2018-22
POWERLINK QUEENSLAND REVENUE PROPOSAL

Project Pack - PUBLIC

CP.01666
Dysart Substation Rebuild

Delivering better value

ID&TS – Reset 2017/18-2021/22 Project Proposal for CP.01666 Dysart Substation Replacement

Document Approval		
	Name	Position
Prepared by		Project Manager
Reviewed by		Manager Projects
Approved by		Group Manager Infrastructure Delivery

Contents

1. Executive Summary

Dysart substation is situated approximately 70 KM north of Lilyvale and is a major 132kV site in Central Queensland, the substation was originally constructed in 1974 and augmented in the 1980's, in 2011 with the addition of the F7383 Eagle Downs Mine feeder and again in 2013 with the installation of 2 x 132kV 25/50MVar capacitor banks. Dysart substation supplies the local Dysart area via Ergon Energy's 22kV reticulation and also provides Static VAr Compensation for QR Aurizon Rail supply network in the area. The SVC was installed in 1986 and the replacement of the secondary system associated with the SVC was undertaken in project CP.00752 and completed in 2008.

The original substation plant is now over 38 years of age, the circuit breakers have an inadequate short line fault rating and the manufacturers no-longer provide support for this type of equipment, spares holdings are limited.

The objective of this project is to replace selected equipment at T035 Dysart Substation in situ using AIS plant and equipment by October 2019.

2. Project Definition

2.1 Project Scope

Briefly, the project consists of the in-situ replacement of selected substation primary plant and secondary systems. The replacement of the SVC, feeder bay F7383, bus coupler bay and the two new capacitor banks and associated bus does not form part of the scope of work. The replacement of the power transformers and the transformer bay primary plant is also excluded from the scope of work and will be undertaken under a separate project.

2.1.1 Transmission Line Works

Design, procure, construct and commission modified transmission line entries suitable for the revised Substation layout:

- Modify 2 feeder line entries for feeder F7150 and feeder F7124
- Modify 1 line entry for Dysart SVC bay connection.

2.1.2 T035 Dysart Substation Works

Design, procure, construct and commission the in-situ rebuild of T035 Dysart Substation:

- Upgrade substation roadways including associated drainage to current Powerlink standards;
- Replace existing strain poles and beams;
- Upgrade existing lightning protection including poles and OHEW;
- Establish new demountable control building and a separate telecommunications infrastructure building;
- Replace 132kV Busbar including structures, insulators, & foundations;

- Replace 2 x 132kV Transformer bays (Secondary);
- Replace 2 x 132kV Feeder Bays, F7124 & F7150 (Primary and Secondary);
- Replace 1 x 132kV Feeder bay SVC (Primary and Secondary);
- Upgrade existing earth grid to accommodate for a fault level for 2 x 100MVA transformers to be replaced under a concurrent project;
- Replace existing substation fence;
- Establish 2 x 300kVA tertiary supplied station services 19.1/11kV/433V transformers;
- Decommission & recover all redundant 132kV plant and equipment;
- Replace existing 1 x 125V DC Battery bank and 125V DC charger with dual 125V DC battery banks and associated battery chargers;
- Establish 2 site infrastructure panels (including Station Common IED, Eng PC/HMI, WAN Routers, 2 Gateways, Site Core Switches, Firewalls);
- Establish Full OpsWAN system and control including suitably mounted OpsWAN cameras and camera poles; and
- Replace existing customer metering with new Type 2 Meters and 2 x metering panels.

2.2 Major Scope Assumptions

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

- 132kV primary plant for transformer bays for Tx1 & Tx2 are being replaced under CP.02463 Dysart Transformer Replacement project. The secondary system replacement work is part of the scope of work;
- The replacement of feeder bay F7383 does not form part of the scope of work. This is a new SDM8 bay constructed as part of project CP.01490 Eagle Downs Mine Connection;
- It is assumed that the bays will be replaced to the existing standards on site (SDM8) and will not be upgraded to SDM9. This is mainly due to the fact that the bus coupler bay, capacitor bank bays and F7383 bay are relatively new and do not require replacement. The secondary panels not being replaced will remain in the existing control building;
- The upgrade of the oil separation tank will be performed under the CP.02473 Dysart Transformer Replacement project;
- New transformer pads and transformer bays can be constructed offset from existing bays to minimise outage times. Initial investigation have shown that there is sufficient space within the existing security fence for future TF1 & TF2 replacement provided the Ergon 22kV infrastructure can be relocated. If the Ergon 22kV asset can not be relocated an alternative would be to extend the substation fence/boundary and construct the new transformer in the future transformer 3 location shown in the ultimate substation general arrangement. The extension of the substation fence/boundary would incur additional cost and time;

- A new SVC bay can be constructed in a spare bay to reduce outage durations. The SVC can then be cutover to the new bay after it is constructed and tested. Initial investigations indicate that there is space in the old bus coupler bay for a new SVC bay;

- The 22kV Ergon infrastructure can be relocated in time to allow the new transformer bays to be constructed immediately adjacent the existing transformers. No cost have been allowed for the relocation of the Ergon 22kV equipment as this is assumed to be Ergon work. Detailed consultation should occur with Ergon Energy as early as practical;

- Any existing assets to be removed and disposed of as part of this scope are identified within the estimate together with the forecast asset residual value at the time of disposal;

- Plant and equipment identified as suitable to be recovered for use as spares or returned to stores should be packaged and transported to an appropriate storage location, with a suitable allowance for the cost included in the estimate; and

- The project implementation can be performed as per the high level staging included in this document. Outage requirements are based on high level advice from Network Operations and outage plans have not been submitted as part of this estimate. Detailed outage plans will need to be prepared and submitted at the project proposal stage to confirm the detailed outage requirements and availability.

2.3 Scope Exclusions

The following items are excluded from the scope of work:

- Relocation of, or modifications to, the Ergon 22kV distribution source. It is assumed that this work will be performed and paid for by Ergon;

- Replacement of primary plant for 132kV transformer bays Tx1 & Tx2 as these are being replaced under CP.02463 Dysart Transformer Replacement project;

- Extension of the existing platform;

- Work on feeder bay F7383, 2 x capacitor bank bays or the bus coupler bay;

- Construction of a new workshop and amenities building; and

- Upgrade of the Oil separation tank capacity for 2 x 100 MVA transformers.

3. Project Execution

3.1 Project Dependencies & Interactions

Project No.	Project Description	Planned Comm Date	Comment
Pre-requisite Projects			

	Ergon Relocation of 22kV assets	May 2018	Ergon 22kV assets need to be relocated prior to construction of the new TF bays.
Co-requisite Projects			
CP.02463	Dysart 132/66kV Transformer Replacement	Oct 2019	CP.02463 includes the replacement of the primary plant for the two transformer bays. Should CP.02463 not proceed it is expected that the TF bay primary plant replacement would need to be included in the CP.01666 scope of work.
Other Related Projects			

3.2 Site Specific Issues

Ground conditions: No identified concerns.

Location: Remote location adjacent to Dysart in a rural area with no major environmental or cultural heritage issues. As the site is in North Queensland the wet season period of December to March should be avoided.

Resource availability: It is anticipated that the Maintenance Service Provider (MSP) (Ergon) and specialist transformer contractor resources would be utilised for this project.

Existing infrastructure: Dysart Substation is a well developed site. No expansion of the existing site infrastructure is required for this project however some infrastructure will be replaced as part of the scope of work.

3.3 Project Delivery Strategy

It is expected that the project will be constructed using a Substation Panel Contractor under a 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	Powerlink
	Telecommunication Design	Powerlink
Construction	Earthworks Construction	SPA Contractor
	Civil Construction	SPA Contractor
	Electrical Construction / Installation	SPA Contractor
	Transmission Line Construction	Powerlink
Testing	Substation Testing – FAT	SPA Contractor
	Substation Testing – SAT	Ergon Energy
	Substation Testing – Cut-Over	Ergon Energy
	Telecommunication Testing	Ergon Energy

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 October 2017.

High Level Schedule

- Ergon Notification : June 2016
- Project Approval : 1st October 2017
- Design Complete : March 2018
- SPA Construct contract awarded : May 2018
- Staged bay construction : June 2018 – August 2019
- Staged bay test/commissioning : August 2018 – Sept 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	Relocate Ergon 22kV infrastructure (Ergon work).
2	Construct the new SVC Bay in the old coupler bay on TF side of the existing F7150 bay. Construct new F7124 Bay opposite existing SVC bay (potential clearance issues with SVC overhead conductors may require new F7124 bay to be constructed as part of a later stage).
4	Test and Commission relocated SVC bay
5	Construct new F7150 bay in old SVC bay (Construct new F7124 in bay opposite new F7150 bay).
6	Test and Commission relocated F7150 in new location
9	Test and Commission new F7124 Bay (include construction of new F7124 bay in this stage if clearance issues prevent it being constructed as part of Stage 1).
10	Upgrade remaining bus

Note: Additional stages may be required following detailed planning.

3.4.3 Network Impacts and Outage Planning

There are significant outage constraints at this site. Preliminary outage advice from Network Operations has indicated that long duration outages (or outages with a long return to service time) will not be available due to load/security of supply impacts on mine customers, rail customers and Ergon load. It is recommended that TF1, TF2, the SVC bay and the F7150 bay are not rebuilt in their current location as the required outages are unlikely to be granted and/or there would be very significant contingency plan cost associated with them.

In order to overcome the outage constraints the construction staging has been developed based on the new transformer bays being constructed adjacent the existing bays. A spare bay (old coupler bay) can be utilised for the construction of the new SVC bay. The SVC can then be cutover/relocated (shorter duration outage) into this new/spare bay. The old SVC bay will then become free to be removed and rebuilt for the new F7150 bay. The F7124 bay can be constructed in the spare bay opposite the new F7150 bay. Once the new bays are constructed the F7150 feeder and F7124 feeder can be cutover into their new locations resulting in significantly reduced outage durations.

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. The 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

The 22kV Ergon infrastructure needs to be relocated to allow the new transformer bays to be constructed immediately adjacent the existing transformers. No cost have been allowed for the relocation of the Ergon 22kV equipment as this is assumed to be Ergon work. Detailed consultation should occur with Ergon Energy as early as practical to ensure that this work occurs prior to the commencement of site work for CP.01666.

A high level risk analysis has been performed and some cost for risks have been included in the estimate. Please refer to the estimate details of the risks that have been included.

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.01666 Dysart Substation Replacement is as follows:

CP.01666 Quotation in $ AUD	Base Levels	Escalated to Compln.	Comment (Costs @ Base Levels)
Line Works	[redacted]	[redacted]	Modify Line entries for 2 feeders and 1 SVC.
T035 Dysart Substation	[redacted]	[redacted]	Replace substation primary plant with deadtanks and secondary systems in-situ including transformer panels but excluding SVC, power transformers & primary transformer bays.
Telecommunications	[redacted]	[redacted]	Provide new telecommunications equipment in new building
Project Management	[redacted]	[redacted]	
Qleave	[redacted]	[redacted]	
Other Costs			
TOTAL QUOTE (EXCL RISKS AND OFFSETS)	**10,389,373**	**11,710,510**	
Offsets Estimate	**0**	**0**	
TOTAL QUOTE (INCL OFFSETS)	**10,389,373**	**11,710,510**	
Climate	[redacted]		
Construction			
Design			
Risk Estimate			
TOTAL QUOTE (INCL RISKS AND OFFSETS)	**11,089,373**	**12,410,510**	

Please follow the link in the table in Section 6 References for the Estimate Detail.

5.2 Asset Disposal Table

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

CP.01666 Asset Disposal Table. Values Current at 30th June 2016

Functional Loc.	Description	Asset	Subnumber	Book val.	% Disposal	Disposal Value	Currency
T035-D04-7124	7124 FEEDER BAY	105851	0	98,317.95	100%	$ 98,317.95	AUD
T035-D04-7150	7150 FEEDER BAY	105852	0	98,317.95	100%	$ 98,317.95	AUD
T035-D05-481-	132kV 1 STATIC COMPENSATOR BAY	105855	0	101,594.38	100%	$ 101,594.38	AUD
T035-SIN	SUBSTATION INFRASTRUCTURE	105864	0	612,554.50	50%	$ 306,277.25	AUD
T035-SSS-441-	132kV 1 TRANSF BAY	105850	0	10,984.54	100%	$ 10,984.54	AUD
T035-SSS-442-	132kV 2 TRANSF BAY	105847	0	22,069.47	100%	$ 22,069.47	AUD
T035-SSS-481-	132kV 1 STATIC COMPENSATOR BAY	105856	0	103,214.76	100%	$ 103,214.76	AUD
T035-SSS-7124	7124 FEEDER BAY	105853	0	4,401.65	100%	$ 4,401.65	AUD
T035-SSS-7150	7150 FEEDER BAY	105854	0	22,504.36	100%	$ 22,504.36	AUD
T035-SSS-METR-REVMET1	TRANSF 1 22KV ENERGY METERING (REVENUE)	104000	0	11,477.98	100%	$ 11,477.98	AUD
T035-SSS-METR-REVMET2	TRANSF 1 66KV ENERGY METERING (REVENUE)	104001	0	11,565.64	100%	$ 11,565.64	AUD
T035-SSS-METR-REVMET3	TRANSF 2 22KV ENERGY METERING (REVENUE)	104002	0	11,565.64	100%	$ 11,565.64	AUD
T035-SSS-METR-REVMET4	TRANSF 2 66KV ENERGY METERING (REVENUE)	104003	0	11,565.64	100%	$ 11,565.64	AUD
					Total	$ 813,857.21	AUD

NOTE: The Substation Infrastructure asset 105864-0 has been identified to have 50% written off to reflect the replacement and upgrading of, the earth grid, lightning protection, substation fence and battery banks under this project. The 50% that is to remain is to reflect the value that has been added to the asset from projects over the last 10 years which is still valid.

6. References

Document name and hyperlink (as entered into Objective)	Version	Date
Project Scope Report	1.0	July 2015
Estimate Detail	3.0	August 2015
CP.01666 Dysart Sub Replacement Proposed New Bay Locations	1.0	July 2015