January 2026

Powerlink 2027-32 Revenue Proposal

Project Pack

Battery Cell Replacement Programme

Project Status: Unapproved

Network Requirement

Direct Current supply systems (DC systems) are deployed at all Powerlink substation and telecommunications sites. The primary role of the DC systems is to provide a source of energy that is independent of the primary Alternating Current (AC) supplies. This ensures that in the event of the loss of the primary supply the site control and communications systems that require energy to operate can continue to do so. A DC system comprises battery chargers, battery monitors and batteries. Each component has a different expected service life and different failure modes due to the stress and function they perform.

The battery component is required to be able to supply the DC electrical requirements of a substation when there is no output from the battery charger, such as following a loss of AC supply to the site or a fault in the battery charger itself. The DC power requirements include SCADA, control, protection, monitoring, communications and circuit breaker switching operations.

Valve Regulated Lead Acid (VRLA) batteries have a limited service life and as they age they experience the following issues:

- Decline in capacity – as it ages a battery's ability to hold and deliver charge gradually diminishes due to chemical changes and material degradation;
- Increased risk of failure – aged batteries start to experience internal corrosion, sulphation and plate degradation that can lead to unexpected failures;
- Increased safety risk – aged batteries are more prone to overheating, leakage and in rare cases rupture of the casing.

To manage these asset risks Powerlink maintains a six-monthly inspection and testing regime to monitor the condition of batteries. Research has shown that internal battery cell impedance increases with decreases in battery capacity due to age and discharge frequency. Powerlink has identified a threshold for battery impedance change that signals the need for battery replacement. Based on historical fault data and regular impedance testing Powerlink has identified the nominal replacement age for batteries with 2V cells as 12 years and for 12V cell as 8 years.

Recommended Option

Given the size of the installed population and expected life of DC batteries it is recommended that Powerlink maintain an annual programme of battery replacements. To manage the forward programme battery banks will be allocated a target replacement year based on the nominal replacement age for that type of battery. It is proposed to then replace batteries on a needs basis within a specific year such that batteries that require urgent replacement may displace one or more of the priority sites identified for that year [1].

Powerlink does not consider non-network options are likely to be able to meet the identified need to provide backup supplies to critical substation and telecommunications site equipment.

Cost and Timing

The estimated cost to replace DC battery systems each year in a programme of work is set out in Table 1 below:

Project	Number of systems	Estimated cost[1] (Real, 2025/26)	Target commissioning date
CP.03168 [1]	9	$1.1 million [2]	December 2028
CP.03169 [3]	20	$2.2 million	December 2029
CP.03170 [3]	21	$1.8 million	December 2030
CP.03171 [3]	38	$3.2 million	December 2031

Notes:

1. Adjusted to reflect the proportion of the project cost that relates to prescribed services assets.

Documents in Battery Cell Replacement Programme Project Pack

Public Documents

1. CP.03168 Battery Cell Replacement – 2028 – Project Scope Report
2. CP.03168 Battery Cell Replacement – 2028 – Project Management Plan
3. *Documents available on request*

Project Scope Report

CP.03168

Battery Cell Replacement - 2028

Concept – Version 1

Document Control

Change Record

Issue Date	Revision	Prepared by	Reviewed by	Approved by	Background
8/10/2025	1	[redacted]	[redacted]		Initial Version

Related Documents

Issue Date	Responsible Person	Objective Document Name
28/04/2025	[redacted]	PIF - 2028 DC Battery Cell Replacement – Project Initiation Form (A5855616)
	[redacted]	DC Systems Replacement – Master List (A5281528)

Document Purpose

The purpose of this Project Scope Report is to define the business (functional) requirements that the project is intended to deliver. These functional requirements are subject to Powerlink's design and construction standards and prevailing asset strategies, which will be detailed in documentation produced during the detailed scoping and estimating undertaken by DTS (or FAM), i.e. it is not intended for this document to provide a detailed scope of works that is directly suitable for estimating.

Project Contacts

Project Sponsor	[redacted]
Connection & Development Manager	Not Applicable
Strategist – HV/Digital Asset Strategies	[redacted]
Project Manager	TBC
Design Manager	TBC

Project Details

1. Project Need & Objective

Reliable DC supply systems are critical to maintaining protection and control of HV substations and providing reliable electrical supply. In line with the DC Supplies – Standard *(ASM-SPE-A3369893)* and the Batteries Maintenance – Procedure *(ASM-PRO-A510492)*, it is vital to replace existing systems in the field which have reached the end of their serviceable life.

Given the installed population and expected life of DC systems across Powerlink's transmission network, it is proposed to replace batteries on a needs basis within a specific year. This is intended to result in more cost effective delivery and assist with capitalisation of assets within a given project.

Consequently, the delivery strategy should allow for flexibility in the specific location and quantity of batteries to be replaced within the financial year, such that batteries that require urgent replacement may displace one or more of the priority sites listed in this scope.

The objective of this project is to replace batteries on a needs basis by December 2028, as identified in Appendix A.

2. Project Drawing

Not Applicable

3. Deliverables

The following deliverables must be provided in response to this Project Scope Report:

1. A report (e.g. Concept Estimate Report) detailing the works to be delivered, high level staging, resource requirements and availability, and outage requirements
2. A class 5 estimate (minimum)
3. A basis of estimate document and risk table, detailing the key estimating assumptions and delivery risks, and
4. Outline staging and outage plan.

4. Project Scope

4.1. Original Scope

The following scope presents a functional overview of the desired outcomes of the project. The proposed solution presented in the estimate must be developed with reference to the remaining sections of this Project Scope Report, in particular *Section 7 Special Considerations*.

Briefly, the project consists of replacement of battery cells associated with substation secondary and telecommunications systems on a needs basis identified in Appendix A.

4.1.1. Transmission Line Works

Not Applicable

4.1.2. Substation Works

Design, procure, construct and commission replacement of DC batteries as identified in Appendix A. Within the scope of work:

- Replace batteries on a like-for-like basis;
- ensure that the replaced systems meet Powerlink's standards and requirements;
- update drawing records, SAP records, configuration files, etc. accordingly; and
- decommission, recover and dispose of all redundant equipment in compliance with Powerlink's requirements.

At completion of project, provide a report of the batteries replaced, reconciled against the systems listed in Appendix A.

4.1.3. Telecoms Works

Not applicable

4.1.4. Easement/Land Acquisition & Permits Works

Not applicable

4.2. Key Scope Assumptions

Not applicable

4.3. Variations to Scope (post project approval)

Not applicable

5. Key Asset Risks

Asset risk management shall be in accordance with the Asset Risk Management Process Guideline (A4870713). Need date for each site is listed in the document "DC Systems Replacement – Master list" (A5281528).

6. Project Timing

6.1. Project Approval Date

The anticipated project approval is 30 November 2027.

6.2. Site Access Date

All affected locations are existing operational substation/telecommunication sites; as such, they are immediately accessible.

6.3. Commissioning Date

The latest date for the commissioning of the new assets included in this scope and the decommissioning and removal of redundant assets, where applicable, is 30 December 2028.

7. Special Considerations

The estimate shall be based on the scope of batteries to be replaced per Appendix A.

Battery cell replacement program across multiple sites throughout Powerlink substations and communication sites will be delivered as annual packages of works through the following projects:

- CP.02979 – Battery Cell Replacement – 2024
- CP.02980 – Battery Cell Replacement – 2025
- CP.03043 – Battery Cell Replacement – 2026
- CP.03044 – Battery Cell Replacement – 2027
- CP.03168 – Battery Cell Replacement – 2028
- CP.03169 – Battery Cell Replacement – 2029
- CP.03170 – Battery Cell Replacement – 2030

- CP.03171 – Battery Cell Replacement - 2031

Consideration shall be given to coordinate contractors and resources, where applicable, for these projects to achieve efficient outcome.

8. Asset Management Requirements

Equipment shall be in accordance with Powerlink equipment strategies.

Unless otherwise advised Boon Pang will be the Project Sponsor for this project. The Project Sponsor must be included in any discussions with any other areas of Network and Business Development including Asset Strategies & Planning.

Business Development representative will provide the primary customer interface with customer where relevant. The Project Sponsor should be kept informed of any discussions with the customer.

9. Asset Ownership

The works detailed in this project will be Powerlink Queensland assets.

10. System Operation Issues

Operational issues that should be considered as part of the scope and estimate include:

- interaction of project outage plan with other outage requirements;
- likely impact of project outages upon grid support arrangements; and
- likely impact of project outages upon the optical fibre network.

11. Options

Not Applicable

12. Division of Responsibilities

Not applicable

13. Related Projects

Project No.	Project Description	Planned Comm Date	Comment
Pre-requisite Projects			
Co-requisite Projects			
Other Related Projects			
CP.02977	DC Systems Replacement – 2024 & 2025	June 2025	DTS managed
CP.02978	DC Systems Replacement – 2026 & 2027	June 2027	DTS managed
CP.03174	DC Systems Replacement – 2028 & 2029	Dec 2029	DTS managed
CP.03175	DC Systems Replacement – 2030 & 2031	Dec 2031	DTS managed
CP.03178	DC Systems Replacement – 2032	Dec 2032	DTS managed
CP.02979	Battery Cell Replacement - 2024	Dec 2024	FAM managed
CP.02980	Battery Cell Replacement - 2025	Dec 2025	FAM managed
CP.03043	Battery Cell Replacement - 2026	Dec 2026	FAM managed
CP.03044	Battery Cell Replacement - 2027	Dec 2027	FAM managed
CP.03169	Battery Cell Replacement – 2029	Dec 2029	FAM managed
CP.03170	Battery Cell Replacement – 2030	Dec 2030	FAM managed
CP.03171	Battery Cell Replacement – 2031	Dec 2031	FAM managed

Appendix A –Sites for battery replacement

Replacement of the following identified DC battery system components:

SITE	SITE NAME	FUNCTIONAL LOC.	DESCRIPTION	EQUIPMENT
T054	Barron Gorge	T054-SIN-DCSU-50DCA/20085807	BATTERY BANK 50V 200Ah	20085807
T054	Barron Gorge	T054-SIN-DCSU-50DCB/20085808	BATTERY BANK 50V 200Ah	20085808
H008	Boyne Island	H008-SIN-DCSU-50DCA/20085280	BATTERY BANK 50V 400Ah	20085280
H008	Boyne Island	H008-SIN-DCSU-50DCB/20085281	BATTERY BANK 50V 400Ah	20085281
H030	Callide B PS	H030-SIN-DCSU-50DCA/20085288	BATTERY BANK 50V 400Ah	20085288
H030	Callide B PS	H030-SIN-DCSU-50DCB/20085289	BATTERY BANK 50V 400Ah	20085289
T127	Egans Hill	T127-SIN-DCSU-125DCX/20087900	BATTERY BANK 125V 200Ah	20087900
H004	Mudgeeraba	H004-SIN-DCSU-125DCX/20086097	BATTERY BANK 125V 300Ah	20086097
H004	Mudgeeraba	H004-SIN-DCSU-125DCY/20086098	BATTERY BANK 125V 300Ah	20086098
H004	Mudgeeraba	H004-SIN-DCSU-50DCA/20086094	BATTERY BANK 50V 400Ah	20086094
H004	Mudgeeraba	H004-SIN-DCSU-50DCB/20086095	BATTERY BANK 50V 400Ah	20086095
H035	Strathmore	H035-SIN-DCSU-125DCX9/20087262	BATTERY BANK 125V 300Ah	20087262
H035	Strathmore	H035-SIN-DCSU-125DCY9/20087263	BATTERY BANK 125V 300Ah	20087263
H023	Upper Kedron	H023-SIN-DCSU-125DCX4/20128675	BATTERY BANK 125V 300Ah	20128675
H023	Upper Kedron	H023-SIN-DCSU-125DCY4/20128676	BATTERY BANK 125V 300Ah	20128676
T177	King Creek	T177-SIN-DCSU-125DCX	BATTERY BANK 125V 100Ah (6V Cells)	20124884
T177	King Creek	T177-SIN-DCSU-125DCY	BATTERY BANK 125V 100Ah (6V Cells)	20124885

CP.03168 Battery Cell Replacement - 2028

Concept Estimate

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1. Executive Summary

This concept estimate has been developed based on the CP.03168 Battery Cell Replacement - 2028 Project Scope Report (PSR).

Reliable Direct Current (DC) supply systems are critical to maintaining protection and control of High Voltage (HV) substations and providing reliable electrical supply. In line with the DC Supplies – Standard *(ASM-SPE-A3369893)* and the Batteries Maintenance – Procedure *(ASM-PRO-A510492)*, it is vital to replace existing systems in the field which have reached the end of their serviceable life.

Given the installed population and expected life of DC systems across Powerlink's transmission network, it is proposed to replace batteries on a needs basis within a specific financial year. This is intended to result in more cost-effective delivery and assist with capitalisation of assets within a given project.

There are a total of 9 Systems and 8 Sites under this project.

Following sites are included in the project:

Site	Systems
T054 Barron Gorge	1
H008 Boyne Island	1
H030 Callide B Power Station	1
T127 Egans Hill	1
H004 Mudgeeraba	2
H035 Strathmore	1
H023 Upper Kedron	1
T177 King Creek	1

An assessment of this proposal has established that the project can be delivered by December 2028.

1.1 Project Estimate

No escalation costs have been considered in this estimate.

		Total ($)
Estimate Class	5	
Base Estimate – Un-Escalated (2025/2026)		1,058,305
TOTAL		**1,058,305**

1.2 Project Financial Year Cash Flows

No escalation costs have been considered in this estimate.

DTS Cash Flow Table	Un-Escalated Cost ($)
To June 2028	159,701
To June 2029	898,604
TOTAL	**1,058,305**

2. Project and Site-Specific Information

2.1 Project Dependencies & Interactions

This project is related to the following projects:

Project No.	Project Description	Planned Commissioning Date	Comment
Dependencies			
Interactions			
CP.02813	Telecommunications Network Consolidation RAN4	TBA	Concept Phase SDH and PDH Multiplexer replacement program.
CP.02399	Strathmore 275kV and 132 kV Secondary System Replacement	June 2027	Concept Phase
CP.02729	Mudgeeraba 110kV Secondary System Replacement	May 2030	Mudgeeraba Secondary System Upgrade.
Other Related Projects			
CP.02977	DC Systems Replacement – 2024 & 2025	June 2025	DTS managed
CP.02978	DC Systems Replacement – 2026 & 2027	June 2027	DTS managed
CP.03174	DC Systems Replacement – 2028 & 2029	Dec 2029	DTS managed
CP.03175	DC Systems Replacement – 2030 & 2031	Dec 2031	DTS managed
CP.03178	DC Systems Replacement – 2032	Dec 2032	DTS managed
CP.02979	Battery Cell Replacement - 2024	Dec 2024	FAM managed
CP.02980	Battery Cell Replacement - 2025	Dec 2025	FAM managed
CP.03043	Battery Cell Replacement - 2026	Dec 2026	FAM managed
CP.03044	Battery Cell Replacement - 2027	Dec 2027	FAM managed
CP.03169	Battery Cell Replacement – 2029	Dec 2029	FAM managed
CP.03170	Battery Cell Replacement – 2030	Dec 2030	FAM managed
CP.03171	Battery Cell Replacement – 2031	Dec 2031	FAM managed

2.2 Site Specific Issues

- Replacing DC batteries may expose the network to elevated risk during critical events like bus zone tripping, where DC loads can exceed charger capacity. If replacement timing or readiness is misaligned, the system may lack sufficient discharge support, leading to potential instability.
- Asbestos-containing materials (ACM) has been identified at some of these sites. Appropriate precautions must be taken, including reviewing the site-specific Asbestos Register and Management Plan prior to commencing any work.

- Weather conditions in Queensland may impact site access; monitor forecasts and follow site-specific entry protocols and contingency plans.

3. Project Scope

3.1 Substation Works

Design, procure, construct and commission selective replacement of the DC Battery systems. Refer to table below:

- DC systems to be replaced on a like-for-like basis.
- Replaced systems as per Powerlink' standards and requirements.
- Decommission and recover all redundant equipment.
- Update drawing records, SAP records, config files.

SITE	SITE NAME	FUNCTIONAL LOCATION	DESCRIPTION	BATTERY/ CHARGER
T054	Barron Gorge	T054-SIN-DCSU-50DCA/20085807	BATTERY BANK 50V 200Ah	Battery
T054	Barron Gorge	T054-SIN-DCSU-50DCB/20085808	BATTERY BANK 50V 200Ah	Battery
H008	Boyne Island	H008-SIN-DCSU-50DCA/20085280	BATTERY BANK 50V 400Ah	Battery
H008	Boyne Island	H008-SIN-DCSU-50DCB/20085281	BATTERY BANK 50V 400Ah	Battery
H030	Callide B PS	H030-SIN-DCSU-50DCA/20085288	BATTERY BANK 50V 400Ah	Battery
H030	Callide B PS	H030-SIN-DCSU-50DCB/20085289	BATTERY BANK 50V 400Ah	Battery
T127	Egans Hill	T127-SIN-DCSU-125DCX/20087900	BATTERY BANK 125V 200Ah	Battery
H004	Mudgeeraba	H004-SIN-DCSU-125DCX/20086097	BATTERY BANK 125V 300Ah	Battery
H004	Mudgeeraba	H004-SIN-DCSU-125DCY/20086098	BATTERY BANK 125V 300Ah	Battery
H004	Mudgeeraba	H004-SIN-DCSU-50DCA/20086094	BATTERY BANK 50V 400Ah	Battery
H004	Mudgeeraba	H004-SIN-DCSU-50DCB/20086095	BATTERY BANK 50V 400Ah	Battery
H035	Strathmore	H035-SIN-DCSU-125DCX9/20087262	BATTERY BANK 125V 300Ah	Battery
H035	Strathmore	H035-SIN-DCSU-125DCY9/20087263	BATTERY BANK 125V 300Ah	Battery
H023	Upper Kedron	H023-SIN-DCSU-125DCX4/20128675	BATTERY BANK 125V 300Ah	Battery

SITE	SITE NAME	FUNCTIONAL LOCATION	DESCRIPTION	BATTERY/ CHARGER
H023	Upper Kedron	H023-SIN-DCSU-125DCY4/20128676	BATTERY BANK 125V 300Ah	Battery
T177	King Creek	T177-SIN-DCSU-125DCX	BATTERY BANK 125V 100Ah (6V Cells)	Battery
T177	King Creek	T177-SIN-DCSU-125DCY	BATTERY BANK 125V 100Ah (6V Cells)	Battery

3.2 Major Scope Assumptions

The following key assumptions were made for this Project Estimate.

- The existing temperature control in the building is sufficient.
- Secondary System Outages will be available on request. Please refer to Section 4.2 Network Impacts for further details.
- Field and Asset Management (FAM) resources will be available to complete the works.
- Procurement of DC Battery Systems align with project delivery requirements.

The following assumptions have been made with respect to Secondary Systems design:

- New battery systems will be to the current specifications and design templates.

The following assumptions have been made with respect to Civil design:

- The existing internal substation road is fit for purpose.

3.3 Scope Exclusions

- Removal of any unsuitable material, including asbestos and other contaminants.
- Changes to existing site control systems.
- Existing building structures are suitable for any new loads due to the battery system replacement, therefore structural modifications are excluded from this scope.
- Modification to ventilation of rooms where the batteries are to be installed.
- Any significant rewiring of the existing installation.
- No Restricted Access Zone will be deployed on this site during execution.

4. Project Execution

4.1 Project Schedule

A high-level Project Schedule has been developed for the project stages:

Milestones	High-Level Timing
Request for Class 3 Estimate	July 2027
Class 3 Project Proposal Submission	August 2027
Project *Approval (PAN)* includes funds for design & procurement	September 2027
Execute Delivery	October 2028
FAM Site Works	October 2028 – December 2028
Project Commissioning	December 2028

4.2 Network Impacts

- No HV outages required.

4.3 Resourcing

Resources for the project will be completed by internal design resources with support from external design partners. The construction and commissioning works will be completed by a combination of DC Battery System vendor and Field and Asset Management (FAM).

5. Project Asset Classification

Asset Class	Base ($)	Base (%)
Substation Primary Plant	-	-
Substation Secondary Systems	1,058,305	100
Telecommunications	-	-
Overhead Transmission Line	-	-
TOTAL	**1,058,305**	**100**

6. References

Document name and hyperlink	Version	Date
Project Scope Report	1.0	08/10/2025