Fountain Head communications site supply reliability

Regulatory Business Case (RBC) 2024-29

PowerWater

Contents

1. 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 high supply reliability risk at the Fountain Head communications site.

1.1 Business need

Fountain Head Communications Site (FHCS) is experiencing poor reliability of the electricity service supplying the site. Power and Water has tried to address the issue through replacing damaged assets/components and installing surge arrestors. These have not proven to be successful in managing the issue.

The service connecting FHCS to the network does not provide adequate protection from lightning. As a result, the supply is often interrupted during the wet season due to lightning strikes. A number of battery system failures have also occurred, increasing the risk of the communications site being off-line and elevating the risk to maintaining network security.

FHCS is located in a remote area, and while the standard battery back-up for the communications equipment can provide supply for approximately four days following a power outage, the site can be inaccessible for durations longer than four days during the wet season, which is also when there is a higher frequency of lightning strikes and hence higher risk of loss of supply.

The prolonged reliance on the battery system is compounded by a number of failures of the battery rectifier/charger, suspected to be a result of the lightning strikes. The damage to the rectifier/charger has flow on effects on battery life, resulting in reduced duration of backup supply.

The poor reliability of supply and inaccessibility of the site puts the communications network at risk. Our risk assessment has identified this to be a High risk according the to the Enterprise Risk Management Standard.

To enable Power and Water to ensure the safety of its staff, efficient operations and a reliable communications network it must address the reliability of the power supply at FHCS.

1.2 Options analysis

Two options were considered as described in Table 1.

Table 1 Summary of credible options

Option No.	Description	Recommended
1	Address outages reactively following a failure (current practice)	No
2	Replace with a compliance service	Yes

As part of a holistic assessment, non-network solutions, capex/opex trade-offs and retirement or derating options were also considered, but found that none of these options addressed the underlying network issues.

1.3 Recommendation

The recommended option is Option 2 - Replace with a compliant service, at an estimated cost of $0.3 million (real 2021/22)**,** as the most prudent and cost effective to meet the identified needs. The project is planned for 2024-25 to allow for time to investigate the cause of the problem, how it can be addressed and for construction to occur during the dry season to ensure site accessibility.

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	250	-	-	-	-	250
Opex	-	-	-	-	-	-
Total	**250**	**-**	**-**	**-**	**-**	**250**

2. 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.

2.1 Asset profile

Fountain Head Communications Site (FHCS) is experiencing poor reliability of the electricity service supplying the site.

The service connecting FHCS to the network does not provide adequate protection from lightning. As a result, the supply is often interrupted during the wet season due to lightning strikes. A number of battery system failures have also occurred, increasing the risk of the communications site being off-line and elevating the risk to maintaining network security.

FHCS is located in a remote area between the Adelaide River and Pine Creek, about 8km (straight line) off the Stuart Highway. It has a normal supply fed from Pine Creek ZSS and has standard battery back-up for the communications equipment. The battery back-up can provide supply for approximately four days following a power outage, however, the site can be inaccessible for durations longer than four days during the wet season, which is also when there is a higher frequency of lightning strikes and hence higher risk of loss of supply.

The prolonged reliance on the battery system is compounded by a number of issues with the battery rectifier/charger during the same period of time, suspected to be a result of the lightning strikes. The damage to the rectifier/charger for the battery system results in increased reliance on the batteries, causing more charge/discharge cycles and therefore reducing the battery life more rapidly. As batteries deteriorate, their capacity decreases so the duration of backup supply they provide also decreases. With accessibility issues in the wet season, a potentially decreased back up supply duration increases the risk to the network.

Power and Water has tried to address the issue through replacing damaged assets/components and installing surge arrestors. These have not proven to be successful in managing the issue.

The number of outages is shown in Figure 1. On average, there is one failure of the mains per year and there have been failures of the battery/rectifier system in three out of eight years.

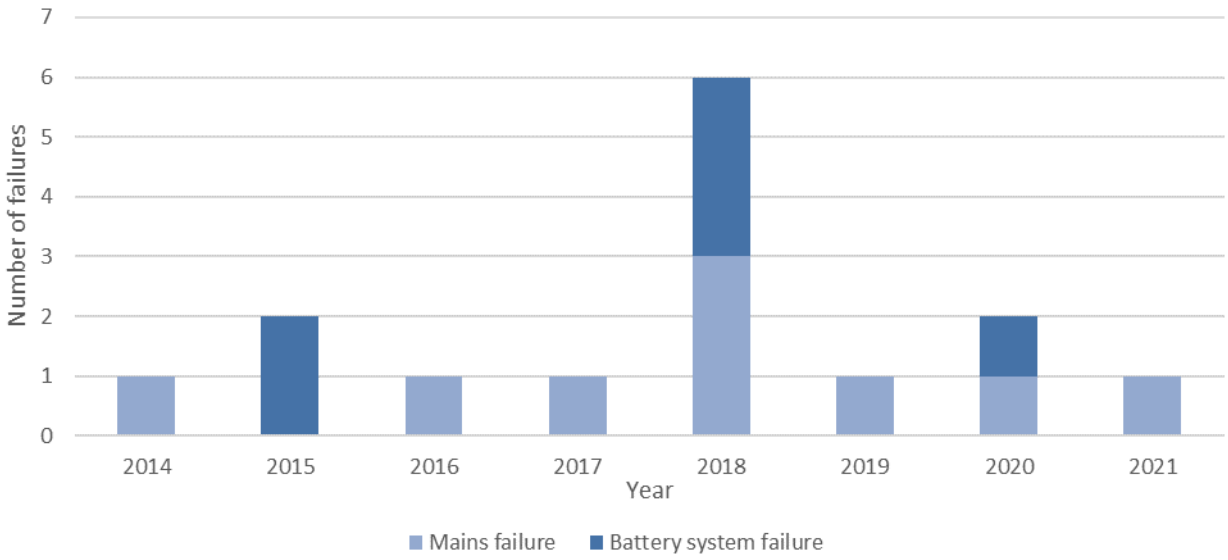

Figure 1 History of supply outage and battery rectifier issues

2.2 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, there is insufficient data to undertake a quantitative analysis on the impact of loss of FHCS, a qualitative assessment of the risk has been undertaken using the relevant key consequence areas set out in the Risk Quantification Procedure.

The FHCS is critical for control of the network for protection systems, to undertake network switching operations and to have visibility of the network status. Without adequate reliability there is a high risk of loss of communications contributing to the following risks:

- **Health and Safety**: FHCS is critical for the Digital Mobile Radio (DMR) network that is used by field crews. If it fails, it may degrade the service of the DMR and therefore pose a hazard to the safety of field crews when they are in remote areas.
- **Service delivery**: FHCS is also critical for the SCADA and protection network that is used to operate the network by the control room and to ensure correct operation of protection assets if there is a network fault. Failure of FHCS may 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 Appendix B for details.

The risk assessment is shown in Figure 2 in the matrix format as specified in the Enterprise Risk Management Standard. It shows the current risk ranking and the target risk ranking.

	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 2 Qualitative risk assessment

2.3 Summary

Power and Water has identified an ongoing issue at FHCS that has not been successfully addressed through low cost solutions.

The poor reliability of supply puts the communications network at risk as the site can be inaccessible for extended durations during the wet season that can exceed the battery capacity. Without electricity supply from the network or battery system, the functionality of the communications network will be affected.

Our risk assessment has identified this to be a High risk according the to the Enterprise Risk Management Standard.

To enable Power and Water to ensure the safety of its staff, efficient operations and a reliable communications network it must address the reliability of supply at FHCS.

Section 3 discusses options to achieve the required reliability of electricity supply.

3. Options analysis

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

3.1 Comparison of credible options

Credible options are identified 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 – Do nothing, address outages reactively following a failure (current practice)
- Option 2 - Replace with an improved service

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
NPV ($'000, real FY22)	NA	NA
BCR	NA	NA
Capex ($'000, real FY22)	0	250
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

3.1.1 Option 1 – Do nothing, address outages reactively following a failure

The current approach to managing this asset is to reactively repair it following failure. However, this approach has the following disadvantages:

- The unplanned nature of the work attracts increase operational cost for field crews.
- This approach place increased reliance on the battery system for longer durations when FHCS may be inaccessible during the wet season.

- The rectifier/charger for the battery system has been damaged in the past (suspected to be caused by lightning strikes) as shown in Figure 1 which makes the battery system less reliable / resilient to the expected failure mode.
- Frequent charge/discharge cycles reduce the capacity of the batteries below design, and therefore reduce the length of time it can provide back up supply.

This option is not recommended on the basis that it does not adequately meet the identified need.

3.1.2 Option 2 - Replace with an improved service

Option 2 proposes to replace the existing service with a compliant mains supply at an estimated cost $0.3 million (real 2021/22) in 2024/25. This will avoid any further increases in opex and ensure that the performance of the supply to FHCS meets the reliability expectations and requirements for a communications site.

While the cause of the outages is understood to be lightning strikes, the actual cause of the failures is still being assessed so a suitable solution can be designed. The proposed timing allows time for the relevant studies to be undertaken and for a suitable solution to be developed.

The scope of work is expected to include the replacement of the battery system, including charger and batteries, as well as work to be undertaken on the service to improve the lighting protection.

This option is recommended as it prudently addresses the identified need.

3.2 Non-credible options

Our analysis also identified a number of options found to be non-credible. These options are described below and were not taken through to detail analysis for the reasons provided.

3.2.1 Defer replacement to extend life – does not address the need

Deferring replacement does not address the need and will increase reliance on the battery system. Over time the frequency of the charge/discharge cycles reduces the capacity of the batteries and deferring any remedial action will result in a progressively shorter capacity of the back up supply, hence increasing the risk to the network when there is restricted accessibility to the FHCS during the wet season.

Based on the risk to the communications network reliability, Power and Water does not consider deferral of replacement to be a prudent approach to managing this risk. It does not address the need of regular outages of normal supply forcing reliance on the battery system.

3.2.2 Retire or de-rate assets to extend life – does not address the need

Total retirement of the assets is not a credible option as FHCS is required for safe and reliable distribution of the electricity network and normal supply from the network is required to ensure reliable operation.

3.2.3 Non-Network alternatives – does not address the need

Due to the type and function of these assets, there are no non-network alternatives or solutions that can be implemented in place of direct asset replacement with like for like (modern equivalent) assets.

4. Recommendation

The recommended option is Option 2 - Replace with a compliant service, at an estimated cost of $0.3 million (real 2021/22), as the 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.

4.1 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

4.2 Dependent projects

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

4.3 Deliverability

This is a low-cost project that relies on standard stills and business as usual tasks. No delivery risks have been identified.

4.4 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.

4.5 Expenditure profile

Table 5 show a summary of the expenditure requirements for the 2024-29 regulatory period.

Table 5 Annual capital and operational expenditure ($'000, real 2021/22)

Item	FY25	FY26	FY27	FY28	FY29	Total
Capex	250	-	-	-	-	250
Opex	-	-	-	-	-	-
Total	**250**	**-**	**-**	**-**	**-**	**250**

4.6 High-level scope

This project will address lightning strike issue that is resulting in outages at FHCS. The solution is expected to involve investigation of the cause, development and implementation of a solution. This is expected to involve replacement of the defective battery system and charger and provision of lightning protection, such as a combination of surge arrestors and/or replacement of a section of the distribution line with covered conductor.

Appendix A. Cost estimation

The scope of work is expected to include the replacement of the battery system, including charger and batteries, as well as work to be undertaken on the service.

The cost has therefore been estimated based on a battery system replacement in 2016 and an allowance for distribution lines upgrades. Further analysis of the issue is required before a detailed cost estimate can be developed.

Appendix B. 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, compliance has been considered 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 2021/22[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 introduction of the proposed Critical Infrastructure Bill. 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

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