GOLDFIELDS GAS PIPELINE

Access Arrangement Revision Proposal

Supporting Information

Attachment 1: CAPEX Business Cases

Review submission date: 1 January 2019

BUSINESS CASE 01

Service provider	Goldfields Gas Transmission
Asset	Goldfields Gas Pipeline
Project	ILI Inspection – Verification Digs
Project type	*Capex – SIB (licence compliance)* *Capex – SIB (risk mitigation)*
Prepared by	Geoff Callar
Endorsed by **(Asset Manager WA & NT)**	Aiden Trend
Approved by **(General Manager GGP)**	Barrie Sturgeon
Date	*Dec 2018 for the 2020 – 2024 Access Arrangement*

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PURPOSE

To present a project recommendation and expenditure forecast for inclusion in the Goldfields Gas Transmission System Strategic Asset Management Plan for 2020

BACKGROUND

In-line Inspection of the GGP Pipeline and the Newman Lateral was completed in 2015. The results of the 2015 survey indicated that the pipeline had a minor amount of significant metal loss corrosion that, if it were allowed to remain in the pipeline, could grow and reach an unacceptable size by 2021.

In September 2018 the integrity review was updated (see report GGP PL24 – ILI Verification Shortlist) and proposed works detailed including the necessary timeframe.

IDENTIFICATION OF NEED

The proposal is to inspect by direct assessment (digging) three features on the DN350 Sections 7 and 9 of the Goldfields Gas Pipeline and six locations on the Newman Lateral, identified by the 2015 in-line inspection. The work is proposed for 2020, prior to the 2021 integrity determined deadline.

In-line Inspection for metal-loss is carried out using magnetised tools whose passage along the pipeline builds a magnetic flux in the pipe wall. As the flux passed through corrosion features disruption to the flux passage is observed. The tools are calibrated prior to launch however field confirmation is a significant part of confirming that the tool has correctly measure the pipe wall anomalies throughout the run and that the analytical assessment was correct. The larger anomalies are typically selected to reduce the relative error in the field measurement and to ensure that the worst case scenario defects are inspected in a timely manner prior to them becoming significant to integrity.

This proposal involves the excavation and validation of 7 reported corrosion anomalies and 2 dents to confirm their condition and the measurement accuracy of the ILI tool. Very few excavations have been required on these pipelines previously, therefore direct field measurement of the features and individual integrity reviews will ensure that they are repaired appropriately and confirm the actual corrosion growth rates. It is anticipated that each corrosion feature will require a repair by grinding, but for the dents and any corrosion features that are significant support sleeves may also be required.

The results of the validation digs will also be used to validate the inspection data and confirm, or otherwise, all anomalies identified by the ILI. Should the anomalies be poorly sized or incorrectly discriminated the ILI results may require revisions which could increase the number of digs and the reinspection interval. For the purpose of the forecast the anomalies are assumed to be perfectly discriminated and sized and therefore no additional dig-ups are required.

RISK ASSESSMENT

The counter factual is the pipeline has been under evaluated and unsatisfactory defects are not excavated for repair and grow to failure. For the purpose of assessment a large leak is considered that ignites with personnel in the vicinity.

- Integrity. Pipeline failure several years after pigging due to metal-loss defects growing to failure.
- Safety. Undetected deterioration of pipeline integrity could lead to high pressure gas leaks, causing damage and serious injury in the vicinity.
- Environment. *Gas leaks and ruptures will contribute to increasing levels of carbon dioxide and other greenhouse gases in the atmosphere.*
- Business. *Potential restriction of gas supply to downstream users due to emergency activity.*

Primary Risk Assessment

Deterioration of the pipeline (corrosion and denting) remaining, potentially leading to a rupture. Corrosion is unchecked could lead to features sufficiently sized to rupture without previously leaking and dents may contain cracks which grow to failure.

Untreated Severity	-	*Severe (Injury requiring hospital treatment)*
Untreated Likelihood	-	*Unlikely (but possible)*
Untreated Risk	-	*INTERMEDIATE*

Treated Risk Assessment

Pipeline defects repaired and survey results validated

Treated Severity	-	*Severe (Injury requiring hospital treatment)*
Treated Likelihood	-	*Remote (not anticipated)*
Treated Risk	-	*LOW*

EVALUATION OF ALTERNATIVES

Option 1: Not excavating the survey indications to confirm/repair (Do nothing)

This is not considered an acceptable solution due to:

- Reliability and integrity risks
- Public safety risks

Option 2: More dig ups

- Unnecessary expenditure
- Additional risk to employees

Option 3: Validation by excavation and inspection/repair

A satisfactory option. The corrosion data anomalies are excavated and inspected. Integrity assessment and sentencing determines whether repairs and of which style are carried out.

RECOMMENDATION

Option 3 is recommended. This work will repair corrosion and dent features detected by in-line inspection to be repaired if necessary to maintain the system integrity, whilst enabling the survey report to be validated.

ESTIMATED COST

An approximate costing of $35k per dig has been utilised for the contractor. This is marginally more expensive than typical excavations on pipelines of this diameter, but takes into account the circumstances for this work:

- Restricted accommodation in remote areas;
- the likelihood of grinding or sleeve repairs;
- the increased difficulty in determining the exact pipeline location on site; and
- mobilisation and demobilisation of staff and plant to desert locations.

Engineering effort will be required for:

- Preparation of dig sheets;
- Pressure limitation considerations and control
- permit issuing and management on site;
- pipe wall scanning for 3D images of corrosion features;
- integrity sentencing and repair criteria;
- validation of inspection data; and
- records and reporting.

	Total Internal Labour	**Materials and Equipment**	**Subcontract Services**	**Project Costs**
9 verification excavations	30,000	40,000	315,000	**385,000**
			TOTAL	**$385,000**

PLAN FOR EFFECTIVE EXECUTION

It is anticipated that sub-contractors would be utilised for the physical work using excavation equipment and repair equipment as necessary. APA would provide the engineering considerations, site supervision as necessary and permit duties.
Pressure reductions are required for the excavation of potential defects on live pipelines which will be managed by the IOC in Brisbane.

JUSTIFICATION

The requirements for justification of conforming capital expenditure specified in Rule 79(2) are as follows:

The capital expenditure must be justifiable on one of the following grounds;

a. The overall economic value of the expenditure is positive, or
b. The present value of the expected incremental revenue to be generated as a result of the expenditure exceeds the present value of the capital expenditure, or
c. The capital expenditure is necessary;
    i. To maintain and improve the safety of services, or
    ii. To maintain integrity of services, or
    iii. To comply with regulatory obligation or requirement, or
    iv. To maintain the service provider's capacity to meet levels of demand for services existing at the time the capital expenditure is incurred (as distinct from projected demand that is dependant on an expansion of pipeline capacity); or
d. The capital expenditure is an aggregate amount divisible into two parts, one referable to incremental services and the other referable to a purpose referred to in paragraph "c", and the former is justifiable under paragraph "b" and the latter under paragraph "c".

This capital expenditure project is justified under Rule 79(2)(c)(i) and 79(2)(c)(ii) as the work is necessary safety preparation for the ILI which is to maintain the safety and integrity of service.

APPROVAL

BUSINESS CASE 02

Service provider	Goldfields Gas Transmission
Asset	Goldfields Gas Pipeline
Project	Preparation for In-line-Inspection • ILI Inspection – 16” Mainline • ILI Inspection – 14” Mainline • ILI Inspection – 8” Newman Lateral
Project type	*Capex – SIB (safety, integrity and compliance)*
Prepared by	Geoff Callar
Endorsed by **(Asset Manager WA & NT)**	Aiden Trend
Approved by **(General Manager WA)**	Barrie Sturgeon
Date	*Dec 2018 for the 2020 – 2024 Access Arrangement*

PURPOSE

To present a project recommendation and expenditure forecast for the preparation works, associated with the 2025 in-line inspection of pipelines (pigging), for inclusion in the Goldfields Gas Transmission System Strategic Asset Management Plan for year 2024.

BACKGROUND

High pressure pipelines could have dramatic failure modes if their integrity is not appropriately managed. Integrity inspections are therefore a key activity for pipelines and for most pipelines pipe wall inspection using non-destructive in-line tools is possible. It is necessary to understand the condition of the asset to determine what mitigation is required, therefore inspections for dents and reduced wall thickness (from corrosion and gouging) is necessary.

The in-line inspection technique involves advanced Geometry and Magnetic Flux Leakage tools (pigs) being inserted into the pipeline and pushed along in the gas stream. As they travel the pigs generate a strong magnetic field and measure disturbances to the resulting flux to determine the pipe wall thickness around 360 degrees for the total length. Analysis of the scans allows the integrity of the pipewall to be assessed.

Regulatory approval has been gained to inspect the GGP every 10 years, which mirrors the default cycle utilised throughout APA Group. The pipeline was last inspected in 2015 and is therefore due for further inspection in 2025.

The GGP is therefore due to be inspected outside of the proposed Access Arrangement period, but the preparatory works including liaison, easement preparation, flow confirmation, procedure development, risk assessment and mitigation will necessarily be carried out in advance and is forecast to be completed during 2024.

IDENTIFICATION OF NEED

Preparation of an ILI project involves a significant amount of planning and easement preparation to ensure that the project can be delivered safely without impacting other parties and stakeholders.

General pre-planning

In-line inspection has inherent risks and a significant amount of planning goes into every run from initial concept through vendor selection and risk review and mitigation:

- Vendor selection for the inspection tools is through a two vendor panel between Rosen and Baker Hughes, both of whom have extensive experience. There tools and pricing are reasonably comparable, but not exactly.

- Of particular importance is modelling to predict the gas speed in the pipeline throughout the inspection period and adjusting the run schedule and/or pipeline parameters to ensure that it matches the particular tool requirements. A production plan is developed to provide instruction to the Gas Controllers to ensure that they are briefed thoroughly in the designed pipeline parameters and methods to ensure successful runs.

- Whilst modern tools are unlikely to get stuck in the pipeline, the selection of the inspection and cleaning tools and the operating processes for pipeline cleaning need to be

determined and prepared for. Initial review and consideration for a stuck pig event is necessary.

- Safety Management Studies are held to consider each run to consider the risks for all stakeholders and determine whether any specific liaison, preparation and necessary mitigation is necessary and schedule it for implementation.

Easement Preparation

Of particular note the GGP operates through desert conditions in remote areas and has unique challenges. The easement can be subject to damage from regular cyclonic rains and other natural events. These events can cause significant degradation of access tracks and the right of ways from washaways and subsidence which can make the areas unpassable. This project will inspect and upgrade the easement as necessary to provide a safe place of work for the project team.

- During the preparatory works and the actual project delivery access tracks that are generally not used during general maintenance may be utilised and a heavy crane truck will be required to attend at each scraper station to handle the intelligent pig. Whilst the easement is maintained in a trafficable condition for normal maintenance purposes the significant number of journeys and including ones which may take place overnight demand a higher standard of track and easement preparation. Natural events can create serious damage therefore the inspection and any upgrade is carried out immediately in advance of the inspection project and may require some addition attention during the period.

- Vehicle travel is a significant component of pigging and particularly when the intelligent tool is being used operations may involve night travel to monitor progress and to move the GPS markers. Whilst all travel has risks associated with it, inspection once started operates to the schedule determined by the gas speed. Crews are focussed upon being at particular locations at particular times and poor access track and easement condition isn't safe.

SCOPE OF THE PROPOSAL

The exact scope would be finalised at the commencement of the project, however the following are typical activities associated with any metal-loss inspection runs.

- Inspection and upgrade of the easement
- Liaison with landholders
- Contracted rectification work
- Gas flow modelling
- Liaison with shippers and stakeholders
- Development of a Production Plan for the Integrated Operations Control Room
- Risk assessment

RISK ASSESSMENT

The risks associated with failure to plan for an ILI could involve lodged pigs and an inability to deliver gas, however for the purpose of this assessment the more physical aspects of the preparation works are considered.

The potential is for a single vehicle accident associated with un-trafficable access or easement circumstances. Roll-overs have been experienced on many pipelines during normal operations, this style of event may occur at any time, but is more likely at dawn/dusk when ambient light is poor. Pigging typically operates throughout 24 hours per day and travel may occur at any time throughout the day or night.

Primary Risk Assessment

Severity	-	*Severe (Injury requiring hospital treatment)*
Likelihood	-	*Unlikely (possible to occur but not likely)*
Untreated Risk	-	*Intermediate*

Treated Risk Assessment

The treatment involves inspecting and upgrading access tracks and easement on all pipeline sections being inspected to minimise any likelihood of significant vehicle incidents.

Treated Severity	-	*Severe (Short term interruption)*
Treated Likelihood	-	*Remote (not anticipated)*
Treated Risk	-	*Low*

EVALUATION OF ALTERNATIVES

EVALUATION OF ALTERNATIVES

Option 1: Rely on routine easement maintenance (Do nothing)

This is not considered an optimised situation due to:

- Potential for recent natural events to have damaged tracks and easement routes
- Unknown driving condition of infrequently used access routes.
- No assurance of a safe workplace

Option 2: Upgrade and maintain easements at a level sufficient to support ILI

This is not considered an optimised situation due to:

- Increase in the cost of maintaining the easements
- In non-pigging years when vehicle access is less and during daylight hours the standard of the easement would be higher than necessary to maintain the safe and reliable operation of the pipeline.

Option 3: Inspect and maintain easement and access tracks prior to project commencement

This is an acceptable situation. Inspection would identify locations where work would be required specifically to ensure the safety of crews during the pigging project.

RECOMMENDATION

Option 3 is recommended and is required to efficiently ensure safety of the public and personnel, the integrity of the assets and compliance with Standards. In addition as discussed the normal ILI preparation works will be completed in advance of the main programme scheduled for 2025.

ESTIMATED COST

The previous Access Arrangement had separate business cases for the easement preparation for ILI and the actual ILI and its associated processes.

In 2015 the easement preparation works cost ~$129k, whilst the costs associated with the ILI process preparation were expended against the ILI project.

It is proposed that for 2020 – 2024 that the ILI preparation works are separated from the ILI delivery reflecting operations in two different access arrangement periods.

	Total Internal Labour	Materials and Equipment	Subcontract Services	Project Costs
Easement inspection/rectification	50,000		100,000	150,000
ILI preparation	50,000			50,000
Proposal total	**100,000**		**100,000**	**200,000**

PLAN FOR EFFECTIVE EXECUTION

- The pigging preparation project will be managed by a Project Manager, who will utilise the experience and knowledge of APA's Internal Engineering department and Operations to develop necessary procedures, plans and logistical preparation.
- Field inspection for easement suitability and rectification will be carried out and contractual resources determined and mobilised for the work.
- All affected stakeholders will be consulted and where appropriate involved in safety management study (AS2885) workshops.

JUSTIFICATION

The requirements for justification of conforming capital expenditure specified in Rule 79(2) are as follows:

The capital expenditure must be justifiable on one of the following grounds;

a. The overall economic value of the expenditure is positive, or

b. The present value of the expected incremental revenue to be generated as a result of the expenditure exceeds the present value of the capital expenditure, or

c. The capital expenditure is necessary;

i. To maintain and improve the safety of services, or

ii. To maintain integrity of services, or

iii. To comply with regulatory obligation or requirement, or

iv. To maintain the service provider's capacity to meet levels of demand for services existing at the time the capital expenditure is incurred (as distinct from projected demand that is dependent on an expansion of pipeline capacity); or

d. The capital expenditure is an aggregate amount divisible into two parts, one referable to incremental services and the other referable to a purpose referred to in paragraph "c", and the former is justifiable under paragraph "b" and the latter under paragraph "c".

This capital expenditure project is justified under Rule 79(2)(c)(i), 79(2)(c)(ii) and 79(2)(c)(iv) as the work is necessary to ensure safety of the public and personnel, the integrity of the assets and compliance with Standards.

BUSINESS CASE 03

Service provider	Goldfields Gas Transmission
Asset	Goldfields Gas Pipeline
Project	Site accommodation upgrade program
Project type	*Capex – SIB (safety)*
Prepared by	Geoff Callar
Endorsed by (Asset Manager WA & NT)	Aiden Trend
Approved by (General Manager WA)	Barrie Sturgeon
Date	*Dec 2018 for the 2020 – 2024 Access Arrangement*

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PURPOSE

To present a project recommendation and expenditure forecast for a site upgrade program for inclusion in the Goldfields Gas Transmission System Strategic Asset Management Plan for years 2020 - 2021.

BACKGROUND

The project is to provide upgraded on-site accommodation for personnel working at Goldfield Gas Transmission Pipeline sites: Wiluna Compressor Station and Ilgarari Compressor Station.

GGP compressor stations were constructed with accommodation attached to the workshops when built around 2000 and subsequently additional overflow accommodation in the form of 2 bedroom demountable buildings with common toilet were added. Due to age, the existing accommodation is in need of refurbishment and upgrade.

The success and experience of similar works completed at Wyloo West, Neds Creek and Turee Creek have been considered in the development of the design.

GGP is in a competitive environment with the pay and employment opportunities in the mining sector, therefore increased expectations for their living conditions and modern OHS concerns for the wellbeing including the mental health of FIFO employees working in remote areas require GGP to ensure that site facilities remain appropriate.

IDENTIFICATION OF NEED

In addition the operating philosophy behind the compressor facilities has changed since the original accommodation was constructed around 2000. As a result of these changes more beds and additional manning is required at various locations, which will enable workers to stay on site rather than travel to hotel accommodation alleviating safety issues associated with repeated driving before and after work in remote areas.

The implementation of this upgrade will provide modern facilities for staff with better facilities including modern water storage and treatment, creating a healthier and more supportive working environment for staff. In addition the stations will be provided with a modest multipurpose room for miscellaneous training, leisure and meeting style activities.

There have been numerous expressions of concern regarding the current status of the accommodation and this upgrade is anticipated and should assist in alleviating these concerns improving job satisfaction, employee engagement and safety.

It would be inconsistent with reasonable employee expectations if these facilities were not maintained at the appropriate standard such as comparable to those provided at a typical country motel and the EBA has the following requirement to be considered as standard accommodation. This standard is in the context that additional allowances are payable for sub-standard situations. GGP intend to meet requirements that are directly under its control.

- Single person per room
- Each room to have a TV.
- Each room to have a telephone or access to a mobile phone.
- Each room to have a bathroom facility.

- Room to be in good condition and secure
- Meals to be available in the building or restaurant within the local town.
- Air conditioning.

SCOPE OF THE PROPOSAL

The general scope of work for the accommodation upgrades has been determined and being rolled out generally.

References for further information

- Scope of Work – Accommodation Building General
- GGP Central Accommodation Feasibility Study

At Wiluna an entirely new accommodation block will be necessary.

Photo. Wiluna Compressor Station

RISK ASSESSMENT

The impact of the work doesn't provide a direct risk reduction, however the work will significantly impact the fitness for duty of staff and the amount of remote area travel.

The risks can be categorised as follows:

- Safety. Reduction in travel to and from remote area accommodation at start and end of shifts
- Safety. Quality single room accommodation with modern overnight rest and relaxation facilities.

Primary Risk Assessment

The primary risk relates directly to the safety of employees related to them carrying out physical duties without achieving satisfactory rest between shifts and from driving in remote areas to and from accommodation when tired.

Untreated Severity - *Severe (Injury)*

Untreated Likelihood - *Unlikely (may possibly occur)*

Untreated Risk - *INTERMEDIATE*

An INTERMEDIATE risk level is very undesirable and requires treatment.

Treated Risk Assessment

The accommodation upgrade is appropriate to ensure that staff are suitably housed when away from home and are less likely to be exposed to increased risk from reduced physical condition, whilst carrying out their duties.

Treated Severity - *Severe (injury)*

Treated Likelihood - *Remote (not anticipated)*

Treated Risk - *LOW*

EVALUATION OF ALTERNATIVES

There isn't really a suitable alternative that is suitable long term. It is appropriate to ensure that the staff are well housed and that their 'windscreen kilometres' are restricted as much as practicable.

Option 1: Maintain current circumstances (Do nothing)

This is not considered an acceptable solution due to:

- Potential for employees to be injured due to fatigue
- Potential for industrial concern
- Modern accommodation is necessary to achieve acceptable safety standards
- Modern accommodation is anticipated for staff of APA.

Option 2: Carry out minor maintenance to accommodation

As an ongoing program this would provide some improvement, however longer term it is not sustainable as it retains the employee working conditions at a level inconsistent with reasonable employee expectations which is unsatisfactory. This creates the potential for sustaining, or causing, an injury resulting for lack of attention due to fatigue whilst on site or travelling to and from the site and loss of staff to other industries better meeting their expectations.

Option 3: Upgrade the accommodation to modern remote area standards

Providing employees engaged in remote area work with access to a level of accommodation consistent with that which is consistent with the expectations of a reasonable employee will ensure as far as is possible that they are fully fit for their duty. Under these circumstances injuries are considerably less likely to occur.

RECOMMENDATION

Option 3 is recommended to provide field staff with an appropriate level of accommodation at the work site to reduce the level of remote driving necessary and enhance their general well being whilst working in remote locations.

ESTIMATED COST

A detail design has yet to be finalised so cost estimates are based on previous experience at other locations.

Two vendors, Aerison and Fleetwood provided indicative pricing for the supply of the new buildings to site. Aerison were cheaper and their pricing was used in the development of pricing for the full construction.

The work is anticipated to commence towards the end of 2019 and will continue under the proposed Access Arrangement throughout 2020 with completion anticipated in early 2021. These are remote area constructions and all of the work to be completed is significantly more expensive than would be experienced in a city.

Sites	Total Internal Labour	Subcontract services (incl materials)	Project Costs Total
Ilgarari & Wiluna	$506,000	$4,114,000	$4,620,000

CALENDARISATION

2019	2020	2021
$600,000	$3,700,000	$320,000
	Total	$4,620,000

PLAN FOR EFFECTIVE EXECUTION

Aerison would be contracted to provide the buildings to site. The overall project would be managed by an APA Project Manager, who will utilise the experience and knowledge from previous builds to effectively coordinate and manage work on site.

JUSTIFICATION

The requirements for justification of conforming capital expenditure specified in Rule 79(2) are as follows:

The capital expenditure must be justifiable on one of the following grounds;

a. The overall economic value of the expenditure is positive, or

b. The present value of the expected incremental revenue to be generated as a result of the expenditure exceeds the present value of the capital expenditure, or

c. The capital expenditure is necessary;

i. To maintain and improve the safety of services, or

ii. To maintain integrity of services, or

iii. To comply with regulatory obligation or requirement, or

iv. To maintain the service provider's capacity to meet levels of demand for services existing at the time the capital expenditure is incurred (as distinct from projected demand that is dependent on an expansion of pipeline capacity); or

d. The capital expenditure is an aggregate amount divisible into two parts, one referable to incremental services and the other referable to a purpose referred to in paragraph "c", and the former is justifiable under paragraph "b" and the latter under paragraph "c".

This capital expenditure project is justified under Rule 79(2)(c)(i) as the work is necessary to ensure safety of our personnel.

BUSINESS CASE 04

Service provider	Goldfields Gas Transmission
Asset	Goldfields Gas Pipeline
Project	GEA 60,000hr overhaul program
Project type	*Capex – SIB (integrity)*
Prepared by	Geoff Callar
Endorsed by (Asset Manager WA & NT)	Aiden Trend
Approved by (General Manager WA)	Barrie Sturgeon
Date	*Dec 2018 for the 2020 – 2024 Access Arrangement*

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PURPOSE

To present a project recommendation and expenditure forecast for the overhaul of compressor station GEAs for inclusion in the Goldfields Gas Transmission System Strategic Asset Management Plan for years 2021 to 2024.

BACKGROUND

Gas Engine Alternators (GEA) are located at remote compressor stations where sufficient electrical power to allow the site is not available. The alternators have large piston engines, similar to a semi-trailers, but use gas as their fuel driving alternator packages. Depending upon the actual site loads there may be GEAs turning on and off, syncing together automatically to meet the power requirement.

IDENTIFICATION OF NEED

The OEM recommend service and overhaul requirements for their plant. As with most plant the units can be run past the OEM recommendations, however the potential for failure increases. Failure of a piston engine can cause significant internal damage.

GGP bases servicing upon OEM recommendations:

- Minor services at 1,500 hours and yearly;
- medium services and top end overhaul at 15,000 hours;.
- in-frame engine overhaul at 30,000 hours; and
- engine replacement at 60,000 hours.

For GEAs a 60,000 hour engine replacement interval is consistent with OEM recommendations and has therefore been adopted by GGP and is completed routinely with an engine exchange.

The loss of a GEA at a compressor station would impact the redundancy the station and leave the whole station dependent upon a single power source for operation. If both GEAs failed the compressor station would fail to operate. This would be significant as the pipeline has little supply redundancy.

APA is currently embarking on new maintenance strategies based upon reliability and criticality to better prioritise the maintenance effort, this is unlikely to impact the overhaul frequency.

RISK ASSESSMENT

The risk associated with the GEA's relates to a failure of one engine during operation followed by a failure to start or a breakdown of the second engine. The resultant total failure of site power would lead to compression shut-down and impact the pipeline delivery capability.

Primary Risk Assessment

For risk assessment purposes it is assumed that all units exceed their overhaul period and it leads to a dual failure at a site which impacts delivery capability downstream.

Untreated Risk Assessment

Untreated Severity - *Severe (short term supply interruption)*

Untreated Likelihood - *Occasional (may occur)*

Untreated Risk - *INTERMEDIATE*

This risk is unacceptable, but describes a worst case scenario whereby multiple units have exceeded their recommended overhaul and one or both have significant engine failures.

Routine engine overhaul intervals is an appropriate maintenance strategy and whilst extending the interval further is possible, it would not be appropriate to allow the exposure to the increased operational risk and potential failure costs.

Treated Risk Assessment

The treatment involves proactive overhaul of the units in a timely manner.

Treated Severity - *Severe (short term supply interruption)*

Treated Likelihood - *Remote (Not anticipated)*

Treated Risk - *LOW*

EVALUATION OF ALTERNATIVES

Option 1: Repair units upon failure (Do nothing)

This is not considered an acceptable solution due to:

- Potential for major failure of the engine
- Extended periods without power redundancy
- Increased supply risks from failure of the compression site.

Option 2: Maintenance overhaul schedule revised to 40,000 hours

- Benefits of a shorter period overhaul is not demonstrated in terms of reliability
- More frequent overhauls increase the cost of maintenance of the GEAs.

Option 3: Maintenance overhaul schedule maintained at 60,000 hours

- Consistent with the OEM recommendations minimising risk of engine failure
- Results in less expenditure than a shorter, more frequent overhaul would result in.

Engine hours tracked and the 60,000 hr operational life forecasted in annual budgeting for delivery in the appropriate year.

RECOMMENDATION

Option 3 is recommended. It ensures that the units are considerably less likely to suffer a catastrophic failure in service potentially requiring a lengthy down-time repair during which the station wouldn't have power supply redundancy.

SCHEDULE

The following schedule has been derived from the actual operating hours since the last overhauls (see Appendix for further details):

Site	Equipment overhaul	Predicted
GEA 2 Paraburdoo	0hrs engine exchange, predicted 60,000hrs	Jan 2021
GEA B Wiluna	0hrs engine exchange, predicted 60,000hrs	May 2021
GEA A Ilgarari	0hrs engine exchange, predicted 60,000hrs	May 2021
GEA B Ilgarari	0hrs engine exchange, predicted 60,000hrs	Jun 2021
GEA A Wiluna	0hrs engine exchange, predicted 60,000hrs	Apr 2022
GEA B Yarraloola	0hrs engine exchange, predicted 60,000hrs	Dec 2023
GEA 1 Paraburdoo	0hrs engine exchange, predicted 60,000hrs	Nov 2024

NOTE: Business Case 10 – GGP Reliability Upgrades has a specific requirement to replace the GEA systems including the GEAs themselves at Yarraloola and Ilgarari. Yarraloola GEA B and both Ilgarari units have therefore been removed from the scope of this business case.

ESTIMATED COST AND CALANDERISATION

The following cost estimates are based upon historical pricing experience.

	Total Internal Labour	Materials and Equipment	Subcontract Services	Year	Total Project Costs
GEA 2 Paraburdoo	115,000	*99,000*	*0*	2021	115,000
GEA B Wiluna	110,000	*99,000*	*0*	2021	110,000
GEA A Wiluna	110,000	*99,000*	*0*	2023	110,000
GEA 1 Paraburdoo	115,000	*99,000*	*0*	2024	115,000
			Total 5 year cost		**$450,000**

PLAN FOR EFFECTIVE EXECUTION

The requirement for conforming capital expenditure specified in Rule 79(1) is that the capital expenditure must be such as would be incurred by a prudent service provider acting efficiently, in accordance with accepted good industry practice, to achieve the lowest sustainable cost of providing services.

GGP has a dedicated project team to manage the processes which would be scheduled to accommodate the operating plant requirements. The work would typically be carried out by APA staff.

JUSTIFICATION

The requirements for justification of conforming capital expenditure specified in Rule 79(2) are as follows:

The capital expenditure must be justifiable on one of the following grounds;
a. The overall economic value of the expenditure is positive, or
b. The present value of the expected incremental revenue to be generated as a result of the expenditure exceeds the present value of the capital expenditure, or
c. The capital expenditure is necessary;
    i. To maintain and improve the safety of services, or
    ii. To maintain integrity of services, or
    iii. To comply with regulatory obligation or requirement, or
iv. To maintain the service provider's capacity to meet levels of demand for services existing at the time the capital expenditure is incurred (as distinct from projected demand that is dependent on an expansion of pipeline capacity); or
d. The capital expenditure is an aggregate amount divisible into two parts, one referable to incremental services and the other referable to a purpose referred to in paragraph "c", and the former is justifiable under paragraph "b" and the latter under paragraph "c".

This capital expenditure project is justified under Rule 79(2)(c)(ii) as the work is necessary to ensure the integrity of service.

Appendix A

GEA UNIT HOURS PREDICTION

The prediction of overhaul dates has been developed by extrapolating the running hours since the previous overhaul. This assumes continued pipeline operations in a similar manner to that previously experienced.

Station	Equipment Type	Equipment Name	Driver Model	Driver Brand	Equipment Function	Current Hours	Date updated	Major OH hrs remainir	Last OH date	Days since last OH	Avg hrs/d	Predicted Date
Paraburdoo	Gas Engine Alternator	PBD-GEA2	VSG-F11GSI	Waukesha	Alternator	53626	27/07/2018	6374	01/12/2000	6447	8.32	22/01/2021
Wiluna	Gas Engine Alternator	WIL-GEA2	VSG-F11GSI	Waukesha	Alternator	79470	27/07/2018	40530	01/11/2013	1729	45.96	17/05/2021
Ilgarari	Gas Engine Alternator	ILG-GEA1	VSG-F11GSI	Waukesha	Alternator	92620	27/07/2018	27380	04/05/2010	3006	30.81	24/05/2021
Ilgarari	Gas Engine Alternator	ILG-GEA2	VSG-F11GSI	Waukesha	Alternator	85398	27/07/2018	34602	02/05/2012	2277	37.50	27/06/2021
Wiluna	Gas Engine Alternator	WIL-GEA1	VSG-F11GSI	Waukesha	Alternator	70695	27/07/2018	49305	01/11/2013	1729	40.89	6/04/2022
Yarraloola	Gas Engine Alternator	YLA-GEA2	VSG-F11GSI	Waukesha	Alternator	37930	27/07/2018	22070	01/12/2009	3160	12.00	30/12/2023
Paraburdoo	Gas Engine Alternator	PBD-GEA1	VSG-F11GSI	Waukesha	Alternator	44954	27/07/2018	15046	01/12/2000	6447	6.97	13/11/2024
Yarraloola	Gas Engine Alternator	YLA-GEA1	VSG-F11GSI	Waukesha	Alternator	29389	27/07/2018	30611	01/12/2009	3160	9.30	22/12/2027
Paraburdoo	Gas Engine Alternator	PBD-GEA3	VSG-F11GSI	Waukesha	Alternator	29005	27/07/2018	30995	01/12/2006	4256	6.82	31/05/2031

BUSINESS CASE 05

Service provider	Goldfields Gas Transmission
Asset	Goldfields Gas Pipeline
Project	Station - Hazard Area (HA) Upgrades
Project type	*Capex – SIB (Safety)* *Capex – SIB (Compliance with Codes)*
Prepared by	Geoff Callar
Endorsed by **(Asset Manager WA & NT)**	Aiden Trend
Approved by **(General Manager GGP)**	Barrie Sturgeon
Date	*Dec 2018 for the 2020 – 2024 Access Arrangement*

PURPOSE

To present a project recommendation and expenditure forecast for station hazardous area upgrades for inclusion in the Goldfields Gas Transmission System Strategic Asset Management Plan for years 2020 - 2024.

BACKGROUND

The GGP compressor stations and scraper and valve sites were built to the codes of the day and the more recent legislation leaves the site potentially non-compliant with respect to hazardous area equipment. This is a low risk issue for GGP but requires upgrading to comply with the standard.

Previous efforts at other APA stations have indicated that with some effort these stations can be made compliant typically by replacement of equipment or declassification.

All electrical equipment installed in a hazardous area must be recorded in a Hazardous Area Verification Dossier (HAVD). It is a requirement of AS60079 to inspect and demonstrate the continued compliance and safety of electrical installation within hazardous areas.

Recent inspections have also indicated significant UV damage on exposed cabling and equipment which requires replacement.

IDENTIFICATION OF NEED

To meet the requirements of AS60079 and AS2381, a HAVD is a mandatory requirement for compliance and safety of the electrical equipment installed within the hazardous areas and it needs to be maintained and rechecked.

AS/NZS 60079. 17:2009 Clause 4.3.1 state that;

“to ensure that the installations are maintained in a satisfactory condition for continued use within a hazardous area, either a) regular periodic inspection, or b) continuous supervision by skilled personnel.”

AS/NZS 60079.17:2009 Clause 4.4.2 state that;

“The interval between periodic inspections shall not exceed four years without conducting and documenting a risk assessment based on the equipment type, location and service”

This work has been ongoing across the WA assets but for GGP specifically additional work is required to ensure conformity with the requirements. A hazardous area inspection is necessary to record all the equipment information and condition to identify the extent of non-conformance. SPIE have quoted to carry out this work (see attached) for a base price of $9600 per site.

It may lead to rectification work for non-conformances. It is difficult to determine exact costs of the rectification work until the site is audited to identify what will need rectification. In other pipeline areas some equipment was found to meet overseas standards, other equipment found to be incorrectly installed voiding the manufacturer’s hazardous area certification, and some equipment was not suitable for installation in hazardous areas.

A particular issue known with these remote area stations is the damage incurred by ultraviolet radiation to the exposed cables. Ilgarari Compressor Station in particular has

suffered significant UV damage and the outer cable sheathing is no longer providing the desired protection. Whilst all of the sites are considered to currently be safe further deterioration is expected so rectification is necessary. This is an additional factor that may require extensive cable replacement works.

RISK ASSESSMENT

GGP has responsibility to ensure all the electrical equipment installed in hazardous areas is in safe working condition and meets the legal requirement and that compliance is maintained with all relevant Standards.

Failure to comply with the Australian Standard and States Electricity Acts and Regulations may result in:

- Safety and integrity risk –Without a HAVD, APA cannot identify the current compliance status of hazardous area rated equipment. Inappropriate equipment or inappropriately installed equipment installed in a hazardous area has the capability to become a source of ignition
- Non-compliance risk - Breach of the Standard and regulatory obligations leading to penalty or sanction
- Business risk – A failure of the equipment could create an incident which either terminates supply, or necessitates the termination of supply until upgraded equipment can be installed.

Primary Risk Assessment

The primary risk is for severe personnel injury due to inappropriate equipment operating in hazardous areas causing electrocution or ignition of gas during maintenance activities killing or severely burning staff on site. A regulatory investigation would be held.

Untreated Severity - *Major (Few fatalities)*

Untreated Likelihood - *Remote (not anticipated)*

Untreated Risk - *INTERMEDIATE*

Treated Risk Assessment

Completing the Hazardous areas study, upgrading necessary equipment and resolving the HAVD deficiencies would effectively remove the risks to staff and the business.

Treated Severity - *Trivial (Minimal impact on health)*

Treated Likelihood - *Remote (not anticipated)*

Treated Risk - *NEGLIGIBLE*

EVALUATION OF ALTERNATIVES

Option 1: Maintain the existing site documentation (Do nothing)

This is not considered an acceptable solution

- Intermediate safety and business risks
- Out-of-date information and does not comply with the Standard AS60079
- Does not meet best industry practice
- Risk to the public from potential gas fires in the hazardous area
- Risk of injury to staff during maintenance work

Option 2: Audit sites and build an electronic HAVD, upgrade equipment as necessary and perform ongoing regular inspection

A dedicated project team will establish a HAVD for each site. A satisfactory process for maintenance of hazardous area equipment will be established and documented in GGP hazardous area procedures.

Note: Risk remains until work is completed.

RECOMMENDATION

Option 2 is recommended. This option would bring the sites up to full compliance, which can be maintained in future years.

ESTIMATED COST

There are three compressor stations on the GGP involved which would be given priority due to their complexity. In addition the final year of the program deals with the ancillary site such as scraper and mainline valve stations where similar hazardous areas exist.

Accurate detailed estimation of the costs is impossible until the preliminary surveys have been completed, but broad values have been proposed reflecting the known complexity of the station. The UV damage to the exposed site cables at Ilgarari will potentially have a very significant impact upon the costing for all stations. The work involved to pull new cables into the conduit and remake the connections will be time consuming and difficult. It is anticipated that a significant amount of rectification at each station will be required and all will be completed in the same manner.

For the compressor stations it is anticipated that the initial unit work will resolve common aspects of the upgrade therefore the second unit on each station will take significantly less effort to resolve.

Site	Total Internal Labour	Materials and Equipment	Subcontract Services	Total Project Costs	Year
Ilgarari	40,000	60,000	100,000	**200,000**	2020
Ilgarari	20,000	30,000	50,000	**100,000**	2021
Yarraloola/Wiluna	40,000	60,000	100,000	**200,000**	2022
Yarraloola/ Wiluna	20,000	30,000	50,000	**100,000**	2023
Scraper stations and Mainline valves	40,000	60,000	100,000	**200,000**	2024
			TOTAL	**$800,000**	

PLAN FOR EFFECTIVE EXECUTION

The requirement for conforming capital expenditure specified in Rule 79(1) is that the capital expenditure must be such as would be incurred by a prudent service provider acting efficiently, in accordance with accepted good industry practice, to achieve the lowest sustainable cost of providing services.

GGP has a dedicated project team to management the processes. A range of policies and procedures have been setup and published. All hazardous area sites will be fall into this program in order to build a completed set of HAVD. The execution plan for this program is listed below:

1. Utilises external qualified inspectors to perform inspections and identify any non-conformance
2. Enter field inspections to HAVD by a Hazardous Area Record Officer
3. Analyse the HAVD and prioritise the non-conformance by the project team
4. Build an on-going Inspection Plan to meet the Standard
5. Develop a schedule for Rectification Work
6. Perform rectification on the non-conformance equipment

JUSTIFICATION

The requirements for justification of conforming capital expenditure specified in Rule 79(2) are as follows:

The capital expenditure must be justifiable on one of the following grounds;
a. The overall economic value of the expenditure is positive, or
b. The present value of the expected incremental revenue to be generated as a result of the expenditure exceeds the present value of the capital expenditure, or
c. The capital expenditure is necessary;
    i. To maintain and improve the safety of services, or

ii. To maintain integrity of services, or
iii. To comply with regulatory obligation or requirement, or
iv. To maintain the service provider's capacity to meet levels of demand for services existing at the time the capital expenditure is incurred (as distinct from projected demand that is dependent on an expansion of pipeline capacity); or

d. The capital expenditure is an aggregate amount divisible into two parts, one referable to incremental services and the other referable to a purpose referred to in paragraph "c", and the former is justifiable under paragraph "b" and the latter under paragraph "c".

This capital expenditure project is justified under Rule 79(2)(c)(i) and 79(2)(iii) as the work is necessary to ensure the safety of services and compliance with Standards.

BUSINESS CASE 06

Service provider	Goldfields Gas Transmission
Asset	Goldfields Gas Pipeline
Project	Bristol Flow Computer Upgrade
Project type	*Capex – SIB (integrity, business efficiency)*
Prepared by	Geoff Callar
Endorsed by (Asset Manager WA & NT)	Aiden Trend
Approved by (General Manager GGP)	Barrie Sturgeon
Date	*Dec 2018 for the 2020 – 2024 Access Arrangement*

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PURPOSE

To present a project recommendation and expenditure forecast for Bristol flow computer upgrades for inclusion in the Goldfields Gas Transmission System Strategic Asset Management Plan for years 2020 and 2021.

BACKGROUND

GGP has a number of Bristol flow computers that the manufacturers no longer keep supplies for and are now considered to be obsolete and no longer supported. The units are still operable; however obtaining spares and completing repairs is becoming increasingly difficult.

IDENTIFICATION OF NEED

Electrical equipment has a finite lifecycle, generally considered to be in the region of 12 – 15 years for field electronics. The experience on the GGP with electronic equipment along the pipeline is that the devices will often continue to operate successfully however, once obsolete and unsupported they are increasingly difficult to manage.

The Bristol DPC Flow Computers proposed for replacement are located at four sites on the GGP and are currently in operation. It would be prudent to remove them from service before they reach end of life and fail, as they are not duplicated.

Failure of a flow computer is unsatisfactory and whilst there is no physical risks resulting, there are manual calculations required which might generate commercial issues should billing estimates of system used gas (SUG) be challenged and /or found to have imposed unfair or inappropriate charges on users. Any issues would not be financially severe, but could impact the integrity of GGP and ultimately lead to longer term consequences for the viability of the pipeline.

Location	Flow Computer Type	Commissioned	Age at replacement
Parraburdoo CS (fuel gas)	Bristol DPC PLC	2004	17
Ilgararri CS (fuel gas)	Bristol DPC PLC	1997	24
Wiluna CS Flow (fuel gas)	Bristol DPC PLC	2001	19
Jeedamya SS (check meter)	Bristol DPC PLC	1997	24

RISK ASSESSMENT

The pro-active replacement of the flow computers would avoid the potential for loss of data due to age and obsolescence. The loss of a flow computer would necessitate manual estimation for billing purposes which is inappropriate as it introduces the risk of error.

- Integrity: *Failure of flow computer causing data loss whilst parts/replacement is sourced*
- Business: *Manual work-arounds to develop flow estimation. Potential for incorrect metering. Harm to reputation*

Primary Risk Assessment

Harm to reputation.

Untreated Severity - *Minor (based upon local problem rectified in other ways)*

Untreated Likelihood - *Frequent (Expected to occur)*

Untreated Risk - *INTERMEDIATE*

As a 'non-technical risk' the assessment has indicated that running metering to failure is not appropriate for a major pipeline. The devices are aged and rectification will most likely be necessary the near future following failure. It would be inappropriate to run metering devices to failure without 100% redundancy.

Treated Risk Assessment

Programmed replacement prior to anticipated failure

Treated Severity - *Trivial*

Treated Likelihood - *Remote (not anticipated)*

Treated Risk - *NEGLIGABLE*

EVALUATION OF ALTERNATIVES

Option 1: Replace Bristols on failure (Do nothing)

This is not considered an acceptable solution due to:

- Need to maintain plant in fit of purpose condition.
- Increasing likelihood of failure.
- Potential for reputational damage.
- Failure will occur in an unplanned manner.

Option 2: Pro-active replacement prior to anticipated end of life

A satisfactory option. Good business practice to replace obsolete equipment prior to failure. The risk is minimised by changing the equipment prior to excessive age.

RECOMMENDATION

Option 2 is recommended. This option would reduce the likelihood of a failure which requires manual intervention and estimated charges. This end of the pipeline process is very visible to stakeholders and it is necessary to portray a well managed and maintained service.

ESTIMATED COST

The overhaul costs are based on units installed at other remote sites. APA's Facilities team developed costing based upon their knowledge of similar projects.

Unit	Internal Labour	Materials and Equipment	Subcontract Services	Project Costs
Parraburdoo	$ 61,600	$ 34,100	$ 102,300	$ 198,000
Ilgarari	$ 61,600	$ 34,100	$ 102,300	$ 198,000
Wiluna	$ 61,600	$ 34,100	$ 102,300	$ 198,000
Jeedamya	$ 61,600	$ 34,100	$ 102,300	$ 198,000
			Total Project Cost	$ 792,000

PLAN FOR EFFECTIVE EXECUTION

It is anticipated that APA's project delivery team would carry out the work with subcontractor support.

JUSTIFICATION

The requirements for justification of conforming capital expenditure specified in Rule 79(2) are as follows:

The capital expenditure must be justifiable on one of the following grounds;
a. The overall economic value of the expenditure is positive, or
b. The present value of the expected incremental revenue to be generated as a result of the expenditure exceeds the present value of the capital expenditure, or
c. The capital expenditure is necessary;
    i. To maintain and improve the safety of services, or
    ii. To maintain integrity of services, or
    iii. To comply with regulatory obligation or requirement, or
    iv. To maintain the service provider's capacity to meet levels of demand for services existing at the time the capital expenditure is incurred (as distinct from projected demand that is dependent on an expansion of pipeline capacity); or
d. The capital expenditure is an aggregate amount divisible into two parts, one referable to incremental services and the other referable to a purpose referred to in paragraph "c", and the former is justifiable under paragraph "b" and the latter under paragraph "c".

This capital expenditure project is justified under Rule 79(2)(c)(ii) as the work is necessary to maintain the integrity of service.

BUSINESS CASE 07

Service provider	Goldfields Gas Transmission
Asset	Goldfields Gas Pipeline
Project	Gas Chromatograph Replacement Program
Project type	*Capex – SIB (integrity)*
Prepared by	Geoff Callar
Endorsed by (Asset Manager WA & NT)	Aiden Trend
Approved by (General Manager WA)	Barrie Sturgeon
Date	*Dec 2018 for the 2020 – 2024 Access Arrangement*

PURPOSE

To present a project recommendation and expenditure forecast for the replacement of gas chromatographs (GCs) for inclusion in the Goldfields Gas Transmission System Strategic Asset Management Plan for years 2020 to 2022.

BACKGROUND

Gas quality and heating value is typically measured at all inlets and larger offtakes along a pipeline to measure the hydrocarbon components in the gas stream to thus enable the heating value to be determined for metering and compliance purposes. C6 GCs are typically used for pipelines with C9 only at significant inlets.

GGP has 6 – Daniel C6 GCs, 2 units at Yarraloola and 4 units at offtakes.

IDENTIFICATION OF NEED

All of the GGP GCs along the pipeline with the exception of Kalgoorlie South are aged and are due to be replaced. Kalgoorlie South is younger and currently acceptable. Whilst fully operational the GCs are an operational threat and support is limited. The units are no longer trouble free and are requiring additional response visits to deal with errors and alarm conditions (see Appendix).

Redundant and unsupported equipment must be replaced before operational issues arise. The failure of the GC to provide the gas composition readings restricts the ability of GGP to accurately calculate the amount of energy in the gas delivered. This would lead to estimates of the energy which might be exceed or understate that delivered.

RISK ASSESSMENT

The loss of a GC at an off-take can be manually resolved by comparing the SCADA trend with other off-take sites with allowances for differences in the delivery timing to establish the heating value. It is though a laborious task and can lead to concern for the downstream parties being charged for their energy taken by this method.

Primary Risk Assessment

It is potentially embarrassing to GGP, harming the reputation of APA and GGP, particularly if the cause is identified as antiquated and unreliable equipment. This would harm the reputation of the pipeline should this occur and would become significant if it re-occurred and ultimately could lead to longer term consequences for the viability of the pipeline.

Untreated Risk Assessment

Untreated Severity - *Trivial*

Untreated Likelihood - *Occasional*

Untreated Risk - *LOW*

Whist the risk is low from a technical viewpoint the reputational issues associated with operating aged equipment that fails in service is potentially a larger risk. This though isn't quantifiable suggesting that a risk assessment process isn't a good measure in this instance.

Planning for older obsolete electrical equipment should be in place and when maintenance issues are developing and the impact affects other commercial parties it should be delivered with priority before it causes any concern.

Treated Risk Assessment

The treatment involves proactive replacement of units in a timely manner.

Treated Severity - *Trivial*

Treated Likelihood - *Hypothetical*

Treated Risk - *NEGLIGABLE*

EVALUATION OF ALTERNATIVES

Option 1: Repair units upon failure and wait for On-line SIM (Do nothing)

This is not considered an acceptable solution due to:

- Potential for device unserviceability
- Potential for urgent replacement of field equipment
- Possibility that on-line SIM will be delayed or not proven

Option 2: Replace the units proactively

A gradual proactive upgrade to modern standards to remove the risk of unserviceability entirely and avoid equipment downtime whilst repairs are facilitated or replacements organised.

RECOMMENDATION

Option 2 is recommended with the following schedule:

Site	Equipment	Year
Newman	Daniels C5	2020
Yarraloola A	Daniels C5	2021
Yarraloola B	Daniels C5	
Mount Keith	Daniels C5	
Leinster	Daniels C5	2022

ESTIMATED COST

APA's Facilities team developed costing based upon their experience with similar projects. The dual units at Yarraloola has reduced labour and sub-contractor costs reflecting a single mobilisation to deal with two units.

Cost per unit

Unit	Internal Labour	Materials and Equipment	Subcontract Services	Total Project Costs
Newman	$ 54,000	$ 61,000	$ 85,000	$200,000
Yarraloola A	$ 36,000	$ 61,000	$ 50,000	$147,000
Yarraloola B	$ 36,000	$ 61,000	$ 50,000	$147,000
Mount Keith	$ 54,000	$ 61,000	$ 85,000	$200,000
Leinster	$ 54,000	$ 61,000	$ 85,000	$200,000
			Total cost	**$894,000**

PLAN FOR EFFECTIVE EXECUTION

The requirement for conforming capital expenditure specified in Rule 79(1) is that the capital expenditure must be such as would be incurred by a prudent service provider acting efficiently, in accordance with accepted good industry practice, to achieve the lowest sustainable cost of providing services.

GGP will utilise a dedicated project team to manage the processes which would be scheduled with other business activities.

JUSTIFICATION

The requirements for justification of conforming capital expenditure specified in Rule 79(2) are as follows:

The capital expenditure must be justifiable on one of the following grounds;
a. The overall economic value of the expenditure is positive, or
b. The present value of the expected incremental revenue to be generated as a result of the expenditure exceeds the present value of the capital expenditure, or
c. The capital expenditure is necessary;
    i. To maintain and improve the safety of services, or
    ii. To maintain integrity of services, or
    iii. To comply with regulatory obligation or requirement, or
    iv. To maintain the service provider's capacity to meet levels of demand for services existing at the time the capital expenditure is incurred (as distinct from projected demand that is dependent on an expansion of pipeline capacity); or
d. The capital expenditure is an aggregate amount divisible into two parts, one referable to incremental services and the other referable to a purpose referred to in paragraph "c", and the former is justifiable under paragraph "b" and the latter under paragraph "c".

This capital expenditure project is justified under Rule 79(2)(c)(ii) as the work is necessary to ensure the integrity of service and to provide accurate metering data.

Appendix – GC issues

The following is a log of the ad hoc maintenance demands from the GC units that required response.

M3304652	please investigate frozen Apache meter and frozen GC at Y arraloola	Reg&Meter Stn, Yarraloola, GGP, 001	FAILINV	04/03/16 4:45 AM	YARRALOOLA
M3465384	Please check GC 3 gas data is accurate.	CTL & Monitoring, GGP, 000, Scraper Site Apache, Yarraloola Interconnects	CALIBRATE	06/04/16 12:26 PM	YARRALOOLA
M4162570	Investigate FC3 GC Fault	Compressor Stn, Yarraloola, GGP, 001	INV	06/07/16 6:00 AM	YARRALOOLA
M4724239	Change out GC solenoid. GC using excessive nitrogen	Gas Conditioning, GGP, 001, Compressor Stn, Yarraloola	REPAIR	06/10/16 11:00 AM	YARRALOOLA
M4779630	Please investigate GC data health alarm. GC data is not b eing used form site.	CTL & Monitoring, GGP, 1378, Reg&Meter Stn, Kalgoorlie Sth	FAILINV	19/10/16 5:00 AM	KALGOORLIE SOUTH
M4936000	Investigate Kal Sth GC data health alarm and flatline data	CTL & Monitoring, GGP, 1378, Reg&Meter Stn, Kalgoorlie Sth		21/11/16 9:00 AM	KALGOORLIE SOUTH
M5280779	Quadrant GC data flatline	CTL & Monitoring, Station Control, GGP, 001, Compressor Stn , Yarraloola	FAILINV	13/02/17 9:00 AM	YARRALOOLA
M5381208	Investigate GC Issue	Reg&Meter Stn, Kalgoorlie Sth, GGP, 1378	GENMAINT	01/03/17 7:16 AM	KALGOORLIE SOUTH
M5415962	Repair GC A	Meter Common, GGP, 001, Reg&Meter Stn, Yarraloola	REPAIR	14/03/17 11:16 AM	YARRALOOLA
M5702401	Investigate Kal Sth GC data health alarm and some flatlin ing and FC general alarms	Meter Common, GGP, 1378, Reg&Meter Stn, Kalgoorlie Sth		09/05/17 9:31 AM	KALGOORLIE SOUTH
M5730577	GC Analyser Replacement	Reg&Meter Stn, Kalgoorlie Sth, GGP, 1378	CALIBRATE	31/05/17 8:00 AM	KALGOORLIE SOUTH
M5958547	Check GC flow Rates and rotameters. May require Flow st reream Balance	Meter Common, GGP, 001, Reg&Meter Stn, Yarraloola	MAINT	31/07/17 1:43 PM	YARRALOOLA
M6094720	Rectify low carrier gas pressure GC unit 1	CTL & Monitoring, Station Control, GGP, 001, Compressor Stn , Yarraloola	FAILINV	23/07/17 6:00 AM	YARRALOOLA
M6138525	Yarraloola CS - GC Alarm Incorrectly Mapped on FC2	Compressor Stn, Yarraloola, GGP, 001	CALIBRATE	30/08/17 12:00 AM	YARRALOOLA
M6263734	New GC testing and commissioning with Emerson Enginee r and APA Technician	Reg&Meter Stn, Kalgoorlie Sth, GGP, 1378	CALIBRATE	18/09/17 8:00 AM	KALGOORLIE SOUTH
M6701313	Investigate GC fault on Unit 1 and Unit 2	Reg&Meter Stn, Yarraloola, GGP, 001	FAILINV	01/12/17 5:35 AM	YARRALOOLA
M6741774	Yarraloola GC 1 Carrier Gas Pressure Low.	Common Services, Yarraloola, GGP, 001	FAILINV	15/12/17 6:00 AM	YARRALOOLA
M6955725	Investigate GC A & B faults	Gas Conditioning, GGP, 001, Reg&Meter Stn, Yarraloola	REPAIR	30/03/18 7:45 AM	YARRALOOLA
M7002377	Investigate Apache GC data not updating	Reg&Meter Stn, Yarraloola, GGP, 001	FAILINV	12/02/18 5:00 AM	YARRALOOLA
M7490191	Rebuild sample probe and check GC unnormalized totals	Meter Common, GGP, 001, Reg&Meter Stn, Yarraloola	MAINT	21/05/18 7:05 AM	YARRALOOLA
M7653761	GC data health and communications health in alarms on FC1 or FC2	Reg&Meter Stn, Kalgoorlie Sth, GGP, 1378	FAILINV	11/06/18 8:28 AM	KALGOORLIE SOUTH

BUSINESS CASE 08

Service provider	Goldfields Gas Transmission
Asset	Goldfields Gas Pipeline
Project	Station RTU Upgrade Program
Project type	*Capex – SIB (integrity)*
Prepared by	Geoff Callar
Endorsed by (Asset Manager WA & NT)	Aiden Trend
Approved by (General Manager WA)	Barrie Sturgeon
Date	*Dec 2018 for the 2020 – 2024 Access Arrangement*

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PURPOSE

To present a project recommendation and expenditure forecast for the upgrade of station RTUs for inclusion in the Goldfields Gas Transmission System Strategic Asset Management Plan for years 2020 to 2023.

BACKGROUND

There are 16 sites with Modicon Quantum station RTUs on the GGP. The 16 units are aged and their programming language is no longer compatible with modern GGP equipment.

It was anticipated that these units would start to fail and benefit from a pro-active replacement during the last Access Arrangement, but with maintenance efforts removing and recycling old cards, the units have proved surprisingly reliable and the replacement program was temporarily suspended.

The units though are a further 5 years older than at the last submission. It is now significantly more likely that the units will start to fail and the vendor has indicated that it considers the units obsolete as of the end of 2018. The ability to purchase new cards will end, however one-off repair services are being implemented by the vendor/supplier to extend the remaining life where possible. This is only possible where the repair utilises existing spare parts or doesn't involve replacement of any parts of the RTU.

This isn't a satisfactory solution and repairs could involve extensive downtime and inconvenience

This business case has been prepared on a site by site basis and it is now proposed to commence a replacement program in 2019, which would see many of the replacements actually being completed between 2020 and 2024.

Additionally the station RTUs also have a legacy design whereby the CP system is controlled from the RTU. Modern station designs typically separate the CP system completely from the RTU allowing the two systems to operate independently. This is a good business practice allowing the reliability of the station RTU to be improved by offloading the duty associated with the CP system. A further benefit from isolating CP communications from the station controller is the ability to allow technicians remote access to the CP system for operational purposes without compromising the communication security around the station controllers.

IDENTIFICATION OF NEED

AS2885.3 section 8.9 'Supervisory Control and Data Acquisition (SCADA)' requires that where a pipeline has a SCADA system that the following is maintained during the operational life of the pipeline:

- Security and reliability;
- Supervision of the operation of the pipeline system;
- The capability of issuing operating and control commands;
- The capability of collecting, storing and displaying data, facility alarms and status and
- Ensuring safe operation of control systems at remote facilities.

AS2885.3 section 5.2 (b) requires that "……the operating pressure at any point in the pipeline does not exceed the MAOP, and that transient pressure does not exceed 110% of

the MAOP". To achieve this APA has equipment specifically designed with SCADA monitoring and alarms.

AS 2885.3 Section 5.8.1 (f) requires in a station related clause that "When deviations from the normal operating conditions that affect the safety of the pipeline occur, corrective action shall be initiated immediately. Where RTUs have failed, the identification of an unsafe supply condition and immediate corrective action would be unachievable.

The Modicon Quantum RTUs require a programming language that is not compatible with Windows 10. This is primarily due to the process that is utilised. Whilst the hardware is generally 15- 20 years old the devices and wiring is known to still be in good condition and it is considered inefficient to replace the whole unit.

It is therefore proposed to change all 16 of the devices progressively over the five year period with newer styles that use "Unity" programming software that is compatible with APAs current standard of Windows 10. The existing units can't be reprogrammed or adjusted to suit APAs Windows 10 computers and utilising older laptops with earlier versions of Windows to maintain the capability is not appropriate on an ongoing basis.

It is further proposed to install an additional RTU that would enable the CP systems to operate independently of the station controller. Completing this work in association with the RTU upgrade is more efficient than as a standalone second program, and would prepare the site for remote control of CP without compromising station security.

RISK ASSESSMENT

The need to maintain out-dated equipment reduces efficiency of field operations and is ultimately a short term solution. Redundant and partly supported equipment must be replaced before major issues arise. Keeping this equipment in service means maintaining older style laptops that are unsupported will ultimately lead to unserviceable equipment.

The loss of an RTU at a compressor station would disable the ability of the operator to start or stop equipment remotely and where GEA control is involved there is potential for the compressor station to shut-down. At a telemetered line valve, loss of an RTU would result in control being lost. Both situations could lead to commercial and integrity risks.

Failure of device typically leaves the site facilities operational, but without communications and only under field local control. In this circumstance the failure of other key control devices would not be visible to the controllers and there would be no capability to shut-down or adjust remotely should other devices also fail and lose control.

Primary Risk Assessment

There is a significant risk of site communication and control failure leading to a potential loss of the integrity of pipeline services and ultimately safe operations. The inability to shut a valve or appropriately control a compressor is not acceptable for pipeline operations.

Untreated Risk Assessment

Untreated Severity	-	*Major (major off-site impacts)*
Untreated Likelihood	-	*Remote (not anticipated)*
Untreated Risk	-	*INTERMEDIATE*

This risk is unacceptable, but describes a worst case scenario whereby the failure of the Quantum RTU is subsequently impacted by a local failure. In practice this is quite unlikely, however it is very undesirable and the design of the station equipment originally was to avoid this situation.

The uncertainty surrounding such an event is high but regardless a replacement program allows it to be considered ALARP.

Treated Risk Assessment

The treatment involves proactive replacement of units in a timely manner.

Treated Severity - *Trivial*

Treated Likelihood - *Remote (Not anticipated)*

Treated Risk - *NEGLIGABLE*

EVALUATION OF ALTERNATIVES

Option 1: Repair units upon failure (Do nothing)

This is not considered an acceptable solution due to:

- Potential for device unserviceability
- Potential for urgent response demands for field equipment

Option 2: Replace RTUs in the units proactively

A gradual proactive upgrade to modern standards to remove the risk of unserviceability entirely and avoid equipment downtime whilst repairs are facilitated or replacements organised.

RECOMMENDATION

Option 2 is recommended. Removing a potential source of pipeline device failure and the associated issues is only achieved with this option.

The provision of a separate controller for the CP units at the time of implementing the upgrade is a cost efficient way to provide the facility for CP Engineers to remotely access their CP system without compromising the station security. Carrying out the upgrade in conjunction with the station RTU works is anticipated to avoid ~$40,000 per site of additional costs from the re-work.

Initially not all of the CP units will be compatible, but their upgrade under BC 09 – CPU Upgrade Program which will also result in that compatibility can occur smoothly after the RTU works without interfering with the station controller.

CALANDERISATION

The following schedule is proposed. The work will commence in 2019 at Wiluna, which has been included here for information purposes and does not feature in the estimated costs.

Site	Equipment	Year
Wiluna Compressor Station (GEA2)	Modicon Quantum RTU	2019
Wiluna Compressor Station (GEA1)	Modicon Quantum RTU	
Wiluna Compressor Station (RTU1)	Modicon Quantum RTU	
Yarraloola Compressor Station	Modicon Quantum RTU	2020
Newman Scraper Station	Modicon Quantum RTU	
Paraburdoo Compressor Station (RTU1)	Modicon Quantum RTU	2021
Paraburdoo Compressor Station (RTU2)	Modicon Quantum RTU	
Ilgarari Compressor Station	Modicon Quantum RTU	2022
Three Rivers MLV	Modicon Quantum RTU	2023
Mt Keith MLV	Modicon Quantum RTU	
Leonora MLV	Modicon Quantum RTU	
Leinster Scraper Station	Modicon Quantum RTU	
Jeedamya Scraper Station	Modicon Quantum RTU	
Kalgoorlie South Meter Station	Modicon Quantum RTU	2024
Kalgoorlie West MLV	Modicon Quantum RTU	
Kalgoorlie North MLV	Modicon Quantum RTU	

ESTIMATED COST

Each of the different stations has differing complexity therefore it was necessary to price them individually. Wiluna is scheduled to be delivered in 2019 and was included for information, but will not be included in the following project cost determination.

The costs below include for the CP work necessary to separate the CP units from the RTUs but do not include the power unit which has been separately requested under BC09 – CPU upgrade program.

Estimation for the works at all sites was developed for APA by Electro80 the equipment supply vendor. (see 10938-REP-101_APA_Draft)

Cost per unit

Unit	Internal Labour	Materials and Equipment	Subcontract Services	Total Project Costs
Yarraloola Compressor Station	$ 57,000	$ 120,000	$ 174,000	$ 351,000
Newman Scraper Station	$ 57,000	$ 32,000	$ 116,000	$ 205,000
Paraburdoo Compressor Station (RTU1)	$ 57,000	$ 102,000	$ 146,000	$ 305,000
Paraburdoo Compressor Station (RTU2)	$ 52,000	$ 21,000	$ 133,000	$ 206,000
Ilgarari Compressor Station	$ 57,000	$ 104,000	$ 245,000	$ 406,000
Three Rivers MLV	$ 55,000	$ 17,000	$ 154,000	$ 226,000
Mt Keith MLV	$ 55,000	$ 16,000	$ 106,000	$ 175,000
Leonora MLV	$ 55,000	$ 18,000	$ 106,000	$ 179,000
Leinster Scraper Station	$ 57,000	$ 33,000	$ 133,000	$ 223,000
Jeedamya Scraper Station	$ 57,000	$ 33,000	$ 150,000	$ 240,000
Kalgoorlie South Meter Station	$ 57,000	$ 98,000	$ 250,000	$ 405,000
Kalgoorlie West MLV	$ 55,000	$ 16,000	$ 106,000	$ 177,000
Kalgoorlie North MLV	$ 55,000	$ 16,000	$ 106,000	$ 177,000
			Total project cost	**$ 3,275,000**

PLAN FOR EFFECTIVE EXECUTION

GGP has a dedicated project team to manage the delivery processes, which would involve contractor support and be scheduled with other business activities.

JUSTIFICATION

The requirements for justification of conforming capital expenditure specified in Rule 79(2) are as follows:

The capital expenditure must be justifiable on one of the following grounds;
a. The overall economic value of the expenditure is positive, or
b. The present value of the expected incremental revenue to be generated as a result of the expenditure exceeds the present value of the capital expenditure, or
c. The capital expenditure is necessary;
    i. To maintain and improve the safety of services, or
    ii. To maintain integrity of services, or
    iii. To comply with regulatory obligation or requirement, or
iv. To maintain the service provider's capacity to meet levels of demand for services existing at the time the capital expenditure is incurred (as distinct from projected demand that is dependent on an expansion of pipeline capacity); or
d. The capital expenditure is an aggregate amount divisible into two parts, one referable to incremental services and the other referable to a purpose referred to in paragraph "c", and the former is justifiable under paragraph "b" and the latter under paragraph "c".

This capital expenditure project is justified under Rule 79(2)(c)(i) and (ii) as the work is necessary to ensure the safety and integrity of service.

BUSINESS CASE 09

Service provider	Goldfields Gas Transmission
Asset	Goldfields Gas Pipeline
Project	CPU upgrade program
Project type	*Capex – SIB (integrity, risk mitigation)*
Prepared by	Geoff Callar
Endorsed by (Asset Manager WA & NT)	Aiden Trend
Approved by (General Manager GGP)	Barrie Sturgeon
Date	*Dec 2018 for the 2020 – 2025 Access Arrangement*

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PURPOSE

To present a project recommendation and expenditure forecast for the replacement of Cathodic Protection Units (CPUs) for inclusion in the Goldfields Gas Transmission System Strategic Asset Management Plan for year 2020 to 2024.

BACKGROUND

The CPU power systems are old and whilst effective have very limited communication capability.

The cathodic protection systems at the major sites on the GGP are managed by the station RTUs, with only basic voltage and power adjustments being made automatically by the station RTU. The units cannot be controlled by SCADA due to their poor compatibility and only have basic monitoring telemetered. All adjustments to the CPU require a site visit to access the panel which is particularly inefficient for CP surveys where the stations need to be switched.

Business Case 08 - Station RTU upgrade program will provide a new RTU for each of the CPUs to enable the CP Engineers to communicate directly with the units in the field, if they have been upgraded.

IDENTIFICATION OF NEED

The technology of the existing CPUs is considered obsolete due to the age of the units, this creates difficulty in sourcing compatible auxiliary equipment especially for communication.

Failure of the CPU directly impacts the pipelines susceptibility to corrosion. The current telemetry system through the station RTU puts this failure out of sight of the CP engineers and may go unnoticed. If left in this state the pipeline will rust and eventually fail to contain the gas.

This proposal is to upgrade the power units on the CP system with units capable of communicating efficiently with the new RTUs and SCADA system. This will enable remote monitoring, fault finding, switching and routine adjustment where necessary.

RISK ASSESSMENT

GGP has responsibility to ensure that the pipeline remains in safe working condition in accordance with AS2885 with cathodic protection functioning in accordance with AS3832. The failure of a CP system to control adequately can be detected, but corrective action is significantly delayed requiring a crew to attend to the remote site. This would see under- or over-protection until rectification works can occur.

Primary Risk Assessment

Insufficient protection of the pipeline and station pipework allowing metal loss to initiate.

Untreated Severity	-	Trivial (no supply interruption – *short term* only)
Untreated Likelihood	-	Occasional (May occur)
Untreated Risk	-	Low

Treated Risk Assessment

The treatment involves timely replacement of the old station CPUs with new power units with greater communication capability.

Treated Severity	-	Trivial (no supply interruption – short term only)
Treated Likelihood	-	Unlikely (Unlikely but possible)
Treated Risk	-	Negligible

EVALUATION OF ALTERNATIVES

Option 1: Do nothing

This is not considered an acceptable solution due to:

- Lack of good communication capability
- Risk of ineffective CP protection
- Long term integrity damage if not rectified

Option 2: Maintain facilities as they fail

Facilities are maintained to ensure they remain operational for the maximum term possible. Replacement is only considered where the equipment has exceeded its life expectation and at a stage where repair to keep units in service is not appropriate. These units would remain insufficiently compatible with modern communication capabilities to assist with remote management and are undesirable longer term.

Option 3: Pro-active maintenance of facilities

Rather than wait until the CPUs fail, a proactive upgrade of the CPU can be carried out to remove the antiquated power supplies and enable modern control capabilities. Couple with the new RTU provision the units would be up to date with modern standards and the CP Engineers provided with modern control and monitoring capabilities.
This provides the communication advantages outlined in BC 08 and improved reliability from replacing an antiquated CPU.

RECOMMENDATION

Option 3 is recommended. It finalises the program to update the site communications providing new reliable CPU with remote access communication.

ESTIMATED COST

The requirements at each of the stations are identical with the exception of Marymia which is not at a station and requires additional equipment to communicate via a new satellite link to SCADA. Most sites have two CP system, each protecting the pipeline on either side of the station, although Yarraloola and Kalgoorlie being at the ends of the pipeline only have one each.

The costs below include for the new power unit and connection onto the provided RTU.

Estimation for the works at all sites was developed for works being carried out following or in conjunction with business case BC08.

Unit	Internal Labour	Materials and Equipment	Subcontract Services	Project Costs Total
Yarraloola Inlet	$ 11,000	$ 22,000	$ 22,000	$ 55,000
Wyloo Scraper Station	$ 11,000	$ 44,000	$ 33,000	$ 88,000
Newman Scraper Station	$ 11,000	$ 44,000	$ 33,000	$ 88,000
Paraburdoo Scraper Station	$ 11,000	$ 44,000	$ 33,000	$ 88,000
Turee Scraper Station	$ 11,000	$ 44,000	$ 33,000	$ 88,000
Ilgarari Scraper Station	$ 11,000	$ 44,000	$ 33,000	$ 88,000
Marymia	$ 11,000	$ 72,600	$ 66,000	$ 149,600
Neds Creek Scraper Station	$ 11,000	$ 44,000	$ 33,000	$ 88,000
Jeedamya Scraper Station	$ 11,000	$ 44,000	$ 33,000	$ 88,000
Wiluna Scraper Station	$ 11,000	$ 44,000	$ 33,000	$ 88,000
Leinster Scraper Station	$ 11,000	$ 44,000	$ 33,000	$ 88,000
Leonora MLV	$ 11,000	$ 44,000	$ 33,000	$ 88,000
Newman Meter Station	$ 11,000	$ 44,000	$ 33,000	$ 88,000
Kalgoorlie South Meter Station	$ 11,000	$ 22,000	$ 22,000	$ 55,000
			Total Project Cost	**$ 1,227,600**

CALENDARISATION

Where possible the works for this business case have been scheduled to coincide with the RTU upgrade work at the same site.

RTU Upgrade (BC08)	CPU Upgrade (this proposal)	Year
Yarraloola Compressor Station	Yarraloola Inlet	2020
Newman Scraper Station	Wyloo Scraper Station	
	Newman Scraper Station	
Paraburdoo Compressor Station (RTU1)	Paraburdoo Scraper Station	2021
Paraburdoo Compressor Station (RTU2)	Turee Scraper Station	
Ilgarari Compressor Station	Ilgarari Scraper Station	2022
	Marymia	
	Neds Creek Scraper Station	
Three Rivers MLV	Jeedamya Scraper Station	2023
Mt Keith MLV	Wiluna Scraper Station	
Leonora MLV	Leinster Scraper Station	
Leinster Scraper Station	Leonora MLV	
Jeedamya Scraper Station	Leinster Scraper Station	
Kalgoorlie South Meter Station	Kalgoorlie South Meter Station	2024
Kalgoorlie West MLV		
Kalgoorlie North MLV		

2020	2021	2022	2023	2024
$ 231,000	$ 176,000	$ 325,600	$ 440,000	$ 55,000

PLAN FOR EFFECTIVE EXECUTION

The requirement for conforming capital expenditure specified in Rule 79(1) is that the capital expenditure must be such as would be incurred by a prudent service provider acting efficiently, in accordance with accepted good industry practice, to achieve the lowest sustainable cost of providing services.

GGP has a dedicated project team to management the processes.

NOTE: It is intended that this business case will be delivered, where possible, in association with Business Case 08 – Station RTU upgrade. The upgrade which will provide each CPU with its own RTU which requires RTU programming. A combined upgrade program at the station would avoid the need to repeat the control system programming work and enable a new build to be delivered without early modifications. It is anticipated that the combined construction would minimise the project delivery cost to those shown saving approximately $40,000 per site.

JUSTIFICATION

The requirements for justification of conforming capital expenditure specified in Rule 79(2) are as follows:

The capital expenditure must be justifiable on one of the following grounds;
a. The overall economic value of the expenditure is positive, or
b. The present value of the expected incremental revenue to be generated as a result of the expenditure exceeds the present value of the capital expenditure, or
c. The capital expenditure is necessary;
    i. To maintain and improve the safety of services, or
    ii. To maintain integrity of services, or
    iii. To comply with regulatory obligation or requirement, or
iv. To maintain the service provider's capacity to meet levels of demand for services existing at the time the capital expenditure is incurred (as distinct from projected demand that is dependent on an expansion of pipeline capacity); or
d. The capital expenditure is an aggregate amount divisible into two parts, one referable to incremental services and the other referable to a purpose referred to in paragraph "c", and the former is justifiable under paragraph "b" and the latter under paragraph "c".

This capital expenditure project is justified under Rule 79(2)(c)(ii) as the work is necessary to ensure the integrity of service.

BUSINESS CASE 10

Service provider	Goldfields Gas Transmission
Asset	Goldfields Gas Pipeline
Project	GGP Reliability Upgrade
Project type	*Capex – SIB (integrity)*
Prepared by	Geoff Callar
Endorsed by (Asset Manager WA & NT)	Aiden Trend
Approved by (General Manager WA)	Barrie Sturgeon
Date	*Dec 2018 for the 2020 – 2024 Access Arrangement*

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PURPOSE

To present a project recommendation and expenditure forecast for a reliability upgrade for inclusion in the Goldfields Gas Transmission System Strategic Asset Management Plan for year 2020.

BACKGROUND

The compressor station power generation systems at several stations are old and are experiencing failures.

Yarraloola, as an example, has experienced 10 on-line failures over the last 12 months which on six of the occasions shut down the compression station. Despite expedited responses the failure still resulted in a delivery shortfall on one occasion. The issues appear to simply relate more to the age of the overall generator system rather than a specific maintenance issue.

IDENTIFICATION OF NEED

The WA assets were selected to be the pilot study as they are relatively low in gas supply complexity, which would enable easier reviews initially whilst the process was bedded in.

Reliability and criticality measures were developed for each of the stations along the GGP to ensure that the risks associated with the current stations were fully understood. The more critical assets were mapped and are now undergoing initial reviews of the age, condition and maintenance history/ requirements.

It is anticipated that during 2019 further national planning will enable APA to gather a broad view and understanding of the asset risks now targeted by the criticality and reliability reviews to develop strategic upgrade plans for future years.

There are three categories of equipment that are likely to be highlighted for specific attention as part of this study;

- Those that are involved with the increase of gas pressure to facilitate throughput and maintain downstream deliveries;
- Those that control pipeline pressures to stay within maximum levels;
- Those that actively release gas to avoid target pressure levels being exceeded.

Gas compression stations will be high in any criticality listing and similarly the equipment and services that support them. As part of this study power supply condition assessment studies will be carried out in 2019 for the three compressor stations.

The Yarraloola GEA system is comparable to the other power generation systems along the pipeline, therefore it is reasonable to assume that the reliability studies will provide the same outcome for the other power systems at the other compressor stations.

While additional work is required to complete the reliability study, based on current knowledge the best solution is to completely replace the older compressor station power supply systems at Yarraloola, Ilgarari and Wiluna in 2020 – 2024 and potentially a large amount of ancillary equipment change-outs at all stations. However, some of this will

already have been addressed by the work being undertaken as a result of Business Cases 05, 06, 07, 08 and 09.

To support an understanding of the cost of this option an initial vendor quotation has already been obtained.

If at the end of the study the optimal solution is something other than the replacement of the GEAs then it should be noted that the expenditure for BC04 - GEA 60,000 hr overhauls would increase by $330,000 to include the need to overhaul the GEA systems at the three compressor stations are replaced.

At Wiluna the GEA arrangement is different and in this case only the control system upgrade is required, whilst at Paraburdoo the current system is of a newer design and appropriate to remain in service.

It is though recognised that the priorities may vary with the criticality considerations and alternative assets may require upgrade in priority over or in addition to the power supply systems. Other assets are far less certain of financially significant and will not therefore be proposed at this time.

RISK ASSESSMENT

The GEA systems at Yarraloola, Ilgarari and Wiluna Compressor Stations are over 20 years old and despite maintenance activities there have been observed failures in station power increases, the impact of which at Yarraloola has already disabled compression and caused a deliver shortfall.

Each of these GGP compressor stations are supplied with power in a similar manner therefore it is the failure of these stations as a result of a complete failure in the power supply system that causes the risk of GGP failing to meet its delivery obligations.

Primary Risk Assessment

The loss of a GEA at a compressor station would impact the redundancy at the station leaving the whole station dependent upon a single power source for operation. If both GEAs or the control system running them failed, the compressor station would be unable to operate appropriately.

For risk assessment purposes it is assumed that station power fails at the site which shuts down the station until manual intervention on site can identify the cause and rectify the defective aspect. It can be assumed that this would impact delivery capability downstream on 10% of the occasions and if the delay is extensive could terminate supply to key users entirely.

Untreated Risk Assessment

Untreated Severity	-	*Severe (short term supply interruption)*
Untreated Likelihood	-	*Occasional (may occur)*
Untreated Risk	-	*INTERMEDIATE*

This risk is unacceptable, but describes a worst case scenario whereby the generation system at the station has entirely failed. Yarraloola has indicated that this could be an annual event on the GGP.

Treated Risk Assessment

The treatment involves proactive replacement of the whole generation system with new control packages and modern GEAs (where necessary) in a timely manner.

Treated Severity - *Trivial*

Treated Likelihood - *Remote (Not anticipated)*

Treated Risk - *NEGLIGABLE*

EVALUATION OF ALTERNATIVES

Option 1: Maintain current system (Do nothing)

This is not considered an acceptable solution due to:

- Potential for major failure of the station
- Increased supply risks from failure of the compression site.

Option 2: Replace the GEAs and the control system

This is an ideal situation where the whole power generation system is replaced. This would implement reliable generation control packages with current model GEAs and would be a prudent use of funds.

Option 3: Stage the replacement of the alternators and control system, but maintain the engines themselves until their overhaul becomes due

This is a less efficient manner for upgrading the power generation system and potentially impractical. The control systems are directly linked to the engines and generator packages which would therefore require specialist re-design and a significant amount of rework later.

As the GEA engines are a relatively small amount of the cost and delaying their replacement would eliminate a substantial amount of the desired reliability improvement, it was rejected.

RECOMMENDATION

Option 2 is proposed as the more efficient method for upgrade.

ESTIMATED COST

Synchrotech Controls have quoted $973,500 ($885,000 + 10%) for GGP to supply the equipment for option 2, the replacement of the entire generation system.

This includes the complete GEA system (1 duty + 1 standby), including generator set, enclosure, enclosure electrical, gas valve train, generator set controls, contract administration and engineering and factory testing, but not the removal of the old equipment or installation. (see APA – Yarraloola Compressor Stations – Replacement Generators - Tender 1860CG)

The estimate has been assumed suitable for the other sites except that Wiluna has been adjusted to exclude the motors and alternators from its scope.

The design and planning for the replacement project has not yet been scoped or estimated but is labour intensive with plant and contractor support. 50% of the material cost has therefore be added to reflect the likely labour component to assist with the installation and testing and the removal and disposal of the old equipment.

The overall Business Case estimate is $3,900,000 with expenditure scheduled as follows

		2019	2020	2021	2022	2023	2024
Power Systems Program	Power Supply Condition Assessment Study						
	Yarraloola	20,000					
	Ilgarari	20,000					
	Wiluna	20,000					
	GEA Re-life/replacement program						
	Yarraloola GEA A		750,000				
	Yarraloola GEA B		750,000				
	Ilgarari GEA A						750,000
	Ilgarari GEA B						750,000
	Wiluna GEA A				450,000		
	Wiluna GEA B				450,000		
Solar Package Program	Wiluna Fuel Gas Supply						
	Wiluna Fuel Gas Supply modification	210,000					
	Wet Seal oil pump pneumatic supply modification	30,000					
	Proposed AA costs		**1,500,000**		**900,000**		**1,500,000**

PLAN FOR EFFECTIVE EXECUTION

The requirement for conforming capital expenditure specified in Rule 79(1) is that the capital expenditure must be such as would be incurred by a prudent service provider acting efficiently, in accordance with accepted good industry practice, to achieve the lowest sustainable cost of providing services.

GGP has a dedicated project team to manage the processes supported by contractors as necessary.

JUSTIFICATION

The requirements for justification of conforming capital expenditure specified in Rule 79(2) are as follows:

The capital expenditure must be justifiable on one of the following grounds;
a. The overall economic value of the expenditure is positive, or
b. The present value of the expected incremental revenue to be generated as a result of the expenditure exceeds the present value of the capital expenditure, or
c. The capital expenditure is necessary;
    i. To maintain and improve the safety of services, or
    ii. To maintain integrity of services, or
    iii. To comply with regulatory obligation or requirement, or
iv. To maintain the service provider's capacity to meet levels of demand for services existing at the time the capital expenditure is incurred (as distinct from projected demand that is dependent on an expansion of pipeline capacity); or
d. The capital expenditure is an aggregate amount divisible into two parts, one referable to incremental services and the other referable to a purpose referred to in paragraph "c", and the former is justifiable under paragraph "b" and the latter under paragraph "c".

This capital expenditure project is justified under Rule 79(2)(c)(ii) as the work is necessary to ensure the integrity of service.