2023-27
POWERLINK QUEENSLAND REVENUE PROPOSAL

Project Pack – PUBLIC

CP.02771, CP.02811, CP.02812, CP.02813
Telecommunication Network Consolidation

CP.02771, CP.02811-2813 – Telecommunications Network Consolidation

Project Status: Not Approved

1. Network Requirement

Powerlink owns and maintains its own private telecommunications network for the monitoring, control and operation of the High Voltage network. Synchronous Digital Hierarchy (SDH), Plesiochronous Digital Hierarchy (PDH) and Multiprotocol Label Switching (MPLS) networks currently enable data communications between Powerlink substations, corporate head office and the Business Continuity Centre (BCS). These networks support real time and business support services such as supervisory control and data acquisition (SCADA), protection, remote monitoring and voice services.

Clause 4.11.2 of the National Electricity Rules (NER) requires a Network Service Provider to provide the necessary primary communications facilities for control, operational metering and indication from the relevant local sites. As the telecommunications network also provides protection signalling services, it is also required to ensure the correct and compliant operation of protection equipment on the transmission network, as detailed in Schedule 5.1.9 of the NER.

Equipment associated with these networks will reach the end of their manufacture and support dates between 2022 and 2029. After this period equipment will become obsolete with no support from the manufacturer and limited spares available. Beyond their nominal service life and manufacturing support period, telecommunications systems suffer increased failure rates which could limit Powerlink's ability to effectively remotely monitor and maintain the network. Increasing failure rates, along with the increased time to rectify the telecommunications connections due to equipment obsolescence, significantly affects the availability and reliability of these systems. We therefore need to address this emerging risk to ensure ongoing compliance with clause 4.11.2 and Schedule 5.1.9(c) of the NER.

2. Recommended Option

As this project is currently 'Not Approved'.

The current recommended option is to replace current SDH, MPLS and PDH equipment with a single consolidated device to provide Time Division Multiplexing (TDM) and Internet Protocol (IP) transport and interface requirements. This program of works is planned for delivery in four stages:

- Stage 1 – first Regional Access Network
- Stage 2 – North Queensland Regional Access Networks
- Stage 3 – Central Queensland Regional Access Networks
- Stage 4 – Southern Queensland Regional Access Networks

This recommended option is based on the outcomes of a Registration of Interest issued to the market to understand available technologies which could; reduce the number of equipment vendors and models, support legacy devices that rely on older technology, provide future support to IP, and reduce reliance on TDM via a migration to IP where possible.

The following options were considered but not proposed:

- Do Nothing – rejected due to non-compliance with compliance obligations.

The recommended option will extend the asset life by 15 years[3].

3. Cost and Timing

The estimated cost to replace SDH, MPLS and PDH equipment and target commissioning date per stage is outlined in Table 1.

Table 1: Cost and timing of replacement of SDH, MPLS and PDF equipment

Stage	Estimated replacement cost	Target commissioning date
Stage 1	7.3m ($2019/20)[3]	October 2023[3]
Stage 2	22.4m ($2019/20)[5]	June 2026[5]
Stage 3	12.4m ($2019/20)[7]	June 2026[7]
Stage 4	18.5m ($2019/20)[9]	June 2027[9]

4. Documents in CP.02771, CP.02811-2813 Project Pack

Public Documents

1. Horizon – A 10 year plan for telecommunications
2. Project Scope Report CP.02771 Telecommunication Network Consolidation – Stage 1
3. Concept Estimate for CP.02771 – Telecommunication Network Consolidation Stage 1
4. Project Scope Report CP.02811 Telecommunications and Digital Network Consolidation Stage 2
5. Concept Estimate for CP.02811 – Telecoms and Digital Network Consolidation Stage 2
6. Project Scope Report CP.02812 Telecommunications and Digital Network Consolidation Stage 3
7. Concept Estimate for CP.02812 – Telecoms and Digital Network Consolidation Stage 3
8. Project Scope Report CP.02813 Telecommunications and Digital Network Consolidation Stage 4
9. Concept Estimate for CP.02813 – Telecoms and Digital Network Consolidation Stage 4

Supporting Documents

10. Asset Reinvestment Criteria - Framework
11. Asset Management Plan 2021

Technology and Planning

Digital Asset Strategies

Horizon -
A 10 year plan of telecommunications

Prepared by: [redacted]

November 2018

Table of Contents

1. Executive Summary

This document outlines a proposal to transition to a more flexible and consolidated telecommunications network. It focuses on the reduction of telecommunications equipment types whilst retaining support for legacy requirements and providing the functionality of a more IP based network.

In addition to reducing equipment types it is intended to re-architect the telecommunications network through the creation of independent regional access networks (RAN) supported by a common core network, as depicted below in figure 1. This is complemented by a delivery strategy that provides Powerlink greater control over mid to long term resource requirements and a known spend profile. The concept of a vendor health check is also introduced, and when coupled with the new architecture and delivery strategy, as shown in figure 2, minimises obsolescence risk and provides Powerlink with increased influence over vendor performance.

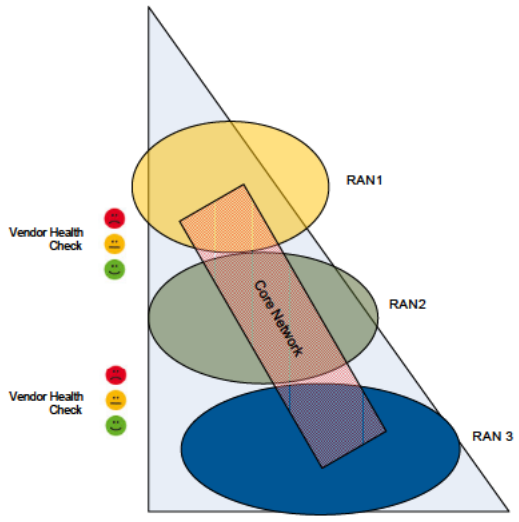

Figure 1

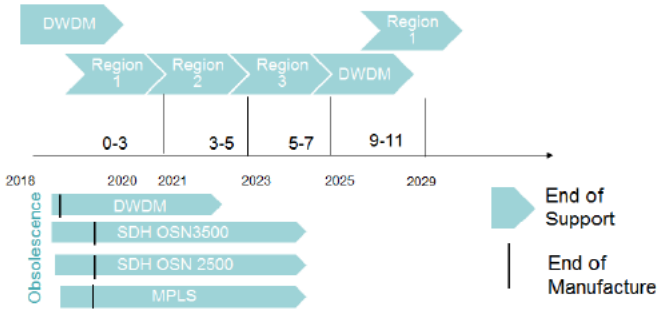

Figure 2

It is anticipated that by adopting this strategy the following benefits can be gained in the medium to long term:

- Reduced lifecycle cost for the telecommunications network
- Reduced risk from obsolescence
- More flexible deployment methodology

- Greater ability to stay current with emerging trends or requirements
- Known spend profiles over long-term
- Known resource requirements over long-term
- Easier migration path to an IP network
- Increased influence over equipment vendors

2. Background

Powerlink owns and maintains its own private telecommunications network for the monitoring, control and operation of the High Voltage network. The telecommunications network has developed over time to meet the changing needs of the secondary and primary systems.

Whilst HV network technologies have changed at a relatively modest pace, the method of transmitting telecommunications and changes in telecommunications technology have progressed at a rapid rate. This divergence poses significant challenges to Powerlink whereby ever-changing telecommunications driven by external influences must support a network based on industry specific requirements and protocols.

With the exception of the recently deployed MPLS equipment which uses IP as its transfer protocol, the remaining technologies are based on Time Division Multiplexing (TDM). Time Division Multiplexing is essentially the means whereby multiple signals are combined and carried over a single, dedicated, communications channel and has traditionally been the method by which telecommunication service providers provisioned voice services. However, the telecoms industry has undergone dramatic changes from a voice only platform to a multi service platform where voice now only comprises a small part of a service provider's portfolio. As consumers move from "ear" to "eye", i.e. from a pure voice requirement to more visual data consumption demand, the technology platforms have had to adjust accordingly.

This has a spiralling effect on telecommunications expectations. As service providers look to provide more features to remain competitive, the investment in legacy technology becomes less, resulting in reduced incentive on manufacturers to continue to support or produce equipment where there is no future need. This has led to the gradual phasing out of TDM technology as the preferred method of providing services, with IP based networking being more suited to consumer-based data usage. It should also be noted that with advances in mobile/cellular technology and the advent of 5G, there will be a greater focus on equipment that

supports non-wired forms of telecommunications with the capability to transmit large amounts of data.

Powerlink remains heavily reliant on TDM based functionality to support the operation of the HV network and whilst this is manageable in the short to medium term it is not sustainable. It is important to position ourselves for the future.

This 10 year plan, *horizon*, is broken down into 3 sections and is aimed to provide a reliable and robust network whilst migrating away from legacy technologies and protocols in the face of the changing telecommunications landscape.

The 3 sections are :-

fusion : discusses current and future network architecture based on convergence of equipment allowing migration to an IP network

synthesis : outlines an approach that combines independent access networks supported by a core to provide a flexible connected network

odyssey : details the course required to achieve the principles of horizon

3. *fusion* – Consolidated network

Powerlink's telecommunications network contains differing technologies and sub-networks that whilst providing discrete functionality, comprise the network as a whole.

The following diagram, figure 3, conceptually shows the interconnectivity of these devices in relation to their role in the network

Figure 3. Current architecture

3.1 Architecture – current state

DWDM

The DWDM network was installed 2009 and has been augmented over time to provide a fully redundant network. Its prime operational use is to provide high capacity transmission between the regions and Virginia and the Business Continuity Site. Spare capacity on this network has been provided to 3rd parties under commercial and operational agreements.

The equipment, based on [redacted], ceased being manufactured in 2015 and is currently under a limited support agreement until July 2022.

SDH

The existing SDH network was installed between 2009 and 2015 to replace obsolete Nokia and Marconi equipment. The network, wholly comprised of the [redacted] series of equipment, provides inter-substation transmission and has varying end of manufacturing (EoM) dates with end of support (EoS) for some devices as early as December 2024.

PDH

The prime use of PDH equipment is to provide the telecommunications interface to substation IEDs. The vast majority of PDH equipment is based on the [redacted] which became unsupported in 2013. [redacted] is now used which is compatible with the [redacted] and has ongoing support.

MPLS

[redacted], based on the [redacted], has been installed in the Powerlink network since 2014 to provide IP connectivity for operational services and to lessen reliance on PDH equipment. Whilst the main deployment of equipment was installed under CP.02098, the equipment has also been installed where IP connectivity to a substation is required. The AR series of routers utilised in the network has an end of support date of December 2024.

A summary of the equipment and supportability is provided in the tables below

Technology/Network	Connectivity	Function	Transmission Type
DWDM	Inter Region	High capacity transport between regions	Wavelength TDM/IP
SDH	Inter Substation	Medium/High capacity transport between substations	TDM
PDH	Intra/Inter Substation	Low capacity interface to substation IED's	TDM
MPLS	Inter/Intra Substation	Medium capacity interface to substation IED's and some transport between substations	IP

Manufacturer	Equipment	Functionality	Count	End of Manufacture	End of Support
[redacted]	[redacted]	SDH	146	31-Dec-19	31-Dec-24
	[redacted]	SDH	62	31-Dec-21	31-Dec-27
	[redacted]	SDH	12	31-Dec-24	31-Dec-29
	[redacted]	SDH	3	31-Dec-24	31-Dec-29
	[redacted]	DWDM	106	31-Dec-15	30-Jun-22
	[redacted]	MPLS	154	31-Dec-19	31-Dec-24
[redacted]	[redacted]	PDH	878	2013	2013
[redacted]	[redacted]	PDH	36	TBA	TBA

The end of manufacture (EoM) date is the date by which the equipment will no longer be manufactured by the vendor and at which point Powerlink will enter into a support mode. A replace on fail provision will be in effect until the end of support date.

Taking these factors into account, it can be seen that the critical elements that need to be addressed in the short to medium term are the [redacted] and [redacted] SDH equipment, the [redacted] MPLs equipment and the Huawei [redacted] DWDM equipment.

3.2 Consolidated telecommunications ROI

With different equipment either at or approaching end of life in a similar timeframe it gives Powerlink an opportunity to revisit the network architecture from a functional, cost and management perspective. In order to determine the future strategy a Registration of Interest (ROI) was issued for the consolidation of telecommunications equipment.

The ROI was focused on reducing the number of equipment types with particular focus on

- Reducing the number of equipment vendors and models;
- Supporting legacy devices that rely on older technology;
- Providing future support for IP; and
- Reducing the reliance on TDM via migration to IP where possible

The intent of the ROI was to complete a market scan of the technologies available so that a fully considered approach could be taken to determine the future strategy. To ensure sufficient responses the ROI did not specify a particular technology but was left open to the respondents to provide a solution based on their capabilities.

Nine responses to the ROI were received with 12 solutions offered, i.e. some vendors offered more than one proposal. These ranged from –

- Pure IP technology
- Pure IP over Optical Transmission Network
- Pure TDM
- Hybrid IP and TDM technology

Whilst all had merits –

- A pure IP platform, though technically achievable, has not as yet satisfactorily proven itself capable of meeting the stringent requirements of protection circuits required for the safe and reliable operation of the HV network

- A pure TDM will meet our current needs but significantly reduces our capability moving forward as more telecommunication services become IP based.
- A hybrid IP and TDM equipment type will support our current needs, meet our future requirements, reduce equipment types and allow a controlled migration from TDM to IP. However, by trying to achieve all functionality in a single piece of equipment there is a trade off in overall capability. The hybrid equipment is limited in its ability to support transmission distances for future capacity requirements.

3.3 Architecture Future State

With the ROI determining a number of feasible solutions are available, it is proposed that Powerlink consolidates its networks to realise benefits while providing similar or improved functionality

A conceptual architecture is outlined below:

Hybrid multiplexors will replace the functionality of SDH, PDH and MPLS into one device, thereby reducing the amount of equipment. DWDM is provided to transmit over longer distances, meet growing capacity requirements and to improve flexibility by using a regionalised segmented network.

4. synthesis - Regionalised Access Network

Whilst the previous sections focused on technology and functionality the concurrent timing of obsolescence in multiple systems also provides a unique opportunity to consider the state-wide architecture of the telecommunications network.

Currently the network, at a high level, can be conceptualised as comprising of two networks.

1) The access network (SDH, PDH and MPLS) that provides connectivity to and between substations and;
2) The core network (DWDM) that provides higher capacity and spans longer transmission between the regions and Virginia and the Business Continuity Site.

The DWDM, SDH and MPLS equipment are currently supplied by one vendor and this is simplified in the graphic below,

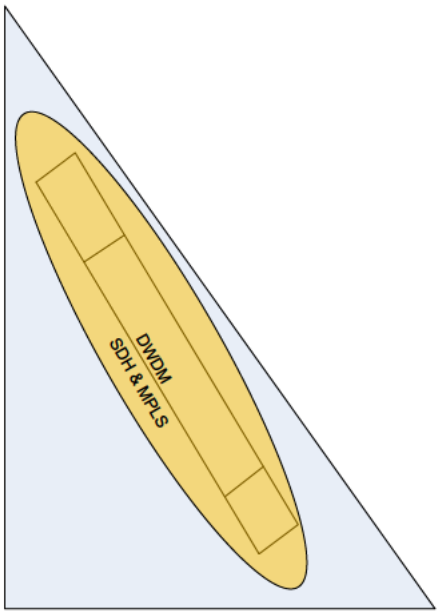

Figure 5 Current DWDM, SDH and MPLS network

The DWDM deployed circa 2008 was introduced to overcome capacity and transmission limitations of the SDH network in place at the time. In 2009 a series of projects was raised to refresh the SDH with a single vendor solution starting in the north of the state and progressively working south. The SDH projects took 6 years to complete and it is envisaged that a complete network refresh on the same scale will take a similar timeframe.

Whilst having a single vendor solution implemented as a complete network refresh has its advantages, such as

- A single management platform.
- A single set of equipment spares.
- A single vendor to manage.

It also poses some significant issues, namely –

- The last equipment installed is already 6 years further into the manufacturer lifecycle than that installed first
- The last equipment installed, whist relatively new has the same obsolescence issues as those installed first
- A subset of the equipment, i.e. card, that becomes unsupported during the lifecycle affects the whole base of installed equipment across the state
- Any vendor issues (such as bugs or defective batches of components) affect the entire fleet of equipment, making them high impact and extremely costly to resolve.
- It locks Powerlink into a single vendor type restricting functionality to that manufacturer's device
- It limits incentive on the manufacturer to provide better support or pricing as they have a monopoly

And these impact Powerlinks abilities to derive the most value from its assets.

To address these issues, it is proposed to introduce segmented regionalised access networks (RAN) supported by a high capacity common, core network, conceptualised as follows.

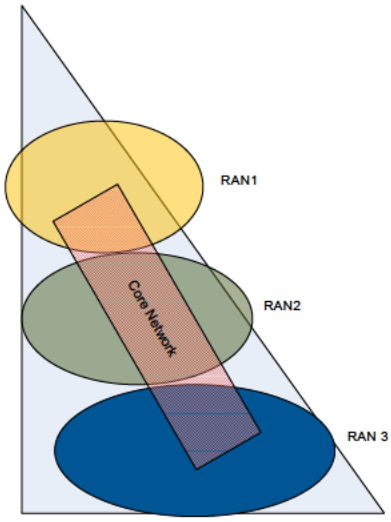

Figure 6 RAN's supported by core network

In this instance the core network (DWDM) provides high capacity over long transmission distances improving flexibility, and allowing access networks to be compartmentalised in regions. These RANs interface at strategic points on the core network where the telecommunications traffic is then transported directly to Virginia and the Business Continuity Site creating completely independent networks. 3 RANs are shown for illustrative purposes but this may increase depending on detailed design

In deploying this architecture a gated approach is recommended where, instead of continuing to deploy equipment that was installed in a previous RAN, a review of the vendor/equipment is conducted to evaluate the suitability, performance, support etc. If acceptable, a negotiated equipment support of 10 years could be agreed for the RAN thus providing Powerlink with surety of manufacture and support. This approach would then be applied to subsequent RANs, negating a whole of network obsolescence. The approach allows Powerlink to change its equipment strategy should new information become available on requirements for the new RAN or performance of earlier RANs.

The advantages are;

- Short regional deployment timeframes - as RANs are independent of each other the whole network does not have to be built at once
- Any vendor issues (such as bugs or defective batches of components) affect the entire fleet of equipment, making them high impact and extremely costly to resolve.
- Regions can operate independently reducing operational risk – an issue in one RAN need not affect any of the others
- Greater influence over vendors by applying a gated approach - a greater onus is on the vendor to provide support if the deployment of their equipment for a subsequent RAN is dependent on their performance.
- Reduced obsolescence risk – each RAN will be negotiated to have a minimum 10 year equipment support, therefore the whole network will not reach obsolescence at the same time.
- Allows a multi-vendor network – if equipment/vendor deployed in a previous RAN is not operating as expected or they cannot guarantee a minimum support period for the next RAN then Powerlink can deploy a different equipment option in the next RAN

While this approach can potentially result in multiple vendors and equipment, these risks can be managed.

5. *odyssey* – Deployment strategy

In order to rollout the proposed regional access networks, the following implementation plan is proposed.

1) Replace Core Network (DWDM).
2) Sequentially replace regions (SDH, PDH & MPLS).

5.1 Replace Core Network

The foundational nature of the DWDM network means it naturally forms a dependency for the sub-networks to integrate with. As such, its replacement forms the core enabler for Powerlink to pursue the proposed RAN architecture

5.2 Implement Regional Access Networks

With the next generation DWDM network selected, it is possible to start the planning for the first regional access network. Spares recovered during the implementation of this first RAN will enable Powerlink to continue to support SDH, PDH & MPLS equipment in other regions, allowing the life extension of these assets.

5.3 Odyssey summary

The following, figure 7, depicts a deployment strategy to overcome current obsolescence issues and to achieve a regionalised flexible network. The timeline below shows the required steps whilst also cross referencing supportability of the currently installed equipment. The deployment timeline is indicative; however any introduced delay at the beginning will have significant impacts to the overall network as the EoS and EoM are fixed for each.

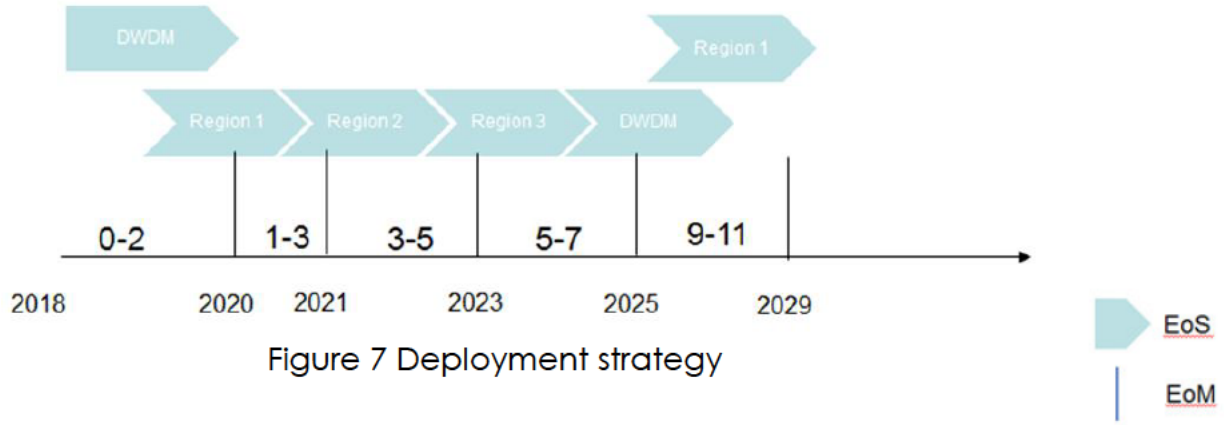

Figure 7 Deployment strategy

The replacement of the core DWDM network, and subsequent RAN's cover the expected 10-year lifecycle of the DWDM network. At this point the plan is repeated, with the replacement of the DWDM network and subsequent RAN replacements occurring as each network reaches its end of life.

It is anticipated that the costs to replace the DWDM will be in the region of $11 million with an additional $4 million required to maintain the existing non regulated capacity services.

The RAN deployment is predicted to be in the region $43-55 million and is heavily dependent on the vendor chosen

These costs are discussed further in section 7.

6. Recommendation

In order for Powerlink to:

- Continue to provide support for legacy TDM technology, while transitioning to and benefiting from the advances of IP technology.
- Respond to approaching end-of-life dates for current systems and ensuring that replacement systems realise their maximum asset life.
- Manage resource constraints in deploying telecommunications systems statewide.
- Reduce operating risk,
- Promote market participation to lower overall cost of the telecommunications asset.

It is recommended that Powerlink adopt the Horizon plan.

In order to do so, the following steps must be undertaken:

- The Horizon plan is endorsed by Executive
- The DWDM replacement project is initiated. Note: this will require significant effort and market engagement to estimate and will likely require Board approval
- The first RAN replacement projects is initiated upon full approval of the DWDM project
- Subsequent RAN projects are initiated as required

7. Addendum

To obtain high level budgetary estimates two different methodologies were under taken

7.1 Regional Access Network Estimate

A concept area was produced containing 42 substations with connectivity between sites based on a strategic architecture of TDM and IP connectivity between sites and typical interface requirements, depicted below

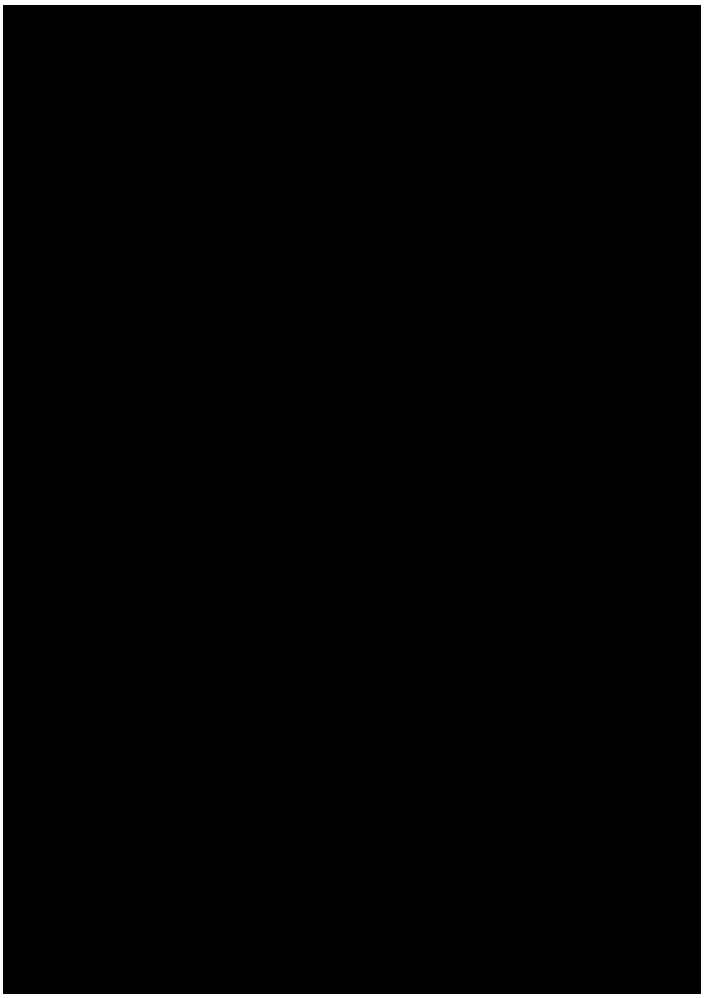

Figure 8 Concept RAN

Two vendors from those who submitted a response to the ROI and who met the criteria for a hybrid solution were approached and agreed to provide a budgetary estimate. It should be noted that under the ROI there are more than two vendors who meet the criteria and not all were approached, this decision was based purely on time constraints and vendor relationships and not on any perceived lack of technical functionality of equipment from other vendors.

The estimates are detailed in the following table with both vendors given the exact same requirements

Vendor	RAN Estimate A$	Estimated cost per site A$
[redacted]	[redacted]	184,130
[redacted]	4,000,000	95,238

[redacted]

Whilst these figures should be taken as indicative only and will vary on a more detailed design with more specific requirements they were compiled by technical teams within both organisations.

Comparing the proposed hybrid solution as opposed to replacing current equipment on a like for like basis.

Vendor	Estimated cost per site A$	Like for like cost per site A$ (SDH,MPLS,PDH) x 2	Difference vs Like for like
[redacted]	184,130	116,00	+ 68130
[redacted]	95,238		- 21000

Utilising the hardware costs quoted it is anticipated that the overall costs on a network basis will be as indicated below.

Vendor	Estimated cost per site	PLQ labour per site*	Total based on 149 substations
[redacted]	184,130	190,000	55,745,370
[redacted]	95,238	190,000	42,500,462
Like for Like	116,000	240,350**	53,096,150

*A factor of 1.9 applied to hardware and design costs

** Additional costs due to multiples of equipment, SDH and MPLS

Like for like replacement costs have been shown for comparison purposes and have been estimated on existing equipment which is approaching end of life and will soon be unavailable for purchase.

7.2 Core Network Estimate

A different approach was taken to compile an estimate for the core network. Recently Powerlink undertook an exercise to provide a quotation [redacted] for 100Gbit services from Townsville to Brisbane over geographically diverse routes to provide capacity for [redacted]. As a result detailed estimates for DWDM were at hand and have been modified to reflect a strategically architecured core network to provide access points to the RAN's.

The architecture used is shown below and is based on existing optical transmission routes.

Optical Add/Drop for RAN connectivity (regulated)

Existing Non Regulated customer connections

The costs in the following tables are based on [redacted] DWDM equipment and are in A$

	[redacted] Hardware	PLQ Labour	Infrastructure	Licence Costs	Total
Regulated	3,807,507	6,021,181*	1,200,000***	500,000	11,528,688
Non Regulated	2,745,842	1,126,510**		550,000	4,422,352

	[redacted] Hardware	PLQ Labour	Infrastructure	Licence Costs	Total
Regulated	3,230,620	6,021,181*	1,200,000***	500,000	10,951,802
Non Regulated	1,465,842	1,126,510**		550,000	3,880,852

*A factor of 1.9 applied to hardware and design costs, [redacted] used in both cases
** A factor of 0.5 applied to hardware and design costs on the assumption the majority of design is undertaken deploying the operational requirements, [redacted] used in both cases
*** Assumed 2 new buildings are required and 4 DC upgrades required due to lack of capacity

Project Scope Report

CP.02771

Telecommunication Network Consolidation - Stage 1

Concept – Version 2

Document Control

Change Record

Issue Date	Responsible Person	Objective Document Name	Background
12/07/2019	[redacted]	Project Scope Report CP.02771 Telecommunication Network Consolidation - Stage 1	Initial Draft
03/08/2020	[redacted]	Project Scope Report CP.02771 Telecommunication Network Consolidation - Stage 1	Update - RAN 1 Stage 1 Sites

Related Documents

Issue Date	Responsible Person	Objective Document Name
July 2018	[redacted]	Horizon – a 10 year plan of telecommunications

Project Contacts

Project Sponsor	[redacted]	[redacted]
Senior Telecommunications Strategies Engineer	[redacted]	[redacted]
Manager Operational Technology Services	[redacted]	[redacted]
Snr BD Manager - Telecomms & Digital	[redacted]	[redacted]
Customer Account Manager (Ergon)	[redacted]	[redacted]
Program Manager	TBD	Ext.
Project Manager	[redacted]	[redacted]

Project Details

1. Project Need & Objective

Powerlink's Synchronous Digital Hierarchy (SDH), Plesiochronous Digital Hierarchy (PDH) and Multi-Protocol Label Switching (MPLS) networks enable data communications between Powerlink's substations, corporate head office and the BCS. The prime functions of these network is to support a wide range of real time and business support services such as SCADA, protection, remote monitoring and voice services.

The equipment that comprise the networks is shortly coming to end of manufacture and subsequent support dates and is summarised in the table below.

Manufacturer	Equipment	Functionality	Count	End of Manufacture	End of Support
[redacted]		SDH	146	31-Dec-19	31-Dec-24
		SDH	62	31-Dec-20	31-Dec-27
		SDH	12	31-Dec-24	31-Dec-29
		SDH	3	31-Dec-24	31-Dec-29
		MPLS	154	31-Dec-19	31-Dec-24
		PDH	878	2013	2013
		PDH	36	TBA	TBA

With different equipment either at or approaching end of life in a similar timeframe it has given Powerlink an opportunity to revisit the network architecture from a functional, cost and management perspective.

Under an Expression of Investment (ROI) the market was engaged to determine what equipment will functionally meet Powerlink's requirements whilst at the same time allowing the consolidation of functionality.

Based on the investigation and in conjunction with the Dense Wave Division Multiplexing (DWDM) replacement (CP.02269) and OpsWAN replacement projects (CP.02512, etc.), the conceptual architecture represented in Figure 2.1 is proposed.

Where the DWDM will provide the long haul communications and interconnect points for discrete regionalised 10Gbit rings.

The OpsWAN replacement project will provide all the routing requirements at a substation. However if it is determined that the solution provided under this project can provide sufficient routing functionality then this will be used in preference.

The objective of this project will replace the current SDH, MPLS and PDH equipment with a single consolidated device to provide Time Division Multiplexing (TDM) and Internet Protocol (IP) transport and interface requirements by October 2023 for the first regionalised access network (RAN).

2. Project Drawing

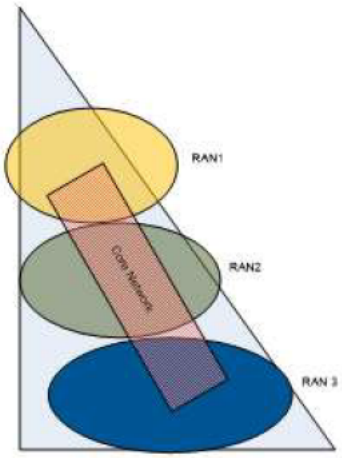

Figure 2.1: Regional Area Network (RAN) Concept

[redacted]

Figure 2.2: CP.02771 Telecommunications network consolidation

3. Project Scope

3.1. 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 5 Special Considerations*.

The intent of this project is to provide functionality within the substation environment that will replace the SDH, PDH and MPLS equipment with a hybrid multiplexer that will allow for the transmission of telecommunications TDM and IP traffic whilst also providing the interface capability to secondary system and communications devices, i.e. Remote Terminal Unit's (RTU), protection devices, etc.

It is also the intent of the project to introduce the concept of a RAN, whereby subnetworks are formed that can operate independently of each other supported by the DWDM network and this is conceptualised in Figure 2.2.

Reference should be made to: horizon – a 10 year outlook of telecommunications.

The project is to be limited to the installation of equipment and to the migration of services on a like for like basis, it is not the intent of the project to convert services to IP unless it is absolutely necessary to do so to overcome technical difficulties in limited circumstances

As this project entails significant work in architectural design, equipment selection, capacity requirements and deployment it is proposed to split this project into two deliverables.

- Deliverable 1 Pre-works.
- Deliverable 2 Deployment.

3.1.1. Transmission Line Works

Not applicable.

3.1.2. Substation Works

As per telecoms works.

3.1.3. Telecoms Works

The following telecoms works are to be done in two stages:-

Deliverable 1 Pre-works

Determine

An architecture in conjunction with the DWDM[1] replacement scope of works to determine the size and number of the RAN(s), taking into account

- the capacity required to support legacy TDM services; and
- the capacity required to meet the current and projected growth in IP traffic.

[1] Refer CP.02269 DWDM Replacement

Existing services are to be migrated on a like for like basis, i.e. TDM services will be migrated as TDM.

TDM and IP traffic are to be segregated where possible.

IP traffic shall have QoS applied.

RAN's are to be interfaced to the DWDM network.

The complexity for the transition of a service from TDM to IP through the hybrid multiplexor should be kept to minimum.

In consultation with key stakeholders, finalise a functional requirements specification based on the ROI (PP180015) findings to enable a closed tender engagement for the equipment.

The possibility of the substation routing functionality being undertaken by the hybrid multiplexor must be fully explored to enable a reduction in equipment required under CP.02512

Prepare tender documentation

Based on the investigations of PP180015, visits from vendors, subsequent market scans and in alignment with the horizon strategy conduct a tender for telecommunications equipment that can be identified as meeting Powerlink's requirements for a hybrid multiplexor that has PDH and Ethernet interface connectivity and is capable of MPLS-TP and native TDM transmission.

The initial contract is for the deployment to **1 (one)** RAN (refer Attachment 1 sites) only in alignment with "horizon".

To ensure continuity of services the deployed solution will be installed in parallel to the existing SDH, MPLS and PDH networks and therefore a validation report is required for each site to determine supporting infrastructure requirements for:

- floor space availability in both comms and control buildings;
- rack Space availability both comms and control buildings;
- DC capability both comms and control buildings; and
- any perceived or known issues.

Costs associated with any upgrade works are to be provided including asset write off costs of any replaced equipment.

A scope and business case is to be produced for approval to move to the deployment phase.

Deliverable 2 Deployment

For the sites in the identified RAN (Refer Attachment 1):-

- install and configure the solution determined in Deliverable 1 to one RAN only;
- migrate services to the new solution and decommission existing equipment;
- network is to be fully modelled in Operational Support System (OSS);
- network management system is to be integrated into OSS; and
- all records across systems are to be updated and in alignment with each other.

3.1.4. Easement/Land Acquisition & Permits Works

Not applicable.

3.2. Key Scope Assumptions

The following assumptions should be included in the estimating of this scope:

- All procurement activities will be conducted in accordance with Powerlink's procurement procedures.
- Whilst there may be multiple RAN(s) defined across the state the project is to only install the solution to one RAN.
- At the conclusion of the work the deployed solution is to be fully modelled in the OSS.
- All documentation and drawings are to be updated to reflect the delivered solution.
- SAP is to updated to reflect the delivered solution and the decommission assets and equipment.
- Treatment of alarms from the delivered solution should be in accordance with operational requirements.
- Any training required on the delivered solution and its component equipment should be included in the estimate.

3.3. Variations to Scope (post project approval)

Not applicable.

4. Project Timing

4.1. Project Approval Date

Full project approval is required by 31 October 2021.

4.2. Site Access Date

Access to all Powerlink substation sites will be immediately available.

4.3. Commissioning Date

The latest date for the commissioning of Deliverable 1 included in this scope is 30 June 2021. The latest date for the commissioning of Deliverable 2 is 31 October 2023.

5. Special Considerations

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

- Any existing assets to be removed and disposed of as part of this scope must be identified within the Project Proposal together with the forecast asset write off amounts at time of disposal.
- Plant and equipment identified to be recovered for use as spares or returned to stores should be packaged and transported to Powerlink's storage location. Costs to be included in the estimate.
- A high level project implementation plan including staging and outage plans should be considered and produced as part of the estimate.

- Good communication and interaction needs to occur between this project and the project teams for CP.02512 & CP.02269 as decisions taken made in one project may have significant impact on one or more of the other projects. The estimate should therefore include some cost to cover regular co-ordination meetings between this project and CP.02512 & CP.02269, and subsequent deployment projects (refer related projects).
- Ensure the Data Communications Network (DCN) is modified accordingly.

6. Asset Management Requirements

Equipment shall be in accordance with Powerlink equipment strategies.

Unless otherwise advised [redacted] will be the Project Sponsor for this project. The Project Sponsor must be included in any discussions with any other areas of Strategy and Business Development.

[redacted] will provide the primary customer interface with Energy Queensland (Ergon Energy). The Project Sponsor should be kept informed of any discussions with the customer. [redacted] will provide the primary customer interface with telecoms customers. The Project Sponsor should be kept informed of any discussions with telecoms customers.

7. Asset Ownership

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

8. 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.

9. Options

Not applicable.

10. Division of Responsibilities

Not applicable.

11. Related Projects

Project No.	Project Description	Planned Comm Date	Comment
Pre-requisite Projects			
CP.02269	DWDM Replacement	Dec 2022	
Co-requisite Projects			
Other Related Projects			
CP.02811	Telecommunication Network Consolidation Stage 2	Oct 2024	
CP.02812	Telecommunication Network Consolidation Stage 3	Oct 2025	
CP.02813	Telecommunication Network Consolidation Stage 4	Oct 2026	
CP.02512	OpsWAN Replacement Stage 1	Oct 2023	
CP.02513	OpsWAN Replacement Stage 2	Oct 2024	
CP.02514	OpsWAN Replacement Stage 3	Oct 2025	
CP.02822	OpsWAN Replacement Stage 4	Oct 2026	

Attachment 1 – RAN Sites Stage 1

Site	
S005	Western Downs
H052	Kogan Creek
H078	Orana
H077	Columboola
T216	Condabri North
T217	Condabri Central
T218	Condabri South
H076	Wandoan South
T219	Wolebee Creek
T224	Dinoun South
H079	Yuleba North
T225	Clifford Creek
H082	Blythedale
H080	Eurombah
H081	Fairview South
T227	Fairview

Concept Estimate for CP.02771 - Telecommunication Network Consolidation Stage 1

Record ID	A4367089	
Policy stream	Asset Management	
Authored by	Project Manager	[redacted]
Reviewed by	Project Manager	[redacted]
Approved by	Program Director Telecommunications	[redacted]

Table of Contents

1. Executive Summary

Powerlink's SDH, PDH and MPLS networks enable data communications between Powerlink's substations, corporate head office and the BCS to support a wide range of real time and business support services such as SCADA, protection, remote monitoring and voice services.

The equipment comprised by the networks is nearing the end of manufacture and support. The timing of the end of support and manufacture for the various equipment is summarised in the following table.

Manufacturer	Equipment	Functionality	Count	End of Manufacture	End of Support
[redacted]		SDH	146	31-Dec-19	31-Dec-22
		SDH	62	31-Dec-20	31-Dec-22
		SDH	12	31-Dec-20	31-Dec-22
		SDH	3	31-Dec-20	31-Dec-22
		DWDM	106	31-Dec-15	30-Jun-22
		MPLS	154	31-Dec-19	31-Dec-22
		PDH	878	2013	2013

Powerlink has developed the conceptual architecture that will satisfy its future telecommunications needs. (Refer Figure 1). It comprises replacement of the DWDM to provide backbone communications throughout the length of the network, and provide connection points for discrete regionalised 10Gbit rings.

The objective of this project is to replace the current SDH, MPLS and PDH equipment with a single consolidated device to provide TDM and IP transport and interface requirements in the South Western Queensland Region by October 2023.

This is Stage 1 of a four stage suite of projects to replace the entire Powerlink SDH, MPLS and PDH networks.

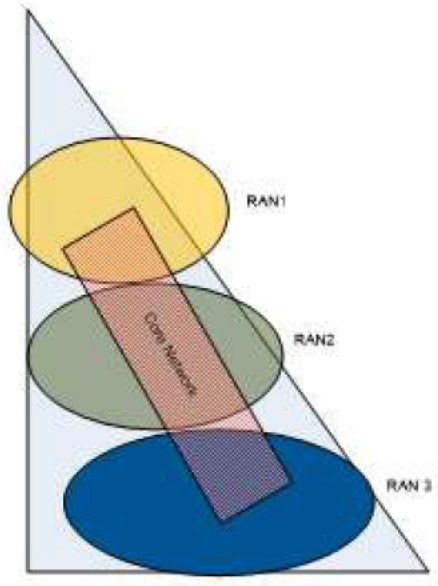

Figure 1 Regional Area Network (RAN) Concept

1.1 Project Estimate

The Powerlink costs of $190,000 per site are based on previous Powerlink projects for the SAN replacement of the SDH nodes with [redacted] and the MPLS projects that installed the [redacted] into the Network.

Estimate Components		Base $	Escalated $
Estimate Class	5		
Estimate Accuracy	+100% / -50%		
Base Estimate		**7,279,584**	**7,740,599**
Mitigated Risk	[redacted]	[redacted]	[redacted]
Contingency Allowance	[redacted]	[redacted]	[redacted]
TOTAL		[redacted]	[redacted]

1.2 Project Financial Year Cash Flows

	May 2020 Base $	Escalated $
To June 2022	3,607,494	3,720,102
To June 2023	2,746,543	2,976,376
To June 2024	925,547	1,044,121
TOTAL	**7,279,584**	**7,740,599**

2. Project and Site Specific Information

2.1 Project Dependencies & Interactions

Project CP.02771 Telecommunication Network Consolidation will determine the vendor and the platform chosen to replace the existing Powerlink Telecommunication network.

The following scope presents a functional overview of the desired outcomes of the project

Briefly, the project consists of the consolidation of the telecommunications and digital network in the South Western Queensland region. The consolidation will replace the SDH, PDH and MPLS equipment with a hybrid multiplexer to support the transmission of telecommunications TDM and IP traffic, and interface to the secondary systems and communications equipment. (Refer Figure 2).

As this project entails significant work in architectural design, equipment selection, capacity requirements and deployment it is proposed to split this project into two stages with a preliminary stage to determine the architecture and preferred equipment, and a delivery stage to implement the solution at selected sites.

Figure 2 – Consolidated Telecommunications Network Architecture

This project is dependent on the completion delivery of the following projects:

Project No.	Project Description	Planned Commissioning Date	Comment
Dependencies			
CP.02269	DWDM Replacement	Dec 2022	
Interactions			
Nil			
Other Related Projects			
CP.02811	Telecommunications and Digital Network Consolidation Stage 2	Oct 2024	The second of four Network Consolidation Projects.
CP.02812	Telecommunications and Digital Network Consolidation Stage 3	Oct 2025	The third of four Network Consolidation Projects.
CP.02813	Telecommunications and Digital Network Consolidation Stage 4	Oct 2026	The fourth of four Network Consolidation Projects.

2.2 Site Specific Issues

The work is to be done at sixteen (16) separate sites. All sites are owned and controlled by Powerlink.

3. Option 1

3.1 Definition

3.1.1 Scope

The solution that this Concept Estimate is based on is drawn from previous SDH and MPLS projects and from engagement with Secondary System & Telecomms Strategies.

The preliminary works include:

- determine an architecture in conjunction with the DWDM replacement scope of works to determine the size and number of the RAN(s);
- finalise a functional requirements specification In consultation with key stakeholders; and
- conduct a tender for telecommunications equipment, including a hybrid multiplexor that has PDH and Ethernet interface connectivity and is capable of MPLS-TP and native TDM transmission.

3.1.2 Substations Works

For the 16 identified sites in the RAN:

- install and configure the solution determined in Deliverable 1 to one RAN only;
- migrate services to the new solution and decommission existing equipment;
- network is to be fully modelled in Operational Support System (OSS);
- network management system is to be integrated into OSS; and
- all records across systems are to be updated and in alignment with each other.

3.1.3 Transmission Line Works

Not applicable

3.1.4 Telecommunication Works

Telecommunications works to be completed per the above scope at the identified sites.

3.1.5 Easement/Land Acquisition & Permit Works

Not applicable

3.1.6 Major Scope Assumptions

- It is assumed that the vendor and platform has been selected and the implementation and cutover process has been determined.
- It is assumed that Powerlink staff will be trained as part of this project.

3.1.7 Scope Exclusions

- The conversion of Protection Signalling relays to IP.

3.2 Project Execution

3.2.1 Project Schedule

Task	Target Completion
Project Approval (issue of PAN)	Oct 2021
Design Commencement	Nov 2021
Design Complete	Apr 2022
Procurement Orders	Jan 2022
Procurement Deliveries	Mar 2022
Pan Tel Contract	Jan 2022
Site Access Date	Immediate
Final Decommissioning	Oct 2023
Project Commissioning Date	Oct 2023

3.2.2 Network Impacts

There will be no impact on the HV Network. The plan will be to build the new network in parallel with the existing network and then cut over circuit by circuit from old to new.

3.2.3 Project Staging

The high level project staging are as follows:

Stage	Activity/Stage Description	High Level Timing
Not applicable	Design and Procurement	Nov 2021 – Apr 2022
1	Construction and of Commissioning new Network	May 2022 – Oct 2022
2	Cutover of service to new Network	Nov 2022 – Oct 2023
3	Commissioning of Project	Oct 2023

3.2.4 Resourcing

Internal Powerlink resources will be used for all Project Management, Design and Procurement.

Telecoms Panel Contractor (PANTEL) resources may be used to install cubicles, chassis and cabling.

Maintenance Service Providers (MSP) resources will be used for all FAT, SAT and cutover of all service to new equipment.

3.3 Project Estimate

The Powerlink internal costs of $190,000 per site (excluding materials) are based on previous Powerlink projects for the SAN replacement of the SDH nodes with [redacted] and the MPLS projects that installed the [redacted] into the Network.

Estimate Components		Base $	Escalated $
Estimate Class	5		
Estimate Accuracy	+100% / -50%		
Base Estimate		**7,279,584**	**7,740,599**
Mitigated Risk	[redacted]	[redacted]	[redacted]
Contingency Allowance	[redacted]	[redacted]	[redacted]
TOTAL		[redacted]	[redacted]

3.4 Project Financial Year Cash Flows

	May 2020 Base $	Escalated $
To June 2021	860,951	860,951
To June 2022	2,746,543	2,859,151
To June 2023	2,746,543	2,976,376
To June 2024	925,547	1,044,121
TOTAL	**7,279,584**	**7,740,599**

3.5 Project Asset Classification

Asset Class	Asset Life	Base $	Percentage
Secondary systems	15 years	54,954	0.75%
Communications	15 years	$7,224,630	99.25%
TOTAL		**7,279,584**	**100%**

4. References

Document name	Version	Date
Project Scope Report	2.0	03 Aug 2020

Project Scope Report

CP.02811

Telecommunications and Digital Network Consolidation Stage 2

Concept – Version 1

Document Control

Change Record

Issue Date	Responsible Person	Objective Document Name	Background
May 20	[redacted]	Project Scope Report CP.02811Telecommunicatrions & Digital Network Consolidation Stage 2	Preliminary scope

Related Documents

Issue Date	Responsible Person	Objective Document Name
July 2018	[redacted]	Horizon – a 10 year outlook of telecommunications

Project Contacts

Project Sponsor	[redacted]	[redacted]
Connection & Development Manager	<name>	Ext.
Strategist – HV/Digital Asset Strategies	<name>	Ext.
Planner – Main/Regional Grid	<name>	Ext.
Manager Projects	<name>	Ext.
Project Manager	<name>	Ext.
Design Coordinator	<name>	Ext.
<delete or insert more if needed>		

Project Details

1. Project Need & Objective

Powerlink's SDH, PDH and MPLS networks enable data communications between Powerlink's substations, corporate head office and the BCS to support a wide range of real time and business support services such as SCADA, protection, remote monitoring and voice services.

The equipment comprised by the networks is nearing the end of manufacture and support. The timing of the end of support and manufacture for the various equipment is summarised in the following table.

Manufacturer	Equipment	Functionality	Count	End of Manufacture	End of Support
[redacted]		SDH	146	31-Dec-19	31-Dec-22
		SDH	62	31-Dec-20	31-Dec-22
		SDH	12	31-Dec-20	31-Dec-22
		SDH	3	31-Dec-20	31-Dec-22
		DWDM	106	31-Dec-15	30-Jun-22
		MPLS	154	31-Dec-19	31-Dec-22
		PDH	878	2013	2013

Powerlink has developed the conceptual architecture that will satisfy its future telecommunications needs (refer Figure 1). It comprises replacement of the DWDM to provide backbone communications throughout the length of the network, and provide connection points for discrete regionalised 10Gbit rings. This permits the staged consolidation of the telecommunications and digital networks (refer Figure 2) that will allow the structured replacement of the network while releasing existing equipment to the spares inventory to support the network in the interim. In addition, the OpsWAN replacement project will provide all the routing requirements at a substation, where it cannot be provided with the consolidated solution.

The objective of this project is to replace the current SDH, MPLS and PDH equipment with a single consolidated device to provide TDM and IP transport and interface requirements in the North Queensland Region by June 2024.

2. Project Drawing – Proposed Architecture

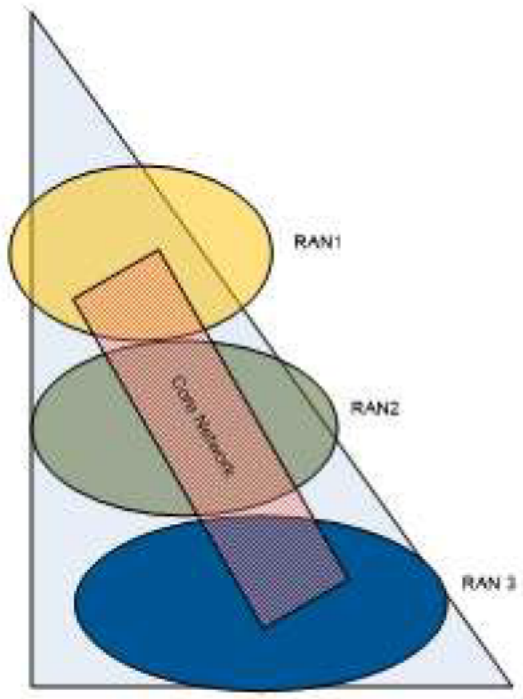

Figure 1 – Regional Area Network (RAN) Concept

Figure 2 – Consolidated Telecommunications Network Architecture

3. Project Scope

3.1. 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 5 Special Considerations*.

Briefly, the project consists of the consolidation of the telecommunications and digital network in the North Queensland region. The consolidation will replace the SDH, PDH and MPLS equipment with a hybrid multiplexer to support the transmission of telecommunications TDM and IP traffic, and interface to the secondary systems and communications equipment. (Refer Figure 2).

3.1.1. Transmission Line Works

Not applicable

3.1.2. Substation Works

Refer 3.1.3 Telecoms Work

3.1.3. Telecoms Works

Design procure, test and commission the establishment of the consolidated telecommunications in the Northern Regional Access Network. Sites to be confirmed, but for estimating assume the following 56 sites:

- H011 NEBO SUBSTATION
- H013 ROSS SUBSTATION
- H032 CHALUMBIN SUBSTATION
- H035 STRATHMORE SUBSTATION
- H039 WOREE SUBSTATION
- H044 BAYVIEW HEIGHTS REPEATER
- H056 YABULU SOUTH SUBSTATION
- H060 WALKAMIN SUBSTATION
- H091 HAUGHTON RIVER
- KMTR KELLY MOUNTAIN MICROWAVE REPEATER
- MFXR MT FOX FIBRE OPTIC REPEATER
- MSVR MT SEAVIEW (ERGON)
- SMHR SMITHS HILL (TELSTRA)
- T034 MORANBAH SUBSTATION
- T036 INVICTA SUGAR MILL SUBSTATION
- T037 COLLINSVILLE POWER STATION SWITCHYARD
- T038 MACKAY SUBSTATION
- T039 PROSERPINE SUBSTATION
- T046 GARBUTT SUBSTATION
- T048 TULLY SUBSTATION
- T049 KAREEYA POWER STATION SWITCHYARD
- T050 INNISFAIL SUBSTATION
- T051 CAIRNS SUBSTATION (Hartley Street)
- T053 KAMERUNGA SUBSTATION
- T054 BARRON GORGE POWER STATION

- T055 TURKINJE SUBSTATION
- T056 TOWNSVILLE SOUTH SUBSTATION
- T065 ALLIGATOR CREEK SUBSTATION
- T067 KEMMIS SUBSTATION
- T069 NEWLANDS SUBSTATION
- T092 DAN GLEESON SUBSTATION
- T094 TOWNSVILLE EAST
- T110 PEAK DOWNS SUBSTATION
- T129 EDMONTON SUBSTATION
- T134 CARDWELL SUBSTATION
- T137 NORTH GOONYELLA
- T139 BURTON DOWNS SUBSTATION
- T140 TOWNSVILLE ZINC SMELTER SUBSTATION
- T141 PIONEER VALLEY SUBSTATION
- T145 TOWNSVILLE GT SWITCHYARD (YABULU SUB)
- T150 ALAN SHERRIFF SUBSTATION
- T157 INGHAM SOUTH SUBSTATION
- T171 EL ARISH SUBSTATION
- T172 MINDI SUBSTATION (Joint QR)
- T175 QR BOLINGBROKE
- T177 KING CREEK
- T178 STONY CREEK
- T181 BOWEN NORTH
- T192 QR MACKAY PORTS SUBSTATION
- T193 CLARE SOUTH SUBSTATION
- T212 GOONYELLA RIVERSIDE SUBSTATION
- T215 EAGLE DOWNS SUBSTATION
- T220 COLLINSVILLE NORTH SUBSTATION
- T221 WOTONGA SUBSTATION
- T245 MORANBAH PLAINS
- WRLR WRIGHTS LOOKOUT

Within the scope of work:

- Design the telecommunications network including staging of the implementation in alignment with the outcomes of CP.02771;

- Procure the new telecommunications equipment;

- Install and configure the new equipment to each site connected and configure to the respective RAN, noting that:

    - 2 hybrid multiplexers shall be installed at each site to replace the SDH multiplexer, MPLS router and all PDH multiplexers;

    - Hybrid multiplexers are to be installed in the comms room with the exception of existing combined comms and control buildings;

    - Where the number of PDH multiplexers at any specific site exceeds the interface capacity of the hybrid multiplexer, then additional ‘PDH’ equivalent multiplexers shall be installed as necessary; and

    - All SDH and MPLS links shall be cutover to the new hybrid multiplexers.

- Migrate the existing services to the new equipment on an as is basis and decommission existing equipment;
- Battery systems that will be 12 years or older at time of final project commissioning are to be replaced;
- Test and commission;
- Ensure the new network is fully modelled in OSS;
- Ensure the network management system is integrated into OSS;
- Decommission the existing redundant equipment;
- Return all redundant equipment to the stores as spare inventory;
- Update all drawings and databases across all systems ensuring alignment with each other; and
- SAP is to be updated in alignment with the current specification.

3.1.4. Easement/Land Acquisition & Permits Work

Not applicable

3.2. Key Scope Assumptions

The following assumptions should be included in the estimate of this scope:

- All procurement activities shall be in accordance with Powerlink's procurement policy;
- Treatment of alarms shall be in accordance with operational requirements;
- The conversion of services to IP is excluded from the scope of this project unless it is necessary to facilitate the most cost effective solution; and
- An allowance for training.

4. Project Timing

4.1. Project Approval Date

The anticipated date by which the project will be approved is 30 June 2022.

4.2. Site Access Date

The assets are located in existing Powerlink sites; site access is immediately available.

4.3. 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 June 2024.

5. Special Considerations

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

- Any existing assets to be removed and disposed of as part of this scope must be identified within the Project Proposal together with the forecast asset write off amounts at time of disposal;
- Plant and equipment identified to be recovered for use as spares or returned to stores should be packaged and transported to Powerlink's storage location. Costs to be included in the estimate;
- A high level project implementation plan including staging and outage plans should be considered and produced as part of the Project Proposal; and
- Ensure the Data Communications Network (DCN) is modified accordingly.

6. Asset Management Requirements

Equipment shall be in accordance with Powerlink equipment strategies.

Unless otherwise advised [redacted] will be the Project Sponsor for this project. The Project Sponsor must be included in any discussions with any other areas of Investment & Planning.

[redacted] will provide the primary customer interface. The Project Sponsor should be kept informed of any discussions with the customer.

7. Asset Ownership

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

8. 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.

9. Options

Not applicable

10. Division of Responsibilities

Not applicable

11. Related Projects

Project No.	Project Description	Planned Comm Date	Comment
Pre-requisite Projects			
Co-requisite Projects			
Other Related Projects			
CP.02771	Telecommunications & Digital Network Consolidation Stg 1	30 June 2023	
CP.02812	Telecommunications & Digital Network Consolidation Stg 3	30 June 2025	
CP.02813	Telecommunications & Digital Network Consolidation Stg 4	30 June 2026	

Concept Estimate for CP.02811 - Telecoms and Digital Network Consolidation Stage 2

Record ID	A3362072	
Policy stream	Asset Management	
Authored by	Project Manager	[redacted]
Reviewed by	Project Manager	[redacted]
Approved by	Program Director Telecommunications	[redacted]

Table of Contents

1. Executive Summary

Powerlink's SDH, PDH and MPLS networks enable data communications between Powerlink's substations, corporate head office and the BCS to support a wide range of real time and business support services such as SCADA, protection, remote monitoring and voice services.

The equipment comprised by the networks is nearing the end of manufacture and support. The timing of the end of support and manufacture for the various equipment is summarised in the following table.

Manufacturer	Equipment	Functionality	Count	End of Manufacture	End of Support
[redacted]		SDH	146	31-Dec-19	31-Dec-22
		SDH	62	31-Dec-20	31-Dec-22
		SDH	12	31-Dec-20	31-Dec-22
		SDH	3	31-Dec-20	31-Dec-22
		DWDM	106	31-Dec-15	30-Jun-22
		MPLS	154	31-Dec-19	31-Dec-22
		PDH	878	2013	2013

Powerlink has developed the conceptual architecture that will satisfy its future telecommunications needs. (Refer Figure 1). It comprises replacement of the DWDM to provide backbone communications throughout the length of the network, and provide connection points for discrete regionalised 10Gbit rings.

The objective of this project is to replace the current SDH, MPLS and PDH equipment with a single consolidated device to provide TDM and IP transport and interface requirements in the North Queensland Region. The PSR requested a commissioning date of June 2024. However, due to the number of sites, and requirement to integrate works with wider portfolio of works in the region, the earliest deliverable date has been identified as June 2026.

This is Stage 2 of a four stage suite of projects to replace the entire Powerlink SDH, MPLS and PDH networks.

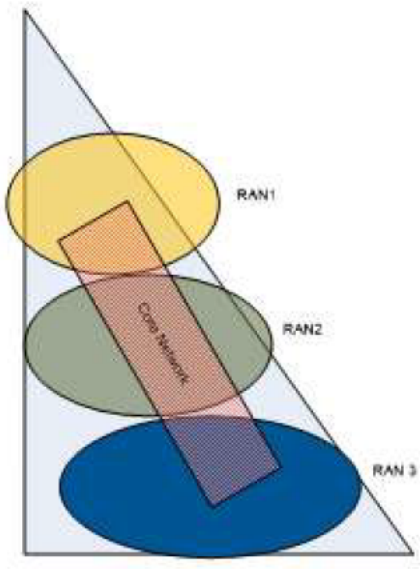

Figure 1: Regional Area Network (RAN) Concept

1.1 Project Estimate

The Powerlink costs of $190,000 per site are based on previous Powerlink projects for the SAN replacement of the SDH nodes with [redacted] and the MPLS projects that installed the [redacted] into the Network.

Estimate Components		Base $	Escalated $
Estimate Class	5		
Estimate Accuracy	+100% / -50%		
Base Estimate		22,408,412	26,347,113
Mitigated Risk	[redacted]	[redacted]	[redacted]
Contingency Allowance	[redacted]	[redacted]	[redacted]
TOTAL		[redacted]	[redacted]

1.2 Project Financial Year Cash Flows

	June 2020 Base $	Escalated $
To June 2021	80,000	83,086
To June 2022	4,463,237	4,836,725
To June 2023	4,463,237	5,035,031
To June 2024	4,475,465	5,255,827
To June 2025	4,463,237	5,456,367
To June 2026	4,463,236	5,680,077
TOTAL	22,408,412	26,347,113

2. Project and Site Specific Information

2.1 Project Dependencies & Interactions

The design of the telecommunications network including staging of the implementation in alignment with the outcomes of CP.02771. Project CP.02771 Telecommunication Network Consolidation will determine the Vendor and the platform chosen to replace the existing Powerlink Telecommunication network.

The following scope presents a functional overview of the desired outcomes of the project

Briefly, the project consists of the consolidation of the telecommunications and digital network in the North Queensland region. The consolidation will replace the SDH, PDH and MPLS equipment with a hybrid multiplexer to support the transmission of telecommunications TDM and IP traffic, and interface to the secondary systems and communications equipment. (Refer Figure 2).

Figure 2: Consolidated Telecommunications Network Architecture

This project is for the Northern Regional Area Network

This project is dependent on the completion delivery of the following projects:

Project No.	Project Description	Planned Commissioning Date	Comment
Dependencies			
CP.02771	Telecommunication Network Consolidation	June 2022	The first of four Network Consolidation Projects.
Interactions			
Other Related Projects			
CP.02812	Telecommunications and Digital Network Consolidation Stage 3	June 2024	The third of four Network Consolidation Projects.
CP.02813	Telecommunications and Digital Network Consolidation Stage 4	June 2025	The fourth of four Network Consolidation Projects.

2.2 Site Specific Issues

The work is to be done at fifty six (56) separate sites. Of these, fifty four (54) sites are Powerlink owned and two (2) are owned by third parties.

3. Telecoms and Digital Network Consolidation (Northern RAN)

3.1 Definition

3.1.1 Scope

The solution that this Concept Estimate is based on is drawn from previous SDH and MPLS projects and from engagement with Secondary System & Telecomms Strategies.

3.1.1.1 Substations Works

For the 56 identified sites in the RAN:

- install and configure the solution determined in CP.02771 Telecommunications Network Consolidation Stage 1 (Deliverable 1) to one RAN only;
- migrate services to the new solution and decommission existing equipment;
- network is to be fully modelled in Operational Support System (OSS);
- network management system is to be integrated into OSS; and
- all records across systems are to be updated and in alignment with each other.

3.1.1.2 Transmission Line Works

Not applicable

3.1.1.3 Telecommunication Works

Telecommunications works to be completed per the above scope at the identified sites.

3.1.1.4 Easement/Land Acquisition & Permit Works

Not applicable

3.1.2 Major Scope Assumptions

- It is assumed that that project, CP.02771 will have been completed and the Vendor and platform has been selected and the implementation and cutover process has been determined.

3.1.3 Scope Exclusions

- The conversion of Protection Signalling relays to IP.

3.2 Project Execution

3.2.1 Project Schedule

Task	Target Completion
Project Approval (issue of PAN)	June 2021
Design Commencement	July 2021
Design Complete	June 2022
Procurement Orders	July 2021
Procurement Deliveries	June 2022
Energy Queensland Training on new platform	June 2022
Pan Tel Contract	June 2022
Final Decommissioning	June 2026
Project Commissioning Date	June 2026

The PSR requested a commissioning date of June 2024. However, due to the number of sites, and requirement to integrate works with wider portfolio of works in the region, the earliest deliverable date has been identified as June 2026.

3.2.2 Network Impacts

There will be no impact on the HV Network. The plan will be to build the new network in parallel with the existing network and then cut over circuit by circuit from old to new.

3.2.3 Project Staging

The high level project staging are as follows:

Stage	Activity/Stage Description	High Level Timing
Not applicable	Design and Procurement	July 2021 to June 2022
1	Construction and of Commissioning new Network	July 2022 to June 2023
2	Cutover of service to new Network	July 2023 to June 2026
3	Commissioning of Project	June 2026

3.2.4 Resourcing

Internal Powerlink resources will be used for all Project Management, Design and Procurement.

Telecoms Panel Contractor (PANTEL) resources may be used to install cubicles, chassis and cabling.

Maintenance Service Providers (MSP) resources will be used for all FAT, SAT and cutover of all service to new equipment.

3.3 Project Estimate

The Powerlink costs of $190,000 per site are based on previous Powerlink projects for the SAN replacement of the SDH nodes with [redacted] and the MPLS projects that installed the [redacted] into the Network.

Estimate Components		Base $	Escalated $
Estimate Class	5		
Estimate Accuracy	+100% / -50%		
Base Estimate		22,408,412	26,347,113
Mitigated Risk	[redacted]	[redacted]	[redacted]
Contingency Allowance	[redacted]	[redacted]	[redacted]
TOTAL		[redacted]	[redacted]

3.4 Project Financial Year Cash Flows

	June 2020 Base $	Escalated $
To June 2021	80,000	83,086
To June 2022	4,463,237	4,836,725
To June 2023	4,463,237	5,035,031
To June 2024	4,475,465	5,255,827
To June 2025	4,463,237	5,456,367
To June 2026	4,463,236	5,680,077
TOTAL	**22,408,412**	**26,347,113**

3.5 Project Asset Classification

Asset Class	Asset Life	Base $	Percentage
Secondary systems	15 years	184,473	1%
Communications	15 years	22,223,939	99%
TOTAL		**22,408,412**	

4. References

Document name	Version	Date
Project Scope Report	1.0	14/05/2020

Project Scope Report

CP.02812

Telecommunications and Digital Network Consolidation Stage 3

Concept – Version 1

Document Control

Change Record

Issue Date	Responsible Person	Objective Document Name	Background
May 2020	[redacted]	Project Scope Report CP.02812 Telecommunications & Digital Network Consolidation Stage 3	Preliminary scope

Related Documents

Issue Date	Responsible Person	Objective Document Name
July 2018	[redacted]	Horizon – a 10 year plan of telecommunications

Project Contacts

Project Sponsor	[redacted]	[redacted]
Connection & Development Manager	<name>	Ext.
Strategist – HV/Digital Asset Strategies	<name>	Ext.
Planner – Main/Regional Grid	<name>	Ext.
Manager Projects	<name>	Ext.
Project Manager	<name>	Ext.
Design Coordinator	<name>	Ext.

Project Details

1. Project Need & Objective

Powerlink's SDH, PDH and MPLS networks enable data communications between Powerlink's substations, corporate head office and the BCS to support a wide range of real time and business support services such as SCADA, protection, remote monitoring and voice services.

The equipment comprised by the networks is nearing the end of manufacture and support. The timing of the end of support and manufacture for the various equipment is summarised in the following table.

Manufacturer	Equipment	Functionality	Count	End of Manufacture	End of Support
[redacted]		SDH	146	31-Dec-19	31-Dec-22
		SDH	62	31-Dec-20	31-Dec-22
		SDH	12	31-Dec-20	31-Dec-22
		SDH	3	31-Dec-20	31-Dec-22
		DWDM	106	31-Dec-15	30-Jun-22
		MPLS	154	31-Dec-19	31-Dec-22
		PDH	878	2013	2013

Powerlink has developed the conceptual architecture that will satisfy its future telecommunications needs. (Refer Figure 1). It comprises replacement of the DWDM to provide backbone communications throughout the length of the network, and provide connection points for discrete regionalised 10Gbit rings. This permits the staged consolidation of the telecommunications and digital networks (Refer Figure 2) that will allow the structured replacement of the network while releasing existing equipment to the spares inventory to support the network in the interim. In addition, the OpsWAN replacement project will provide all the routing requirements at a substation, where it cannot be provided with the consolidated solution.

The objective of this project is to replace the current SDH, MPLS and PDH equipment with a single consolidated device to provide TDM and IP transport and interface requirements in the Central Queensland Region by June 2025.

2. Project Drawing – Proposed Architecture

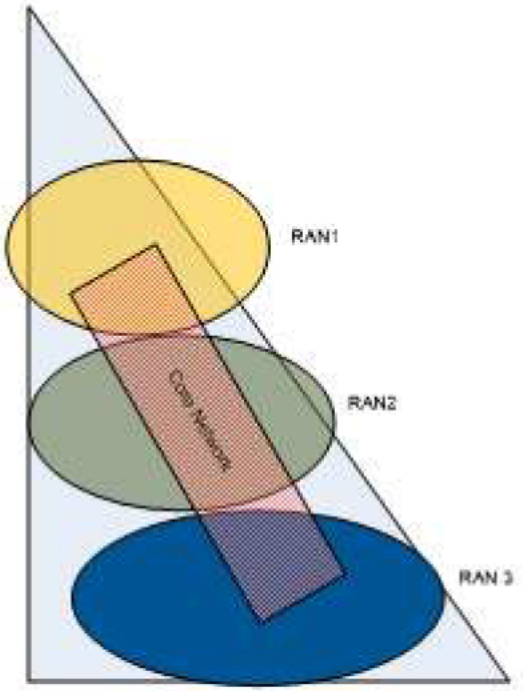

Figure 1 – Regional Area Network (RAN) Concept

Figure 2 – Consolidated Telecommunications Network Architecture

3. Project Scope

3.1. 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 5 Special Considerations*.

Briefly, the project consists of the consolidation of the telecommunications and digital network in the Central Queensland region. The consolidation will replace the SDH, PDH and MPLS equipment with a hybrid multiplexer to support the transmission of telecommunications TDM and IP traffic, and interface to the secondary systems and communications equipment. (Refer Figure 2).

3.1.1. Transmission Line Works

Not applicable

3.1.2. Substation Works

Refer 3.1.3 Telecoms Work

3.1.3. Telecoms Works

Design procure, test and commission the establishment of the consolidated telecommunications in the Central Regional Access Network. Sites to be confirmed, but for estimating assume the following 31 sites

- H007 GLADSTONE POWER STATION 275 KV SWITCHYARD
- H008 BOYNE ISLAND (COMALCO) SUBSTATION
- H010 BOULDERCOMBE SUBSTATION
- H015 LILYVALE SUBSTATION
- H020 BROADSOUND SUBSTATION
- H024 CALVALE SUBSTATION
- H029 STANWELL POWER STATION SWITCHYARD
- H033 STANWELL POWER STATION ANNEX
- H040 WURDONG SUBSTATION
- H058 LARCOM CREEK SUBSTATION
- H067 CALLIOPE RIVER
- H073 QR RAGLAN (Powerlink owned site)
- T022 CALLIDE 'A' SUBSTATION
- T023 ROCKHAMPTON SUBSTATION (GLENMORE)
- T026 BILOELA SUBSTATION
- T027 MOURA SUBSTATION
- T031 BARALABA SUBSTATION
- T032 BLACKWATER SUBSTATION
- T035 DYSART SUBSTATION
- T061 PANDOIN SUBSTATION
- T097 GREGORY SUBSTATION
- T101 CALLEMONDAH SUBSTATION
- T127 EGANS HILL SUBSTATION (Joint with ERGON)

- T152 GLADSTONE STH SUBSTATION
- T153 QAL WEST
- T182 QAL SOUTH
- T199 YARWUN SUBSTATION
- T209 QR BLUFF (QR owned site)
- T210 QR DUARINGA (QR owned site)
- T211 QR WYCARBAH (Shared site)
- T244 BUNDOORA SUBSTATION

Within the scope of work:

- Design the telecommunications network including staging of the implementation in alignment with the outcomes of CP.02771
- Procure the new telecommunications equipment;
- Install and configure the new equipment to each site connected and configure to the respective RAN, noting that
  - 2 hybrid multiplexers shall be installed at each site to replace the SDH multiplexer, MPLS router and all PDH multiplexers;
  - Hybrid multiplexers are to be installed in the comms room with the exception of existing combined comms and control buildings;
  - Where the number of PDH multiplexers at any specific site exceeds the interface capacity of the hybrid multiplexer, then additional 'PDH' equivalent multiplexers shall be installed as necessary; and
  - All SDH and MPLS links shall be cutover to the new hybrid multiplexers.
- Migrate the existing services to the new equipment on an as is basis and decommission existing equipment;
- Battery systems that will be 12 years or older at time of final project commissioning are to be replaced;
- Test and commission;
- Ensure the new network is fully modelled in OSS;
- Ensure the network management system is integrated into OSS;
- Decommission the existing redundant equipment;
- Return all redundant equipment to the stores as spare inventory;
- Update all drawings and databases across all systems ensuring alignment with each other; and
- SAP is to be updated in alignment with the current specification.

3.1.4. Easement/Land Acquisition & Permits Work

Not applicable

3.2. Key Scope Assumptions

The following assumptions should be included in the estimate of this scope:

- All procurement activities shall be in accordance with Powerlink's procurement policy;
- Treatment of alarms shall be in accordance with operational requirements;
- The conversion of services to IP is excluded from the scope of this project unless it is necessary to facilitate the most cost effective solution; and
- An allowance for training.

4. Project Timing

4.1. Project Approval Date

The anticipated date by which the project will be approved is 30 June 2023.

4.2. Site Access Date

The assets are located in existing Powerlink sites; Site access is immediately available.

4.3. 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 June 2025.

5. Special Considerations

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

- Any existing assets to be removed and disposed of as part of this scope must be identified within the Project Proposal together with the forecast asset write off amounts at time of disposal;
- Plant and equipment identified to be recovered for use as spares or returned to stores should be packaged and transported to Powerlink's storage location. Costs to be included in the estimate;
- A high level project implementation plan including staging and outage plans should be considered and produced as part of the Project Proposal; and
- Ensure the Data Communications Network (DCN) is modified accordingly.

6. Asset Management Requirements

Equipment shall be in accordance with Powerlink equipment strategies.

Unless otherwise advised [redacted] will be the Project Sponsor for this project. The Project Sponsor must be included in any discussions with any other areas of Investment & Planning.

[redacted] will provide the primary customer interface. The Project Sponsor should be kept informed of any discussions with the customer.

7. Asset Ownership

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

8. 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.

9. Options

Not applicable

10. Division of Responsibilities

Not applicable

11. Related Projects

Project No.	Project Description	Planned Comm Date	Comment
Pre-requisite Projects			
Co-requisite Projects			
Other Related Projects			
CP.02771	Telecommunications & Digital Network Consolidation Stg 1	30 June 2023	
CP.02811	Telecommunications & Digital Network Consolidation Stg 2	30 June 2024	
CP.02813	Telecommunications & Digital Network Consolidation Stg 4	30 June 2026	

Concept Estimate for CP.02812 - Telecoms and Digital Network Consolidation Stage 3

Record ID	A3362086	
Policy stream	Asset Management	
Authored by	Project Manager	[redacted]
Reviewed by	Project Manager	[redacted]
Approved by	Program Director Telecommunications	[redacted]

Table of Contents

1. Executive Summary

Powerlink's SDH, PDH and MPLS networks enable data communications between Powerlink's substations, corporate head office and the BCS to support a wide range of real time and business support services such as SCADA, protection, remote monitoring and voice services.

The equipment comprised by the networks is nearing the end of manufacture and support. The timing of the end of support and manufacture for the various equipment is summarised in the following table.

Manufacturer	Equipment	Functionality	Count	End of Manufacture	End of Support
[redacted]		SDH	146	31-Dec-19	31-Dec-22
		SDH	62	31-Dec-20	31-Dec-22
		SDH	12	31-Dec-20	31-Dec-22
		SDH	3	31-Dec-20	31-Dec-22
		DWDM	106	31-Dec-15	30-Jun-22
		MPLS	154	31-Dec-19	31-Dec-22
		PDH	878	2013	2013

Powerlink has developed the conceptual architecture that will satisfy its future telecommunications needs. (Refer Figure 1). It comprises replacement of the DWDM to provide backbone communications throughout the length of the network, and provide connection points for discrete regionalised 10Gbit rings.

The objective of this project is to replace the current SDH, MPLS and PDH equipment with a single consolidated device to provide TDM and IP transport and interface requirements in the Central Queensland Region. The PSR requested a commissioning date of June 2025. However, due to the number of sites, and requirement to integrate works with wider portfolio of works in the region, the earliest deliverable date has been identified as June 2026.

This is Stage 3 of a four stage suite of projects to replace the entire Powerlink SDH, MPLS and PDH networks.

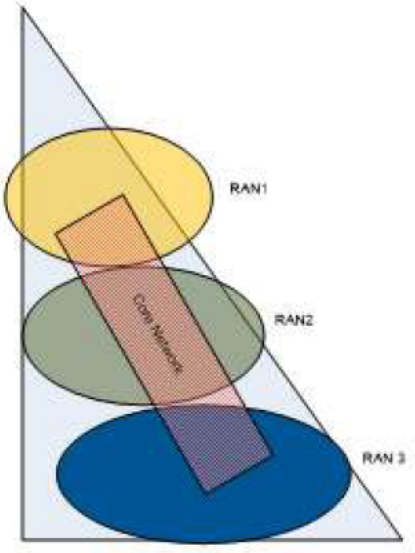

Figure 1: Regional Area Network (RAN) Concept

1.1 Project Estimate

The Powerlink costs of $190,000 per site are based on previous Powerlink projects for the SAN replacement of the SDH nodes with [redacted] and the MPLS projects that installed the [redacted] into the Network.

Estimate Components		Base $	Escalated $
Estimate Class	5		
Estimate Accuracy	+100% / -50%		
Base Estimate		**12,397,862**	**14,858,749**
Mitigated Risk	[redacted]	[redacted]	[redacted]
Contingency Allowance	[redacted]	[redacted]	[redacted]
TOTAL		[redacted]	[redacted]

1.2 Project Financial Year Cash Flows

	June 2020 Base $	Escalated $
To June 2022	80,000	95,879
To June 2023	1,704,910	2,043,322
To June 2024	3,085,789	3,698,296
To June 2025	3,763,582	4,510,626
To June 2026	3,763,581	4,510,625
TOTAL	**12,397,862**	**14,858,749**

2. Project and Site Specific Information

2.1 Project Dependencies & Interactions

The design of the telecommunications network including staging of the implementation in alignment with the outcomes of CP.02771. Project CP.02771 Telecommunication Network Consolidation will determine the Vender and the platform chosen to replace the existing Powerlink Telecommunication network.

The following scope presents a functional overview of the desired outcomes of the project

Briefly, the project consists of the consolidation of the telecommunications and digital network in the Central Queensland region. The consolidation will replace the SDH, PDH and MPLS equipment with a hybrid multiplexer to support the transmission of telecommunications TDM and IP traffic, and interface to the secondary systems and communications equipment. (Refer Figure 2).

Figure 2: Consolidated Telecommunications Network Architecture

This project is for the Central Region or RAN2.

This project is dependent on the completion delivery of the following projects:

Project No.	Project Description	Planned Commissioning Date	Comment
Dependencies			
CP.02771	Telecommunication Network Consolidation	June 2022	The first of four Network Consolidation Projects.
Interactions			
Nil			
Other Related Projects			
CP.02811	Telecommunications and Digital Network Consolidation Stage 2	June 2025	The second of four Network Consolidation Projects.
CP.02813	Telecommunications and Digital Network Consolidation Stage 3	June 2027	The fourth of four Network Consolidation Projects.

2.2 Site Specific Issues

The work is to be done at thirty-one (31) separate sites. Twenty seven (27) sites are owned and operated by Powerlink, and four (4) sites are owned and operated by third parties.

3. Telecoms and Digital Network Consolidation (Central RAN)

3.1 Definition

3.1.1 Scope

The solution that this Concept Estimate is based on is drawn from previous SDH and MPLS projects and from engagement with Secondary System and Telecoms Strategies.

3.1.1.1 Substations Works

For the 31 identified sites in the RAN:

- install and configure the solution determined in CP.02771 Telecommunications Network Consolidation Stage 1 (Deliverable 1) to one RAN only;
- migrate services to the new solution and decommission existing equipment;
- network is to be fully modelled in Operational Support System (OSS);
- network management system is to be integrated into OSS; and
- all records across systems are to be updated and in alignment with each other.

3.1.1.2 Transmission Line Works

Not applicable.

3.1.1.3 Telecommunication Works

Telecommunications works to be completed per the above scope at the identified sites.

3.1.1.4 Easement/Land Acquisition & Permit Works

Not applicable

3.1.2 Major Scope Assumptions

- It is assumed that that project, CP.02771 will have been completed and the Vender and platform has been selected and the implementation and cutover process has been determined.

3.1.3 Scope Exclusions

- The conversion of Protection Signalling relays to IP.

3.2 Project Execution

3.2.1 Project Schedule

Task	Target Completion
Project Approval (issue of PAN)	June 2022
Design Commencement	July 2022
Design Complete	June 2023
Procurement Orders	June 2022
Procurement Deliveries	June 2023
Energy Queensland Training on new platform	June 2023
Pan Tel Contract	June 2023
Final Decommissioning	June 2026
Project Commissioning Date	June 2026

The PSR requested a commissioning date of June 2025. However, due to the number of sites, and requirement to integrate works with wider portfolio of works in the region, the earliest deliverable date has been identified as June 2026.

3.2.2 Network Impacts

There will be no impact on the HV Network. The plan will be to build the new network in parallel with the existing network and then cut over circuit by circuit from old to new.

3.2.3 Project Staging

The high level project staging are as follows:

Stage	Activity/Stage Description	High Level Timing
Not applicable	Design and Procurement	July 2022 to June 2023
1	Construction and of Commissioning new Network	July 2023 to June 2024
2	Cutover of service to new Network	July 2024 to June 2026
3	Commissioning of Project	June 2026

3.2.4 Resourcing

Internal Powerlink resources will be used for all Project Management, Design and Procurement.

Telecoms Panel Contractors (Pan Tel) resources may be used to install cubicles, chassis and cabling.

Maintenance Service Providers (MSP) resources will be used for all FAT, SAT and cutover of all service to new equipment.

3.3 Project Estimate

The Powerlink costs of $190,000 per site are based on previous Powerlink projects for the SAN replacement of the SDH nodes with [redacted] and the MPLS projects that installed the [redacted] into the Network.

Estimate Components		Base $	Escalated $
Estimate Class	5		
Estimate Accuracy	+100% / -50%		
Base Estimate		**12,397,862**	**14,858,749**
Mitigated Risk	[redacted]	[redacted]	[redacted]
Contingency Allowance	[redacted]	[redacted]	[redacted]
TOTAL		[redacted]	[redacted]

3.4 Project Financial Year Cash Flows

	June 2020 Base $	Escalated $
To June 2022	80,000	95,879
To June 2023	1,704,910	2,043,322
To June 2024	3,085,789	3,698,296
To June 2025	3,763,582	4,510,626
To June 2026	3,763,581	4,510,625
TOTAL	**12,397,862**	**14,858,749**

3.5 Project Asset Classification

Asset Class	Asset Life	Base $	Percentage
Secondary systems	15 years	101,903	1%
Communications	15 years	12,295,959	99%
TOTAL		**12,397,862**	

4. References

Document name	Version	Date
Project Scope Report	1.0	14/05/2020

Project Scope Report

CP.02813

Telecommunications and Digital Network Consolidation Stage 4

Concept – Version 1

Document Control

Change Record

Issue Date	Responsible Person	Objective Document Name	Background
May 2020	[redacted]	Project Scope Report CP.02813 Telecommunications & Digital Network Consolidation Stage 4	Preliminary scope

Related Documents

Issue Date	Responsible Person	Objective Document Name
July 2018	[redacted]	Horizon – a 10 year plan of telecommunications

Project Contacts

Project Sponsor	[redacted]	[redacted]
Connection & Development Manager	<name>	Ext.
Strategist – HV/Digital Asset Strategies	<name>	Ext.
Planner – Main/Regional Grid	<name>	Ext.
Manager Projects	<name>	Ext.
Project Manager	<name>	Ext.
Design Coordinator	<name>	Ext.

Project Details

1. Project Need & Objective

Powerlink's SDH, PDH and MPLS networks enable data communications between Powerlink's substations, corporate head office and the BCS to support a wide range of real time and business support services such as SCADA, protection, remote monitoring and voice services.

The equipment comprised by the networks is nearing the end of manufacture and support. The timing of the end of support and manufacture for the various equipment is summarised in the following table.

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Powerlink has developed the conceptual architecture that will satisfy its future telecommunications needs. (Refer Figure 1). It comprises replacement of the DWDM to provide backbone communications throughout the length of the network, and provide connection points for discrete regionalised 10Gbit rings. This permits the staged consolidation of the telecommunications and digital networks (Refer Figure 2) that will allow the structured replacement of the network while releasing existing equipment to the spares inventory to support the network in the interim. In addition, the OpsWAN replacement project will provide all the routing requirements at a substation, where it cannot be provided with the consolidated solution.

The objective of this project is to replace the current SDH, MPLS and PDH equipment with a single consolidated device to provide TDM and IP transport and interface requirements in the Southern Queensland Region by June 2026.

2. Project Drawing – Proposed Architecture

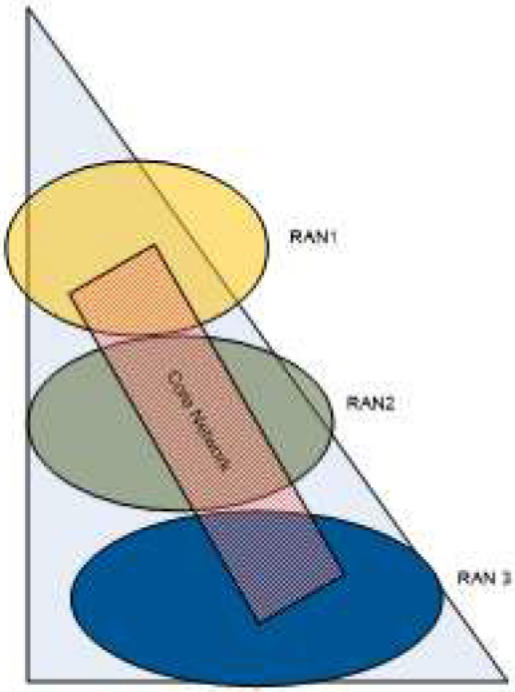

Figure 1 – Regional Area Network (RAN) Concept

Figure 2 – Consolidated Telecommunications Network Architecture

3. Project Scope

3.1. 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 5 Special Considerations*.

Briefly, the project consists of the consolidation of the telecommunications and digital network in the Southern Queensland region. The consolidation will replace the SDH, PDH and MPLS equipment with a hybrid multiplexer to support the transmission of telecommunications TDM and IP traffic, and interface to the secondary systems and communications equipment. (Refer Figure 2).

3.1.1. Transmission Line Works

Not applicable

3.1.2. Substation Works

Refer 3.1.3 Telecoms Work

3.1.3. Telecoms Works

Design procure, test and commission the establishment of the consolidated telecommunications Regional Access Networks for the Southern RAN. Sites to be confirmed, but for estimating assume the following 47 sites:

- CCBR BUSINESS CONTINUITY SITE
- CCVP SEQEB VICTORIA PARK (COMMS)
- DUMQ DUMARESQ 330KV SUBSTATION (TRANSGRID)
- DURR DURONG ROAD FIBRE OPTIC REPEATER
- EHTR EAGLE HEIGHTS MICROWAVE REPEATER
- H002 SOUTH PINE SUBSTATION
- H003 BELMONT SUBSTATION
- H004 MUDGEERABA SUBSTATION
- H005 WOOLOOGA SUBSTATION
- H006 GIN GIN SUBSTATION
- H009 PALMWOODS SUBSTATION
- H012 MOUNT ENGLAND SUBSTATION
- H014 MIDDLE RIDGE SUBSTATION
- H016 ROCKLEA SUBSTATION
- H018 TARONG SUBSTATION
- H021 MURARRIE
- H022 LOGANLEA SUBSTATION
- H023 UPPER KEDRON SUBSTATION
- H027 TARONG POWER STATION, 1-2 CONTROL ROOM
- H028 WIVENHOE POWER STATION
- H031 MOLENDINAR SUBSTATION - POWERLINK (H31)
- H036 BLACKWALL SUBSTATION
- H038 GOODNA SUBSTATION

- H049 AUBURN RIVER FIBRE OPTIC REPEATER
- H051 SWANBANK E SUBSTATION
- H062 ABERMAIN SUBSTATION (275 KV)
- H063 TEEBAR CREEK
- H072 H072 BLACKSTONE 275/110 KV SUBSTATION
- H085 COOPERS GAP WIND FARM
- H086 DARLING DOWNS SOLAR FARM
- HOMS BRISBANE, 61 MARY STREET
- PLVC POWERLINK VIRGINIA COMPLEX
- R002 R2 BRAEMAR 330KV/275KV SUBSTATION
- R003 R3 BULLI CREEK 330KV SUBSTATION
- R004 MILLMERRAN SWITCHYARD
- R005 MILLMERRAN POWER STATION
- S002 HALYS SUBSTATION
- S003 GREENBANK SUBSTATION
- T080 REDBANK PLAINS SUBSTATION
- T142 TENNYSON SUBSTATION (JOINT SITE WITH ENERGEX)
- T146 OAKEY SUBSTATION (AND GT POWERSTATION)
- T147 TANGKAM SUBSTATION
- T155 WEST DARRA SUBSTATION
- T160 SUMNER SUBSTATION
- T161 ALGESTER SUBSTATION
- T162 BUNDAMBA SUBSTATION
- T187 RICHLANDS SUBSTATION

Within the scope of work:

- Design the telecommunications network including staging of the implementation in alignment with the outcomes of CP.02771;
- Procure the new telecommunications equipment;
- Install and configure the new equipment to each site connected and configure to the respective RAN, noting that:
  - 2 hybrid multiplexers shall be installed at each site to replace the SDH multiplexer, MPLS router and all PDH multiplexers;
  - Hybrid multiplexers are to be installed in the comms room with the exception of existing combined comms and control buildings;
  - where the number of PDH multiplexers at any specific site exceeds the interface capacity of the hybrid multiplexer, then additional ‘PDH’ equivalent multiplexers shall be installed as necessary; and
  - All SDH and MPLS links shall be cutover to the new hybrid multiplexers.
- Migrate the existing services to the new equipment on an as is basis and decommission existing equipment;
- Battery systems that will be 12 years or older at time of final project commissioning are to be replaced;

- Test and commission;
- Ensure the new network is fully modelled in OSS;
- Ensure the network management system is integrated into OSS;
- Decommission the existing redundant equipment;
- Return all redundant equipment to the stores as spare inventory;
- Update all drawings and databases across all systems ensuring alignment with each other; and
- SAP is to be updated in alignment with the current specification.

3.1.4. Easement/Land Acquisition & Permits Work

Not applicable

3.2. Key Scope Assumptions

The following assumptions should be included in the estimate of this scope:

- All procurement activities shall be in accordance with Powerlink's procurement policy;
- Treatment of alarms shall be in accordance with operational requirements;
- The conversion of services to IP is excluded from the scope of this project unless it is necessary to facilitate the most cost effective solution; and
- An allowance for training.

4. Project Timing

4.1. Project Approval Date

The anticipated date by which the project will be approved is 30 June 2024.

4.2. Site Access Date

The assets are located in existing Powerlink sites; Site access is immediately available.

4.3. 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 June 2026.

5. Special Considerations

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

- Any existing assets to be removed and disposed of as part of this scope must be identified within the Project Proposal together with the forecast asset write off amounts at time of disposal;
- Plant and equipment identified to be recovered for use as spares or returned to stores should be packaged and transported to Powerlink's storage location. Costs to be included in the estimate;
- A high level project implementation plan including staging and outage plans should be considered and produced as part of the Project Proposal; and
- Ensure the Data Communications Network (DCN) is modified accordingly.

6. Asset Management Requirements

Equipment shall be in accordance with Powerlink equipment strategies.

Unless otherwise advised [redacted] will be the Project Sponsor for this project. The Project Sponsor must be included in any discussions with any other areas of Investment & Planning.

[redacted] will provide the primary customer interface. The Project Sponsor should be kept informed of any discussions with the customer.

7. Asset Ownership

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

8. 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.

9. Options

Not applicable

10. Division of Responsibilities

Not applicable

11. Related Projects

Project No.	Project Description	Planned Comm Date	Comment
Pre-requisite Projects			
Co-requisite Projects			
Other Related Projects			
CP.02771	Telecommunications & Digital Network Consolidation Stg 1	30 June 2023	
CP.02811	Telecommunications & Digital Network Consolidation Stg 2	30 June 2024	
CP.02812	Telecommunications & Digital Network Consolidation Stg 3	30 June 2025	

Concept Estimate for CP.02813 - Telecoms and Digital Network Consolidation Stage 4

Record ID	A3362088	
Policy stream	Asset Management	
Authored by	Project Manager	[redacted]
Reviewed by	Project Manager	[redacted]
Approved by	Program Director Telecommunications	[redacted]

Table of Contents

1. Executive Summary

Powerlink's SDH, PDH and MPLS networks enable data communications between Powerlink's substations, corporate head office and the BCS to support a wide range of real time and business support services such as SCADA, protection, remote monitoring and voice services.

The equipment comprised by the networks is nearing the end of manufacture and support. The timing of the end of support and manufacture for the various equipment is summarised in the following table.

Manufacturer	Equipment	Functionality	Count	End of Manufacture	End of Support
[redacted]		SDH	146	31-Dec-19	31-Dec-22
		SDH	62	31-Dec-20	31-Dec-22
		SDH	12	31-Dec-20	31-Dec-22
		SDH	3	31-Dec-20	31-Dec-22
		DWDM	106	31-Dec-15	30-Jun-22
		MPLS	154	31-Dec-19	31-Dec-22
		PDH	878	2013	2013

Powerlink has developed the conceptual architecture that will satisfy its future telecommunications needs. (Refer Figure 1). It comprises replacement of the DWDM to provide backbone communications throughout the length of the network, and provide connection points for discrete regionalised 10Gbit rings.

The objective of this project is to replace the current SDH, MPLS and PDH equipment with a single consolidated device to provide TDM and IP transport and interface requirements in the Southern Queensland Region. The PSR requested a commissioning date of June 2024. However, due to the number of sites, and requirement to integrate works with wider portfolio of works in the region, the earliest deliverable date has been identified as June 2027.

This is Stage 4 of a four stage suite of projects to replace the entire Powerlink SDH, MPLS and PDH networks.

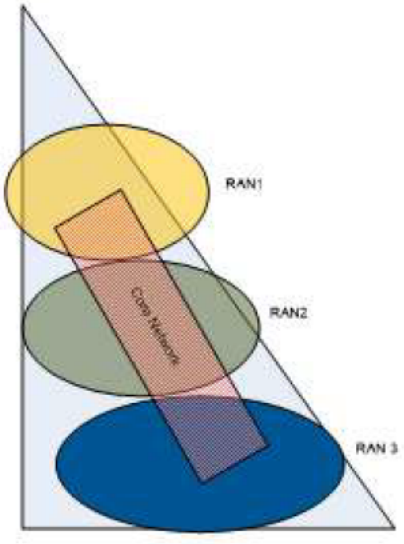

Figure 1: Regional Area Network (RAN) Concept

1.1 Project Estimate

The Powerlink costs of $190,000 per site are based on previous Powerlink projects for SAN replacement of the SDH nodes with [redacted] and the MPLS projects that installed the [redacted] into the Network.

Estimate Components		Base $	Escalated $
Estimate Class	5		
Estimate Accuracy	+100% / -50%		
Base Estimate		**18,513,694**	**23,101,650**
Mitigated Risk	[redacted]	[redacted]	[redacted]
Contingency Allowance	[redacted]	[redacted]	[redacted]
TOTAL		[redacted]	[redacted]

1.2 Project Financial Year Cash Flows

	June 2020 Base $	Escalated $
To June 2023	80,000	99,825
To June 2024	2,066,540	2,578,658
To June 2025	4,605,269	5,746,520
To June 2026	5,880,942	7,338,323
To June 2027	5,880,943	7,338,324
TOTAL	**18,513,694**	**23,101,650**

2. Project and Site Specific Information

2.1 Project Dependencies & Interactions

The design of the telecommunications network including staging of the implementation in alignment with the outcomes of CP.02771. Project CP.02771 Telecommunication Network Consolidation will determine the Vendor and the platform chosen to replace the existing Powerlink Telecommunication network.

The following scope presents a functional overview of the desired outcomes of the project

Briefly, the project consists of the consolidation of the telecommunications and digital network in the Southern Queensland region. The consolidation will replace the SDH, PDH and MPLS equipment with a hybrid multiplexer to support the transmission of telecommunications TDM and IP traffic, and interface to the secondary systems and communications equipment. (Refer Figure 2).

Figure 2 – Consolidated Telecommunications Network Architecture

This project is for the Southern Region or RAN3

This project is dependent on the completion delivery of the following projects:

Project No.	Project Description	Planned Commissioning Date	Comment
Dependencies			
CP.02771	Telecommunication Network Consolidation	June 2022	The first of four Network Consolidation Projects.
Interactions			
Other Related Projects			
CP.02811	Telecommunications and Digital Network Consolidation Stage 2	June 2025	The second of four Network Consolidation Projects.
CP.02812	Telecommunications and Digital Network Consolidation Stage 3	June 2026	The third of four Network Consolidation Projects.

2.2 Site Specific Issues

The work is to be done at forty-seven (47) separate sites. Forty-three (43) sites are owned and operated by Powerlink and four (4) are sites are owned and operated by third parties.

3. Telecoms and Digital Network Consolidation (Southern RAN)

3.1 Definition

3.1.1 Scope

The solution that this Concept Estimate is based on is drawn from previous SDH and MPLS projects and from engagement with Secondary System & Telecoms Strategies.

3.1.1.1 Substations Works

For the 47 identified sites in the RAN:

- install and configure the solution determined in CP.02771 Telecommunications Network Consolidation Stage 1 (Deliverable 1) to one RAN only;
- migrate services to the new solution and decommission existing equipment;
- network is to be fully modelled in Operational Support System (OSS);
- network management system is to be integrated into OSS; and
- all records across systems are to be updated and in alignment with each other.

3.1.1.2 Transmission Line Works

Not applicable

3.1.1.3 Telecommunication Works

Telecommunications works to be completed per the above scope at the identified sites.

3.1.1.4 Easement/Land Acquisition & Permit Works

Not applicable

3.1.2 Major Scope Assumptions

- It is assumed that that project, CP.02771 will have been completed and the Vender and platform has been selected and the implementation and cutover process has been determined.
- It is assumed that Powerlink staff will have been trained in the new technology.

3.1.3 Scope Exclusions

Training will need to be provided on the new equipment to Powerlink staff. This will be done under project, CP.02771 Telecommunication Network Consolidation

Exclusions as follow:

- Training of Powerlink staff; and
- The conversion of Protection Signalling relays to IP.

3.2 Project Execution

3.2.1 Project Schedule

Task	Target Completion
Project Approval (issue of PAN)	June 2023
Design Commencement	July 2023
Design Complete	June 2024
Procurement Orders	June 2023
Procurement Deliveries	June 2024
Pan Tel Contract	June 2024
Final Decommissioning	June 2027
Project Commissioning Date	June 2027

The PSR requested a commissioning date of June 2024. However, due to the number of sites, and requirement to integrate works with wider portfolio of works in the region, the earliest deliverable date has been identified as June 2027.

3.2.2 Network Impacts

There will be no impact on the HV Network. The plan will be to build the new network in parallel with the existing network and then cut over circuit by circuit from the old to the new.

3.2.3 Project Staging

The high level project staging are as follows:

Stage	Activity/Stage Description	High Level Timing
Not applicable	Design and Procurement	Jul 2023 to Jun 2024
1	Construction and of Commissioning new Network	Jul 2024 to Jun 2025
2	Cutover of service to new Network	Jul 2025 to Jun 2027
3	Commissioning of Project	June 2027

3.2.4 Resourcing

Internal Powerlink resources will be used for all Project Management, Design and Procurement.

Telecoms Panel Contractors (Pan Tel) resources may be used to install cubicles, chassis and cabling.

Maintenance Service Providers (MSP) resources will be used for all FAT, SAT and cutover of all service to new equipment.

3.3 Project Estimate

Estimate Components		Base $	Escalated $
Estimate Class	5		
Estimate Accuracy	+100% / -50%		
Base Estimate		**18,513,694**	**23,101,650**
Mitigated Risk	[redacted]	[redacted]	[redacted]
Contingency Allowance	[redacted]	[redacted]	[redacted]
TOTAL		[redacted]	[redacted]

3.4 Project Financial Year Cash Flows

	June 2020 Base $	Escalated $
To June 2023	80,000	99,825
To June 2024	2,066,540	2,578,658
To June 2025	4,605,269	5,746,520
To June 2026	5,880,942	7,338,323
To June 2027	5,880,943	7,338,324
TOTAL	**18,513,694**	**23,101,650**

3.5 Project Asset Classification

Asset Class	Asset Life	Base $	Percentage
Secondary systems	15 years	154,531	1%
Communications	15 years	18,359,163	99%
TOTAL		**18,513,694**	

4. References

Document name	Version	Date
Project Scope Report	1.0	14/05/2020