Antenna monitoring system

Regulatory Business Case (RBC) 2024-29

PowerWater

Contents

Summary

This business case has been prepared to support the 2024-29 Regulatory Proposal The business case demonstrates that Power and Water has undertaken appropriate analysis of the need for the expenditure and identified credible options that will resolve the need and ensure that Power and Water continues to meet the National Electricity Objectives and maintain the quality, reliability, and security of supply of standard control services and maintain the safety of the distribution system.

The proposed investment identified in this business case will undergo further assessment and scrutiny through Power and Water's normal governance processes prior to implementation and delivery.

This business case addresses the condition and compliance risks of communication antennas.

Business need

Antennas are a critical component of the communications system. Without them, there would be no radio networks, which are essential for field crew voice communications and SCADA and protection functionality.

Due to the type of information the communications systems carry, the system and therefore the antennas, are required to have very high levels of security and a typical link availability of 99.99%.

As these assets age, the risk of defects and water ingress is increases, and therefore the level of security and availability would decrease.

A new monitoring system for antennas is available and has been trialled at the McMinns communications site since 2020. The system is an electronic device that is connected into the antenna systems to provide continuous monitoring of key antenna parameters that are not visible from the visual inspections and enables issues to be identified and monitored as they develop over a period of time. This enables Power and Water to proactively schedule outages and plan maintenance to ensure the security and availability of the communications network.

Overall, we consider the failure of these assets to pose a high risk to the safety and reliability of the network.

There are 16 communications sites on the network with antennas installed. The new devices do not replace the visual inspections which are required for assessing the structures and enclosures at the communications sites.

Options analysis

Two options were considered as described in Table 1.

Table 1 Summary of credible options

Option No.	Description	Recommended
1	Continue current practice with visual inspection only	No
2	Install the new monitoring device to compliment current visual inspection practices	Yes

Recommendation

The recommended option is Option 2 - Install the new monitoring device to compliment current visual inspection practices at an estimated cost of $0.3 million (real 2021/22) to be most prudent and cost effective to meet the identified needs. Option 2 mitigates risk to an appropriate level over an acceptable timeframe.

Table 2 shows a summary of the expenditure requirements for 2024-29 regulatory period.

Table 2 Annual capital and operational expenditure ($'000, real FY22)

Item	FY25	FY26	FY27	FY28	FY29	Total
Capex	-	130	-	150	-	280
Opex	-	-	-	-	-	-
Total	-	130	-	150	-	280

Identified need

This section provides the background and context to this business case, identifies the issues that are posing increasing risks to Power and Water and its customers, describes the current mitigation program and its delivery status, highlights the consequence of asset failure, and provides a risk assessment of the inherent risk if no investment is undertaken.

Asset profile

Antennas are a critical component of the communications system. Without them, there would be no radio networks, which are essential for field crew voice communications and SCADA and protection functionality.

There are 16 communications sites with antennas set up on the network, one located at each of Alice Springs and Tenant Creek, and 14 located across the Darwin-Katherine System. Antennas are typically located in remote, hard to reach locations.

Due to the type of information the communications systems carry, the system and therefore the antennas, are required to have very high levels of security and a typical link availability of 99.99%.

Current management programs

The current management program is limited to visual inspection.

Visual inspection is undertaken periodically, but can only identify obvious visible issues such as corrosion or physical damage. The current inspection practices are unable to identify any issues relating to the electronic systems, cable integrity or other operational items.

As a result, any defects are only identified when there is an unplanned outage or degradation in the service of the microwave system and maintenance is undertaken reactively. Scheduling outages that do not impact the electricity network and the logistics of getting field crew to site with the right equipment and parts can be challenging in short timeframes.

As these assets age, the risk of defects is increasing and therefore the level of security and availability of the system will decrease.

1.1.1 New monitoring system available

A new monitoring system for antennas is available and has been trialled at the McMinns communications site since 2020. The system is an electronic device that is connected into the antenna systems to provide continuous monitoring of al electronic aspects that are not visible from the visual inspections.

This device compliments, rather than replaces, the current periodic visual inspections.

The device enables issues to be identified and monitored as they develop over a period of time, in turn enabling Power and Water to proactively schedule outages and plan maintenance to ensure the security and availability of the communications network.

Risk assessment

Power and Water has developed the Risk Quantification Procedure to enable consistent quantification of risk from their assets into dollar terms. 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.

However, since we currently do not have adequate data to undertake a quantitative analysis on the impact of antennas, a qualitative assessment of the risk has been undertaken using the relevant key consequence areas set out in the Risk Quantification Procedure.

There are three key risks of antenna failure:

- **Health and Safety:** The antennas are critical for the Digital Mobile Radio (DMR) network that is used by field crews. If an antenna fails, it will degrade the service of the DMR and therefore pose a risk to the safety of field crews when they are in remote areas.
- **Service delivery:** The antennas are critical for the SCADA and protection devices that are used to operate the network from the control room and to ensure correct operation of protection assets if there is a network fault. If an antenna fails, it will degrade the communications and protection functionally and may result in the network being in an unsafe condition or prevent operations to restore supply.
- **Compliance:** Power and Water is required to maintain the communications network. Refer to 4.6Appendix B for details.

Overall, we consider the failure of these assets to pose a high risk to the safety and reliability of the network. The risk assessment is shown in the matrix format as specified in the Enterprise Risk Management System highlighting the inherent risk and the target risk.

We expect the likelihood of the consequence materialising is increasing due to the ongoing aging of the assets. Without a complete understanding of the electrical integrity of the internal components, we are not able to make informed decision regarding the optimal maintenance or replacement actions that should be undertaken to maximise the serviceable life with the required level of availability.

	Insignficiant	Minor	Moderate	Major	Severe
Almost certain	Medium	High	Very High	Extreme	Extreme
Likely	Low	Medium	High	Very High	Extreme
Possible	Low	Low	Medium	High	Very High
Unlikely	Low	Low	Medium	High	High
Rare	Low	Low	Low	Medium	Medium

Figure 1 Qualitative risk assessment

Summary

Power and Water's communications rely distributed communications sites. These sites have antennas that are currently only inspected visually. A new device has become available that monitors the electrical components and it has been successfully trialled at McMinns communication site. This device two key benefits:

- It provides permanent monitoring of the electrical integrity of the antennas enabling improved decision making for maintenance and replacement.

- It will enable Power and Water to trend performance overtime to identify emerging issues rather than only responding reactively to faults.
- It will enable Power and Water to manage the risk to the health and safety of field crew and the public, as well as impacts on the reliability of the network, by preventing failure of the antennas and associated equipment.

Overall, we consider the failure of these assets to pose a high risk to the safety and reliability of the network.

There are 16 communications sites on the network with antennas installed. The new devices do not replace the visual inspections which are required for assessing the structures and enclosures at the communications sites.

Options analysis

This section describes the various options that were analysed to address the increasing risk to identify the recommended option.

Comparison of credible options

Credible options are identified by the AER as options that address the identified need, are technically feasible and can be implemented within the required timeframe. The following options have been identified:

- Option 1 - Continue current practice with visual inspection only
- Option 2 - Install the new monitoring device to compliment current visual inspection practices

Table 3 provides a high-level comparison of the two identified credible options. A detailed discussion of each option is provided in the following sections.

Table 3 Summary of options analysis outcomes

Assessment metrics	Option 1	Option 2
NPC ($'000, real FY22)	-	244
BCR	NA	NA
Capex ($'000, real FY22)	0	280
Meets customer expectations	○	●
Aligns with Asset Objectives	○	●
Technical Viability	●	●
Deliverability	●	●
Preferred	✗	✓

● Fully addressed the issue ◕ Adequately addressed the issue ◑ Partially addressed the issue ○ Did not address the issue

1.1.2 Option 1 - Continue current practice with visual inspection only

This option proposes to continue with only visual inspections and continue to reactively replace or repair components of the antenna systems when they fail.

There is no incremental additional cost for this option.

This option is likely to result in a gradual deterioration of the communication system as the asset age. Since these assets are critical for field crew safety, it is likely to increase the risk for filed crews in remote locations and make network operations more difficult with less reliable radio communications.

1.1.3 Option 2 - Install the new monitoring device to compliment current visual inspection practices

This option proposes to adopt the antenna monitoring systems with initial roll out to eight sites based on criticality of services provided, location, remoteness, and age.

The current practice of periodic visual inspections will also continue, however, the new monitoring device will enable Power and Water to identify defects that are not currently visible, track emerging issues, and proactively address replace or repair components of the antenna systems prior to failure.

The additional cost of this option will be $280,000 (real 2021/22) based on eight monitoring devices to be installed at a cost of [redacted] each. Four devices will be installed during 2025/26 and four during 2027/28. The schedule of replacement has been determined based on prioritisation with other project commitments and managing the resource constraints of the small team.

This option will enable Power and Water to manage the condition of the assets and maintain the security and reliability of the communications system. With a secure and available system, Power and Water can ensure the safety of field crews and ensure efficient network operations can be carried out.

Non-credible options

No non-credible options were identified as the purpose of this asset is to improve Power and Water's diagnostic and monitoring capability of antennas.

Recommendation

The recommended option is Option 2 - install the new monitoring device to compliment current visual inspection practices at an estimated cost of 0.28 million to be most prudent and cost effective to meet the identified needs.

The proposed program is consistent with the National Electricity Rules Capital Expenditure Objectives as the expenditure is required to maintain the quality, reliability, and security of supply of standard control services and maintain the safety of the distribution system.

Strategic alignment

The "Power and Water Corporation Strategic Direction" is to meet the changing needs of the business, our customers and is aligned with the market and future economic conditions of the Northern Territory projected out to 2030.

This proposal aligns with Asset Management System Policies, Strategies and Plans that contributes to the D2021/260606 "PWC Strategic Direction" as indicated in the table below.

Table 4 Alignment with corporate strategic focus areas

	Strategic direction focus area	Strategic direction priority
1	Customer and the community at the centre	Improve Public Health and Safety
2	Always Safe	Cost Prudency

Dependent projects

There are no known projects or other network issues that are dependent on the resolution of this network issue.

Deliverability

This is a low-cost installation project. Our ability to install and monitor the device has been demonstrated by the trial of the device at McMinns Radio Site since 2020. No delivery risks have been identified.

Customer considerations

As required by the AER's Better Resets Handbook, in developing this program Power Services has taken into consideration feedback from its customers.

Feedback received through customer consultation undertaken at the time of writing this PBC, has demonstrated strong support amongst the community for appropriate expenditure to enable long term maintenance of the network to ensure continued reliability, maintainability and safety of supply.

Expenditure profile

Table 5 show a summary of the expenditure requirements for Regulatory Period 2025-29 and financial evaluation metrics, respectively.

Table 5 Annual capital and operational expenditure ($'000, real FY22)

Item	FY25	FY26	FY27	FY28	FY29	Total
Capex	-	130	-	150	-	280
Opex	-	-	-	-	-	-
Total	-	**130**	-	**150**	-	**280**

High-level scope

This business case will address eight of the 16 antennas located on the network. The eight sites selected have been based on criticality of services provided, location, remoteness, and age.

Cost estimation

The cost estimate for these assets was based on the McMinns trial. The works and estimated costs are described in Table 6.

Table 6 Estimated cost breakdown for monitoring unit and installation ($'000, real FY22)

Item	Cost
Onsite equipment	[redacted]
Planning and design	[redacted]
Service outage planning	[redacted]
Onsite works (install and commissioning for approx. one week with two field crew)	[redacted]
Total	[redacted]

Compliance requirements

Power and Water is required to maintain the communications network to ensure compliance with a number or legislative requirements. This is consistent with the principles of the Risk Quantification Procedure, and while there are legislated penalties for non-compliance, we have considered compliance in a qualitative manner.

The relevant Legislation, Regulation and Codes include:

- Electricity Reform Act 2000
- Network Licence (varied 15 May 2020)
- National Electricity (NT) Rules (NT NER)
- Network Technical Code and Network Planning Criteria (Network Technical Code)
- System Control Technical Code

The key clauses that relate to the provision of communications systems are:

- The System Control Technical Code Clause 6.18(a) requires System Participants (the definition includes Power and Water as the network operator) to provide control and monitoring, alarms and measurements to the Power System Controller's SCADA system via communication links.
- The Network Technical Code Clauses 3.2.6 and 3.3.6.2 define the communications links between a User (generator or load) and the control centre (System Control) to be the responsibility of the Network Operator (Power Services).
- The Network Licence Clause 10 requires Power and Water to comply with all applicable provisions of the System Control Technical Code and the Network Technical Code.
- The Electricity Reform Act 2000 Clause 31 provides a maximum penalty of 2,500 penalty units for contravening the licence conditions. A penalty unit is worth 157 in FY22[1], providing a maximum penalty of 392,500 per contravention.

There are clear legislative and government requirements for Power and Water to maintain a modern communications system and that the requirements are expected to become more stringent within the next few years with the recent amendments to the Security of Critical Infrastructure Act. Decisions made on the technology and asset types installed now must provide real options[2] for providing the cyber security capability and technology compatibility required in the near future.

[1] https://justice.nt.gov.au/attorney-general-and-justice/units-and-amounts/penalty-units

[2] Regulatory Investment Test for Distribution, Application Guidelines, December 2018, Australian Energy Regulator, Section 3.2.3

Contact

Power and Water Corporation

55 Mitchell Street, Darwin NT 0800

Phone 1800 245 092

powerwater.com.au

PowerWater