by our ICT systems to be developed for all asset classes.		
Preparing our network and systems to be ready for the future, including building in flexibility for future uncertainty, maximising hosting capacity for customer DERs and enabling the energy transition to reviewable energy according to the governments targets.	Vendor support, compatibility and functionality of technology	Vendor support available for electronic devices	Partly achieved: - EMS limited support. - RTUs C50, C2025 and SCD5200 not supported.
		No compatibility or functionality issues	Minor compatibility issues with PDH multiplexors
	Cyber security maturity	As required by the SOCI Act / Australian Energy Sector Cyber Security Framework (AESCSF)	In progress

Table 3 - Asset Management Objectives

3.1 Reliability performance

SCADA asset performance and network reliability is measured by tracking the number of asset failures, as well as analysing SCADA's SAIDI and SAIFI contribution to network performance. Historically, SCADA assets have had an immaterial impact on the performance of the network. There have not been any outages attributed to SCADA as the root cause since 2015-16.

3.2 Asset and technology compatibility

Power and Water has received a number of End of Support and Last Time Buy notices from vendors for the majority of C50 and C2025 RTUs which currently make up 21% of the SCADA assets. These assets use obsolete technologies and are not compatible with the new IP based technologies being developed by vendors.

A program has been established to address these obsolete assets, include those without vendor support. The replacement program is now also focused on installing a zone substation LAN at each zone substation.

The replacement of the remaining C50 and C2025 RTUs is planned to be completed by the end of the current regulatory control period. However, implementation of ZSS LAN is a longer-term project.

3.3 Cyber security

The Security of Critical Infrastructure (SOCI) Act has recently been amended in federal parliament. The implication of this is discussed in section 4.3.

4. Asset Challenges and emerging issues

Power and Water has undertaken a review of the asset class including asset age and condition, condition deterioration drivers, economic drivers, assessed trend in the asset population and trends in the operating environment. We have identified the challenges described below that are expected to impact this asset class during the 10-year planning horizon.

There are six primary challenges in relation to Power and Water's SCADA assets:

- End of vender support
- Insufficient functionality to meet standards required by Power and Water, NT NER & the Technical Code
- New cyber-security obligations
- Environmental challenges – temperature, cyclone resilience & wet season accessibility
- Sufficient and appropriately skilled personnel
- Obtaining and managing appropriate asset information for managing the assets

These are described further below.

4.1 End of vendor support

A key asset challenge is asset obsolescence related to end-of-vender support. Vendor support is critical to having equipment repaired, resolving software/firmware bugs, updating security patches to guard against cyber threats, and general overall support in programming and maintaining this equipment. When equipment is at End of Support (EoS), the vendor support is no longer available, and vendors do not sell spares or undertake repairs of faulty equipment.

Power and Water has identified an increasing risk presented by obsolescence of RTUs and vendors ending support of assets currently used by Power and Water. The assets impacted include:

- C2025
- C50
- SCD5200

Currently there are some short-term spares management initiatives in place to manage the existing assets while we transition to the new technology. We salvage decommissioned RTUs for spares, however we are finding that the C2025 RTUs are at higher risk of failing when redeployed so we hold a larger pool of (salvaged) spares for that asset type.

Power and Water has already started initiatives to replace the obsolete C2025 and C50 assets and will replace the SCD5200 RTUs with SCD6000 RTUs at their end of life. As these are modular assets, they can be quickly replaced at failure.

4.2 Obsolescence of technology

The rapid pace of technological change is an on-going challenge for Power and Water's SCADA network. The integration of older SCADA assets with newer digital technologies into one cohesive system is an on-going issue for Power and Water, and is expected to remain a challenge.

Key challenges include:

- The changes in technology resulting in the inability to undertake repairs of complex equipment. Repairs can only be undertaken by the vendor, increasing reliance on vendor support and forcing maintenance into a ‘black box’ replacement methodology
- The requirement to have a very broad breath of knowledge and skills to maintain the various legacy systems in use and compatibility issues between modern and legacy systems

In addition, the functionality required to provide services to our customers and meet relevant standards is changing. This includes the need to support the Future Networks Strategy which is likely to result in increased complexity of SCADA systems, as well as changes to requirements specified by Power and Water, the NT NER, the Network Technical Code and Planning Criteria, and the System Control Technical Code. Older assets are unlikely to be able to meet these requirements which may have implications on technology selection and replacement or augmentation needs.

4.3 Energy Management System

Power and Water Corporation (PWC) uses the General Electric (GE) Energy Management System (EMS). An EMS is a suite of applications for the data acquisition, management, analysis and real time operation of a power system. Electricity network operators and market operators worldwide use an EMS as the principal suite of tools to monitor, analyse and operate power systems.

The present EMS v2.6 was released by GE in 2010 and an upgrade was implemented in 2013-14. At that time, inverter based renewable energy was not operating in power systems at any large extent or scale. EMS v2.6 has limited capability to integrate or operate inverter based renewable energy technologies such as solar and battery storage.

A business case has been approved to address these issues with the preferred being an upgrade of the existing system from v2.6 to the latest GE EMS version (v3.3). This will provide key upgrades in capability and functionality of the EMS throughout every module. Additional functionality will so be incorporated which will enable Power Services to model, analyse, compute, control and monitor inverter based renewable energy and battery storage technologies.

4.4 Cyber security

The Security of Critical Infrastructure (SOCI) Act has recently been amended in federal parliament. The act contains requirements for critical infrastructure businesses to increase their cyber security capability to defined levels within defined timeframes. These requirements are likely to require upgrading or ring-fencing of existing technologies to enable compliance. The bill contains provisions for penalties for non-compliance.

A recent audit of Power and Water Operation Technology (OT) systems across both Power Services, Water Services and IES against the Australian Energy Sector Cyber Security Framework (AESCSF) has informed the development of plans and investments required to maintain a mature approach to cyber security as our operating environment and regulations continue to evolve.

4.5 Environmental challenges

The network covers a range of environments and geographies which present different challenges for SCADA assets. Table 4 provides an overview of environmental challenges in relation to managing Power and Water’s SCADA assets across its operating regions. Power and Water has unique requirements compared to other DNSPs around Australia due to climatic conditions; extreme temperatures, the wet season and cyclones.

Diverse environmental conditions also result in many additional asset management challenges for ensuring that a reliable SCADA system is available at all times.

Region	Environment	Challenges	Expenditure/ risk implications
Alice Springs / Tennant Creek	Desert	• High temperatures contributing to the overheating of SCADA assets.	• Infant mortality / early life replacement due to technical failure. • An increased dependence on temperature control / air-conditioning at zone substation control centres and SCADA shelters.
Darwin	Coastal / Tropical	• High humidity possibly resulting in damage to internal components of assets. • High temperatures contributing to the overheating of SCADA assets if air conditioners within substation control rooms are damaged/fail. • Access to SCADA asset sites and the ability to work on these assets during the wet season – heat and rain/flooding (safety issue and detrimental to assets). • Cyclonic or storm events resulting in frequent / prolonged power outages- resulting in blocked / flooded roads • Managing personnel and prioritising issues during severe weather events. • Corporate resiliency assessment and mitigation requirements against extreme weather events	• Increase in maintenance frequency. • Increased importance of maintenance to address leaks. • An increased dependence on temperature control / air-conditioning at zone substation control centres. • Public and Power and Water employee safety is reduced if assets fail to operate as intended. • Ensuring sufficient battery capacity so that sites remain in operation during severe weather events or periods of prolonged inaccessibility. • Ensuring solar power sites have sufficient battery capacity to maintain load during adverse weather conditions – such as monsoonal conditions where there may be significant cloud cover for weeks at a time. • Assessment and management costs to ensure all Power and Water sites meet corporate resilience assessment and mitigation requirements
Katherine	Inland / Tropical	• As above	• As above

Table 4 - Environmental challenges in relation to SCADA asset management

4.6 Workforce capability and location

The majority of staff who are appropriately qualified to work on SCADA assets are located in Darwin. Currently there are no SCADA staff members located in Alice Springs or Tennant Creek. As a result, undertaking routine inspections or simple replacement tasks has a high time and cost burden. The climate also has a significant impact on the accessibility of assets.

The distance and time required for specialised staff to operate and maintain network assets has the following implications:

- Increased operational travels costs of maintaining and fixing the SCADA assets.

- Increased battery costs (capex) associated with an increase in battery capacity and reliability to ensure Power and Water sites remain operational during severe weather events or periods of prolonged inaccessibility.
- Outages which can last for a prolonged period due to travel times to reach the site or accessibility constraints during the wet season.

Power and Water is assessing new technologies (for example, local area networks in substations) that may be able to mitigate some of the costs associated with these problems.

Attracting sufficient appropriately skilled staff to the Northern Territory has been difficult and is expected to remain a challenge in the medium term due to the activity currently underway in the electricity industry as a result of the transition to renewable energy.

4.7 Asset information

Power and Water is in the process of maturing their approach to asset management and need to improve their asset data collection processes. The two key challenges are:

- Lack of comprehensive asset data (both characteristic and condition data)
- Not all SCADA assets are recorded in Maximo (asset database). Most of the SCADA asset data is stored in unique systems developed that do not support consistent data management and quality reporting applied to the majority of network asset information.

Improved data sources are required to fully understand the asset fleet and the impact that deterioration of assets has on the operational integrity and functionality of the communications network. To address this, Power and Water's plan includes all asset information being migrated to Maximo, develop suitable asset condition parameters and establish clear data maintenance processes.

5. Implementation plan

The following set of projects and programs have been developed to address the gaps in asset performance compared to the asset objectives and our long-term view to start planning for forthcoming asset challenges.

5.1 Replacement expenditure

Replacement expenditure is defined as work to replace an asset with its modern equivalent where the asset has reached the end of its useful life. Capex has a primary driver of replacement expenditure if the factor determining the expenditure is the existing asset's inability to efficiently maintain its service performance requirement.

The identified projects and programs are listed below. The indicative cost (real FY22) of the project or program for the 10-year horizon is provided and includes the entire project, not only the SCADA asset components:

- Berrimah zone substation replacement ($28.1 million)
- Obsolete and condition-based replacement ($4.9 million)
- Energy management system replacement ($8.6 million)

5.2 Augmentation expenditure

Augmentation expenditure is defined as work to extend the network or to increase its capacity to transmit or distribute electricity. It also includes work relating to improving the quality of supply to customers within the network, for example, to meet regulatory obligations.

The identified projects and programs are listed below. The indicative cost (real FY22) of the project or program for the 10-year horizon is provided and includes the entire project, not only the SCADA:

- DKTL Secondary System Upgrade ($6.4 million)

5.3 Operational expenditure

The forecast annual expenditure on maintenance activities is outlined in Table 5 below. Table 5 includes both SCADA and Communications expenditure.

Maintenance Type	All Assets	SCADA & Communication
Routine Maintenance	$7.0	$1.4
Non-Routine Maintenance	$7.7	$0.7
Emergency Response	$7.6	$0.0
Total	**$22.3**	**$2.2**

Table 5 – Forecast annual maintenance expenditure ($ Million FY22)

5.4 Delivery plan

There have been a number of challenges during the current regulatory period that have resulted in under-delivery of capital plans. Power and Water have undertaken a detailed analysis of our internal processes and activities to identify the causes and compiled a detailed plan to address this issue. The analysis and resulting plan to enable delivery of the proposed program of works is described in our Capital Delivery Plan.

6. Risk quantification and mitigation

Power and Water has established a Risk Quantification Procedure for Investment Decision Making to assess the overall risk posed by the asset fleet and enable consistent quantification of risk from their assets into dollar terms. Our procedure considers the asset's condition and failure modes, the likely risks of failure on safety, security and reliability of services to customers, and the relative maintenance and capital costs. In some cases, our decision making will be influenced by demand growth or customer upgrade requirements. Essentially, our decision making is based on an economic assessment of risks, costs, and benefits.

The procedure is applicable to most assets where there is a direct link between an asset failure and the impact of that failure on the defined consequence categories. Sufficient network data also needs to be available to derive the required inputs.

The SCADA assets are difficult to analyse using the risk quantification procedure:

- The SCADA system has inbuilt redundancy, so a second contingency event is required to possibly result in a disruption of supply or a safety incident.
- Supply of electricity can continue to operate without SCADA, although with a reduced level of control and monitoring. Hence, a loss of the SCADA assets does not necessarily lead directly to an outage or safety incident but may increase the likelihood or consequence of an incident should it occur.
- There isn't sufficient outage data for SCADA assets recorded to develop appropriate inputs to the risk model. Hence, application of the risk model would require a lot of assumptions with the outcome not likely to be meaningful.

As a result of the above issues, it is not possible to identify the probability of an outage, the likelihood of consequences that may result from an outage, nor the cost impact of any regulatory compliance issues.

Power and Water has undertaken a qualitative assessment of the risks posed by the identified issues as part of each business case.

7. Lifecycle asset management

Power and Water's asset management approach considers the entire asset lifecycle. This approach supports prudent asset management decision making to effectively balance risk, cost and performance over the life of the asset. The intended outcomes of a lifecycle approach are to:

- Maximise asset utilisation
- Minimise asset lifecycle costs
- Keep asset risk as low as reasonably practical
- Review and continuously improve asset management practices

The following sections detail Power and Water's lifecycle management activities.

7.1 Planning

The asset planning stage defines the need for an asset to exist. It also establishes the functional requirements of the assets and ultimately the number of assets, design, function, criticality, configuration, level of redundancy, capability, and capacity.

Key criteria to ensure optimal line route selection, establishing prudent, cost efficient, intrinsically safe, and sustainable corridors for the life cycle management of the SCADA assets.

An example of the planning approach is the proposed replacement of the SCADA asset replacement program, where the replacement of assets is part run-to-fail and part targeted replacement (based on obsolescence and deficient functionality). This program utilises a combination of new and existing assets to optimise cost-efficiency whilst minimising risk. Various options are considered during the planning stage, with the optimal option being implemented.

7.2 Design

The design phase involves the detailed specification of the asset function and physical characteristics.

Power and Water develops and maintains standard designs and technical specifications for most distribution assets, including SCADA assets, and all new SCADA assets installed in the Power and Water network must comply. Standardisation has many benefits, including staff familiarity, asset and component interchangeability, increased production and productivity, and standardisation of construction equipment and processes.

Asset failures or feedback from maintainers will trigger updates and improvements to our design standards.

7.3 Maintenance

Asset maintenance involves the upkeep of assets to ensure they will function to their required capability in a safe and reliable manner from their commissioning through to their disposal. Maintenance requirements can evolve as the condition and performance requirements of the assets change throughout its life.

Maintenance activities can be classified into three distinct areas:

- **Preventative maintenance** requirements are documented in our Asset Strategies Procedures and SCADA and Communication's maintenance policy which sets out the type and frequency of inspection and testing to be undertaken. The testing schedule is modified, where possible, to align with major asset inspections or works. If an asset is found to fail testing a report is raised to the SCADA engineers to determine the most appropriate action to be taken on a case-by-case basis.

- **Corrective maintenance** involves planned activities to repair defects or restore asset condition. Defects are typically identified during preventative maintenance and are prioritised for rectification based on the risk they pose to the network. Corrective maintenance on electronic devices generally cannot be undertaken by Power and Water. The device must be returned to the manufacturer for any maintenance and repair, however it is becoming less common for assets to be repairable by vendors.
- **Unplanned maintenance** involves activities to immediately restore the asset or make a site safe in response to asset functional failure. For electronic devices, this typically involves replacement with a spare device and the faulty device is returned to the manufacturer for repair, however it is becoming less common for assets to be repairable by vendors.

7.4 Renewal

Asset renewal is the establishment of a new asset in response to an existing asset's condition, or the extension of life of an existing asset. The need for the renewal is identified in the asset maintenance stage and verified in the asset planning stage. Asset renewal aims to optimise the utilisation of an asset whilst managing the safety and reliability risk associated with the failure of the asset.

Section 5 outlines the implementation plans.

7.5 Disposal

The decision to reuse or dispose of an asset is made with consideration of the potential to:

- Reuse the asset
- Utilise the asset as an emergency spare
- Salvage asset components as strategic spare parts

The remaining asset is disposed of in an environmentally responsible manner.

8. Continuous improvement

Table 6 below outlines the improvement plans related to the asset class.

Improvement Area	Today	Tomorrow / In Development	Future
Asset data	Asset data in outside of core asset management system, manual reporting	Create/update assets and transfer data into asset system (Maximo)	Automated reporting, aligned with other asset classes
Maintenance strategy	Asset data and hierarchy not fit-for-purpose, failure and performance data limited	Formalise asset hierarchy and implement in Maximo to enable fit-for-purpose asset and maintenance management	Improved asset performance and risk analysis to optimise maintenance and replacement plans
OT Capability	Limited capability to support new technology, DER and other changes to network operation	SCADA systems and support capability to enable efficient integration renewables and associated management / analytics in real-time operations	Implement distribution management capability and analytics to support wide area DER management and other future network capabilities.

Table 6 - Asset improvement plan

Appendix A. Asset data

A.1 Description of asset types

Remote Terminal Units (RTU)

Remote Terminal Units (RTUs) typically exist at substations and are the interface between the substation assets such as Circuit Breakers and Transformers and the Master Station. The RTU monitors digital and analogue inputs and can control digital outputs. The RTU provides the status of these points back to the Master Station for display to the operator. Operators can also change the status of a device via the Energy Management System (EMS), such as opening or closing a Circuit Breaker.

RTU assets include Human Machine Interfaces (HMI): A display device in the substation which provides local monitoring and control of the substation assets via the RTU.

RTU assets include GPS Clocks: Provides a highly accurate (sub millisecond) time signal to ensure all RTUs are operating in synchronisation. This is critical when analysing protection events on the system by ensuring that common time reference exists.

Energy Management System (EMS)

The Energy Management System (EMS) is the SCADA system for the regulated power systems and provides the user interface and data visualisation for System Controllers. Using the EMS, system controllers can locate any specific asset, view its status and remotely operate it. The EMS also records all operations of monitored devices for reporting purposed and enables advanced planning of network operations.

The EMS consists of:

- Software applications used to visualise and manage the electrical network, including SCADA, as well as analytics applications to support operational decision making and contingency planning to maintain system security.
- Software applications used to configure, manage and maintain the EMS applications and the hardware.
- Computer servers which host the various software applications and ancillary software applications required to configure, manage and maintain the EMS.

Server/equipment room – Uninterruptible Power Supply (UPS) and process coolers

This ancillary equipment is required to provide a stable environment for the EMS equipment to operate within.

Substation Local Area Network (LAN)

The substation LAN allows all substation equipment to be remotely accessed to allow configuration management and post event data to be accessed.

A.2 Asset type data breakdown

Asset category	Asset description	Quantity	Average Age (years)	Average nominal Lifespan (years)	Percentage exceeding lifespan
Field devices	RTU	111	9.47	15	20.72%
Master station assets	EMS	7	3.00	6	0%
	Server/equipment room	13	6.92	15	0%
Other	Substation LAN	11	2.36	15	0%

Table 7 - Summary of asset types

A.2.1 Field devices

Asset description	Number of assets
Field Devices	
C2025	13
C50	10
SCD5200	89
SCD6000	4
Master Station Assets (to be updated post EMS upgrade)	
Network Applications	
Servers, core networks, GPS Clocks	
Other support applications/hardware	
Hardware	
Core SCADA Software and applications	
Backup Systems (Commvault and hardware)	
Server / equipment room assets	
UPS	7
Process coolers	6
Substation LAN	
Fixed LANs	8
NOMAD LANs	2
Mobile switch room LAN	1
Total	**147**

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