



Business Need Identification

Power and Water Corporation

CONTROLLED DOCUMENT

NMP14

Substation Fire Protection Equipment Replacement Program

Proposed:

A handwritten signature in black ink, appearing to read "Stuart Eassie", written over a horizontal line.

Stuart Eassie
Manager Asset Strategy
Power Networks
Date: 26/2/2018

A handwritten signature in blue ink, appearing to read "Djuna Pollard", written over a horizontal line.

Djuna Pollard
Executive General Manager
Power Networks
Date: 26/2/2018



1 Project Summary

Project Title:	Fire Protection System Replacements and Upgrades		
Project No:	NMP14	SAP Ref:	
Financial Commencement:	Year FY18		
Business Unit:	Power Networks		
Project Owner (GM):	Djuna Pollard	Phone No:	8985 8431
Contact Officer:	Stuart Eassie	Phone No:	8985 7150
Date of Submission:		File Ref No:	
Submission Number:	NA	Priority Score:	
Primary Driver:	Safety	Secondary Driver:	Compliance Asset renewal
Project Classification:	Capital Program of Works		

2 Recommendation

2.1 MAJOR PROJECT >\$1M OR PROGRAM

It is recommended that IRC note the proposed Fire Systems Replacement Program for an estimated budget of \$0.75M, and approve the inclusion of this Fire Systems Replacement Program into the SCI for this amount, with a corresponding completion date of June 2024.

The forecast for this program of work extends beyond the current SCI period. The three years of this program aligns with the last three years of the 2017-18 SCI. This program will be included in the 2019-24 Regulatory Proposal to the Australian Energy Regulator (AER).

Note that individual projects within the program will be documented in Business Case Category Cs to be approved by the Executive General Manager Power Networks.

3 Description of Issues

3.1 Legislative provisions

Power and Water Corporation (PWC) is obliged to maintain its fire protection systems and equipment in accordance with the requirements of the following Northern Territory legislation:



- *Building Act;*
- *Building Regulations;*
- *Fire and Emergency Act; and*
- *Fire and Emergency Regulations.*

The effect of the legislation is to oblige PWC to install, commission, operate and maintain comprehensive fire protection systems and equipment to mitigate the life safety risk to its employees, contractors and the public at large.

3.2 Equipment issues

3.2.1 Fire indicator panels

Fire protection systems depend for their successful continued operation on many different types of components located according to the relevant standards and codes, and connected back to a secure central location near the entrance to each building where the monitoring system and fire indicator panel (FIP) is located. The lifetimes of all components will have a statistical variation, but owing to the criticality of the systems and the severe consequences in the event of component or system failure, elements of the systems are replaced prior to failure to give greater assurance of continued operation.

As with many such systems, manufacturers continue to develop new products to supersede their older ranges. As such advances occur, manufacturers reduce the level of support that they offer to purchasers of the older products, with equipment becoming obsolescent and spare parts having reduced availability after typically no more than 15 years.

At such times, building owners will also take advantage of the opportunity to reassess their systems in the light of advances in detection and protection technologies. For example, owners might incorporate newer niche technologies into their systems to mitigate specific risks in particular locations, or they may plan a general roll-out across all locations where significant improvements in fire safety can be achieved by adopting newer technologies.

3.2.2 Fire suppression systems

Power and Water Corporation has two locations, Berrimah zone substation and Hudson Creek system control, that are still equipped with Pyrozone™ fire suppression systems. The Berrimah suppression system will be replaced as part of a Major Project to upgrade the zone substation. Pyrozone technology uses low pressure carbon dioxide (CO₂) as its extinguishing medium. The CO₂ is stored as a liquid at a pressure of approximately 20 bar, and a temperature of approximately -18°C. The systems are now nearly 20 years old and in addition to generic issues with low pressure CO₂ fire suppression systems (see below), Power and Water Corporation has the following specific issues:

- Gas leaks – the gas systems have developed persistent leaks that have proven extremely difficult to identify and correct. Valve and pipework replacement and testing has proven ineffective to the extent that the gas systems are now depleted.



- Fire system impairment notifications – owing to the depleted systems, fire system impairment notifications are issued advising that personnel must exercise caution when working at the sites.
- The existing systems will not be able to suppress a fire should the need arise.

Low pressure CO₂ fire suppression systems also present the following generic issues:

- For CO₂ to be stored as a liquid at a pressure of approximately 20 bar, it must be cooled to a temperature of approximately -18°C. This requires a significant investment of capital and operational expenditure in refrigeration equipment, and requires the refrigeration equipment to continue operating. This is not ideal in Darwin's tropical climate.

Health and safety risks of CO₂ - there is a body of evidence that CO₂ presents considerable health and safety risks when used as a fire suppression medium, particularly in enclosed spaces. Alternative fire suppression inert gases or blends of gases, such as argon, which do not present health and safety problems to the same extent, are the current standard for Power and Water Corporation and the industry in general.

4 Potential Solution

This BNI addresses the need for PWC to:

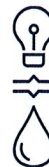
- replace fire monitoring equipment that is approaching the end of its useable life, which is at an increasing and unacceptable risk of failure, and which is at risk of reducing levels of support from manufacturers;
- replace outdated protection systems and equipment or augment existing protection systems with equipment based on modern technologies with improved detection and protection capabilities.
- Replace low pressure CO₂-based fire suppression systems with inert gas-based suppression systems to eliminate health and safety risks.

This BNI considers the replacement of fire detection and protection equipment at the following locations during the following periods.

2018/19 – one location: Hudson Creek System Control

2019/20 – one location: Archer Substation

2020/21 – four locations: Casuarina Zone Substation,
Hudson Creek (System Control),
Lovegrove Switching Station, and
Owen Springs Substation



2021/22 – seven locations: Batchelor Substation, Channel Island 132kV Switchyard, Katherine 132kV Substation, Mitchell Street Switching Station, Palmerston Substation, Pine Creek Substation, and Tindal Intake Substation

2022/23 – one location: Woolner Substation

2023/24 – one location: Sadadeen Substation

5 Strategic Alignment

This program aligns with the Asset Objectives defined in the Strategic Asset Management Plan (SAMP) and Asset (Class) Management Plans (AMP). The capital investment into the Fire Protection infrastructure outlined in this program will contribute to the Corporation achieving the goals defined in the boards Strategic Directions and SCI Key Result Areas of Health and Safety.

6 Timing Constraints

Fire protection systems are critical safety systems. The increasing risk of system or component failure of aging equipment would ultimately result in an unacceptable safety risk to PWC employees, contractors and the public at large. To mitigate this risk, components and equipment should be replaced prior to the end of their service lives wherever possible. For most critical components in the asset class, maximum acceptable service lives are generally expected to be 10 years from the date of commissioning.

7 Expected Benefits

Driver	Benefit	Measure
Safety	The principal purpose of fire protection systems is to prevent the loss of life or damage to equipment due to the effects of fire.	Zero harm to the general public, PWC personnel. Zero damage to equipment due to the effects of fire or fire-related events.
Asset Renewal	Ongoing assured operation	Reduced in-service failure of systems and equipment Zero false alarms.



Driver	Benefit	Measure
Compliance	Eliminate non-conformance with legislation and standards	Zero NCRs raised by Northern Territory Fire and Rescue Service during inspections.

8 Milestones (mm/yyyy)

Investment Planning	Project Development	Project Commitment	Project Delivery	Review
01/2018	NA	06/2019	06/2024	09/2024

The program delivery is scheduled to run over 5 years from July 2019 to June 2024. A program review will be held at the end of the 5 year program as well as interim reviews at the end of each Financial Year.

9 Key Stakeholders

Stakeholder	Responsibility
Internal governance stakeholders	Executive General Manager Power Networks
	Group Manager Service Delivery
	Chief Engineer
	Senior Manager Asset Management
Internal Design Stakeholders	Manager Protection
	Manager Test & Protection Services
	General Manager System Control
	Manager SCADA and Communication Services
External – Unions and public	ETU
External regulators	Utilities Commission
	Australian Energy Regulator
	Northern Territory Fire and Rescue Service



10 Resource Requirements

Not applicable. Resourcing requirements for this program are considered Business as Usual and will be incorporated into the development of Category C Business Case's for each individual replacement, including engagement of fire system design specialists.

11 Delivery Risk

Consultation with System Control will be critical to ensure network operations are not compromised during system replacement works. Additional controls will be detailed in the Category C Business Case for this work.

12 Financial Impacts

12.1 Expenditure Forecasting Method

Capital expenditure estimates are based on historical costs and recent quotations. The majority of services are delivered through period contracts.

12.2 Capex Profile

The capex in the table below is in \$2017-18, and is excluding capitalised overheads and cost escalation.

Phase	2018-19 (\$'000)	2019-20 (\$'000)	2020-21 (\$'000)	2021-22 (\$'000)	2022-23 (\$'000)	2023-24 (\$'000)	Total (\$'000)
Project Delivery	376.58	24.50	135.65	164.20	42.10	25.95	746.98
Total	376.58	24.50	135.65	164.20	42.10	25.95	746.98

12.3 Opex Implications

Installation of Inergen®-based fire suppression systems eliminates the need for low pressure CO₂ refrigeration systems at Hudson Creek Substation and control centre to maintain the gas storage temperature at -18°C, thereby saving the cost of energy consumed by the refrigeration systems.

12.4 Variance

The forecast for this program of work extends beyond the current SCI period. The first two years of this program aligns with the last two years of the 2017-18 SCI.

