

Code compliance and safety program

Regulatory Business Case (RBC) 2024-29

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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 risk of communications network installations that are not compliant with Power and Water's legislative obligations including the Network Technical Code and Planning Criteria.

1.1 Business need

Power and Water is required to maintain the communications network to ensure compliance with a number of legislative requirements¹ including the Network Technical Code and Planning Criteria (NTC). An essential aspect of a communications system for critical infrastructure is that it is secure and resilient and will continue to operate in the event of a network incident or failure of a communications pathway.

The communications network has been progressively built over a number of years. Whilst compliant at that time, the requirements of the NTC have changed over time resulting in non-compliance of some legacy installations, that no longer comply with new requirements of the NTC.

Power and Water has identified:

- Non-compliant asset installations relating to the need to provide redundant and independent communication pathways for protection schemes. Power and Water has identified locations where the network topology is installed as a 'folded loop', meaning that a single fibre optic cable contains both pathways for communications and therefore represents a single point of failure. These installations are not fully independent communication pathways, and therefore are not compliant with the NTC.
- A history of currently unidentified instances of non-compliance that are identified as a part of business as usual activities. These are typically instances of minor non-compliance and/or lower cost solutions to address the non-compliance with the current NTC. The scope and type of non-compliance are not known in advance.

These installations are considered to present a high risk, and need to be rectified to ensure compliance with the NTC and therefore Power and Water's Network Licence.

¹ As are set out in Appendix B

1.2 Options analysis

The options considered to resolve this need are shown in Table 1.

Table 1 Summary of credible options

| Option No. | Option name | Description | Recommended |
|------------|-----------------------------------|--|-------------|
| 1 | Do nothing | Do not undertake specific investment to ensure compliance with the NTC | No |
| 2 | Address identified non-compliance | Undertake specific investment to ensure compliance with the NTC. | Yes |

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

A cost benefit analysis was completed for each of the options where the risk reduction, compared to Option 1, was used as the benefit achieved by the option.

1.3 Recommendation

The recommended option is Option 2 – Address non-compliances at an estimated cost of \$1.25 million (real 2021/22) as the most prudent and cost effective to meet the identified needs.

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

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

| Item | FY25 | FY26 | FY27 | FY28 | FY29 | Total |
|--------------|------------|------------|------------|------------|------------|--------------|
| Capex | 250 | 250 | 250 | 250 | 250 | 1,250 |
| Opex | | | | | | |
| Total | 250 | 250 | 250 | 250 | 250 | 1,250 |

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 Compliance requirements

Power and Water is required to maintain the communications network to ensure compliance with a number of legislative requirements that are set out in Appendix B, including the Network Technical Code and Planning Criteria (NTC). An essential aspect of a communications system for critical infrastructure is that it is secure and resilient and will continue to operate in the event of a network incident or failure of a communications pathway.

2.2 Current issues and risks

The communications network has been progressively built over a number of years. Whilst compliant at that time, the requirements of the NTC have changed over time resulting in non-compliance of some legacy installations, that no longer comply with new requirements of the NTC.

This section describes the nature of the non-compliance considered in this business case. This includes provision for:

- identified non-compliance relating to the need to provide redundant and independent communication pathways for protection schemes; and
- currently unidentified instances of non-compliance that have historically been identified as a part of business as usual activities.

2.2.1 Redundant / independent communications pathways

The communications network throughout Darwin is primarily based on fibre optic. Microwave and radio communications are used in rural areas to efficiently cover long distances.

A core function of the fibre optic network is to provide communications for protection schemes that incorporate differential protection and intertrips:

- Differential protection schemes detect a fault between two relays to protect the network asset between them. These relays can be located a long distance apart and are required to signal circuit breakers to open within milliseconds.
- Intertrips are signals to other protection relays or devices to ensure a protection scheme operates correctly.

These functions are required to minimise the fault current and avoid damaging assets or harming people.

Power and Water has identified some locations on the network where the network topology is not consistent with good practice, or compliant with the NTC. In particular, there are several locations where the fibre optic cable is currently installed as a 'folded loop'. This means that the two communications routes between each location are provided by separate cores within the same cable, hence these are not fully independent paths and provide a single point of failure for both communication pathways.

Standard practice is to have N-1 redundancy with full separation between the independent communications paths so that a single incident doesn't disrupt the communications, and therefore SCADA and protection schemes. Full N-1 redundancy requires installing two separate cables taking separate routes so that failure of, or damage to, of one cable does not affect the other.

For example, the NTC sets out specific requirements regarding independent x – y protection schemes for assets that operate at 66kV or above. The relevant clauses from the NTC are included in clause 2.9.2

Duplication of protection:

- 2.9.2(f) Where both protection schemes require end-to-end communications, independent tele-protection signalling equipment and communication channels shall be provided.
- 2.9.2(g) Where failure of the tele-protection signalling would result in the failure of both protection schemes to meet the requirements of this clause 2.9.2.1 independent communication bearers shall be provided.

Power and Water is currently non-compliant with these requirements.

A related program is proposed to be undertaken during the 2024-29 regulatory period to address compliance of the protection relays. To be compliant with the NTC, there needs to be fully independent protection schemes, including communications pathways.

2.2.2 Unidentified non-compliance

In addition to the known non-compliance with the communication network, Power and Water regularly identifies asset installations that are non-compliant with the NTC. This is undertaken as a part of business-as-usual activities, and not as part of a compliance audit across the communication network and assets.

The type of non-compliance is generally considered minor and are not known in advance, nor is the scope of potential solutions. Examples of the type of non-compliance include:

- Single points of failure in the Teleprotection and SCADA system
- Insufficient segregation of devices
- Insufficient separation between sensitive equipment and power sources on-site

Once identified, these instance of non-compliance with the NTC are prioritised for rectification, base don the risk posed to the network and to customers.

Power and Water expects that these ad-hoc minor non-compliances will continue to be discovered during the 2024-29 regulatory period.

2.3 Current program

During the current regulatory period, the following key actions have been undertaken to address minor non-compliances discovered during business as usual activities includes:

- Physical separation of sensitive equipment from power sources on-site and deploying a dedicated power source for assets. This is estimated to have cost an average of \$40,000 per year.
- Implementing segregation of devices by developing and enforcing a ruleset for the communications between the specific hosts and services. This was a one off and cost approximately \$50,000.

The cost for resolving 'folded loop' configurations on the fibre optic network can vary greatly depending on the extent of the non-compliance and the solution required. Examples of two projects being undertaken

are Stage 1 and Stage 2 of the Alice Springs Sadadeen ZSS to Lovegrove ZSS fibre optic upgrade project. These projects will cost approximately \$900,000 (quoted) and \$1,450,000 (estimated), respectively. They provide an indicative cost that may be incurred for other similar projects.

Where identified non-compliances are known, Power and Water seeks to create specific projects which are subject to business case approval.

2.4 Consequence and 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, as there is insufficient data to undertake a quantitative analysis on the impact of non-compliances with the NTC, a qualitative assessment of the risk has been undertaken using the relevant key consequence areas set out in the Risk Quantification Procedure.

The most significant non-compliance identified is inadequate separation of communications paths in the fibre optic cable network. This is critical for proper implementation of independent x-y protection systems. The single points of failure that have been identified also create an elevated risk to the network and add to the non-compliance against the NTC requirements.

The key consequences of the current network topology include:

- **Compliance:** failure to comply with the requirements of the NTC, and therefore the requirements of the Network Licence, can result in financial penalties. Refer to Appendix B.
- **Health and Safety:** Loss of protection for assets that operate at 66kV or above could endanger Power and Water’s field crews and the public through failure of protection devices to isolate faults or through operation of switches that could energise faulted sections of the network.
- **Service delivery:** Loss of protection could result in an upstream protection device occurring and therefore resulting in a more widespread outage than required. This will degrade the level of service received by our customers.

The risk assessment is shown in Figure 1 in the matrix format as specified in the Enterprise Risk Management Standard. It shows the current risk ranking and the target risk ranking.

| | Insignificant | 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

2.5 Summary

Power and Water is required to maintain the communications network to ensure compliance with a number of legislative requirements² including the Network Technical Code and Planning Criteria (NTC). An essential aspect of a communications system for critical infrastructure is that it is secure and resilient and will continue to operate in the event of a network incident or failure of a communications pathway.

The communications network has been progressively built over a number of years. Whilst compliant at that time, the requirements of the NTC have changed over time resulting in non-compliance of some legacy installations, that no longer comply with new requirements of the NTC.

Power and Water has identified:

- Non-compliant asset installations relating to the need to provide redundant and independent communication pathways for protection schemes.
- A history of currently unidentified instances of non-compliance that are identified as a part of business as usual activities.

There are three clear impacts on Power and Water from these instances of non-compliance:

- **Compliance** with the requirements of the NTC.
- **Health and Safety** by providing appropriate protection for assets that operate at 66kV or above.
- **Service delivery** by minimising the extent of outages.

These asset installations are considered to present a high risk, and need to be rectified to ensure compliance with the NTC and therefore Power and Water's Network Licence.

² As are set out in Appendix B

3. Options analysis

This section describes the various options that were analysed to address the increasing risk to identify the recommended option. The options are analysed based on ability to address the identified needs, prudence and efficiency, commercial and technical feasibility, deliverability, benefits and an optimal balance between long term asset risk and short-term asset performance.

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. This option accepts that the non-compliances will remain.
- Option 2 – Address the identified non-compliance. Rectify the non-compliances as identified on the network and include a provision for those identified in business-as-usual activities.

A comparison of the two identified credible options and the issues they address in the identified need is depicted in Table 3.

These options are described and assessed in detail in the sections below.

Table 3 Summary of options analysis outcomes

| Assessment metrics | Option 1 | Option 2 |
|------------------------------|----------|----------|
| NPC (\$'000, real FY22) | - | 1,092 |
| BCR | NA | NA |
| Capex (\$'000, real FY22) | - | 1,250 |
| 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

This option proposes to not undertake any specific investment to address the non-compliance with the NTC and only rely on the incremental benefits received from other programs of work, such as the transition to MPLS, replacement of obsolete and end of life assets or fibre optic installation including in other network projects.

While this approach will result in some reduction of non-compliant asset installations, it is not sufficient to address the identified gaps or those expected to be identified during the next regulatory period.

Specifically, this option does not address the compliance with the x-y protection scheme requirements in the NTC.

This option is not recommended.

3.1.2 Option 2 – Address identified non-compliance

This option proposes to undertake specific investment to correct the fibre optic network sections that are currently implemented as ‘folded loops’ by establishing a fully independent and physically separated communications path. This work will be undertaken in conjunction with other programs of work where possible, such as the installation of OPGW as part of overhead line construction, work associated with Berrimah ZSS replacement and the DWDM retirement. We estimate the cost of \$200,000 per year on average to manage these instances of non-compliance. Since there is no scope currently defined for this work, the forecast was based on the cost to address the folded loop sections in Alice Springs.

In addition, include an allowance to address additional instances of minor non-compliant asset installations identified through business-as-usual activities, and are not known at the time of writing this business case. Based on recent experience, we forecast an annual cost of \$50,000.

This approach will result in non-compliant asset installations being corrected as they are identified. This will contribute to a more secure and resilient communications network, reducing the risk from the current level of High down to the target level of Low.

The expected cost of this program is \$1.25 million (real FY22) across the 2024-29 regulatory period with a present value of \$1.1 million.

This option is recommended.

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 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.

3.2.2 Capex/Opex Substitution – does not address the need

Since the driver of this investment is compliance, it is not feasible to substitute capital expenditure with operational expenditure to resolve the risk. Only capital expenditure on specific assets and systems will resolve the underlying issues and ensure compliance with obligations.

4. Recommendation

The recommended option is Option 2 – Address non-compliances at an estimated cost of \$1.25 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 | Enhance Customer Experience and Engagement |
| 2 | Sustainable solutions for the future | Cost Prudence |

4.2 Dependent projects

The protection relay program that is focused on implementing independent x-y protection schemes for 66kV and above assets is dependent on completion of this project to ensure full independence of the schemes as required by the NTC clause 2.9.2(f) and (g).

4.3 Deliverability

Power and Water considers that this program is deliverable as it is relatively low value and will be delivered through a combination of internal and external staff.

4.4 Customer considerations

As required by the AER’s Better Resets Handbook, in developing this program Power and Water 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 2025-29.

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

| Item | FY25 | FY26 | FY27 | FY28 | FY29 | Total |
|-------|------|------|------|------|------|-------|
| Capex | 250 | 250 | 250 | 250 | 250 | 1,250 |
| Opex | | | | | | |
| Total | 250 | 250 | 250 | 250 | 250 | 1,250 |

4.6 High-level scope

The scope of this program is not yet defined. There is currently analysis being undertaken to further refine the areas of the communications network that need to be addressed.

Appendix A. Cost estimation

The exact scope of work required is not yet defined as the non-compliances will be identified during the course of normal inspection, maintenance and replacement works.

The forecast is an estimate based on subject matter expert assessment of past solutions to non-compliances to determine a prudent level of expenditure that will be required to maintain compliance with the regulations.

Appendix B. Compliance requirements

Power and Water is required to maintain the communications network to ensure compliance with a number of 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 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 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 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 FY22³, providing a maximum penalty of \$392,500 per contravention.

The requirements above demonstrate a clear legislation and government driven requirement for Power and Water to maintain a modern communications system. An essential aspect of a communications system for critical infrastructure is that it is secure and resilient in case of a network incident or failure of a communications pathway.

³ <https://justice.nt.gov.au/attorney-general-and-justice/units-and-amounts/penalty-units>

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