Program Business Need Identification

Power and Water Corporation

CONTROLLED DOCUMENT

NMSC2

SCADA and Communications Battery System Replacement

Proposed:	Approved:
Cameron McKay Asset Manager - SCADA Power Networks Date: 3/11 /2017	Michael Thomson Chief Executive Power and Water Corporation Date: 10/11 /2017

DJuna Pollard	Refer to D2017/490795	Refer to D2018/86500
Djuna Pollard Executive General Manager Power Networks Date: 3/11 /2017	Finance Review Date: 3 / 11 /2017	PMO QA Date: 31/ 10/2017

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1 Project Summary

Project Title:	SCADA and Communications Battery System Replacement		
Project No:		**SAP Ref:**	
Financial Year Commencement:	2019/2020		
Business Unit:	Power Networks		
Project Owner (GM):	Djuna Pollard	**Phone No:**	8985 8431
Contact Officer:	Cameron McKay	**Phone No:**	8985 7150
Date of Submission:		**File Ref No:**	
Submission Number:		**Priority Score:**	
Primary Driver:	Renewal/Replacement	**Secondary Driver:**	Service Improvement
Project Classification:	Capital Program of Works		

2 Recommendation

MINOR PROJECTS UP TO $1M NOT COVERED BY AN EXISTING BNI

It is recommended that Investment Review Committee (IRC) note the proposed five year SCADA and Communications obsolete asset replacement program for an estimated budget of $1.02M, and approve the inclusion of this program into the SCI for this amount.

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. 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

This BNI describes the battery systems for SCADA and Communications assets that have reached the end of their serviceable life and now require replacement. This does not include zone substation batteries that supply substation auxiliary devices.

Batteries are critical to the operation of the telecommunications system. Without batteries of sufficient capacity, the telecommunications system will not operate correctly. Battery banks are most critical in the time of power outages where they are the sole source of power to ensure continued operation of the SCADA and Communications Network, and therefore to maintain control of the network.

This BNI includes solar panels that are installed for the purpose to charge the SCADA and Communications batteries.

The need to replace batteries is based on battery age. The size of the battery systems required is dictated by PWC's unique environmental and remote circumstances. These factors are explained below.

3.1 Loss of capacity with age

A well proven and understood characteristic of batteries is that they lose capacity as they age due to internal deterioration. This means that the amount of energy that batteries can store reduces over time, which results in the voltage output dropping below design levels more quickly than expected. When battery systems do not supply the required voltage levels, the connected devices will not operate correctly.

Batteries do not store well when not in use and hence spares are not held for large capacity battery banks.

The design life of the batteries in PWC's SCADA and Communications Network are shown in Table 1. These lives are based on data from manufacturer's technical sheets.

Figure 1 (page 6) shows the age profile of the battery fleet at 2017. It demonstrates that during the next regulatory period, an additional 42 battery systems are reaching the end of their serviceable life.

Table 1: Battery design life

Equipment Type	Asset Life (yrs)
UXF-150-12	10
A700	12
600/7OPz 2V	18
A600 6V/12V	15
A400	12
SB6	7
SBS	15
G85	10

3.2 Impact of temperature

Battery life is affected by the conditions in which they are used. Experience and technical data sheets[1] show that there is a 50% reduction in battery life for every 10C above 20C. The average temperatures in the Northern Territory range between a low of 23C and a high of 32C[2] .

Not all batteries throughout the PWC network are housed in air conditioned enclosures. This is a result of these sites being solar powered old design standards and remote area construction.

The battery locations listed below are not housed in air conditioned environments and thus are expected to have a reduced life compared to other battery banks housed in air conditioned locations.

This results in a higher volume of batteries reaching end of life.

Table 2: Locations without air conditioning

Location	Equipment Type	Design Life (yrs)	Expected life
[redacted]	SBS320	15	9
[redacted]	SBS320	15	9
[redacted]	SBS320	15	9
[redacted]	SBS320	15	9
[redacted]	8OPzV960	18	11
[redacted]	SB6/330	7	4
[redacted]	8OPzV960	18	11
[redacted]	A600/720	15	9
[redacted]	SB6/330	7	4
[redacted]	G85	10	6
[redacted]	SBS320	15	9

Design life is based on 20C operating temperature. Expected life is calculated at an average ambient temperature of 27.5C resulting in a 40% reduction in battery life.

3.3 Age Profile

The age profile shows that by the end of FY24 there will be 42 batteries that will have reached the end of their design life and will present a risk to the continued operation of the network.

[1] D2017/375703 – Sonnenschein Gel VRLA Handbook Part 2 – Page 35 of 73

[2] Bureau of Meteorology website: http://www.bom.gov.au/climate/averages/tables/cw_014015.shtml

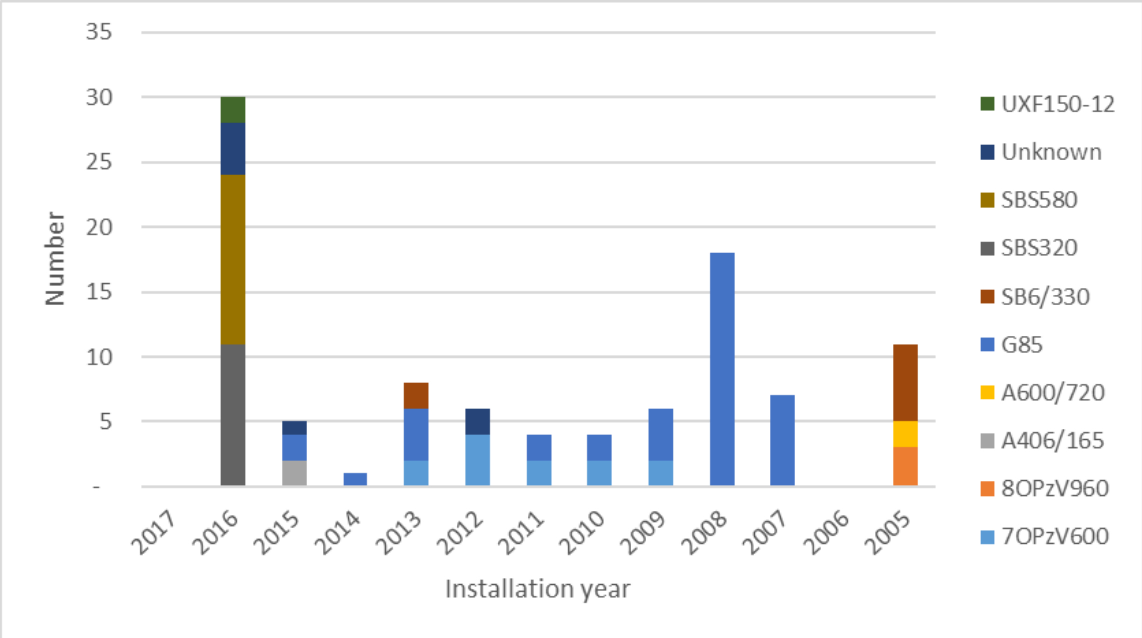

Figure 1: Age profile by battery type

3.4 Environmental considerations

PWC has unique requirements compared to other Distribution Network Service Providers (DNSPs) around Australia due to the climatic conditions, particularly because of the wet season and cyclones.

Cyclonic or storm events result in frequent, and often prolonged, power outages. At these times, access roads maybe blocked or flooded, staff are busy handling other network outages or staff numbers are reduced as they may be attending to personal issues related to the weather event. This means that sites may not be accessible for a long period of time. Sufficient battery capacity needs to exist to ensure the site remains operational during these times.

Solar powered sites need sufficient battery capacity to maintain load during adverse weather conditions, particularly monsoonal times where there can be significant cloud cover for prolonged periods of time, often up to two weeks.

The impact of this is that the battery system capacity on the PWC sites is required to be much higher than for other electricity businesses in Australia, resulting in a higher unit cost.

3.5 Solar panel deterioration

Solar panel capacity does deteriorate over time and some panels have been identified as starting to show signs of water ingress. Both of these issues result in insufficient solar capacity to charge the battery systems to the required state of charge. This can result in the sites becoming non-operational and affecting the SCADA and Communications Network.

3.6 Project Needs

a. Safety
The SCADA and Communications Network is critical to ensure the safe operation of the electrical network. A functioning and reliable SCADA and Communications Network is required for operators at System Control to: • Monitor the state of the electrical network at all times; • Operate the electrical network in a timely and efficient manner without the need to send a technician to site; • React to electrical network events to ensure the network remains in a safe configuration; and • Isolate the electrical network to allow maintenance. The SCADA and Communications Networks also provide tele-protection to provide improved safety to the public and minimise potential damage to the electrical assets by clearing electrical faults as quickly as possible.
b. Compliance
The Power Networks Technical Code and Planning Criteria requires Power Water Corporation to maintain a communications network for monitoring and control of the electricity network. PWC is also required by the Technical Code to provide a communications network between any Users connected to the network and System Control. To meet these obligations, it is necessary for PWC to manage assets that are obsolete or no longer supported by the vendor, or at the end of their design life, through replacement or spares management as set out in the preferred option.
c. Reliability
The SCADA and Communications Network is critical to ensure the reliable operation of the electrical network. It is required for operators at System Control to: • Monitor the state of the electrical network at all times; • Operate the electrical network in a timely and efficient manner without the need to send a technician to site; • React to electrical network events to ensure the network remains in a safe configuration; and • Switch the electrical network to restore supply.

4 Potential Solutions

Due to the function of these assets, there are only a limited number of options that have been considered.

Options considered are:

Option 1 - Do nothing

Allow the battery systems to fail and do not replace. Depending on the communications site affected, this could lead to an outage for the SCADA and Communications Network resulting in a loss of protection services for critical assets. Protection services ensure the safety of the public and personnel as well as minimise damage to plant. Under the Power Networks (PN) Technical Code, protection systems must remain operational at all times except when maintenance of them is required. In addition, SCADA to some Zone Substations could be lost, which for a prolonged outage may require the site to be operated in a manual mode. This would affect the capability of PWC to supply reliable electricity services.

Option 2 - Replace at end of life (age based)

Replace batteries based on their design life, allowing for reduced life of batteries operated outside of air conditioned environments. As historical asset performance data for the communications battery systems is not yet available, this option provides the least risk of an extended outage due to a battery system failure.

Option 3 - Proactive replacement (managed)

Replace the assets prior to end of life by assessing performance and asset condition. This option is not yet available to PN however the capability is being implemented as part of the Asset Management Plans for this asset class.

4.1 Preferred Option

The preferred option is option 2: replace at end of life. Battery systems are critical assets for the SCADA and Communications Network. PWC currently does not have the historical test data for its battery systems to enable the proactive replacement of battery systems. As a result, the forecast for battery replacement is based on the design life of the batteries.

The expenditure and volume of assets forecast for replacement during the 2019-24 regulatory period are listed in Table 3 and Table 4 below. Specific locations targeted during each of these years are listed in Appendix A.

Note that replacement of battery systems [redacted] have been brought forward to align with the solar replacements at those sites (FY21) to gain efficiency for works in remote locations.

Table 3: Forecast battery and solar replacement expenditure

Type	FY20	FY21	FY22	FY23	FY24
	($,000)	($,000)	($,000)	($,000)	($,000)
7OPzV600	$-	$-	$-	$55	$61
8OPzV960	$-	$61	$-	$-	$-
A602/720	$-	$61	$-	$-	$-
G85	$55	$59	$55	$-	$117
TBA	$-	$61	$-	$-	$-
PS1270?	$3	$-	$-	$-	$-
SB6/330	$-	$117	$-	$-	$-
(blank)	$-	$-	$-	$59	$-
Solar Arrays	$	$248	$	$	$
Grand Total	$58	$607	$55	$114	$179

Table 4: Forecast replacement volumes

Type	FY20	FY21	FY22	FY23	FY24
7OPzV600	-	-	-	2	2
8OPzV960	-	2	-	-	-
A602/720	-	2	-	-	-
G85	2	1	2	-	4
TBA	-	2	-	-	-
PS1270?	1	-	-	-	-
SB6/330	-	4	-	-	-
(blank)	-	-	-	-	-
Solar Arrays		2			
Grand Total	**3**	**13**	**2**	**2**	**6**

4.2 Non-Network alternatives

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 or modern equivalent assets.

4.3 Capex/Opex Substitution

Capex opex substitution is not a viable solution for this asset type. The batteries used for the SCADA and Communications Network are typically seal and non-maintainable battery types. The only option is to replace the asset.

4.4 Contingent Project

This project does not qualify as a contingent project as defined by the NER Clause 6.6A.1. It is required for the continual safe and reliable operation of the network and is not contingent based on an external driver and does not exceed $30million or 5% of the forecast capital budget forecast.

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 SCADA and Communications 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 and Operational Performance.

6 Timing Constraints

Batteries generally do not fail to zero output immediately, there is generally a gradual reduction in voltage/current over time so there is some ability to delay replacement of these assets. This has already been accounted for in the forecast.

7 Expected Benefits

Driver	Benefit	Measure
Growth / Demand		
Renewal / Replacement	Network safety	Health and Safety Index
Compliance		
Service Improvement	Network reliability maintained	Performance against SAIDI and SAIFI targets
Commercial / Efficiency		
Social / Environmental		

8 Milestones (mm/yyyy)

1. Investment Planning	2. Project Development	3. Project Commitment	4. Project Delivery	5. Review
01/2018	NA	01/2019	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

Stakeholder	Responsibility
	General Manager System Control
	Manager SCADA and Communication Services
External – Unions and public	ETU
External regulators	Utilities Commission
	Australian Energy Regulator

10 Resourcing Requirements (to next gateway)

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.

11 Delivery Risk

Between FY15 and FY17, Service Delivery was focused on major capital projects that were of high importance and criticality to the network. As a result, lower criticality projects were deferred. This has impacted the SCADA and Communications category, as shown in Figure 2.

To ensure the delivery of the proposed SCADA and Communications works, the forecast includes a higher reliance on external contractors to reduce the reliance on PN's internal Service Delivery group. This also allows PN's Service Delivery group to focus on maintenance issues and address the backlog of works created by deferral of less critical repex as a result of highly critical capital projects.

12 Financial Impacts

12.1 Expenditure Forecasting Method

The expenditure forecast for this asset class was based on a 'Scoped' approach that built a bottom up estimate per site using historical project costs and vendor quotes.

The forecast volumes and locations were based on the temperature adjusted expected life of the battery type (if not housed at an air-conditioned site) and the year in which it will exceed that expected life.

12.2 Historical and Forecast Expenditure

Due to the asset database and systems configuration currently implemented by PWC, the historical expenditure per asset class within the SCADA and Communication category cannot be reported. However, the total expenditure under the SCADA and Communications category is shown below in Figure 2.

At a total category level, the forecast expenditure for the next regulatory period is shown to be approximately $400k higher than annual average for the past 3 years and budgeted two years remaining in this regulatory period.

The historical expenditure decreased during FY15 to FY17 as a result of delivery of multiple high criticality capital projects taking precedence over less critical repex. The forecast includes an uplift in replacement to address the backlog created by the deferral and a plan for higher reliance on external contractors to ensure capacity to deliver the required works.

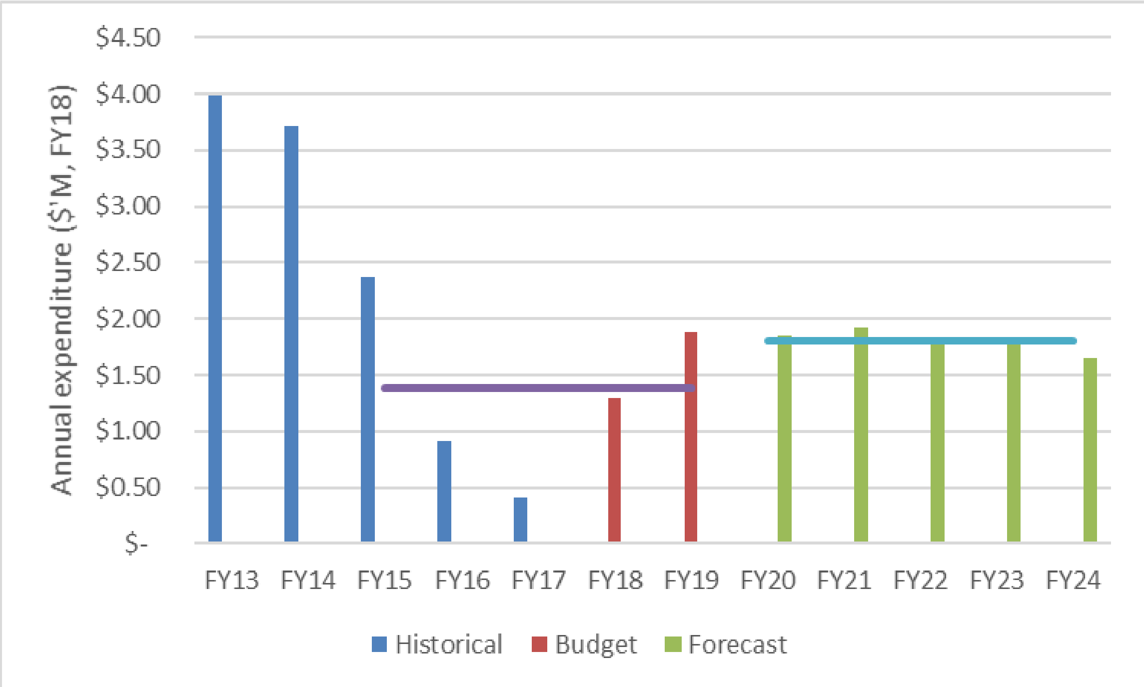

Figure 2: Historical, budget and forecast expenditure for the SCADA and Communications category

12.3 Validation

The forecast is shown to be aligned to historical expenditure at a SCADA and Communications asset category level with an average annual forecast increase of $400k compared to the actual and budgeted average for the current regulatory period.

12.4 Opex Implications

There are no opex step changes associated with this asset category or capex opex substitution opportunities.

12.5Variance

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.

12.6Capex Profile

Year	2019-20 ($'000)	2020-21 ($'000)	2021-22 ($'000)	2022-23 ($'000)	2023-24 ($'000)	Balance ($'000)	Total ($'000)
Investment Planning							
Project Development							
Project Commitment							
Project Delivery	60	610	60	110	180		**1,020**
Review							
Total	**60**	**610**	**60**	**110**	**180**		**1,020**

APPENDIX A

1 Forecast Expenditure by Expenditure Category

This information is to allow the forecast to be escalated.

The expenditure is to be in today's dollars.

RAB Category	Regulatory Year (A$M, $2017-18, Jul to Jun years)				
	2019-20	2020-21	2021-22	2022-23	2023-24
Total	**$0.06**	**$0.61**	**$0.06**	**$0.11**	**$0.18**
Labour	**$0.02**	**$0.12**	**$0.02**	**$0.02**	**$0.03**
Materials	**$0.02**	**$0.22**	**$0.02**	**$0.05**	**$0.09**
Contractors	**$0.02**	**$0.27**	**$0.02**	**$0.04**	**$0.06**
Other	**$-**	**$**	**$-**	**$-**	**$-**

Definitions

Labour – The cost of direct internal Labour for the project. No overheads.

Materials – the cost of materials used in the project. No overheads.

Contractors – the cost of work performed by Contractors in the project, whether Labour or Materials. No overheads.

Other – expenditure that is not Labour, Materials or Contractors. No overheads.

2 Forecast Expenditure by RAB Category

Provide the forecast expenditure for this project / or program, in total and broken down by RAB category, by year for the regulatory control period.

This information is to enable regulatory modelling.

The forecast is to be in today's dollars ($2017-18).

RAB Category	Regulatory Year (A$M, $2017-18, Jul to Jun years)				
	2019-20	2020-21	2021-22	2022-23	2023-24
Total	$0.06	$0.61	$0.06	$0.11	$0.18
System Capex					
Substations					
Distribution Lines					
Transmission Lines					
LV Services					
Distribution Substations					
Distribution Switchgear					
Protection					
SCADA					
Communications	**$0.06**	**$0.61**	**$0.06**	**$0.11**	**$0.18**
Non-system Capex					
Land and Easements					
Property					
IT and Communications					
Motor Vehicles					
Plant and Equipment					

3 Forecast Expenditure by CA RIN Category

This information is to allow the forecast to be escalated.

The expenditure is to be in today's dollars.

RAB Category	Regulatory Year (A$M, $2017-18, Jul to Jun years)				
	2019-20	2020-21	2021-22	2022-23	2023-24
Total	$0.06	$0.61	$0.06	$0.11	$0.18
Repex	$0.06	$0.61	$0.06	$0.11	$0.18
Augex					
Connections					
Non-network: IT					
Non-network: Vehicles					
Non-network: Buildings and property					
Non-network SCADA & network control					
Non-network: Other					

4 Forecast Asset Disposals by RAB Category

Provide the forecast asset disposals for this project / or program, in total and broken down by RAB category, by year for the regulatory control period.

This information is to enable regulatory modelling.

The forecast is to be in today's dollars ($2017-18).

RAB Category	Regulatory Year (A$M, $2017-18, Jul to Jun years)				
	2019-20	2020-21	2021-22	2022-23	2023-24
Total					
System Capex					
Substations					
Distribution Lines					
Transmission Lines					
LV Services					
Distribution Substations					
Distribution Switchgear					
Protection					
SCADA					
Communications					
Non-system Capex					
Land and Easements					
Property					
IT and Communications					
Motor Vehicles					
Plant and Equipment					

5 Forecast Capital Contributions by RAB Category (if required)

Provide the forecast capital contributions for this project / or program, in total and broken down by RAB category, by year for the regulatory control period.

This information is to enable regulatory modelling.

The forecast is to be in today's dollars ($2017-18).

RAB Category	Regulatory Year (A$M, $2017-18, Jul to Jun years)				
	2019-20	2020-21	2021-22	2022-23	2023-24
Total	**$0.06**	**$0.61**	**$0.06**	**$0.11**	**$0.18**
System Capex					
Substations					
Distribution Lines					
Transmission Lines					
LV Services					
Distribution Substations					
Distribution Switchgear					
Protection					
SCADA					
Communications	$0.06	$0.61	$0.06	$0.11	$0.18
Non-system Capex					
Land and Easements					
Property					
IT and Communications					
Motor Vehicles					
Plant and Equipment					

PowerWater

Appendix B – Replacement forecast

Project Description	Type	Life (yrs)	Installed	Planned Replacement Date	Asset Data	FY18	FY19	FY20	FY21	FY22	FY23	FY24
ARZS (A)	G85	10	2010	2020	400a/h	$-	$-	$-	$29	$-	$-	$-
ARZS (B)	G85	10	2010	2020	400a/h	$-	$-	$-	$29	$-	$-	$-
BAWT (A)	G85	10	2007	2017	320a/h	$-	$28	$-	$-	$-	$-	$-
BAWT (B)	G85	10	2007	2017	320a/h	$-	$28	$-	$-	$-	$-	$-
BHCR (A)	G85	10	2011	2021	320a/h	$-	$-	$-	$-	$28	$-	$-
BHCR (B)	G85	10	2011	2021	320a/h	$-	$-	$-	$-	$28	$-	$-
CAZS 11 (A)	G85	10	2008	2018	200a/h	$-	$-	$-	$-	$-	$-	$-
CAZS 11 (B)	G85	10	2008	2018	200a/h	$-	$-	$-	$-	$-	$-	$-
CICR (A)	G85	10	2008	2018	400a/h	$29	$-	$-	$-	$-	$-	$-
CICR (B)	G85	10	2008	2018	400a/h	$29	$-	$-	$-	$-	$-	$-
CICS (A)	7OPzV600	13	2009	2022	580a/h	$-	$-	$-	$-	$-	$28	$-
CICS (B)	7OPzV600	13	2009	2022	580a/h	$-	$-	$-	$-	$-	$28	$-
DMCS (A2)	SB6/330	7	2005	2012	320a/h	$28	$-	$-	$-	$-	$-	$-
DMCS (B2)	SB6/330	7	2005	2012	320a/h	$28	$-	$-	$-	$-	$-	$-
HCCC (A)	G85	10	2013	2023	400a/h	$-	$-	$-	$-	$-	$-	$29
HCCC (B)	G85	10	2013	2023	400a/h	$-	$-	$-	$-	$-	$-	$29
HCCC (C)	G85	10	2013	2023	400a/h	$-	$-	$-	$-	$-	$-	$29
HCCC (D)	G85	10	2013	2023	400a/h	$-	$-	$-	$-	$-	$-	$29
HCCS (A)	SB6/330	7	2013	2020	320a/h	$-	$-	$-	$28	$-	$-	$-
HCCS (B)	SB6/330	7	2013	2020	320a/h	$-	$-	$-	$28	$-	$-	$-
KMWT (A)	G85	10	2007	2017	320a/h	$-	$28	$-	$-	$-	$-	$-
KMWT (B)	G85	10	2007	2017	320a/h	$-	$28	$-	$-	$-	$-	$-
LAWW (A)	G85	10	2009	2019	320a/h	$-	$28	$-	$-	$-	$-	$-
LAWW (B)	G85	10	2009	2019	320a/h	$-	$28	$-	$-	$-	$-	$-
LMSB (A)	PS1270?	10	2008	2018		$-	$3	$-	$-	$-	$-	$-
Lovegrove 66 ZSS (A)	G85	10	2008	2018	200a/h	$-	$26	$-	$-	$-	$-	$-
Lovegrove 66 ZSS (B)	G85	10	2008	2018	200a/h	$-	$26	$-	$-	$-	$-	$-
Lovegrove 22 ZSS (A)	G85	10	2008	2018	200a/h	$-	$26	$-	$-	$-	$-	$-
Lovegrove 22 ZSS (B)	G85	10	2008	2018	200a/h	$-	$26	$-	$-	$-	$-	$-

Marrara WT (A)	G85	10	2009	2019	320a/h	$-	$-	$28	$-	$-	$-	$-
Marrara WT (B)	G85	10	2009	2019	320a/h	$-	$-	$28	$-	$-	$-	$-
McMinns Pump OT (A)	G85	10	2007	2017	85a/h	$-	$3	$-	$-	$-	$-	$-
[redacted]	7OPzV600	13	2010	2023	580a/h	$-	$-	$-	$-	$-	$-	$31
[redacted]	7OPzV600	13	2010	2023	580a/h	$-	$-	$-	$-	$-	$-	$31
[redacted]	PS1270?	10	2009	2019		$-	$-	$3	$-	$-	$-	$-
[redacted]	8OPzV960	13	2005	2018	580a/h	$-	$31	$-	$-	$-	$-	$-
[redacted]	SB6/330	7	2005	2012	580a/h	$-	$31	$-	$-	$-	$-	$-
[redacted]	SB6/330	7	2005	2012	580a/h	$-	$31	$-	$-	$-	$-	$-
Owen Springs SS (A)	G85	10	2008	2018	400a/h	$-	$29	$-	$-	$-	$-	$-
Owen Springs SS (B)	G85	10	2008	2018	400a/h	$-	$29	$-	$-	$-	$-	$-
Owen Springs CS (A)	G85	10	2008	2018	400a/h	$-	$-	$-	$-	$-	$-	$-
Owen Springs CS (B)	G85	10	2008	2018	400a/h	$-	$-	$-	$-	$-	$-	$-
Palmerston ZSS (A)	G85	10	2007	2017	200a/h	$26	$-	$-	$-	$-	$-	$-
Palmerston ZSS (B)	G85	10	2007	2017	200a/h	$26	$-	$-	$-	$-	$-	$-
[redacted]	8OPzV960	13	2005	2018	580a/h	$-	$-	$-	$31	$-	$-	$-
[redacted]	8OPzV960	13	2005	2018	580a/h	$-	$-	$-	$31	$-	$-	$-
[redacted]	new to provide total cap				580a/h	$-	$-	$-	$31	$-	$-	$-
[redacted]	new to provide total cap				580a/h	$-	$-	$-	$31	$-	$-	$-
[redacted]	SX-80U	30	1990	2010		$	$	$	$124	$	$	$
[redacted]	A602/720	13	2004	2017	580a/h	$-	$-	$-	$31	$-	$-	$-
[redacted]	SB6/330	7	2005	2012	580a/h	$-	$-	$-	$31	$-	$-	$-
[redacted]	A602/720	13	2004	2017	580a/h	$-	$-	$-	$31	$-	$-	$-
[redacted]	SB6/330	7	2005	2012	580a/h	$-	$-	$-	$31	$-	$-	$-
[redacted]	VLX-80	30	1990	2020		$	$	$	$124	$	$	$
Sadadeen Admin (A)	G85	10	2008	2018	320a/h	$-	$28	$-	$-	$-	$-	$-
Sadadeen Admin (B)	G85	10	2008	2018	320a/h	$-	$28	$-	$-	$-	$-	$-
Sadadeen Sub (A)	G85	10	2008	2018	400a/h	$-	$29	$-	$-	$-	$-	$-
Sadadeen Sub (B)	G85	10	2008	2018	400a/h	$-	$29	$-	$-	$-	$-	$-
Woolner ZSS (A)		10	2012	2022	400a/h	$-	$-	$-	$-	$-	$29	$-
Woolner ZSS (B)		10	2012	2022	400a/h	$-	$-	$-	$-	$-	$29	$-

Total						**$166**	**$539**	**$58**	**$607**	**$55**	**$114**	**$179**