2018-22
POWERLINK QUEENSLAND REVENUE PROPOSAL

Project Pack - PUBLIC

CP.02617
Kamerunga Substation Rebuild

Delivering better value

ID&TS – Reset 2017/18-2021/22 Project Proposal for CP.02617 T053 Kamerunga Substation Rebuild

Document Approval		
	Name	Position
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Approved by		Group Manager Infrastructure Delivery

Contents

1. Executive Summary

Kamerunga 132 kV substation was established in 1976 and later extended in response to load growth in the Cairns area. An increase in fault level has exceeded the rating of some of the older plant and lack of manufacturer support is leading to difficulties in ongoing maintenance. Much of the primary plant needs to be replaced.

The existing protection equipment is housed in tunnel-entry panels which have exposed live terminals. The design presents a safety hazard and is not in accordance with current design standards. Further, the secondary systems are based on 5A input and it is recommended that new secondary equipment is installed in a new demountable building.

The additional circuit breakers in the bus coupler and Woree feeder circuits shall improve substation functionality. Kamerunga Substation is located within a flood plain in the wet tropics area and the site is subject to periodic inundation

The objective of the project is to replace Kamerunga substation by establishing a new building with 132kV GIS equipment, control room and associated facilities on the existing site by October 2019.

2. Project Definition

2.1 Project Scope

The project scope consists of the replacement of the inadequately rated primary plant, the installation of additional circuit breakers in the bus coupler and Woree feeder circuits and replacement of the secondary systems at T053 Kamerunga substation.

2.1.1 Transmission Line Works

The project scope shall include the procurement, supply and installation of HV underground cable and cable terminations (one set for each feeder) from transmission line landing spans and transformers to the GIS equipment. The building shall have suitable entry for the HV cable.

2.1.2 T035 Kamerunga Substation Works

The project scope at T035 Kamerunga substation includes full substation replacement with gas insulated switchgear (GIS) equipment using the SDM9 design standard as follows:

- Design, procure and construction or install new substation infrastructure as follows:
  - Combined switchgear/control room building (two story building), inclusive of work shop. The control room shall be air conditioned. The building shall be architectural design and aesthetically suitable to the residential area.
  - An integrated GIS equipment consisting of:
    - 2x 132kV busbars.
    - 4x 132kV feeder breaker bays.
    - 2x 132kV transformer breaker bays.

        - 1x Bus coupler breaker bay.
        - GIS switchboard is to be able to be extended to accommodate a minimum of 2 additional feeder bays.
    - 2x 300kVA station services transformers and associated switchgear, LV cabling to new AC changeover board.
    - new AC changeover and AC distribution boards.
    - new 300kVA diesel generator with associated 7 day run fuel supply.
    - new Dual 125V DC battery banks and charger.
    - new Dual 48V DC battery banks and charger.
    - new DC distribution boards.
- Retain and re-use the existing transformers with the new GIS layout.
- Establish new road to location of new building and upgrade existing substation roadways.
- Establish new secondary systems using SDM9 design standard:
    - 4x 132kV feeder panels.
    - 1x coupler panel
    - 1x network panel
    - 2x bus zone protection panels.
    - 2x 132kV transformer (HV) panels.
    - 2x site infrastructure panels (including station common IED, Eng PC/HMI, WAN routers, 2x gateways, site core switches, firewalls, etc.).
    - 2x meter panels.
    - Opswan cameras and associated infrastructures.
- New telecommunication equipment to the new building.
- Substation Decommissioning Works:
    - The existing 132kV switchyard shall be decommissioned, items removed and disposed in accordance with Powerlink's established policies and procedures.
    - The existing telecommunication and secondary systems shall be decommissioned and removed from the existing building and disposed in accordance with Powerlink's established policies and procedures.
    - The existing building shall be retained and utilised as a facilities building.

2.2 Major Scope Assumptions

The following assumptions and issues are important to consider during the implementation of this project:

- Detailed outage plans are not required to be submitted as part of this reset proposal.
- Proposed arrangement allows for the 2x Smithfield feeder to be installed in the future (not part of this scope).
- Auto reclose shall be modified to accommodate the cable installation.
- Secondary system and telecommunication are suitable for installation adjacent to the GIS equipment.

2.3 Scope Exclusions

The following exclusions are important to consider during the implementation of this project:

- Installation of 2x Smithfield feeder at Kamerunga has been excluded from this scope.
- Replacement or upgrade of 2x power transformers and associated oil separation tank.
- Modification of existing transmission lines and landing spans. Estimate only allows for connection to the existing arrangement.
- Replacement of substation infrastructure, namely fencing, drainage system, etc.
- Any works on Ergon's assets to accommodate the new GIS equipment.

3. Project Execution

3.1 Project Dependencies & Interactions

Project No.	Project Description	Planned Commissioning Date	Comment
Pre-requisite Projects			
	None identified		
Co-requisite Projects			
	None identified		
Other Related Projects			
	None identified		

3.2 Site Specific Issues

The following site specific issues were identified:

- The site area is subject to flooding with depths reaching 1.25m and 1.60m for a 100 and 200 year event respectively.
- Possible noise disturbance and dust pollution issues due to close proximity to residential area.

- Possible traffic management issues due to the influx of heavy vehicles and machineries though the residential streets.
- Kamerunga is a shared site with Ergon and as such a Division of Responsibility needs to be in place before construction works commences on site.

3.3 Project Delivery Strategy

It is expected that the project will be delivered using an individual contract for the GIS equipment and a Substation Panel Contractor (SPA) 'Construct Only' contract. Powerlink is expected to perform the design with the Maintenance Service Provider performing the testing and commissioning.

Project Delivery Strategy Matrix		
Design	Earthworks Design	Powerlink
	Civil Design	Powerlink
	Electrical Design (Primary)	Powerlink
	Electrical Design (Secondary) – Protection	Powerlink
	Electrical Design (Secondary) – Automation	Powerlink
	Transmission Line Design	N/A
	Telecommunication Design	Powerlink
Procurement	GIS Equipment and underground HV Cable	Powerlink
Construction	Earthworks Construction	SPA Contractor
	Civil Construction	SPA Contractor
	Electrical Construction / Installation	SPA Contractor
	GIS Equipment Installation and underground HV Cable Construction	GIS Equipment supplier
	Transmission Line	N/A
Testing	Substation Testing – FAT	MSP
	Substation Testing – SAT	MSP
	Substation Testing – Cut-Over	MSP
	Telecommunication Testing	MSP

3.4 Proposed Sequence of Works

3.4.1 Project Schedule

To meet the required commissioning date of October 2019, full project approval will be required by 1st April 2017.

High Level Schedule

- Project approval : 1st April 2017
- Design : April 2017 - September 2017
- GIS equipment contract tender & award : October 2017 - February 2018
- SPA contract tender & awarded : March 2018 - June 2018
- Staged construction by SPA : July 2018 – December 2018
- GIS equipment installation : January 2019 - March 2019
- Site Testing & integration : April 2019 - June 2019
- Staged test/commissioning : July 2019 – September 2019
- Final decommissioning/tidy up : October 2019
- Project completion : 31st October 2019

3.4.2 Project Staging

Major project stages of the project are considered to be:

Stage	Description/Tasks
1	Rebuild substation including construction of a new building and installation of 132kV GIS equipment bays, 2x 300 kVA station services transformers, AC changeover panel, AC distribution board, diesel generator, 125V DC battery systems, 48V DC battery systems and DC distribution panel. After FAT of new protection and control panels, install panels in new constructed control building including installation of secondary cables.
2	Test and commission 2x 300 kVA station services transformers, AC changeover panel, AC distribution board, diesel generator, 125V DC battery systems, 48V DC battery systems and DC distribution panel.
3	Site integration of new GIS equipment bays for transformer 1, transformer 2, bus section CB, Fdr.7184, Fdr.7143, Fdr.7141 and Fdr.7142.
4	Cut over, test and commission new GIS equipment bays for transformer 1.
5	Cut over, test and commission new GIS equipment bays for transformer 2.
6	Cut over, test and commission new GIS equipment bay for bus section CB.
7	Cut over, test and commission new GIS equipment bay for Fdr.7184.
8	Cut over, test and commission new GIS equipment bay for Fdr.7143.
9	Cut over, test and commission new GIS equipment bay for Fdr.7141.
10	Cut over, test and commission new GIS equipment bay for Fdr.7142.
11	Decommission, remove and dispose of all old bays containing HV plant, HV apparatus and conductors, panels, cubicles, marshalling kiosks, multicore cables, earth grid, foundations and structures as required. Construct new roads as required.

3.4.3 Network Impacts and Outage Planning

Preliminary outage advice from Network Operations has indicated that outages will be available for cutovers during the dry season (from April to September inclusive) as Barron Gorge Power Station is less likely to be generating and loads will be less likely to be an issue. During the outages, the load at T035 Kamerunga will be at risk.

Only one circuit shall be out of service at any time. Each cutover outage shall require a restoration plan.

There are potential impacts on Barron Gorge Power Station and Ergon load/security and more detailed analysis will be required. Agreement from both parties shall be required for the outages.

Outage availability is considered high risk, especially those with long restoration plans.

3.5 Project Health & Safety

The implications of relevant workplace health & safety legislation in delivering the proposed solution have been considered in preparing this estimate. In particular, this estimate includes an allowance for typical safety related activities required in the delivery phase of the project.

3.6 Project Environmental Management

No specific environmental management implications for the delivery of this project have been identified.

4. Project Risk Management

Refer to estimate detail for the Risks that have been included in this estimate.
Refer to the assumptions and exclusion as these items have implications for the overall project risk.

Other major project risk includes the following:

- Procurement lead time to establish contract for the supply, delivery and installation of the GIS equipment.
- Interface between GIS equipment and SDM9 design standards.
- Availability of outages.
- Power Station connection impacts with restriction to the network.
- Inclement weather delaying construction works.

5. Project Estimate

5.1 Estimate Summary

Quote Summary

The quotation at current base level and escalated for completion by 31/10/19 at 4.1% per year, for CP.02617 T053 Kamerunga Substation Rebuild GIS is as follows:

CP.02350 Quotation in $ AUD	Base Levels	Escalated to Compln.	Comment (Costs @ Base Levels)
Line Works	[redacted]	[redacted]	Undergound Cable and Transition Stuctures for 4 x 132kV feeder bays and 2 x 132kV Transformer bays
T053 Kamerunga 132kV Works	[redacted]	[redacted]	Replace 132kV AIS substation with indoor GIS for 4 x Feeder, 2 x Transformer bays and 1 bus coupler in new 2 storey building. Provide new SDM9 Secondary Systems in new building
H054 Barron Gorge Works	[redacted]	[redacted]	Secondary System Changes at remote end for 2x 132kV feeders
H039 Woree Works	[redacted]	[redacted]	Secondary System Changes at remote end for 2x 132kV feeders
Telecommunications	[redacted]	[redacted]	New Telecommunications in New Building
Wet Weather Allowance & Design Coordination	[redacted]	[redacted]	
Project Management	[redacted]	[redacted]	
Qleave	[redacted]	[redacted]	
Other Costs	[redacted]	[redacted]	Project Concept/ Investment & Plan, Net Ops & EMS
TOTAL QUOTE (EXCL RISKS AND OFFSETS)	**21,482,967**	**24,329,177**	
Offsets Estimate	**0**	**0**	
TOTAL QUOTE (INCL OFFSETS)	**21,482,967**	**24,329,177**	
Climate	[redacted]	[redacted]	
Construction	[redacted]	[redacted]	
Design	[redacted]	[redacted]	
Risk Estimate	[redacted]	[redacted]	
TOTAL QUOTE (INCL RISKS AND OFFSETS)	**22,772,967**	**25,619,177**	

5.2 Asset Disposal Table

The current net book value of assets to be disposed as a result of this project is set out in the table below.

CP.02617 Asset Disposal Table. Values current at 30th June 2016

Functional Loc.	Description	Asset	Subnumbe	Book val.	% Disposal	Disposal Value	Currency
T053-D01-441-	132kV 1 TRANSF BAY	106175	0	229,381.50	50%	$ 114,690.75	AUD
T053-D02-442-	132kV 2 TRANSF BAY	106177	0	354,197.69	50%	$ 177,098.85	AUD
T053-D03-7142	7142 FEEDER BAY	106179	0	9,334.46	100%	$ 9,334.46	AUD
T053-D04-7141	7141 FEEDER BAY	106181	0	41,918.25	100%	$ 41,918.25	AUD
T053-D06-7184	7184 FEEDER BAY	106183	0	90,520.49	100%	$ 90,520.49	AUD
T053-D07-411-	132kV A-B BUS SECTION BAY	106185	0	4,531.75	100%	$ 4,531.75	AUD
T053-D08-7143	7143 FEEDER BAY	106186	0	89,124.07	100%	$ 89,124.07	AUD
T053-SIN	SITE INFRASTRUCTURE	106192	0	535,416.22	50%	$ 267,708.11	AUD
T053-SSS-441-	132kV 1 TRANSF BAY	106176	0	40,772.87	100%	$ 40,772.87	AUD
T053-SSS-442-	132kV 2 TRANSF BAY	106178	0	51,181.44	100%	$ 51,181.44	AUD
T053-SSS-7141	7141 FEEDER BAY	106182	0	22,089.05	100%	$ 22,089.05	AUD
T053-SSS-7142	7142 FEEDER BAY	106180	0	0.01	100%	$ 0.01	AUD
T053-SSS-7143	7143 FEEDER BAY	106187	0	158,381.89	100%	$ 158,381.89	AUD
T053-SSS-7184	7184 FEEDER BAY	106184	0	158,381.93	100%	$ 158,381.93	AUD
T053-SSS-METR-REVMET1	TRANSF 1 ENERGY METERING (REVENUE)	106193	0	22,858.45	100%	$ 22,858.45	AUD
T053-SSS-METR-REVMET3	F7143 ENERGY METERING (REVENUE)	106194	0	22,834.25	100%	$ 22,834.25	AUD
T053-SSS-METR-REVMET4	F7184 ENERGY METERING (REVENUE)	106195	0	22,858.34	100%	$ 22,858.34	AUD
T053-SSS-METR-REVMET5	TRANSF 2 ENERGY METERING (REVENUE)	106196	0	22,858.34	100%	$ 22,858.34	AUD
T053-SSS-NBAY	NON BAY	106197	0	245,250.04	100%	$ 245,250.04	AUD
					Total	$ 1,562,393.34	AUD

6. References

Document name and hyperlink (as entered into Objective)	Version	Date
Project Scope Report	1	June 2015
Estimate Detail	1	15/09/2015