Murraylink Transmission Company Pty Ltd

Attachment 7.2
Business cases

January 2013

Contents

This document is an index of the business cases submitted to the AER as part of the Murraylink revised regulatory Proposal. These business cases provide the justification for a number of major elements of the capital and operating expenditure programs.

Ref.	Expenditure Item	Filename
	Murraylink and Directlink DC Power Transmission - Maintenance Strategy	Business case maintenance resourcing v07
Cap010	Berri water tank, pump and reticulation	Business Case Berri water tank v02.doc
Cap015	Cable relocation	Business Case cable relocation v02
Cap004	Air Conditioning Redundancy	Business Case Chiller - Murraylink v03
SIB 036 SIB037 SIB038	Control system end of life replacement	Business Case control system end of life replacement v04
Cap001	Control system enhancements – Runback	Business Case control system runback v04
Cap005 Cap006	Transformer earth switches at Berri and Red Cliffs	Business Case earth switches v03
Cap002	Positive pressure ventilation	Business Case forced ventilation v03
SIB003	Security Fence Replacement	Business Case Security Fence - Murraylink v03

APA Group

Murraylink and Directlink
DC Power Transmission

Maintenance Strategy

Version	Date	Reviewed By	Changes Made
V1		Ed DePrinse GM Transmission	
Approved By:		Signature:	

Contents

1. Executive Summary

The Transfield Services Maintenance Agreements for the Murraylink and Directlink DC power transmission lines expired on 30 June 2012. Under these arrangements, Transfield acted as Head Contractor and engaged subcontractors to perform many of the maintenance tasks associated with these assets.

Transfield was engaged as head contractor on favourable terms at a time when Electranet was seeking alternative suppliers for its maintenance services. APA has received notification from Transfield Services that it will not seek to retain or renew the agreements beyond 30th June 2012, as the provision of such services no longer aligns with its future business model. Moreover, on-site maintenance staff has anecdotally indicated Transfield's dissatisfaction with the profitability of the arrangement.

This situation has provided APA with the opportunity to review the maintenance strategy of these assets. To this end, APA reviewed two options:

- the appointment of an alternative head contractor, to manage all maintenance activities (similar to the current arrangement with Transfield Services); and
- the direct management of the maintenance activities, with a mixture of specialist contractors engaged by APA and some internal APA resources.

Based on APA's experience as an operator during the first decade of operation of these assets, it proposes to pursue the second of the above options. This departs from the previous resourcing strategy to a model comprising outsourcing of some specialised functions and insourcing of most general maintenance functions.

This proposal is expected to result in lower overall costs in the long term compared with continuation of the current head contractor model. The revised model will provides greater control of asset management, lower OHS risks through more direct control and the establishment of in house operational skills. However, it will involve the addition of two new full time internal operator/technician resources, in 2013/14 and the following year.

The program of stay in business capital projects, set out in the Murraylink revenue Proposal to the AER will also require additional engineering resources to manage the work. An engineering role is proposed to be established during 2014/15 year and a full time operator/technician the following year.

2. Contracting Options

APA has considered two contracting options. Firstly, a continuation of the head contractor strategy; and secondly, a specialised contractor strategy, with insourcing of most general maintenance functions and outsourcing of specialised functions. Insourcing of all maintenance functions is not considered due to the infrequent, low volume requirement for activities that involve highly specialised skills.

2.1. Head Contractor Strategy

A head contractor strategy would see similar operation to the current Transfield Services arrangements. Transfield currently sub-contract the majority of the maintenance work to smaller organisations, and generally only provide resources directly during significant maintenance events. Due to the breadth of the skills required, the concentration of work to a few outages each year, and the remote location of both Directlink and Murraylink, the pool of contractors suited to this work is limited.

Historically, only two contractors have tendered for this work package (Transfield Services and ABB). Of these two contractors:

- Transfield has indicated it is no longer interested in tendering for the work; and
- ABB has an extensive history of quoting for maintenance activities at prices that are much higher than alternate suppliers.

The continuation of the head contractor strategy is therefore expected to result in significantly higher overall maintenance costs.

2.2. Specialised Contractor Strategy

In this model, specialised functions will be outsourced to individual or panel contractors, whilst general maintenance functions will be managed by internal resources, with additional resources utilised as required for maintenance concentrated during annual equipment outages. This panel of contractors will also be used to carry out unscheduled maintenance as required, in response to equipment failure or condition monitoring indications.

Contractor support

The contracted specialised functions will be:

- Transformer maintenance;
- Circuit breaker maintenance; and
- Fire protection system maintenance.

In addition, a panel of trade contract labour would be established to support internal labour during peak maintenance periods and to cover staff absences.

The potential contractor or contractor pools, to be established under a request for proposal process are as follows:

Function	Potential Contractor Pool
Transformer maintenance	ABB Australia Limited Wilson Transformer Protech Power
Circuit breaker maintenance	ABB
Fire protection system maintenance	Chubb Australasia Wormald Fire protection Solutions Hawkins on fire Grayling Electrical
Control room	ElectraNet APA Group Dandenong

Internal resources

This model will require internal resources to carry out much of the day-to-day maintenance and manage maintenance by external contractors. The following resources are involved:

- An initial requirement for two additional operator technicians in 2012/13. One technician would be employed for Directlink operations, based at the Mullumbimby converter station in NSW and the second employed for Murraylink operations, based at the Berri converter station in South Australia;
- An additional engineer to carry out asset management activities, based in Brisbane. This role will be required for projects such as the control system replacement as well as the general reliability investigation, operations and maintenance. This position is planned to be filled in 2013/14.
- Because of the 180 km distance between the Murraylink terminal stations, it is likely that a third operator technician would be required at Berri in 2013/14.

3. Option analysis

The benefits and risks associated with each option are outlined below:

Head Contractor Strategy	
Benefits	**Costs/Risks**
• If low requirement for breakdown/corrective work (eg Murraylink), then costs are more manageable under fixed rates, however, where breakdown levels are high (eg Directlink), there is limited control and resulting high maintenance costs. • Contractor is responsible for maintaining appropriately trained workforce.	• Very limited number of head contractors available due to breadth of skills required, the remote locations, and concentration of work to a few times per year. • Lack of control of skilled workforce (including sub-contractors), resulting in increased oversight, management and increased corrective maintenance costs. • High contractor management oversight required to manage costs and activities.

	• High OHS oversight requirements resulting from new OHS harmonisation laws. • Regulatory risk with 10 year fixed revenue, with no flexibility in operating model. • Contractor has financial incentive to avoid work reimbursed by fixed fee in favour of breakdown works reimbursed by hourly rates. • Contractor has financial incentive to deploy the lowest cost/skill resources. • Aging assets likely to have increased breakdown works.
Specialised Contractor/ Inhouse Strategy	
Benefits	**Costs/Risks**
• Specialised activities are carried out by select skilled contractors. • No requirement to hold specialised tools and equipment. • Greater control and management of corrective maintenance costs. • Greater control of skill levels applied to activities. • Reduced regulatory risk by having greater flexibility for cost management. • Develop appropriate in-house skills and retain knowledge within business.	• Skilled staff attraction and retention. • Increased works management effort to schedule resources and maintenance. • Geographical management - single person remote operator for Murraylink.

The cost of a head contractor strategy will not be less than current Transfield Services levels. Recently introduced OHS harmonisation laws in January 2012 have significantly increased contractor risk profile, an overhead that will be passed on.

A marginal cost saving will be achieved in the first year of the specialised contractor strategy (against current Transfield Services levels). Although he overall cost of maintenance will increase in later years, increased savings, over the head contractor strategy, will be driven by managing in-house stay in business projects and corrective maintenance activities, which increase over time with the aging assets. Additional cost savings would be shown against expected higher baseline head contractor costs.

A cost comparison for Murraylink is shown in the table below, which does not include real cost escalation but does include APA's 10% on-costs. The Directlink cost comparison is expected to reveal a similar pattern. The head contract for Directlink is also due for renewal on 1 July 2012.

Murraylink only cost comparison (excludes maintenance spares)

FY ending	2012	2013	2014	2015	2016	2017	2018
Head contractor regime							
Routine maintenance							
Transfield (routine)	512.6						
Labour and related costs (in house)	61.5	61.5	61.5	61.5	61.5	61.5	61.5
Non routine maintenance							
Transfield (corrective)	307.7						
Proposed in-house strategy							
Routine maintenance							
Wilson (transformers)		118.2	118.2	118.2	118.2	118.2	118.2
Chubb (security)		11.9	11.9	11.9	11.9	11.9	11.9
Annual shutdown		56.2	56.2	56.2	56.2	56.2	56.2
ABB CB maintenance							165.0
Labour & related costs (1st technician operator)		115.5	115.5	115.5	115.5	115.5	115.5
Labour & related costs (2nd technician operator)			115.5	115.5	115.5	115.5	115.5
Motor vehicle costs		19.8	39.6	39.6	39.6	39.6	39.6
Non routine maintenance							
Chubb (security)		3.0	9.0	9.0	9.0	9.0	9.0
Corrective (various contractors*)		167.4	167.4	167.4	167.4	167.4	167.4
Total of labour and contract costs	**881.8**	**553.6**	**694.8**	**694.8**	**694.8**	**694.8**	**859.8**

* Based on 2011/12 corrective maintenance cost for Transfield, with a direct reduction of $57,000 and a further reduction in $71,000 in callout service fees.

4. Engineering Resource

Subject to the approval of the maintenance forecast and the proposed stay in business capital projects, in the 2012 revenue proposal to the AER, an additional engineering resource will be required to implement the projects. The engineer will be accountable for the delivery of the works required to complete the projects, as well as analysing the maintenance, failure and condition data to ensure the continued reliable operation of Murraylink. This engineer will be dedicated to Murraylink.

Murraylink only direct cost comparison

FY ending	2012	2013	2014	2015	2016	2017	2018
Additional labour related costs							
Labour & related costs (asset manager/engineer)			154.0	154.0	154.0	154.0	154.0
Motor vehicle costs			19.8	19.8	19.8	19.8	19.8
Total Cost			**173.8**	**173.8**	**173.8**	**173.8**	**173.8**

5. Transition Plan

There are three components of the transition to the new maintenance arrangements. These components are as follows:

- Contract directly with Transfield trade subcontractors that have provided satisfactory services.
- Identify and select specialist maintenance service providers.
- Diversify the labour resource base.

To ensure sufficient resources are available continue the routine maintenance activities and respond to technical faults, the existing subcontractor resource must be maintained. Transfield have engaged separate trade subcontractors, whose businesses are located close to the assets, throughout the term of the existing contract. The aim is to directly engage these experienced contractors, providing continuity of service.

A Request for Quotation process will be used to select contractors with the specialist skills and tools necessary to undertake particular parts of the maintenance work. The three areas of specialist maintenance that are affected by this change are transformer maintenance, circuit breaker maintenance, and fire protection system maintenance.

The labour resource will be diversified by recruiting a small number of permanent APA staff and by identifying additional trade contractors to increase the depth of the labour pool.

6. Recommendation

It is recommended that a specialised contractor strategy be implemented for Murraylink and Directlink, with panel contractors be established for:

- Transformer maintenance;
- Circuit breaker maintenance;

- Fire protection system maintenance; and
- Control room operations.

It is recommended that two technicians be recruited, one in FY2013 and one in FY2014.

It is also recommended that an engineering role be recruited for FY2014 to provide asset management support to implement the stay in business projects.

This operating model will ensure greater control of corrective maintenance costs, reduce additional overhead otherwise required to more closely manage contractors under the new OHS laws. It will also achieve greater protection against loss of business knowledge through staff turnover staff changes and changes in the business of the head contractor.

Business Case

Service provider	Murraylink Transmission Company Pty Limited
Asset	Murraylink Victoria – South Australia Transmission Interconnector
Project	*Berri water tank, pump and reticulation*
Project type	*Capex*
Project ID	*Cap010*
Prepared by	*Stuart Dodds*
Endorsed by (State Manager Asset Management)	
Approved by (General Manager Asset Management)	
Date	

PURPOSE

To present a project recommendation and expenditure forecast for inclusion in the Murraylink Regulatory Proposal for years 2013 to 2023.

BACKGROUND

Berri convertor station is not connected to a reticulated water supply. Water for consumption at the site is stored in a 10,000 litre tank.

Periodic maintenance cleaning of the convertor heat exchangers requires a high volume, high pressure water supply (eg. a fire hose or similar). This is required to effectively wash dust and contamination from the heat exchanger surfaces, which are too deep to be cleaned with a conventional high pressure water cleaner.

The existing water supply is inadequate to provide the volume of water or the pressure required for this cleaning operation.

To date, a water tanker with pump (ex-winery service) has been hired to carry out cleaning, but the continued availability of this aged vehicle is in doubt.

IDENTIFICATION OF NEED

This project is to ensure the continued availability of an adequate high volume, high pressure water supply to carry out regular cleaning of the Berri convertor station heat exchangers. This will be achieved by installing a permanent 25,000 litre water tank, pump and reticulation at the site.

EVALUATION OF ALTERNATIVES

The current reliance on hiring an ex-winery water tanker and pump is a limited term, opportunistic solution. The most economical and reliable long-term solution is to establish a permanent facility capable of doing the maintenance cleaning.

ESTIMATED COST

The expected cost of establishing a permanent 25,000 litre water tank and associated high capacity water pump and reticulation is $7,700. This price is based on a recent inquiry by a specialist equipment installerand includes APA on costs..

PLAN FOR EFFECTIVE EXECUTION

The requirement for AER acceptance of capital expenditure specified in 6A.6.7(c) of the National Electricity Rules (the Rules) is that the expenditure must be such as would be incurred by a prudent service provider acting efficiently, and represent a realistic expectation of the costs to achieve the requirement.

The installation costs above have been estimated on the basis of a recent quotation for the minimum installation to meet the identified need.

The work will be outsourced to a specialist contractor through a competitive process, to ensure the completion of the project at minimum cost.

JUSTIFICATION

This project to establish a permanent water supply for maintenance cleaning of the Berri convertor station heat exchangers is required to meet the following capital expenditure objectives set out in clause 6A.6.7(a) of the National Electricity Rules (the Rules):

(1) meet the expected demand for prescribed transmission services over [the regulatory control] period;

(3) maintain the quality, reliability and security of supply of prescribed transmission services; and

(4) maintain the reliability, safety and security of the transmission system through the supply of prescribed transmission services.

The lack of a permanent water supply to enable scheduled cleaning of the convertor heat exchangers would potentially affect Murraylink's capacity and availability for service.

RECOMMENDATION

It is recommended that provision be made for an expenditure of $7,700 to provide a permanent high volume, high pressure water supply at Berri convertor station for cleaning purposes.

The estimated cost has been included in the capital expenditure forecast for the Murraylink proposal in 2015/6. It is inclusive of 10% on-cost.

Business Case

Service provider	Murraylink Transmission Company Pty Limited
Asset	Murraylink Victoria – South Australia Transmission Interconnector
Project	*Cable relocation*
Project type	*Capex (Stay in Business)*
Project ID	*Cap015*
Prepared by	*Stuart Dodds*
Endorsed by (State Manager Asset Management)	
Approved by (General Manager Asset Management)	
Date	

PURPOSE

To present a project recommendation and expenditure forecast for inclusion in the Murraylink Regulatory Proposal for years 2013 to 2023.

BACKGROUND

The DC cables that form the connection between the Berri and Red Cliffs AC/DC convertor stations have a route length of approximately 180 km. The cables are mostly buried directly in the ground, within the road reservations linking these towns.

Murraylink does not enjoy the property rights of other TNSPs, who acquire easements to protect the tenure of their lines and cables. Almost the entire Murraylink cable route runs within road reservations and the tenancy of the cable is the subject of agreements with the relevant authorities.

Wherever road works take place that would impact on the cable, Murraylink is required by these tenancy agreements to relocate the cable or arrange for it to be protected, at Murraylink's cost. This would take place, for example, where a road is to be realigned, widened, or connected to a new side road. There has been one

such instance during the current regulatory control period, where a concrete protective cover was provided over the cable.

There is thus a high probability that relocation or protection of the Murraylink cable will be required, during the new regulatory control period. The precise details of the each future deviation are unclear but the associated cost impact has been assessed on a probabilistic basis, based on experience.

IDENTIFICATION OF NEED

This project is to retain the integrity of Murraylink by relocating or protecting the DC cables when road realignment or similar activity would otherwise damage or result in the excavation of sections of the cable.

EVALUATION OF ALTERNATIVES

The circumstances surrounding each requirement to relocate or protect the cable will differ and determine the extent of the remedial works that must be carried out. However, there will be no option but to carry out these works, to ensure the integrity and availability of Murraylink's prescribed transmission services.

ESTIMATED COST

The expected cost of relocating the Murraylink cables has been estimated on the basis of a requirement to relocate the cable over a distance of 100 metres.

The cost comprises the following components (in $2012/13):

Survey new cable alignment	$10,000
Trenching	$20,000
Jointing	$16,000
Cable supply	$32,000
Total cost for one relocation	**$78,000**

It is anticipated that there will be two occasions when the cable will need to be relocated during the 2013-23 regulatory control period. This total cost of $156,000 has been factored into the Murraylink capital expenditure program on the basis of 10 equal annual amounts of $17,160 (inclusive of 10% on-cost).

PLAN FOR EFFECTIVE EXECUTION

The requirement for AER acceptance of capital expenditure specified in 6A.6.7(c) of the National Electricity Rules (the Rules) is that the expenditure must be such as would be incurred by a prudent service provider acting efficiently, and represent a realistic expectation of the costs to achieve the requirement.

The expected cable relocation costs above have been estimated using recent costs for the respective components and a realistic expectation of the extent, and number, of cable deviations that will be required during the regulatory control period.

The relocation work will be outsourced to a specialist engineering consultant through a competitive tender process, to ensure the completion of the project at minimum cost and to ensure the requisite standards of reliability.

JUSTIFICATION

This cable relocation project is required to meet the following capital expenditure objectives set out in clause 6A.6.7(a) of the National Electricity Rules (the Rules):

(2) comply with all applicable regulatory obligations or requirements associated with the provision of prescribed transmission services;

(3) maintain the quality, reliability and security of supply of prescribed transmission services; and

(4) maintain the reliability, safety and security of the transmission system through the supply of prescribed transmission services.

Murraylink is required by the terms of its tenancy agreements with road authorities to relocate the cable if so requested. This constitutes a regulatory requirement associated with the provision of Murraylink's prescribed transmission services.

The expenditure will be required to retain the integrity of the Murraylink DC cables and thus the reliability and security of supply of prescribed transmission services and the transmission system.

RECOMMENDATION

It is recommended that provision be made for an expenditure of $15,600 per annum to cover the cost of relocating the Murraylink cable to enable road realignment and similar works, during the 2013-23 regulatory control period.

The estimated costs have been included in the capital expenditure forecasts for the Murraylink proposal.

Business Case

Service provider	Murraylink Transmission Company Pty Limited
Asset	Murraylink Victoria – South Australia Transmission Interconnector
Project	*Air Conditioning Redundancy.*
Project type	*Capex – SIB (efficiency improvement)*
Project ID	*Cap004*
Prepared by	*Stuart Dodds*
Endorsed by (State Manager Asset Management)	
Approved by(General Manager Asset Management)	
Date	

PURPOSE

To present a project recommendation and expenditure forecast for inclusion in the Murraylink Regulatory Proposal for years 2013 to 2023.

BACKGROUND

At the Murraylink terminal stations, the convertor equipment is controlled by computerised systems. When operating, this equipment generates heat. The stations are thus reliant upon air conditioning, to maintain the temperature of the control equipment and the associated building at acceptable levels.

Each Murraylink converter station currently has a single 40kW water chiller and a single 80kW chiller to supply the air conditioning. While the 80kW chiller has sufficient capacity to supply the air conditioning load all year round, the 40kW chiller does not have the capacity to supply the summer air conditioning load. This asymmetric design avoids having the 80kW unit operate inefficiently at light loads for extended periods. The larger unit is operated only when the ambient temperature is above 30^{o}C. The consequence of this arrangement is that the link is not secure against the failure of the 80kW chiller during the summer.

The lack of security against failure of this single element of plant, during temperatures above 30^{o}C, makes continuous availability of 80kW of chiller capacity critical to the operation of the whole transmission line.

The current 80kW chiller has been generally reliable throughout the past ten years of service, however this reliability is expected to diminish during the next revenue control period.

IDENTIFICATION OF NEED

This project arises from the need to maintain the integrity and reliability of the transmission line for the term of the revenue control period.

RISK ASSESSMENT

The operation of the converter station is dependent on the correct operation of several different computerised control systems. These control systems malfunction when the ambient temperature in the control rooms is not maintained at a stable level below 22^{o}C.

The risk has been assessed according to the requirements of the APA Group Risk Management Policy. Based on historical operation of the chiller, the risk likelihood is assessed as Likely. The consequence level is assessed as Minor, leading to an overall risk level of Moderate.

EVALUATION OF ALTERNATIVES

Alternative number 1 is to keep the existing, single chiller. Under this alternative, the converter station sites continue to operate reliably during summer provided the single 80kW chiller is operational at its rated capacity. Should this chiller fail, Murraylink will be shut down until the chiller is restored.

Alternative number 2 is to install a second 40kW chiller in parallel with the existing 40kW chiller. Under this alternative redundancy is achieved by the operation of two 40kW chillers in parallel to supply the summer air conditioning load. This option reduces the purchase cost of the chiller but increases the cost of the chilled water pipework and the cost and complexity of the control system to ensure that air conditioning load is shared evenly between the two chillers.

ESTIMATED COST

The estimated cost for the Berri site is $275,000.

The estimated cost for the Red Cliffs site is $275,000.

The basis for these costs is the quote received from AHI Carrier (Australia) Pty Ltd in December 2011. They are incllusinve of 10% on-cost

PLAN FOR EFFECTIVE EXECUTION

The requirement for AER acceptance of capital expenditure specified in 6A.6.7(c) of the National Electricity Rules (the Rules) is that the capital expenditure must be such as would be incurred by a prudent service provider acting efficiently, and represent a realistic expectation of the costs to achieve the requirement.

The project will be outsourced to one or more specialist contractors through a competitive tender process, to ensure the completion of the project at minimum cost.

JUSTIFICATION

This project is required to meet the following capital expenditure objectives set out in clause 6A.6.7(a) of the National Electricity Rules (the Rules):

(1) meet the expected demand for prescribed transmission services over [the regulatory control] period;

(2) comply with all applicable regulatory obligations or requirements associated with the provision of prescribed transmission services;

(3) maintain the quality, reliability and security of supply of prescribed transmission services; and

(4) maintain the reliability, safety and security of the transmission system through the supply of prescribed transmission services.

This capital expenditure project is justified under clause 6A.6.7(a)(3) as being required to maintain the quality, reliability and security of supply of prescribed transmission services. With no redundancy for the current single 80kW chiller, any fault with this chiller during summer will causes Murraylink to be shutdown.

RECOMMENDATION

Install a second 80kW chiller to provide security for failure of the existing chiller during summer.

The second chiller will be installed by specialist contractors using a competitive tender process.

Business Case

Service provider	Murraylink Transmission Company Pty Limited
Asset	Murraylink Victoria – South Australia Transmission Interconnector
Project	*Control system end of life replacement*
Project type	*Capex*
Project identifier	*SIB 036, SIB037, SIB038*
Prepared by	*Stuart Dodds*
Endorsed by (State Manager Asset Management)	
Approved by (General Manager Asset Management)	
Date	

PURPOSE

To present a project recommendation and expenditure forecast for inclusion in the Murraylink Regulatory Proposal for years 2013 to 2023.

BACKGROUND

Murraylink is capable of independently controlling active and reactive power flow to a set point that can be changed through the full range of Maurraylink's maximum capability. The control system actively maintains the set power flow in the link, irrespective of changes in the generation and load patterns on the external network.

The operation of the link is totally reliant upon the reliable functioning of the associated control system. This control system is based on industrial computers and hardware which are now nearing the end of their lives and at the time of replacement in 2015/16 will be 15 years old. This project covers the replacement of these industrial computers and software at both ends of the link (SIB 038). It also covers the replacement of two consumer grade workstations and associated software (SIB 036 and SIB 037 respectively) used for control, monitoring, maintenance and testing of the link.

IDENTIFICATION OF NEED

The Murraylink control system consists of a variety of industrial grade computerised hardware and software components. The components are tightly integrated and some are proprietary to ABB. Consequently the components cannot be interchanged with other non-OEM components without undertaking a significant amount of re-engineering and presenting an unacceptable technical risk.

Spare hardware components are currently held but key, non-ABB components are out of production and compatible new components cannot cannot be purchased. The software components are limited to operating systems that are no longer supported by the original publisher so cannot be installed on the current computer platforms.

As the control system ages, it becomes increasingly expensive to support and maintain the system. There is also an increasing risk that the failure of this control equipment and likely unavailability of spare parts would impair the availability of the link.

The proposed solution is to replace the control system components and software in 2015/16, to ensure the control system remains maintainable. By that stage, this control equipment will be 15 years old, which is the normal life expectancy of this class of equipment.

The workstations at each terminal are essential for the control, monitoring, maintenance and testing of the link. These workstations are standard off-the-shelf devices equipped with both standard and specialised software. It is anticipated that hardware and software would need to be replaced at intervals of approximately four years.

EVALUATION OF ALTERNATIVES

This project involves relatively minor expenditure, to maintain the effective performance of the existing Murraylink asset and thereby reduce the overall costs to market participants. The only realistic solution is to replace the control system with updated components supplied by the original maufacturer.

The workstations and their software would be replaced with suitable equipment meeting the minimum performance specificaitons.

ESTIMATED COST

The estimated cost of replacement of the link control system equipment and maintenance workstations is:

- Replacement of link control systems: $843,700 (in 2015/16);
- Workstation hardware $5,280 (in 2014/15, 2018/19 and 2022/23; and
- Workstation software $33,000 (in 2012/13 and 2022/23).

The basis for these costs is quotations that have been obtained from suppliers during 2012. The costs quoted are in $2012/13 and inclusive of 10% on-cost.

PLAN FOR EFFECTIVE EXECUTION

The requirement for AER acceptance of capital and operating expenditure specified in 6A.6.7(c) and 6A.6.6(c) of the National Electricity Rules (the Rules) is that the expenditure must be such as would be incurred by a prudent service provider acting efficiently, and represent a realistic expectation of the costs to achieve the requirement.

The costs associated with the control system end of life replacement are those quoted by the original service provider, who is still able to provide the requisite equipment.

The proposed date for the completion of this initiative is during 2015/16.

The workstations and software will be competitively sourced at the time, from suppliers able to provide goods to match the required specifications.

JUSTIFICATION

The elements of this control system end of life project are required to meet the following capital and operating expenditure objectives set out in clause 6A.6.7(a) and 6A.6.6(a) of the National Electricity Rules (the Rules):

(1) meet the expected demand for prescribed transmission services over that period;

(2) comply with all applicable regulatory obligations or requirements associated with the provision of prescribed transmission services;

(3) maintain the quality, reliability and security of supply of prescribed transmission services; and

(4) maintain the reliability, safety and security of the transmission system through the supply of prescribed transmission services.

The expenditure for control sysem replacement is justified under clauses (1) and (3), being required to maintain the capacity of the link and the security of supply in the provision of prescribed transmission services. The expenditure on the workstations and software is justified under the same two clauses.

RECOMMENDATION

It is recommended that end of life replacement of the Murraylink control systems and workstations be carried out. This will ensure the continued maintainability of this equipment and high levels of reliability and availability of the link.

The estimated costs have been included in the capital expenditure forecasts for the Murraylink proposal.

Business Case

Service provider	Murraylink Transmission Company Pty Limited
Asset	Murraylink Victoria – South Australia Transmission Interconnector
Project	*Control system enhancements – Runback*
Project type	*Capex* *Opex*
Project ID	*Cap001*
Prepared by	*Stuart Dodds*
Endorsed by (State Manager Asset Management)	
Approved by (General Manager Asset Management)	
Date	

PURPOSE

To present a project recommendation and expenditure forecast for inclusion in the Murraylink Regulatory Proposal for years 2013 to 2023.

BACKGROUND

The flow in Murraylink is capable of being altered from its maximum capability in one direction of 200 MW, through to maximum capability in the opposite direction, in a matter of milliseconds. The link control system establishes the flow in the link and this is able to respond to a number of external signals.

Exploiting the full capability of the link to support the market and the regional transmission systems in South Australia's Riverland and north-western Victoria will require the development of the existing control systems.

The flow in the link may be limited by the capacity of the adjacent transmission networks, particularly at times when these are heavily loaded or under transmission contingency conditions. In the event of unexpected failure of certain transmission

elements, a ***run-back*** scheme may be employed. This scheme monitors the status of the transmission system to which the link is connected and reduces the link flow in the event of a transmission system contingency, if overloading of other elements of the transmission system would otherwise take place. The link is also presently capable of being programmed for use is a ***run-forward*** mode, where the flow may be reversed to pro-actively support the transmission system in the region with the contingency.

An existing run-back system has existed for some years in the Victorian regional transmission network. The development of equivalent arrangements for the NSW system is covered by this business case.

In addition to providing regional transmission support, the link is capable of providing black-start supplies between regions of the NEM. This would require modification of the control systems to enable the link to maintain synchronous supplies, when other generation was not available. This modification is covered by a separate business case.

IDENTIFICATION OF NEED

This project to enhance the Murraylink control system capability arises from the need to increase the capacity of the South Australian interconnection under both system normal and transmission contingency conditions. Whilst major system augmentations to increase the capacity of interconnection to South Australia are currently under consideration by AEMO, this incremental upgrade was idenitifed at the time of Murraylink's forst regulatory determination.

EVALUATION OF ALTERNATIVES

This project involves relatively minor the expenditure, to enhance the utilisation of the existing Murraylink asset and thereby reduce the overall costs to market participants.

TransGrid's Annual Planning Report describes the NSW runback scheme, for completion when the associated communications have been established[1].

Murraylink has initiated discussions with AEMO and the TNSPs regarding more effective use of the capability of the link, including enhanced runback provisions.

ESTIMATED COST

The estimated cost of establishing the NSW run-back scheme is:

- Capital contribution to enable the re-routing of Telstra services: $275,000;
- Initial connection charges of $8,800; and
- Annual communications charges of $68,200.

The basis for these costs is quotations that have been obtained from suppliers during 2011 and early 2012. They are inclusive of 10% on-cost.

[1] TransGrid, New South Wales Annual Planning Report 2011, p. 60.

PLAN FOR EFFECTIVE EXECUTION

The requirement for AER acceptance of capital and operating expenditure specified in 6A.6.7(c) and 6A.6.6(c) of the National Electricity Rules (the Rules) is that the expenditure must be such as would be incurred by a prudent service provider acting efficiently, and represent a realistic expectation of the costs to achieve the requirement.

The communications costs associated with the NSW run-back scheme are those quoted by the only communications service provider able to provide the required facility.

The proposed date for the completion of this initiative is during 2013/14.

JUSTIFICATION

The elements of this control system enhancement project are required to meet the following capital and operating expenditure objectives set out in clause 6A.6.7(a) and 6A.6.6(a) of the National Electricity Rules (the Rules):

(1) meet the expected demand for prescribed transmission services over that period;

(2) comply with all applicable regulatory obligations or requirements associated with the provision of prescribed transmission services;

(3) maintain the quality, reliability and security of supply of prescribed transmission services; and

(4) maintain the reliability, safety and security of the transmission system through the supply of prescribed transmission services.

The expenditure for the NSW run-back is justified under clauses (1) and (3), being required to maintain the capacity of the link and the security of supply in the provision of prescribed transmission services.

RECOMMENDATION

It is recommended that enhancement of the Murraylink control systems be carried out to complete and commission the NSW run-back scheme.

The estimated costs have been included in the operating and capital expenditure forecasts for the Murraylink proposal.

Business Case

Service provider	Murraylink Transmission Company Pty Limited
Asset	Murraylink Victoria – South Australia Transmission Interconnector
Project	*Transformer earth switches at Berri and Red Cliffs*
Project type	*Capex*
Project ID	*Cap005, Cap006*
Prepared by	*Stuart Dodds*
Endorsed by (State Manager Asset Management)	
Approved by (General Manager Asset Management)	
Date	

PURPOSE

To present a project recommendation and expenditure forecast for inclusion in the Murraylink Regulatory Proposal for years 2013 to 2023.

BACKGROUND

The Murraylink convertor transformers at Berri and Red Cliffs are located outdoors near the convertor station buildings. They are single-phase units and, as is commonplace for oil filled apparatus, are located within blast walls and with oil containment to limit damage, environmental effects and fire in the event of catastrophic failure of a transformer.

The electrical connection to each transformer HV bushing is physically located around seven metres above ground level. These connections are required to be earthed, to enable maintenance and inspection work to take place on the associated transformer.

At present, earthing of the transformers is carried out using portable earths, which are clamped to a 'D' fitting attached to the transformer HV connection. The use of portable earths in this situation raises OH&S issues.

IDENTIFICATION OF NEED

This project aims to rectify a deficiency in the current design of the switchyard, whereby the earthing of the convertor transformer HV connections located seven metres above ground level must be carried out with portable earths. This feature of the design raises OH&S hazards for the staff that must operate and maintain the equipment, as follows:

- The portable earths and their trailing leads are heavy. In raising them to the required height, there is a significant risk that staff will be exposed to physical injury from straining to lift the earthing apparatus;
- There is a risk that staff may overbalance, in the process of lifting the portable earths; and
- On occasion, the earthing clamp can become detached from its insulated operating handle. If a detached earthing clamp and trailing conductor were to fall from the height of the transformer connections, it could cause serious injury to operating staff below.

EVALUATION OF ALTERNATIVES

There is only one satisfactory way to resolve the OH&S issues identified with the use of portable earthing apparatus on the transformer HV connections. The solution is to install permanent earthing switches, which are operated from ground level using a handle and linkage.

Modern transmission switchyard designs invariably include earth switches that are operated from ground level, in situations such as the Berri and Red Cliffs transformer connections.

Equipping the Berri and Red Cliffs switchyards with transformer earthing switches will resolve these OH&S issues and align the design with modern practice.

ESTIMATED COST

The layouts of the switchyards differ. There are three elevated earthing points at Berri and six at Red Cliffs. All require to be fitted with earthing switches.

The estimated cost of installing the earthing switches is $100.000 each, a total of $880,000 for the installations at Berri and Red Cliffs. This cost has been estimated on the basis of a quotation to supply and fit the earth switches obtained from a qualified supplier, early in 2012 and is inclusive of 10% on-cost.

PLAN FOR EFFECTIVE EXECUTION

The requirement for AER acceptance of capital expenditure specified in 6A.6.7(c) of the National Electricity Rules (the Rules) is that the expenditure must be such as would be incurred by a prudent service provider acting efficiently, and represent a realistic expectation of the costs to achieve the requirement.

The installation of the earthing switches at Berri and Red Cliffs will be outsourced to a specialist engineering contractor through a competitive tender process, to ensure the completion of the project at minimum cost.

The proposed date for the completion of both switchyards is during 2014/15, to be coordinated with other major maintenance.

JUSTIFICATION

This earthing switch project is required to meet the following capital expenditure objective set out in clause 6A.6.7(a) of the National Electricity Rules (the Rules):

(2) comply with all applicable regulatory obligations or requirements associated with the provision of prescribed transmission services;

By eliminating an identified OH&S hazard, this expenditure for the transformer earth switches is justified as assists in achieving objective (2),

RECOMMENDATION

It is recommended that transformer earthing switches be installed at the two Murraylink convertor stations to resolve current OH&S issues associated with the use of portable earthing apparatus.

The estimated costs have been included in the operating and capital expenditure forecasts for the Murraylink proposal.

Business Case

Service provider	Murraylink Transmission Company Pty Limited
Asset	Murraylink Victoria – South Australia Transmission Interconnector
Project	*Positive pressure ventilation*
Project type	*Capex*
Project ID	*Cap002*
Prepared by	*Stuart Dodds*
Endorsed by (State Manager Asset Management)	
Approved by (General Manager Asset Management)	
Date	

PURPOSE

To present a project recommendation and expenditure forecast for inclusion in the Murraylink Regulatory Proposal for years 2013 to 2023.

BACKGROUND

The Murraylink AC/DC convertor equipment at Berri and Red Cliffs is designed to be housed in substantial buildings, for weather protection. The heat generated by the electrical equipment is naturally carried by convection to asthe roof and is presently evacuated from the building by a forced ventilation system comprising 6 extraction fans mounted on the roof. The air intake ventilation ducts are in the building walls, near ground level.

IDENTIFICATION OF NEED

This project aims to rectify deficiencies in the current design of the forced ventilation system. These deficiencies are:

- There is no specific provision for access to the ventilation fans, such as by a walkway with guardrails, or tether rails, on the roof. This imposes OH&S issues for staff required to carry out maintenance or replacement of the ventilation fans.

- The design of the existing ventilation system does not include dust filtering on the air intake vents in the walls. In consequence of this, dust from ground level is drawn through the air intake vents and into the building. The dust is electrostatically attracted to the convertor equipment and presents a significant risk of electrical flashover and equipment damage.

- The negative pressure within the building generated by the existing ventilation system draws insects and spiders into the building, through cracks and openings in the walls. Their accumulation also presents a risk of flashover of the convertor equipment.

EVALUATION OF ALTERNATIVES

There are two issues with the design of the existing building ventilation equipment:

- Filtration of the incoming air is required, to reduce the intake of dust distributed within the building and accumulating on the electrical equipment;

- The design of the ventilation system needs to be altered to create positive pressure within the building and thereby discourage the ingress of insects and spiders.

There is only one way to configure a ventilation system that addresses these issues, whilst assisting the natural convection flows of air heated by the electrical equipment within the building. This involves the fitment of air handling equipment (fans equipped with filters) to the ventilation ducts at the base of the building walls and the replacement of the existing vent fans in the roof with capped ventilators. The air handling equipment would create a slight positive pressure within the building and the heated air would escape via the roof vents.

Maintenance impacts

Periodic inspection and checking of the convertor electrical equipment is required. The necessary cleaning of dust and other contamination from insulating surfaces has been carried out during these inspections. This type of preventative maintenance will still be required, although the extent of the decontamination will be reduced.

The filters in the air handling units will be an additional component requiring regular cleaning.

Overall, the effect on the level of routine maintenance will be slightly favourable.

ESTIMATED COST

The estimated cost of establishing the positive pressure building ventilation system at Berri and Red Cliffs is $233,200. This cost had been estimated on the basis of a quotation to supply and fit the air handling equipment and roof ventilators obtained from a qualified supplier in early 2012 and is inclusive of 10% on-cost.

PLAN FOR EFFECTIVE EXECUTION

The requirement for AER acceptance of capital expenditure specified in 6A.6.7(c) of the National Electricity Rules (the Rules) is that the expenditure must be such as would be incurred by a prudent service provider acting efficiently, and represent a realistic expectation of the costs to achieve the requirement.

The installation of the positive pressure ventilation systems at Berri and Red Cliffs will be outsourced to a specialist consultant through a competitive tender process, to ensure the completion of the project at minimum cost.

The proposed date for the completion of both initiatives is during 2014/15.

JUSTIFICATION

The elements of this control system enhancement project are required to meet the following capital and operating expenditure objectives set out in clause 6A.6.7(a) and 6A.6.6(a) of the National Electricity Rules (the Rules):

(2) comply with all applicable regulatory obligations or requirements associated with the provision of prescribed transmission services;

(3) maintain the quality, reliability and security of supply of prescribed transmission services; and

(4) maintain the reliability, safety and security of the transmission system through the supply of prescribed transmission services.

The expenditure for the positive pressure ventilation project is justified under the following sub clauses.

- The installation resolves current OH&S issues associated with maintenance of the roof mounted ventilation fans and thus assists achieving objective (2); and
- By reducing the likelihood of flashover and equipment damage to the convertors due to the accumulation of dust on their insulating surfaces, the project achieves objectives (3) and (4).

RECOMMENDATION

It is recommended that positive pressure ventilation systems be installed at the two Murraylink convertor stations be installed to:

- Resolve current issues associated with the maintenance of the roof mounted ventilations fans; and
- Reduce the risk of equipment flashover due to the accumulation of dust on convertor equipment insulating surfaces.

The estimated costs have been included in the operating and capital expenditure forecasts for the Murraylink proposal.

Business Case

Service provider	Murraylink Transmission Company Pty Limited
Asset	Murraylink Victoria – South Australia Transmission Interconnector
Project	*Security Fence Replacement*
Project type	*Capex – SIB (licence compliance)* *Capex – SIB (risk mitigation)*
Project identifier	*SIB 003*
Prepared by	*Stuart Dodds*
Endorsed by (State Manager Asset Management)	
Approved by(General Manager Asset Management)	
Date	

PURPOSE

To present a project recommendation and expenditure forecast for inclusion in the Murraylink Regulatory Proposal for years 2013 to 2023.

BACKGROUND

A number of incidents involving the injury or death of trespassers in high voltage substations has resulted in changes to the standards for substation fencing. These changes were incorporated into the substation fencing requirements detailed in the National Guideline for Prevention of Unauthorised Access To Electricity Infrastructure published by the Energy Networks Association (ENA).

The security fences at the Berri and Red Cliffs converter stations have been in place since their establishment over a decade ago and will need to be upgraded to the current standard during the next regulatory period.

IDENTIFICATION OF NEED

This project arises from the need to:

- Manage the risk of public liability from injury to trespassers.
- Manage the risk of malicious damage to the equipment in the converter station compound.

RISK ASSESSMENT

With the current security fence, entry to the converter station sites can be gained with the use of basic hand tools. Once inside the compound, there is a risk that an individual without proper instruction could be electrocuted by the high voltages on site or cause material damage to major items of plant such as the switchgear and transformers.

The risk has been assessed according to the requirements of the APA Group Risk Management Policy. The risk likelihood is assessed as Rare and the consequence level is assessed as Major, leading to an overall risk level of High.

EVALUATION OF ALTERNATIVES

The alternative to the project is to keep the existing security fence. Under this alternative, the converter station sites would continue to be secured at the existing standard for the duration of the revenue control period. It is anticipated that the other substations in adjacent areas operated by other TNSPs will have their security arrangements upgraded, leaving the Murraylink converter stations with a high level of vulnerability.

ESTIMATED COST

The estimated cost for the Berri site is $396,000.

The estimated cost for the Red Cliffs site is $539,000.

The basis for these costs is the $813.37 per metre paid for the Bungalora security fence in April, 2011. The estimated costs are in $2012/13 and inclusive of 10% on-cost.

PLAN FOR EFFECTIVE EXECUTION

The requirement for AER acceptance of capital expenditure specified in 6A.6.7(c) of the National Electricity Rules (the Rules) is that the capital expenditure must be such as would be incurred by a prudent service provider acting efficiently, and represent a realistic expectation of the costs to achieve the requirement.

The project will be outsourced to one or more specialist fencing contractors through a competitive tender process, to ensure the completion of the project at minimum cost.

The proposed date for the completion of the security fence replacement is the end of 2015.

JUSTIFICATION

This project is required to meet the following capital expenditure objectives set out in clause 6A.6.7(a) of the National Electricity Rules (the Rules):

(2) comply with all applicable regulatory obligations or requirements associated with the provision of prescribed transmission services;

(3) maintain the quality, reliability and security of supply of prescribed transmission services; and

(4) maintain the reliability, safety and security of the transmission system through the supply of prescribed transmission services.

This capital expenditure project is justified under clause 6A.6.7(a)(2) as being required to comply with regulatory obligations. South Australian Electricity (General) Regulations 1997, section 15 and Schedule 4 section 6 require the buildings and enclosures must be secured so as to prevent entry by unauthorised persons. The Victorian Electricity Safety Act 1998, section 98 requires APA to minimise the hazards and risks to the safety of any person arising from the supply network.

RECOMMENDATION

Replacement of the security fences at Berri and Red Cliffs to modern specifications is recommended, to mitigate the high risk of injury to a member of the public or major equipment damage.

The upgraded fences will be installed by specialist contractors using a competitive tender process.