LIFECYCLE MANAGEMENT PLAN

Amadeus Gas System FY22 – FY26

Rev	Date	Status	Author	Custodian	Checked	Approved
1.0	30/06/20	Issued for use				 P.P
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1. Introduction

1.1 Purpose

This Lifecycle Management Plan (LCMP) presents a summary of the key technical aspects of the management activities with respect to the Amadeus Gas System; comprising the Amadeus Gas Pipeline (AGP) and its associated laterals.

The intent is to present the 'deliverable' requirements of lifecycle management for the AGP that are outside of routine maintenance requirements. The plan details tangible outcomes that are necessary to achieve ongoing safety and reliability.

1.2 Scope

This document is specific to the group of APA assets that collectively form the Amadeus Gas Pipeline system.

Amadeus Basin to Darwin Pipeline PL 04	MAOP (kPa)	Pipe Material	Length (Km)	Diameter (mm)
Palm Valley to Mataranka	9650	API 5L-X-60	1110.445	355.6
Mataranka to DCG	9650	API 5L-X-60	390.847	323.9
Mereenie	9650	API 5L-X-60	116.098	273.1
Tennant Creek Lateral	9650	API 5L-GR-B	23.676	114.3
Katherine Lateral	9650	API 5L-GR-B	5.465	114.3
Pine Creek Off Take	9650	NA	NA	NA

Table 1 – Amadeus Pipeline Sections

The LCMP includes the capital programs necessary to maintain the reliability, safety and integrity of the AGP system to ensure the capability to meet customer requirements.

The scope specifically excludes the Northern Territory Energy Infrastructure Investments (EII) Assets (Bonaparte Gas Pipeline, Weddell Gas Pipeline, Darwin Distribution and Wickham Point Gas Pipeline).

Growth projects and routine operations (operating expenditure) are not reported in this plan.

2. APA Asset Management

In 2018, APA introduced a new approach to asset management across the organisation. The Asset Management Policy and associated Framework guides effective asset management across APA supporting the efficient and effective management of assets.

The Asset Management Policy is critical to ensuring APA balances risk, cost and performance of its assets to meet the services required by our customers. This Policy applies to all assets that are under direct APA asset management control.

As part of implementing the new Policy, APA has restructured and now has a dedicated Asset Management (AM) Department as the custodian for all of APA's owned assets nationally, including the AGP and other Northern Territory assets. The Department works in close association with the leadership of the Northern Territory state operational staff

2.1 Asset Management Responsibilities

The Department is responsible for the following:

Accountable to design, govern and maintain:

- Framework to deliver a consistent and integrated approach to asset management;
- Operational excellence framework for Power, Transmission, Midstream and Network operations; Financial Accountability for P&L.

Accountable to execute:

- Management of operational and non-operational contract obligations of third party operated/maintained assets and Long- Term Service Agreements (LTSAs);

- Asset Business planning and budgeting (including integration with Finance APA Business planning process);
- Asset lifecycle planning;
- Budget management for Stay-In-Business (SIB) Projects, Major Cyclical Maintenance (MCM) and major shutdowns;
- Individual and integrated Asset Management planning and performance reporting;
- Review and improvement processes for Asset Management performance - improvement opportunity identification and delivery.

This particular LCMP is written specifically for the AGP Access Arrangement, but reflects the outcomes from the ongoing management of the assets under the normal lifecycle planning processes carried out across APA.

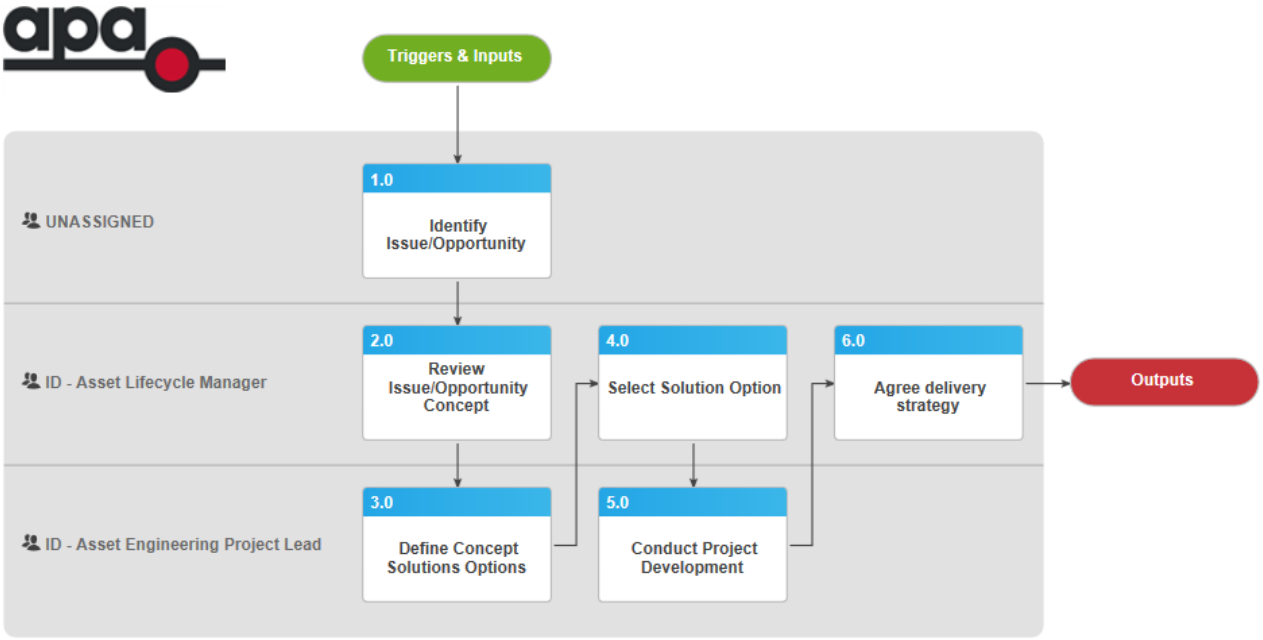
2.2 Lifecycle Management

The role of the Lifecycle Management staff involves the management of the Stay in Business (SIB) cycle across the whole of the asset base nationally. The department manages short and long term SIB with a short and long term focus to provide a broad 20 year view of the anticipated expenditure and more detailed 5, 2 and 1 year views.

The processes are applied nationally across all of the APA assets and during 2020 the other energy assets, power generation, power transmission, storage will fully integrate.

2.2.1 Process Map

The following process map shows the high level approach that is applied to new proposed projects. The detail behind the procedures including the electronic input forms and data processing software is still being developed and optimised, however comprehensive 20 year data bases in SharePoint Online are already populated and were used to generate the budgetary work for the assets which is reflected in this Plan.



2.2.2 Project Identification and Selection

Project initiatives typically originate from three sources:

- Pipeline integrity driven work
- Field inspection driven replacement/upgrades
- Facility reliability improvement and upgrades

Project requests are costed to ~+/-30% and if logical are added to the Lifecycle Management Plan as a new line item. The initiator provides as much information as possible to enable the projects to be understood and generally all proposals are expected to be acceptable. Where a project has insufficient detail or there is concern that the budget proposed is inappropriate further investigation in a pre-FEED style process may be carried out, which might also include more detailed costing.

Most projects in the SIB category have an obvious solution as they typically relate to strategic projects or direct replacement. Where there are multiple solutions possible all will be considered and the preferred selected.

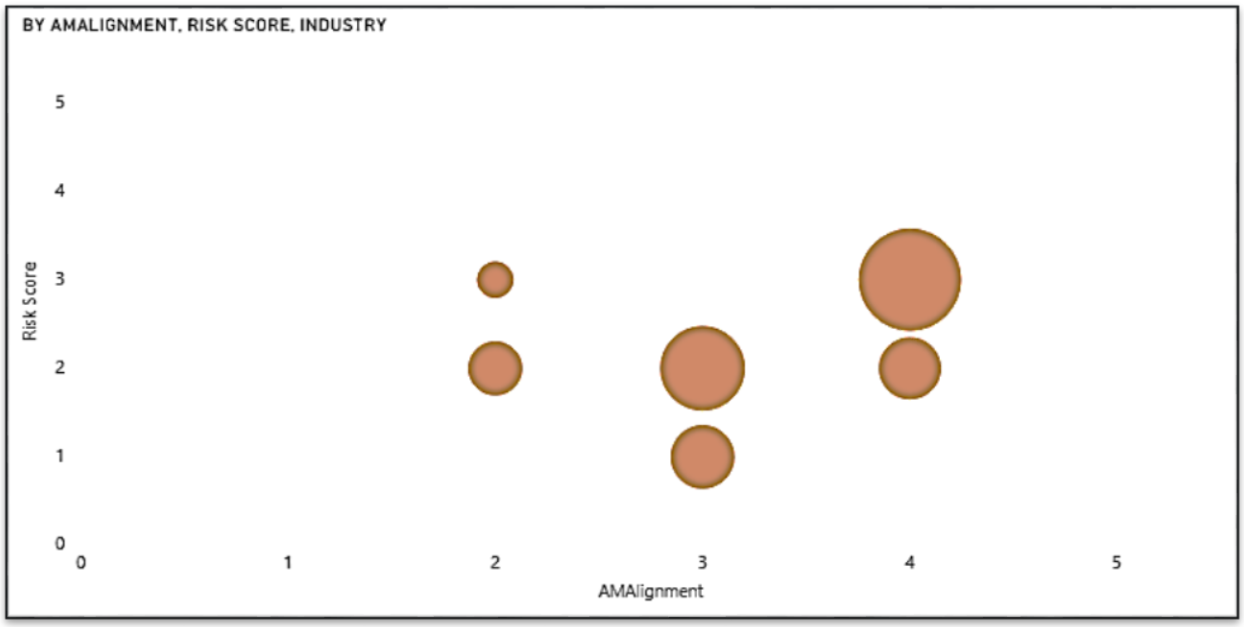
2.2.3 Project ranking and budget development

All proposed projects undergo risk assessment during the identification stage 1.0, however this is validated and adjusted if necessary during the concept stage 2.0. The risk assessment is carried out against APA's corporate matrix (see Appendix B) which is an extension of that used under AS2885.6 but incorporates additional criteria.

As an additionally assessment criteria, each project is rated for their alignment to Asset Management Planning objectives, (see Appendix C) to ensure that APA's strategic objectives are brought into consideration during the prioritisation. This is a critical step to ensure that items such as obsolescence that are likely to have a relatively low risk actually have some strategic priority applied. This balances the risk approach with sound logic enabling a more comprehensive review of priority.

The results are shown also plotted in the following bubble chart, where APA's prioritisation for expenditure can be seen by plotting the risk against the AM alignment. The diagram indicates and the boundary for routine approval. The bubbles sized by their value indicate the big picture priority groupings.

There is no fixed pass or fail line but an initial approval line is normally added during the process to enable automatically successful projects to progress without further consideration against a known budget. Projects that fall below the line are subject to further consideration. In this way project proposals with low risk and a low level of strategic importance can be readily identified.



This methodical approach applies a level of due diligence to the development of the necessary financial quantum for each year's budget, or indeed 5 year budgets. It is though not locked in place and the results are subject to review with the local Asset Manager and may be adjusted to optimise the approach for a specific year.

2.2.4 Project and budget optimisation

The Lifecycle Team has flexibility during the budget development period and throughout the delivery periods to manually adjust the delivery scope where necessary. In addition the lifecycle planning process provides the opportunity to group works on a site basis or on a delivery scope basis. In this way the delivery can be optimised and the project delivery schedules adjusted to cater for any identified efficiency opportunities. It is also necessary throughout the year to manage any unforeseen changes in priority and adjustment for any necessary scope changes.

2.2.5 Delivery management

Projects are either delivered by the local Transmission team or from a nationally focussed project team. Throughout the year the delivery of projects is reviewed and the expenditure re-forecast Monthly. The delivery teams operate independently and separate governance meetings are held monthly.

The Lifecycle team take any variations taken into consideration and may add projects to or defer projects from the annual scope as necessary.

3. Asset Condition Summary

The AGP is reaching mid-life at approximately thirty four years. The updating and replacement of equipment is necessary to maintain the asset condition and to manage obsolescence. The pipeline itself is in a generally sound condition, but has experienced some degradation, which can be assumed to be ongoing for the rest of its lifecycle.

Key processes involved with monitoring the pipe wall involve In-line inspection (ILI) surveys and Direct Current Voltage Gradients (DCVGs) to ensure that the development of any corrosion threat can be assessed, monitored and can be repaired where necessary in a timely manner. For regulatory purposes ILI and DCVG are treated as operating expenditure. For facilities the key processes involve direct inspection, operational performance and vendor support of the equipment.

There are a several significant items on the Amadeus system which the LCMP has considered:

- Pipewall corrosion under failed shrink sleeves
- Cathodic protection levels
- Hazardous area compliance
- Obsolescence of electrical equipment

The management of these items is currently undertaken by routine inspection and refurbishment programs. These programs will be required for the remaining life of the pipeline, and program costs can be expected to escalate as the pipeline continues to age and additional degradation becomes apparent. High-level funding requirements to manage these items are detailed in Tables 2 and 3 herein.

Control systems and electrical systems at many of the older stations have been identified as an issue that will need management and funding throughout this planning period.

4. AGP Risk

APA complies with AS2885.3 for the operation of the assets and utilises a standard risk assessment matrix which is consistent with AS2885.6 for the management of risk, but which has been extended to also satisfy APA's corporate requirements.

For its age and environmental surroundings, the pipeline is in relatively good condition compared to other assets of the same vintage. Under the assessment there are no significant risks at this time, however this has largely been due to the proactive nature of the management applied and generally good pipeline practice. Being proactive requires upfront cost and this is being managed in a responsible manner with medium term programs being applied to avoid sudden financial shocks and reliability issues. It is intended that this approach would continue as should obsolescence and degradation due to ageing and environmental conditions not be addressed proactively, they could lead to challenges in maintaining a safe and reliable system.

The pipeline risk assessments utilised for the business cases confirm that the necessary work over future years will largely be driven by good business practice, dealing with identified threats prior to them materialising. Whilst proactivity comes at a cost, it is being

managed in a responsible manner with medium term programs being applied to avoid sudden financial shocks and reliability issues.

The principal threat on the pipeline that could eventually lead to a dramatic change in the stay-in-business (SIB) expenditure relates to corrosion under failed shrink-sleeve coatings. This is being carefully and thoroughly managed to ensure that sufficient proactivity is in place to avoid significant numbers requiring field repair in the same interval.

The AGP is a major national pipeline and good practice requires it to be appropriately maintained to eliminate the risk of such events. It is proposed and this LCMP has been developed on the basis of the pipeline being managed to a good pipeline practice.

5. AGP Financial Summary

The following table breaks down the expenditure into the five financial years of the Access Arrangement. The expenditure has been developed with the input of the NT Engineering staff and is thought to be a reliable indication of the necessary expenditure.

	FY22	FY23	FY24	FY25	FY26
SIB Capital	$2,216,000	$1,855,000	$2,238,000	$2,307,000	$2,329,000

Table 2 – Five Year SIB Capital Summary

The expenditure shown has been calculated in December 2019 dollars throughout this document.

6. AGP SIB Programs of work

6.1 Expenditure by functional groups

The following table sets out the SIB capital expenditure high level breakdown for the AGP.

The costs have been allocated across financial years to reflect the proposed capital expenditure budget,

Item	FY22	FY23	FY24	FY25	FY26
Cathodic Protection	$515,000	$470,000	$665,000	$480,000	$550,000
E&I	$286,000	$360,000	$543,000	$467,000	$284,000
Integrity	$255,000	$255,000	$255,000	$255,000	$255,000
Mechanical	$170,000	$170,000	$115,000	$150,000	$0
Purchase	$990,000	$600,000	$660,000	$955,000	$1,240,000
Grand Total	**$2,216,000**	**$1,855,000**	**$2,238,000**	**$2,307,000**	**$2,329,000**

Table 2 - Five Year SIB Capital summary by functional group

Commentary

1. The AGP SIB Capital budget is dominated by projects directly related to the ongoing integrity management requirements to ensure that it remain fit-for-purpose throughout its intended operational lifecycle.
2. Growth projects and major expense OPEX projects are not reported in this plan.

6.2 Expenditure by Business Case Grouping

Function – Business Case	FY22	FY23	FY24	FY25	FY26
Cathodic Protection	**$515,000**	**$470,000**	**$665,000**	**$480,000**	**$550,000**
AGP - New Cathodic Protection Sites	$420,000	$420,000	$545,000	$420,000	$420,000
Cathodic Protection – Replacement ground beds	$70,000		$70,000		$70,000
Cathodic protection unit upgrade program	$25,000	$50,000	$50,000	$60,000	$60,000
E&I	**$286,000**	**$360,000**	**$543,000**	**$467,000**	**$284,000**
Battery charger upgrade Program	$26,000	$100,000	$20,000		
Hazardous Area Rectification Program	$10,000	$20,000	$250,000	$230,000	
Site Battery End of life Replacement program	$30,000		$67,000	$87,000	$134,000
Solar panel upgrade Program	$70,000	$25,000	$56,000		
Station RTU Upgrade Program	$150,000	$215,000	$150,000	$150,000	$150,000
Integrity	**$255,000**	**$255,000**	**$255,000**	**$255,000**	**$255,000**
Heat shrink sleeve upgrade program	$255,000	$255,000	$255,000	$255,000	$255,000
Mechanical	**$170,000**	**$170,000**	**$115,000**	**$150,000**	**$0**
MLV Actuators Upgrade Program	$150,000	$150,000	$75,000	$150,000	
Wizard controller update Program	$20,000	$20,000	$40,000		
Purchase	**$990,000**	**$600,000**	**$660,000**	**$955,000**	**$1,240,000**
Miscellaneous Capital	$200,000	$200,000	$200,000	$200,000	$200,000
Vehicle Replacement Program	$790,000	$400,000	$460,000	$755,000	$1,040,000
Grand Total	**$2,216,000**	**$1,855,000**	**$2,238,000**	**$2,307,000**	**$2,329,000**

Table 3 - Five Year SIB Capital summary by business case grouping

6.2.1 Cathodic protection summary

6.2.1.1 *CPU replacement*

The cathodic protection units are effectively smart transformers that responds to the protection level on the pipeline. These units work 24/7 with a finite life and a number of them are obsolete, with spare parts difficult or impossible to obtain. The intention is to proactively replace obsolete CP units prior to them failing, based either upon condition assessment or opportunistically when carrying other electrical upgrades at a site.

6.2.1.2 *New cathodic protection sites*

A buried steel pipeline is protected against corrosion by a coating. Inevitably minor damage may occur during construction and over time the coating system may also be further damaged or degrade. These 'coating defects' might fully penetrate the coating and allow the pipe to become in electrical contact with the surrounding environment. This could lead to corrosion (rust) and ultimately failure of the pipe. A protective cathodic current is therefore applied to the pipeline, from the time of construction, to maintain the pipeline at the desired electrical potential whereby corrosion can't occur.

As the pipeline coating slowly deteriorates with time the protective CP current necessary increases to the point where the CP units have insufficient capacity to supply the full

requirement. Cathodic protection surveys are carried out along the pipeline to identify locations of poor protection and additional CP units are specified to provide the necessary current to restore full protection at those points.

For the AGP it has been found that one additional CP site per year is a reasonable anticipation of the increased power requirement necessary to maintain the protective current.

Additional sites require the negotiation of additional sub-leases, which are at times difficult to obtain. To ensure that the annual additional requirement is achievable, the future requirements for the pipeline are assessed and typically 5 new sub-leases enter into negotiation at a time. This ensures that whilst one site may be troublesome the installation of alternative sites can be arranged to maintain the program. This will process will initiate again in FY24.

6.2.1.3 *Replace cathodic protection ground beds*

A CP ground bed provides an electrical link between the anodes and the pipeline, but are gradually consumed and require replacement. This is monitored throughout their life as the degradation is usage based not time enabling regeneration of the site in a timely manner.

With the number of sites on the AGP it is anticipated that one site every other year would be adequate to maintain a satisfactory system. This has been budgeted for the 2021-22 to 2025-26 period. However ongoing monitoring may identify an increased requirement as the number of units in service increases.

6.2.2 Electrical & Instrumentation Summary

6.2.2.1 *Battery charger upgrade*

Electrical power is critical to ensure the control and monitoring of the stations can be performed and to apply the power for the cathodic protection to the pipeline. Whether power is supplied from 240 volt sources or solar panels an uninterruptible power supply (UPS) battery charger system ensures that the back-up batteries are correctly charged and available.

The battery chargers typically have a useful life of 15 years in the field application and it is important that the UPS systems work reliably, particularly for meter stations. The chargers on the AGP have been assessed and a number are scheduled to be replaced during the 2021-22 to 2025-26 period based upon their age and the level of their ongoing support.

6.2.2.2 *Battery replacements*

The field life of all site batteries is heavily influenced by the temperature that they are exposed to and their type. Regardless, all batteries require replacement at some stage and the sites along the AGP have been scheduled for proactive replacement based upon their type, age and condition.

6.2.2.3 *Hazardous area equipment upgrades*

Most pipeline sites have hazardous area (HA) rated equipment which requires 4 yearly inspection in accordance with AS/NZS 60079.17. The AGP sites had received substantial upgrade programs over previous years, however it is likely that minor upgrades will be required when they are inspected again, due to the impact of the environment that they operate in.

6.2.2.4 *Remote terminal unit replacement*

A typical design life for a remote terminal unit (RTU) is approximately 10 to 15 years under field conditions and as with many electronic items they may become unsupported during their lifecycle. A number of units have been identified as likely to require replacement due to poor condition and obsolescence.

6.2.2.5 *Solar panel upgrades*

The majority of solar panels on the AGP are original equipment (34 years old) and over time the efficiency, reliability and capacity of the panels decreases. This can lead to batteries storing insufficient charge to maintain their capability, typically evidenced by sites failing and recovering the following morning. In worst cases the sites may not recover the following day.

Replacement equipment is the only option where the units have lost their capability and are ineffective. A small number of sites have been scheduled during the period.

6.2.3 Integrity summary

6.2.3.1 *Heat shrink sleeve upgrades*

The heat shrink sleeves applied across the field welds when the AGP was constructed were intended to seal the pipeline from the environments. Over time a very large number have failed to maintain full protection, which has allowed very slow but steadily growing corrosion to develop under them.

This style of corrosion is reasonably slow and readily identified by in-line inspection. This enables the development of corrosion under failed sleeves to be monitored and the ideal repair schedule determined by engineering calculation. After every in-line inspection the necessary repair level and re-inspection interval is reassessed.

Over recent years 13 – 17 corrosion repairs per year have been carried out and it intended to maintain this level of repair.

6.2.4 Mechanical summary

6.2.4.1 *Mainline valve actuator upgrade program*

The Limitorque actuators on the 12" and 14" mainline valves (MLVs) are original equipment and obsolete, as spare parts cannot be readily obtained. It is intended to replace all of the actuators proactively at a rate of two per year to ensure that they are all replaced prior to them creating maintenance and reliability issues.

6.2.4.2 *Wizard controller upgrade*

At Darwin City Gate, Katherine and Pine Creek the pneumatic 'Wizard' controllers are original equipment, well over 30 years, and are nearing the end of their useful life.

The Darwin City Gate and Pine Creek 'Wizards' were proposed for replacement in 2016-17 to 2020-21, but were not carried out as they continued to work reliably and were relatively low priority. As they have aged a further 5 years, their priority has been reassessed and Katherine has also been included in the schedule of replacements to be carried out over the period.

6.2.5 Miscellaneous capital summary

SIB capital items are purchased throughout the year and requested on an individual basis, including plant and equipment in response to condition or age, dependent upon the item.

The category is a small funding pool to facilitate replacement of those minor capital assets, enabling simple and swift purchasing as necessary. All purchase approvals are controlled under APA's delegation limits.

6.2.6 Motor vehicle summary

Vehicles are purchased or replaced on an 'as required basis' depending on personnel, project or operational requirements. Each one is specifically equipped for its duty and the environment under which it will operate.

The criteria for replacement is as follows;

- Passenger (including sedans and station wagons) – the earlier of 3 years and 150,000 km
- Light Commercial 2WD & 4WD (including vans, utes and trucks with a gross vehicle mass (GVM) of less than 4.5 tonnes) – the earlier of 4 years and 200,000 kms
- Heavy Commercial 2WD & 4WD 9 trucks with a GVM of 4.5 tonnes or more) – 10 years

The vehicles anticipated to be required are detailed in the proposed budget, but will be reassessed throughout the period.

APPENDIX A: BUSINESS CASES

The following table sets out the SIB Capital work program developed by individual business cases.

No	Item	Budget
A.1	Mainline valve actuator replacement	$525,000
A.2	Heat shrink sleeve upgrade program	$1,275,000
A.3	New cathodic protection sites	$2,225,000
A.4	Replacement cathodic protection ground beds	$210,000
A.5	Solar panel upgrades	$151,000
A.6	Cathodic protection unit upgrade program	$245,000
A.7	Battery charger upgrade	$146,000
A.8	Battery replacements	$318,000
A.9	Hazardous area equipment upgrades	$510,000
A.10	RTU replacements	$815,000
A.11	Wizard controller update	$80,000
A.12	Miscellaneous Capital	$1,000,000
A.13	Vehicle Replacement Program	$3,445,000
TOTAL		**$10,945,000**

Table 4 - Five year SIB Capital Work Program by Business Case

Risk Analysis

APA utilises the AS2885 risk methodology for the risks associated with integrity challenges, but for general purposes APA has a specifically extended corporate version that includes additional risk categories.

A copy of the Risk Matrix is included as Appendix B.

A.1 – Mechanical – Mainline valve actuators replacement

Background

Mainline valves are installed on all pipelines to provide pipeline isolation during times of emergency if required. The valves are required by AS2885.1 Section 4.8.1 and are a standard item for pipeline safety. "Equipment shall be provided for the isolation of the pipeline system for maintenance purposes or in the event of a loss of containment within the segment".

The valves are operated by actuators with a gas over oil mechanism, whereby adjustable valve positioning allows high pressure gas to drive the oil through the actuator to either open or shut the value. The actuators are installed on all mainline valves located with scraper stations and at critical mid-section mainline valves. They can be operated locally or remotely via SCADA.

The Limitorque actuators on the 12" and 14" mainline valves are original equipment and obsolete, as spare parts cannot be readily obtained. Actuators are inspected and maintained but have a finite life.

In 2011 a valve actuator selection process was carried out between three vendors of rotary actuators. These preferred to the axial style that had been originally adopted by Limitorque. Shafer were rated to be the preferred item, supplied by Centralian Controls / Emmerson Automation Solutions.

To date units are being progressively replaced with the preferred Shafer actuators.

Objectives / Outcomes

Failing to maintain the valves in a reliable working order could see emergency response impacted allowing larger volumes of gas to be released, placing increased emphasis on physically attending site to manually open the close. Delays in isolating a pipeline segment are unacceptable with any increased loss of linepack having potential safety, environmental and financial consequences.

Risk Analysis

For a worst-case scenario, it could be assumed that a pipeline is punctured, and the line valve fails to operate. The impact is for additional volumes of gas being released which limits the response to the incident site and provides some minor environmental and commercial impact.

Regulatory concern demanding completion of program and implementing higher levels of supervision whilst public awareness could reach newspapers suggesting perceived poor maintenance practices and a lack of concern/negligence.

For the purpose of the assessment it is anticipated that an actuator failure coinciding with pipeline damage is **Rare – conceivable, but has not been known to arise previously, (Every 50 years)** with the physical impact relating only to any increase in damage from a longer duration of release.

Risk Area	Impact	Consequence	Current Risk	Treated Risk
HEALTH AND SAFETY				
ENVIRONMENT				
OPERATIONAL CAPABILITY	Extension of delays	Minimal	NEGLIGABLE	NEGLIGABLE
PEOPLE				
COMPLIANCE	Possibility of regulatory action including fines	Significant	NEGLIGABLE	NEGLIGABLE
REPUTATION AND CUSTOMER	Adverse media coverage against APA	Significant	NEGLIGABLE	NEGLIGABLE
FINANCIAL	Potential for increased damage at incident site	Minimal	NEGLIGABLE	NEGLIGABLE

The risk assessment confirms that the risk is negligible linked to the extended period before the gas releasing is no longer a threat. Whilst there would be some concern for an increase in damage this is unlikely to be significant with the principle aspect being the reaction of other parties in the longer term. Shippers might have concerns and demand payment for needing to source urgent gas and for the additional lost gas, the regulator could implement aggressive control measures and APA might incur additional costs and fines.

Evaluation of alternatives

Replacement is mandatory prior to failure. Leaving actuators in service that are obsolete and potentially problematic is not acceptable. There are no logical alternatives to a straight replacement of the equipment.

The program to carry out the changes is driven pro-actively prior to any anticipated failure of the valve operators. Should the program be continued, as currently scheduled, there will be minimal risk.

Deferring or cancelling the program would leave APA exposed to the worst case scenario foreshadowed above with no real ability to mitigate the risk.

Delivery Concept

Replacement of the actuators is not a complex process and will be carried out as part of the annual SIB programs. It is likely that APA staff will complete the work.

Estimate and Timeframe

These units have a long purchasing lead time demanding a pro-active approach. Their replacement is necessary, but not necessarily urgent, however the pro-active nature of their replacement and the criticality of the equipment has led to a program of 2 actuators being replaced annually and it is proposed to maintain this practice until all of the necessary actuators replacements are completed in FY24.

Recommendation

The recommendation is to continue with 2 valve actuator changes per year to the following schedule, which will complete the whole program.

Budget

	FY22	FY23	FY24	FY25	FY26
Mereenie				$75,000	
Palm Valley				$75,000	
Renner Springs			$75,000		
Tanami Road	$75,000				
Ti Tree	$75,000				
Warrego		$75,000			
Wauchope		$75,000			

Table 5 - Mainline Valve Actuators Budget

Justification

Maintaining the use of obsolete equipment is not good business practice however the threat is Rare and any potential for an increase in the physical consequence is likely to be controllable on site, therefore a programmed approach is appropriate.

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

A.2 – Mechanical – Heat shrink sleeve upgrade program

Background

The AGP was factory coated with Shaw 'yellow jacket' polyethylene which has generally been found to be a reliable coating. During construction the individual pipes are welded together leaving a gap between the ends of the coating on adjacent pipes. These were sealed with Canusa heat-shrink sleeves, whereby a sleeve was wrapped and joined around the pipe wall and then shrunk down to a tight fit. The sleeves utilised a heat sensitive adhesive backing which squashed onto the pipe overlapping the polyethylene coating at either side to provide a good seal.

These sleeves have been extensively used in the pipeline industry for decades, but have a failure mode where the adhesion is lost and the local environment can impact the pipe enabling corrosion. Cathodic protection is not effective in protecting pipework beneath failed heat shrink sleeves due to shielding, therefore direct assessment of the pipework and recoating is the only way to prevent corrosion from developing to failure in these areas.

In 2008, Rosen performed an inline inspection of seven 14" pipeline sections on the Amadeus Gas Pipeline. The inspection found numerous corrosion features, mainly adjacent to girth welds beneath heat shrink sleeves. The corrosion typically occurs in a circumferential pattern around the whole perimeter of the pipe. IONIK Consulting performed analysis on this data and prioritised these sleeves for repair based on estimated corrosion growth rates. The initial sleeve repair rate was approximately 100 per year.

In 2013, an inline inspection was performed on two 12" pipeline sections on the Amadeus Gas Pipeline. Results showed a high number of failed heat shrink sleeves on the Mataranka to Helling Section. GE performed a LAPA (length adaptive pressure assessment) incorporating defect growth rates. This method was less conservative than the B31G method used previously, although a significant number of repairs were required in an ongoing manner.

In recent years 13 – 17 repairs per year have been carried out.

Objectives / Outcomes

Failing to maintain the pipeline could lead to a failure. In-line inspection has demonstrated that a large number of joint coatings have failed and where the pipeline could potentially fail from corrosion before the end of its lifecycle they need to be repaired. This however is difficult to quantify to enable a suitable strategy to be assessed.

In 2018 a further in-line inspection was completed and provides the opportunity to better assess the situation by comparison to the 2008 data. A study is currently underway to determine whether the number of repairs per year will be appropriate going forward.

In absence of its finding, for budgetary purposes it is proposed to retain the current repair rate.

Risk Analysis

For a worst case scenario it could be assumed that corrosion occurs under a shrink sleeve and the pipe wall thins to the extent where it fails. The linear length is relatively short so a rupture is very unlikely, so the scenario to be tested would be a significant leak.

Regulatory concern demanding completion of the program might implement higher levels of supervision, whilst public awareness could reach newspapers public indicating poor maintenance practices and a lack of concern/negligence.

For the purpose of the assessment it is anticipated that with a large number of failed sleeves there is a reasonable expectation of a failure every year if a program is not maintained.

The impact is most likely to be just a leak in a remote area, restricted from developing significantly by the heat shrink sleeve, however as a worst case scenario some human impact on site during repair operations is considered from ignition.

The frequency would be **Unlikely – unlikely to occur, but possible when certain circumstances prevail**. This however is likely to escalate in future years once the failure threshold is reached by large numbers of unrepaired defects.

Risk Area	Impact	Consequence	Current Risk	Treated Risk
HEALTH AND SAFETY	Injury requiring first aid treatment	Minimal	NEGLIGABLE	NEGLIGABLE
ENVIRONMENT				
OPERATIONAL CAPABILITY	Pressure restriction during repair	Minimal	NEGLIGABLE	NEGLIGABLE
PEOPLE				
COMPLIANCE	Possibility of regulatory notice	Minor	LOW	NIL
REPUTATION AND CUSTOMER				
FINANCIAL	Emergency conditions during repair	Minimal	NEGLIGABLE	NIL

The pipeline operates in remote areas where it is unlikely to be visible to 3rd parties. The risk assessment confirms that the risk is focussed upon the reaction of the Technical Regulator. Experiencing a failure and needing to repair a leaking pipeline is significantly more expensive and has some risk. It is not a situation that should be allowed to occur on any pipeline and neither APA nor the Regulator would allow any pipeline to operate on the basis of only repairing following a failure.

Evaluation of alternatives

Failed coatings require replacement before they lead to significant corrosion. There are some alternatives in the materials utilised in the repair, but the only real variable that can be controlled is the number of repairs per year to ensure that a situation of being faced with hundreds of potential failures concurrently doesn't occur.

Delivery Concept

Replacement of the shrink sleeve is not a complex process providing they are managed whilst the pipeline is still operating with a good factor of safety. APA has a skilled and practiced contract repair crew that has been carrying out this work annually for many years.

Estimate and Timeframe

This repair program will likely be annual throughout the remaining life of the AGP. Logistics is a significant factor limiting the crew to approximately 2 repairs every three days on average. It easily fits into an annual program.

Recommendation

The recommendation is to continue with a steady budget of approximately $255,000 per year which will allow for the approximately 17 digs per year during the dry season following the ILI campaign, when the pipeline is accessible. Should the current integrity study determine that additional repair numbers are required the program will be increased. It is very unlikely to determine that excessive repairs are being carried out.

Budget

	FY22	FY23	FY24	FY25	FY26
Ban Ban Springs to Darwin City Gate	$255,000				
Darwin City Gate to Channel Island			$255,000		
Mataranka to Helling		$255,000			
Helling to Ban Ban Springs				$255,000	
Palm Valley to Tanami Road					$255,000

Table 6 - Heat shrink sleeve upgrade program budget

Justification

The AGP is a major national pipeline and good practice requires it to be appropriately maintained to eliminate the risk of such events. It is not practical nor necessary to replace ever failed sleeve, but careful monitoring and integrity decisions based upon quality data and best practice are necessary to manage the risks of a pipeline failing by repairing defects that are growing whilst they are known to be still safe.

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

A.3 – Cathodic protection – New cathodic protection sites

Background

CP is essential to ensure that metal loss due to corrosion does not occur which could result in a leak or rupture.

Cathodic protection is applied to protect the steel from corrosion should there be any minor deficiencies in the final coating or should any future damage or degradation to the coating occur. It is usual to install CP sites at intervals determined by a CP system design. CP slows the corrosion process down to negligible rates as long as certain protection criteria can be met.

The CP current is monitored and the current drain provides evidence of the level of protection that is being applied by the system from which any gradual deterioration in the protect level can be determined. Annual CP surveys at test posts along the pipeline are carried out to see the real effectiveness of the imposed current.

Where the system no longer meets the full requirements the CP devices may be replaced with more powerful units, however there is a limit to the amount of CP current that can be injected at a point on the pipeline and where the area of concern is sufficiently distance to the existing CP units additional sites may be necessary.

There are two main methods for implementing additional CP current onto a pipeline. Magnesium anodes or ribbon which corrode favourably to the steel and impressed current from solar or power supplies. The corrosive methods have a role under certain circumstances, however electrical impressed current is preferred being easier and cheaper to install and maintain.

For the remote areas of AGP the power supply is developed from the installation of solar panels.

Objectives / Outcomes

To ensure that CP levels can be maintained as required by AS 2885.1 / AS2832 and the AGP pipeline licence, new impressed current CP sites will be necessary as determined from the review of the performance of the CP system as evidenced from the annual CP survey and the current flow. To achieve this it has been predicted that a new CP site will need to be installed annually requiring additional sub-leases.

To avoid an annual process for obtaining the new sub-leases, some of which can be problematic and thereby disrupt the work planning, where additional units are anticipated to be necessary in the coming years. These are grouped and sub-leases developed to facilitate the installations.

Risk Analysis

For a worst case scenario it would be the ramifications of not installing additional CP sites. With a pipeline partly unprotected from corrosion, it could be assumed that corrosion occurs at a coating defect and the pipe wall thins to the extent where it fails by rupture. A linear length that could lead to a rupture would be associated with severe damage to the coating, such as a mechanical gouge removing the coating, or a large crack developing due to degradation of the polyethylene coating.

A rupture is dramatic, with the potential for fatalities where people are present and severe asset damage. The pipeline might be out of service for weeks and may only be allowed to recommence after hydro-testing or restricted operating pressure. Such a failure though is quite unlikely to have persons in the direct vicinity of a rupture in practice and the scenario considered in the risk assessment is therefore focussed upon the pipeline rupturing in a remote location and has been rated as **UNLIKELY – unlikely to occur, but possible when certain circumstances prevail.**

Risk Area	Impact	Consequence	Current Risk	Treated Risk
HEALTH AND SAFETY				
ENVIRONMENT				
OPERATIONAL CAPABILITY	Disruption <1 month	Significant	MODERATE	NEGLIGABLE
PEOPLE	Pipeline rupture in remote area	Minor	NEGLIGIBLE	NEGLIGABLE
COMPLIANCE	Possibility of regulatory notice	Significant	MODERATE	NEGLIGABLE
REPUTATION AND CUSTOMER	Adverse media coverage	Significant	MODERATE	NEGLIGABLE
FINANCIAL	Force Majeure and repair costs	Minimal	NEGLIGABLE	NEGLIGABLE

The risk assessment indicates that there is a moderate risk, resulting from the failure to provide new CP sites in a timely manner. The impact is largely based upon failing to maintain a safe pipeline system and the disruption to normal business.

Evaluation of alternatives

Continual degradation of the yellow jacket coating on the AGP, requires continued monitoring of the effectiveness of the CP system and augmentation when protection is indicated as less than that required under AS2885.

There are alternative techniques to provide cathodic protection, however they are typically more expensive and less effective.

This business case accepts that those alternative methods may be possible and beneficial under specific circumstances, however there would still be the need to develop an additional traditional impressed current system annually.

Delivery Concept

The land requirements are grouped in 5 year blocks and addressed together, allowing some flexibility in the timing for specific sub-leases.

The annual installation work would typically be carried out with a combination of APA and contract resources.

Estimate and Timeframe

For the purpose of this AA submission the typical annual installation rate is one new site per year, therefore 5 new sites are anticipated for this business case.

Recommendation

The recommendation is to provide funding for the negotiation and development of 5 additional solar powered CP sites at locations to be determined from CP survey data.

Budget

	FY22	FY23	FY24	FY25	FY26
Land acquisition			$125,000		
Installation	$420,000	$420,000	$420,000	$420,000	$420,000

Table 7 - New cathodic protection sites budget

Justification

The AGP is a major national pipeline and good practice requires it to be appropriately equipped to eliminate the risk of such events. Having corroding pipelines without any management action to eliminate the cause is not acceptable practice.

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

A.4 – Cathodic protection – Replacement cathodic protection ground beds

Background

CP is essential to ensure that metal loss due to corrosion does not occur, which could result in a leak or rupture.

In the remote areas CP is typically developed from solar power using battery storage to ensure 24/7 capability. The CP current is monitored and where the CP units are not able to maintain their desired power level the components of the system are examined to determine the limiting factor.

Cathodic protection ground beds form part of the cathodic protection system on a pipeline. The ground bed is the anode being a low resistance path to earth which is connected to the cathodic protection unit and allows current to be applied to the pipeline. Current flowing onto the pipeline from the ground bed consumes the ground bed over time and it loses it capability. This process is accelerated when higher output currents are required or instances where the system develops higher resistance.

To ensure that CP levels can be maintained as required by AS 2885.1 / AS2832 and the AGP pipeline licence, the performance of ground beds is identified from the annual cathodic protection surveys. Whilst some ground beds gradually decline in performance, others may fail over a shorter period of a few years. Replacement is the only option.

Objectives / Outcomes

This business case has been developed to enable a ground bed to be replaced in situ every second year to return the site capability back to that necessary for adequate CP.

The exact number and location will only be determined as the CP surveys are examined, however past experience has indicated that the every second year would be a reasonable expectation.

Risk Analysis

For a worst case scenario it would be the ramifications of not maintaining the ground beds and CP failing to provide adequate protection allowing corrosion to occur at a coating defect and the pipe wall thinning to the extent where it fails by rupture. A linear length that could lead to a rupture would be associated with severe damage to the coating, such as a mechanical gouge removing the coating, or a large crack developing due to degradation of the polyethylene coating.

A rupture is dramatic, with the potential for fatalities where people are present and severe asset damage. The pipeline might be out of service for weeks and may only be allowed to recommence after hydro-testing or restricted operating pressure. Such a failure though is quite unlikely to have persons in the direct vicinity of a rupture in practice and the scenario considered in the risk assessment is therefore focussed upon the pipeline rupturing in a remote location and has been rated as **UNLIKELY – unlikely to occur, but possible when certain circumstances prevail.**

Risk Area	Impact	Consequence	Current Risk	Treated Risk
HEALTH AND SAFETY				
ENVIRONMENT				
OPERATIONAL CAPABILITY	Disruption <1 month	Significant	MODERATE	NEGLIGABLE
PEOPLE	Pipeline rupture in remote area	Minor	NEGLIGIBLE	NEGLIGABLE
COMPLIANCE	Possibility of regulatory notice	Significant	MODERATE	NEGLIGABLE
REPUTATION AND CUSTOMER	Adverse media coverage	Significant	MODERATE	NEGLIGABLE
FINANCIAL	Force Majeure and repair costs	Minimal	NEGLIGABLE	NEGLIGABLE

The risk assessment indicates that there is a moderate risk, resulting from the failure to maintain CP ground beds in a timely manner.

Evaluation of alternatives

The only feasible alternative would be a deep bore CP anode which would typically be less effective, less reliable, more difficult to maintain and much higher cost.

Delivery Concept

The ground bed design would be performed by specialised contractors if necessary. The work would typically be carried out with a combination of APA and contract resources.

Estimate and Timeframe

For the purpose of this AA submission the typical annual installation rate is one refurbished ground bed every second year. The previous access arrangement had funding proposed for FY18 and FY20, therefore 3 sites are anticipated for this business case.

Recommendation

The recommendation is to provide funding for the upgrade of ground beds at locations to be determined from CP survey data.

Budget

	FY22	FY23	FY24	FY25	FY26
Replacement of CP ground beds	$70,000		$70,000		$70,000

Table 8 - Replacement cathodic protection ground beds budget

Justification

The AGP is a major national pipeline and good practice requires it to be appropriately equipped to eliminate the risk of such events. Having corroding pipelines without any management action to eliminate the cause is not acceptable practice.

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

A.5 – Cathodic Protection and E&I – Solar panel upgrades

Background

Electrical power is critical to ensure the control and monitoring of the stations can be performed and to apply the power for the cathodic protection to the pipeline. In the remote areas electrical power is typically developed from solar power using battery storage to ensure 24/7 capability.

Some of the solar panels are mounted on the station hut roof or on elevated frames which presents working at heights issues.

The majority of solar panels on the AGP are original equipment (34 years old) and over time the efficiency, reliability and capacity of the panels decreases. This can lead to batteries with insufficient charge to maintain their capability, typically evidenced by sites failing and recovering the following morning. In worst cases sites may not recover.

Replacement equipment is the only option where the units have lost their capability and are ineffective.

Objectives / Outcomes

This business case is to provide the funding for the complete replacement of old solar panels with modern high power panels and the relocation into panel frames close to ground level to facilitate safer working practices during maintenance.

Risk Analysis

As the panels have two or dual roles the worst case scenario would be failing to provide the CP as the loss of communications from a single site due to electrical failure would be more of an inconvenience

For a worst case scenario it would be the ramifications of the loss of power causing CP failing to provide adequate protection, allowing corrosion to occur at a coating defect and the pipe wall thinning to the extent where it fails by rupture. A linear length that could lead to a rupture would be associated with severe damage to the coating, such as a mechanical gouge removing the coating, or a large crack developing due to degradation of the polyethylene coating.

A rupture is dramatic, with the potential for fatalities where people are present and severe asset damage. The pipeline may be out of service for weeks and may only be allowed to recommence after hydro-testing or restricted operating pressure. Such a failure though is quite unlikely to have persons in the direct vicinity of a rupture in practice and the scenario considered in the risk assessment is therefore focussed upon the pipeline rupturing in a remote location and has been rated as **RARE – conceivable, but has not been known to arise previously**

Risk Area	Impact	Consequence	Current Risk	Treated Risk
HEALTH AND SAFETY				
ENVIRONMENT				
OPERATIONAL CAPABILITY	Disruption <1 month	Significant	MODERATE	NEGLIGABLE
PEOPLE	Pipeline rupture in remote area	Minor	NEGLIGIBLE	NEGLIGABLE
COMPLIANCE	Possibility of regulatory notice	Significant	MODERATE	NEGLIGABLE
REPUTATION AND CUSTOMER	Adverse media coverage	Significant	MODERATE	NEGLIGABLE
FINANCIAL	Force Majeure and repair costs	Minimal	NEGLIGABLE	NEGLIGABLE

The risk assessment indicates that there is a moderate risk, as the likelihood of total power failure from a solar site is low and whilst the site may fail daily the time for extensive corrosion to occur would be significant. This would not be in compliance with AS2885.1 section 6.4.4 that requires "…satisfactory protection ... with timely and appropriate action to restore full protection…"

Evaluation of alternatives

There are no logical alternative to upgrading the solar panels when they fail to meet the desired capability. They have greatly exceeded their anticipated life which would be in the region of 10 – 15 years already.

Thermoelectric generators are relatively new to the pipeline industry and whilst they require some maintenance activities have the benefit of 24/7 operation without reliance on battery back-up on many stations (but not all). They are though impacted negatively by high ambient temperatures, are expensive to install and would require a significant amount of staff training.

Recent developments in thermoelectric generators may in future years be capable and reliable for remote power generation utilising the transported fuel, however currently they are less desirable than solar, which is a well proven and familiar method.

Delivery Concept

The solar panels and frames would be replaced by a combination of APA and contract resources.

Estimate and Timeframe

For the purpose of this AA submission it is anticipated that the following stations would be required to support the power upgrade needs of the CP and general sites in remote areas.

Recommendation

The recommendation is to provide funding for the upgrade of solar power at locations to be determined from monitoring, maintenance and CP survey data. This will complete the solar panel upgrades across the pipeline.

Budget

		FY22	FY23	FY24	FY25	FY26
CP sites	Renner Springs	$30,000				
	Mataranka			$20,000		
UPS sites	Renner Springs	$40,000				
	Ti Tree			$36,000		
	Tyles Pass		$25,000			

Table 9 - Solar panel upgrades

Justification

The AGP is a major national pipeline and good practice requires it to be appropriately equipped to eliminate the risk of such events. Having corroding pipelines without any management action to eliminate the cause is not acceptable practice.

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

A.6 – Cathodic protection – Cathodic protection unit upgrade program

Background

CP is essential to ensure that metal loss due to corrosion does not occur, which could result in a leak or rupture.

To ensure that CP levels can be maintained as required by AS 2885.1 / AS2832 and the AGP pipeline licence, the performance of the CP units (CPUs) is monitored to ensure that the cathode protection units are managing the power and voltage appropriately to ensure the pipelines are maintained at the ideal voltage to resist corrosion should there be a holiday or other coating defect.

The CPU's typically contain a number of proprietary printed circuit boards containing discrete components. Failures can occur through prolonged service and sometimes due to transient voltages on the pipeline.

A number of the existing cathodic protection units are obsolete and spare parts are difficult or impossible to obtain. There are also numerous models of CPU in use, making spare part salvaging and interchangeability difficult.

The lead time for a new CPU is approximately four months.

Objectives / Outcomes

This business case has been developed to replace obsolete CP units prior to them failing. It will be a proactive approach replacing 2 – 3 per year based either upon condition assessment or to be in association with other electrical upgrades at the site.

It is intended to cease the process of relying on a collection of spare used parts from other replacements for repair.

Progress replacement will ensure that cathodic protection is continuously available on the pipeline and gradually standardise the equipment that is in service.

Risk Analysis

For a worst case scenario it would be the ramifications of CP failing to provide adequate protection allowing corrosion to occur at a coating defect and the pipe wall thinning to the extent where it fails by rupture. A linear length that could lead to a rupture would be associated with severe damage to the coating, such as a mechanical gouge removing the coating, or a large crack developing due to degradation of the polyethylene coating.

A rupture is dramatic, with the potential for fatalities where people are present and severe damage. The pipeline may be out of service for weeks and may only be allowed to recommence after hydro-testing or restricted operating pressure. Such a failure though is quite unlikely to have persons in the direct vicinity of a rupture in practice and the scenario considered in the risk assessment is therefore focussed upon the pipeline rupturing in a remote location and has been rated as **UNLIKELY – unlikely to occur, but possible when certain circumstances prevail**.

Risk Area	Impact	Consequence	Current Risk	Treated Risk
HEALTH AND SAFETY				
ENVIRONMENT				
OPERATIONAL CAPABILITY	Disruption <1 month	Significant	MODERATE	NEGLIGABLE
PEOPLE	Pipeline rupture in remote area	Minor	NEGLIGIBLE	NEGLIGABLE
COMPLIANCE	Possibility of regulatory notice	Significant	MODERATE	NEGLIGABLE
REPUTATION AND CUSTOMER	Adverse media coverage	Significant	MODERATE	NEGLIGABLE
FINANCIAL	Force Majeure and repair costs	Minimal	NEGLIGABLE	NEGLIGABLE

The risk assessment indicates that there is a moderate risk, resulting from the failure to replace obsolete CP units pro-actively to ensure that CP is controlled to the desired level to resist corrosion.

This would not be in compliance with AS2885.1 section 6.4.4 that requires "…satisfactory protection … with timely and appropriate action to restore full protection…"

Evaluation of alternatives

The CPU is a relatively small part of a CP site, but a key component. Ensuring that the protection being applied to the pipe wall is adequate by controlling voltage and/or power is a critical aspect and there is no logical alternative where impressed current systems are utilised.

A proactive approach is appropriate. Unreliable CPU's incur high servicing costs which eventually makes them uneconomical. The sparing of existing CPU's would not be economical due to range of models and age of the units.

Delivery Concept

The CPUs would be replaced by APA resources.

Where other electrical or CP work it necessary at a site, the CPU replacement would be completed in association with that work wherever possible.

Estimate and Timeframe

For the purpose of this AA submission the typical annual installation rate is two to three units per year.

Recommendation

The recommendation is to provide funding for the condition based and synergistic replacement of CP units on the pipeline.

Budget

	FY22	FY23	FY24	FY25	FY26
Aileron CP		$25,000			
Daly Waters					$35,000
Front Sturt					$25,000
Helling		$25,000			
Kelly Well			$25,000		
Mereenie	$25,000				
Newcastle Waters				$25,000	
Warrego				$35,000	
Wauchope			$25,000		

Table 10 - Cathodic protection unit upgrade program budget

Justification

The AGP is a major national pipeline and good practice requires it to be appropriately equipped to eliminate the risk of such events. Having corroding pipelines without any management action to eliminate the cause is not acceptable practice.

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

A.7 – Cathodic protection and E&I – Battery charger upgrade

Background

Electrical power is critical to ensure the control and monitoring of the stations can be performed and to apply the power for the cathodic protection to the pipeline. Whether power is supplied from 240 volt sources or solar panels a UPS battery charger system ensures that the back-up batteries are correctly charged and available.

For 240 volt meter station sites the UPS provides power to maintain station control and monitoring in the event that the site power fails. If the UPS system cannot supply the required power for long enough periods prior to the situation being resolved, the site will automatically shut in as a safety precaution. For solar sites the power to the station will be lost.

The battery chargers typically have a useful life of 15 years in the field application and it is important that the UPS system works reliably particularly for meter stations.

Objectives / Outcomes

This business case is to provide the funding for the replacement of solar powered and 240v powered battery chargers on site.

Risk Analysis

Failure of a battery charger is not acceptable for more critical sites, especially the meter stations. Without backup power these sites cannot be monitored or controlled remotely via SCADA in. The ability to perform remote monitoring is a requirement of the pipeline licence and AS 2885.

For a worst case scenario the loss of a meter station failing into the closed position after a power disruption and a simultaneous failure of the UPS has been assessed.

Such a failure though is feasible and has been rated as **UNLIKELY– unlikely to occur, but possible when certain circumstance prevail.**

Risk Area	Impact	Consequence	Current Risk	Treated Risk
HEALTH AND SAFETY				
ENVIRONMENT				
OPERATIONAL CAPABILITY	Disruption <1 week	Minimal	NEGLIGABLE	NEGLIGABLE
PEOPLE				
COMPLIANCE				
REPUTATION AND CUSTOMER	Some decline in customer satisfaction	Minimal	NEGLIGABLE	NEGLIGABLE
FINANCIAL				

The risk assessment indicates that there is only a negligible risk, it is though an unacceptable situation where the risk could be proactively managed out.

Evaluation of alternatives

Replacement equipment is the only logical option where the units are obsolete and in poor condition, or fail. This is increase important with the criticality of the stations.

Delivery Concept

The battery chargers would be purchases against standard APA specification and installed by APA resources.

Estimate and Timeframe

For the purpose of this AA submission it is anticipated that the 7 sites, detailed below, would be required to support the battery charger replacements at CP and general sites in remote areas. These locations will be reassessed closer to the delivery time.

The sites were costed separately reflecting the differing levers of equipment to be addressed.

Recommendation

The recommendation is to provide funding for the proactive upgrade of the battery chargers on an age and condition basis.

Budget

	FY22	FY23	FY24	FY25	FY26
Aileron	$20,000				
Ban Ban Springs		$25,000			
Elliot	$6,000				
Helling		$25,000			
Kelly Waters		$25,000			
Mataranka			$20,000		
Newcastle Waters		$25,000			

Table 11 - Battery charger upgrade budget

Justification

The AGP is a major national pipeline and good practice requires site power to be appropriately maintained to enable the pipeline equipment to operate in accordance with its design basis and AS2885. The battery charger is a critical part of the site performance capability and a proactive approach is warranted.

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

A.8 – E&I – Battery replacements

Background

Electrical power is critical to ensure the control and monitoring of the stations can be performed and to apply the power for the cathodic protection to the pipeline. Whether power is supplied from 240 volt sources or solar panels, a battery charger system ensures that the site batteries are correctly charged and available to provide communications, station monitoring and control and cathodic protection 24/7.

For mains powered site if the UPS system cannot supply the required power, the site will automatically shut in as a safety precaution. Therefore, it is important that the UPS system is reliable so that a fail to supply or fail to take does not occur.

The site life of the batteries is heavily influenced by their temperature exposure.
The older generation of wet cell lead acid batteries used on solar powered sites had a life of approximately 7 years. These batteries have numerous safety related issues and have generally been superseded by gel cell lead acid batteries which have an estimated maximum life in hot conditions of between 7 to 10 years.
The NiCad batteries used in the UPS systems are original equipment and have exceeded their design life of 25 years.

Objectives / Outcomes

This business case is to provide the funding for the proactive replacement of site batteries based upon condition but primarily age.

Risk Analysis

Failure of a batteries is undesirable but not acceptable for more critical sites, especially the meter stations. Without backup power these sites cannot be monitored or controlled remotely via SCADA in. The ability to perform remote monitoring is a requirement of the pipeline licence and AS 2885.

For a worst case scenario the loss of a meter station failing closed after a power disruption and a failure of the UPS has been assessed.

Such a failure though is feasible and has been rated as **UNLIKELY– unlikely to occur, but possible when certain circumstance prevail.** In this case the circumstances would be the continued use of batteries past their useful life.

Risk Area	Impact	Consequence	Current Risk	Treated Risk
HEALTH AND SAFETY				
ENVIRONMENT				
OPERATIONAL CAPABILITY	Disruption <1 week	Minimal	NEGLIGABLE	NEGLIGABLE
PEOPLE				
COMPLIANCE				
REPUTATION AND CUSTOMER	Some decline in customer satisfaction	Minimal	NEGLIGABLE	NEGLIGABLE
FINANCIAL				

The risk assessment indicates that there is a low risk. It is through an unacceptable situation the risk of which that can be proactively managed out.

The AGP is a major national pipeline and good practice requires site power to be appropriately maintained to enable the pipeline equipment to operate in accordance with its design basis and AS2885.

Evaluation of alternatives

Replacement equipment is the only logical option. An economic and technical assessment will be made to determine if a different type of battery should be used, for example, gel cell in place of NiCad. Regardless, the batteries would be purchases against standard APA specifications.

Delivery Concept

Batteries will be purchased and replaced by APA resources as required.

Consideration will be given to replacing batteries at multiple sites in order to achieve synergies and also to addressing multiple items at a site in a single visit. The battery enclosures may also need to be replaced in some instances, depending on their condition and the physical dimensions of the replacement batteries.

Estimate and Timeframe

For the purpose of this AA submission it is anticipated 7 sites, detailed below, would be required to support their battery replacements.

The sites were costed separately reflecting the differing levels of equipment to be addressed.

Recommendation

The recommendation is to provide funding for the upgrade of solar power at locations to be determined from monitoring, maintenance and CP survey data.

Budget

	FY22	FY23	FY24	FY25	FY26
Ban Ban Springs			$19,000		
Batchelor					$15,000
Channel Island					$19,000
Daly Waters					$12,000
Darwin City Gate					$19,000
Fergusson			$12,000		
Forrest Hill					$15,000
Hayfield			$12,000		
Helling			$12,000		
Kalala			$12,000		
Katherine					$12,000
Kelly Well	$18,000				
Mereenie				$14,000	
Palm Valley				$14,000	
Pine Creek					$10,000
Renner Springs					$17,000
Ross Creek				$18,000	
Tanami Road	$12,000				
Tennant Creek				$16,000	
Ti Tree				$13,000	
Townend Road				$12,000	
Wauchope					$15,000

Table 12 - Battery replacement budget

Justification

Batteries have a finite life and a responsible operator would replace them prior to them failing to supply power to a site when necessary.

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

A.9 – E&I – Hazardous area equipment upgrades

Background

In accordance with Northern Territory Legislation and Australian Standards (in particular AS3000, AS 60079), there is a requirement to ensure all electrical equipment achieves Hazardous Area compliance. Hazardous Areas are places where an explosive atmosphere may exist, which coupled with an ignition source will result in ignition and/or explosion. Electrical equipment in the hazardous area is a potential ignition source.

The standards require that only equipment rated for specific hazardous area zones are allowed to be installed. There is a duty of care to ensure that all electrical equipment at all sites are sufficiently rated and maintained for the environment in which it is used.

Hazardous area inspections have been performed at all stations and dossiers have been complied. Instrument / Electrical Technicians have received training in hazardous areas inspections.

A 4 yearly program is in place with rectification work having been completed.

Objectives / Outcomes

This business case is to provide the funding for the ongoing inspection and rectification of electrical equipment in hazardous areas across AGP.

It is anticipated that at most stations there will only be minor upgrade requirements to maintain compliance with the Standards.

Risk Analysis

Non-conforming equipment in hazardous areas is not acceptable however after having previously developed dossiers and inspected the stations it is anticipated that any non-conformances will be relatively minor resulting from upgraded information and things overlooked previously. There is no expectation that anything hazardous exists and a technical non-conformance is more likely.

For a worst case scenario a fire resulting from ignition of a small gas leak by damaged or incorrectly maintained equipment, causing minor burns.

The failure mode is feasible particularly in the remote areas where UV exposure can impact equipment. It has been rated as **REMOTE – not anticipated but may occur if certain abnormal circumstances prevail.**

Risk Area	Impact	Consequence	Current Risk	Treated Risk
HEALTH AND SAFETY	Minor injury	Minor	NEGLIGABLE	NEGLIGABLE
ENVIRONMENT				
OPERATIONAL CAPABILITY				
PEOPLE				
COMPLIANCE	Possibility of regulatory action including fines	Significant	LOW	NEGLIGABLE
REPUTATION AND CUSTOMER				
FINANCIAL				

The risk assessment indicates that there is a LOW risk. It is though an unacceptable situation as the risk can be managed out.

Evaluation of alternatives

There are no alternatives. The inspection and any necessary minor upgrades are mandatory.

Delivery Concept

The work would be carried out by APA resources with specialists engaged only if necessary.

Estimate and Timeframe

The AGP program repeats 4 yearly, however this is first occasion where all of the sites on the AGP are having just a routine inspection and upgrade. The estimate for the work is therefore based upon current understanding of the site conformance and assumes that some minor upgrade work will be required at some sites.

Each site has been 'desktop estimated' individually based upon the likely work required.

Recommendation

The recommendation is to provide funding for the audit and upgrade of the hazardous area equipment

Budget

	FY22	FY23	FY24	FY25	FY26
Ban Ban Springs				$30,000	
Batchelor				$30,000	
Channel Island	$10,000	$20,000			
Daly Waters			$30,000		
Darwin City Gate				$30,000	
Helling			$30,000		
Katherine			$30,000		
Mataranka			$30,000		
Newcastle Waters				$20,000	
Palm Valley			$60,000		
Pine Creek			$30,000		
Renner Springs				$20,000	
Tanami Road				$20,000	
Tennant Creek			$20,000		
Ti Tree				$20,000	
Townend Road				$20,000	
Tylers Pass				$20,000	
Warrego			$20,000		
Wauchope				$20,000	

Table 13 - Hazardous area equipment upgrades budget

Justification

The AGP is a major national pipeline and good practice requires electrical equipment to be appropriately maintained for its context and able to operate in accordance with its design basis.

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

A.10 – E&I – RTU replacement

Background

Remote terminal units (RTU) are a microprocessor controlled device that interfaces field devices such as pressure transmitters, flow meter's, cathodic protection and valve actuators with the supervisory control and data acquisition (SCADA) system.

RTU's are therefore critical in the control and monitoring of gas pipeline facilities.

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.

A typical design life for an RTU is approximately 10 to 15 years under field conditions. As RTU's are electronic equipment they have a finite life based on hardware and software requirements. With time units may function adequately, but are not well supported by the vendor or are obsolete.

A business case for the progressive replacement of the units was included in the previous access arrangement as it was anticipated that these units would start to fail and benefit from a pro-active approach.

Objectives / Outcomes

This business case is to proactively replace pipeline RTU's before they become unreliable or unserviceable.

Risk Analysis

The RTU's carry out a critical role in facilitating SCADA station control and monitoring and failure would disrupt the communications requiring response. Obsolescence for an RTU is not an immediate threat to supply reliability, and may present a very minor reduction in data security, however to continue operations under this circumstance would leave APA vulnerable to any failure. The inability to shut a valve or appropriately control a compressor by command is not acceptable for pipeline operations.

For a worst case scenario a pipeline failure with failed RTUs in service might delay the identification of the issue and restrict the selection of which valve could be remotely closed. This might expand the magnitude of the incident marginally and incur regulatory concern.

Such a failure is feasible if the obsolete equipment continues to be used in the field and if failure under the scenario has been rated as **REMOTE – not anticipated, but may occur if certain abnormal circumstances prevail.** In this case the circumstances would be prolonged use of the obsolete equipment.

Risk Area	Impact	Consequence	Current Risk	Treated Risk
HEALTH AND SAFETY				
ENVIRONMENT				
OPERATIONAL CAPABILITY	Delays during emergencies	Minimal	NEGLIGABLE	NEGLIGABLE
PEOPLE				
COMPLIANCE	Possibility of regulatory action including fines	Minimal	NEGLIGABLE	NEGLIGABLE
REPUTATION AND CUSTOMER	Local media comment	Minimal	NEGLIGABLE	NEGLIGABLE
FINANCIAL				

The risk assessment indicates that there is a negligible risk. It is though an unacceptable situation where the risk can be managed out.

Evaluation of alternatives

There are no alternatives, other than not carrying out the replacement and responding reactively when RTUs fail. This is not considered appropriate.

Delivery Concept

Replacements will be prioritised based on criticality and performance. Initially a list of priority sites has been determined, however this may require adjustment over time.

The RTU's will be replaced using APA resources, however specialised vendors may be engaged to perform site specific configuration of the RTU's if necessary.

Estimate and Timeframe

The estimate is based upon current understanding of the condition of the site equipment.

Recommendation

The recommendation is to provide funding for the audit and upgrade of the hazardous area equipment.

Budget

	FY22	FY23	FY24	FY25	FY26
Aileron CP					
Channel Island			$75,000		
Daly Waters					$75,000
Darwin City Gate		$75,000			
Elliott					
Ferguson					
Front Sturt					
Hayfield					
Helling					
Kelly Well CP					
Lake Woods					
Mereenie				$150,000	
Newcastle Waters					
Pine Creek		$140,000			
Renner Springs	$75,000				
Townend Road	$75,000				
Tylers Pass			$75,000		
Warrego					$75,000
Wauchope					

Table 14 - RTU replacement budget

Justification

The AGP is a major national pipeline and good practice requires the RTUs to be appropriately maintained to enable the pipeline equipment to operate in accordance with its design basis and AS2885.

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

A.11 – E&I – Wizard controller update

Background

At stations where electronic valve control is used for temperature, flow or pressure control, a parallel 'monitor' system is often provided using a pneumatic controller. Should the electronic valve control fail, the pneumatic controller will take over control, therefore preventing a fail to supply event.

At Darwin City Gate and Pine Creek the pneumatic 'Wizard' controllers were original equipment and are nearing the end of their useful life. In a 'monitor' arrangement should the electrical controller fail they would become the 'active' controller without support.

The Darwin City Gate and Pine Creek 'Wizards' were proposed for replacement in the previous Access Arrangement but were not carried out as they continued to work reliably and were relatively low priority. As they have aged a further 5 years, their priority has been reassessed.

Objectives / Outcomes

This business case is to proactively replace the Wizard controllers before they become unreliable or unserviceable.

Risk Analysis

The Wizard controllers are configured as 'monitor' devices, but when called to service would be then active device but are old and unsupported. They are critical items. They are not an immediate threat to supply reliability, however to continue operations with aged controllers would leave APA more likely vulnerable to a possible failure.

For a worst case scenario the electrical controller would need to fail or lose its electrical supply before the pneumatic controller is brought into 'active' service. Failure of the controller to maintain supply control under this circumstance would terminate delivery of gas to the downstream customer.

Such a failure, though feasible, if far less likely as the devices are primarily in monitor mode. The likelihood of a failure under the scenario has been rated as **REMOTE– not anticipated, but may occur if certain abnormal circumstances prevail.**

Risk Area	Impact	Consequence	Current Risk	Treated Risk
HEALTH AND SAFETY				
ENVIRONMENT				
OPERATIONAL CAPABILITY	Loss of supply to downstream customers	Minor	NEGLIGABLE	NEGLIGABLE
PEOPLE				
COMPLIANCE	Possibility of regulatory action including fines	Minimal	NEGLIGABLE	NEGLIGABLE
REPUTATION AND CUSTOMER	Adverse media coverage against APA, decline in customer satisfaction	Minor	NEGLIGABLE	NEGLIGABLE
FINANCIAL				

The risk assessment indicates that there is a negligible risk, although the downstream gas users might not reach the same conclusion. It is certainly an unacceptable situation, the risk of which that can be managed out.

Evaluation of alternatives

There are no alternatives other than not carrying out the replacement and reconsidering the risk whenever the pneumatic controllers are required to control. This is not considered appropriate.

The use of a pneumatic controller in the monitor role is logical and good practice. The Wizard controllers by Fisher are still preferred option and would be a simple change out.

Delivery Concept

Replacements will be prioritised based on criticality and performance. Initially a list of priority sites has been determined, however this may require adjustment over time.

The RTU's will be replaced using APA resources, however specialised vendors may be engaged to perform special configuration of the RTU's if necessary.

Estimate and Timeframe

The estimate is based upon current understanding of the site equipment.

Recommendation

The recommendation is to provide funding for the audit and upgrade of the hazardous area equipment.

Budget

	FY22	FY23	FY24	FY25	FY26
Darwin City Gate	$20,000				
Katherine		$20,000			
Pine Creek (3 valves)			$40,000		

Table 15 - Wizard controller update budget

Justification

The AGP is a major national pipeline and good practice requires the gas controllers to be appropriate to enable the pipeline equipment to operate in accordance with its design basis. Old and obsolete equipment including the Wizard Controllers are overdue for normal replacement and whilst working satisfactorily require replacement.

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

A.12 – Purchase – Miscellaneous capital

Background

SIB capital items are purchased throughout the year and requested on an individual basis.

The category typically includes plant and equipment purchased in an ad hoc fashion in response to circumstances. For pipeline plant and equipment this might occur when devices fail and can't be maintained or are obsolete and for general use the routine replacement of 'run to failure' plant and equipment.

Miscellaneous capital is used to purchase items such as;

Description	Cost
Vehicle tooling	$3,132
Grease gun adaptor kit	$3,020
Flange alignment tools	$3,041
Ice Machine	$4,608
New RTU hut Split AC	$2,380
Shade Sails	$31,400

Table 16 - Miscellaneous capital examples

Objectives / Outcomes

This business case is to ensure that APA is appropriately resourced to perform maintenance and operational activities on the pipeline to meet the requirements of AS2885 and good pipeline practice.

Risk Analysis

Risk assessment is not useful over a wide range of minor items, including day-to-day items including as tools for operational staff.

Evaluation of alternatives

There are no alternatives.

Delivery Concept

Internal approval processes will validate purchase requirements in accordance with the APA Delegations of Authority Policy.

Estimate and Timeframe

As required.

Recommendation

The recommendation is to provide a pool of funding for the purchase of ad hoc plant and materials

Budget

	FY22	FY23	FY24	FY25	FY26
General plant and equipment	$200,000	$200,000	$200,000	$200,000	$200,000

Table 17 - Miscellaneous capital budget

Justification

The AGP is a major national pipeline and good practice requires APA to be appropriately resourced to operate and maintain the pipeline in accordance with its design basis.

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

A.13 – Purchase – Motor vehicles

Background

A fleet of vehicles are in service throughout the AGP system including light cars, utilities and 4WD trucks. The fleet is well maintained, regularly services and reflects a program of staggered renewal.

APA operates to national Motor Vehicle Policy which details the requirements for the vehicle fleet.

Vehicles are purchased or replaced on an as required basis depending on personnel, project or operational requirements. The criteria for replacement is as follows;

- Passenger (including sedans and station wagons) – the earlier of 3 years and 150,000 km
- Light Commercial 2WD & 4WD (including vans, utes and trucks with a gross vehicle mass (GVM) of less than 4.5 tonnes) – the earlier of 4 years and 200,000 kms
- Heavy Commercial 2WD & 4WD 9 trucks with a GVM of 4.5 tonnes or more) – 10 years

Objectives / Outcomes

This business case is to ensure that APA is appropriately resourced to perform maintenance and operational activities on the pipeline to meet the requirements of AS2885 and good pipeline practice. The AGP pipeline operates in some very remote areas of Australia and the vehicles need to be suitably equipped and designed for use across the pipeline environment including some significant off-road areas for access to remote sites.

Risk Analysis

The Motor Vehicle Policy is mandated in APA and risk assessment would be too subjective to be useful.

The AGP is a major national pipeline and good practice requires APA to be appropriately resourced to operate and maintain the pipeline in accordance with its design basis.

Evaluation of alternatives

There are no alternatives.

Delivery Concept

Internal approval processes will validate purchase requirements in accordance with the APA Motor Vehicle Policy.

Estimate and Timeframe

As required.

Recommendation

The recommendation is to provide funding for the purchase of replacement motor vehicles.

Vehicle	Unit cost	FY22	FY23	FY24	FY25	FY26
Hilux	$85,000	3			3	4
Land cruiser	$100,000	5	4		5	7
Trucks	$200,000			2		
Fork truck	$60,000			1		
Air Compressor	$35,000	1				

Table 18 - Motor vehicle replacements

Budget

	FY22	FY23	FY24	FY25	FY26
Motor Vehicles	$790,000	$400,000	$460,000	$755,000	$1,040,000

Table 199 - Motor vehicles budget

Justification

The AGP is a major national pipeline and good practice requires APA to be appropriately resourced to operate and maintain the pipeline in accordance with its design basis. The NT vehicles operate over large distances and remote areas, compromises in vehicle reliability and safety are not acceptable.

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

Appendix B: APA CORPORATE RISK MATRIX

APA Enterprise Risk Matrix - Projects May 18 (Link Here)

Likelihood	Impact (consequences)				
	1. Minimal	2. Minor	3. Significant	4. Major	5. Catastrophic
Frequent	Low	Moderate	High	Extreme	Extreme
Occasional	Low	Low	Moderate	High	Extreme
Unlikely	Negligible	Low	Moderate	High	High
Remote	Negligible	Negligible	Low	Moderate	High
Rare	Negligible	Negligible	Negligible	Low	Moderate

ERM Risk Tables MAY 2018 – APPROVED

1. **Enterprise Risk Matrix - Likelihood table**

Level	Descriptor	Description*	Frequency*
5	Frequent	Expected to occur on a regular basis and many times	Many times in 1yr
4	Occasional	May occur occasionally or in many circumstances	Every 2yrs
3	Unlikely	Unlikely to occur but possible when certain circumstances prevail	Every 5yrs
2	Remote	Not anticipated but may occur if certain abnormal circumstances prevail	Every 20yrs
1	Rare	Conceivable, but has not been known to arise previously	Every 50yrs

* depending on the risks under review, users can choose either the likelihood description, frequency or both. Users can choose based on what is more helpful in risk understanding.

2. **Enterprise Risk Matrix - Impact (Consequence Ratings)**

Consequence Category		Impact (Consequence) Ratings				
		1. Minimal	2. Minor	3. Significant	4. Major	5. Catastrophic
1. Health & Safety Injuries, illness or death of employees, contractors or members of the public		Injuries or illness requiring first aid treatment only i.e. able to return to work immediately or the next day	- Injury / illness resulting in time lost from work of one day / one shift or more (LTI) - Member of the public requiring medical treatment	- Injury / illness resulting in permanent or partial disability to employees - Member of the Public requiring hospitalisation	Fatality or life threatening injuries or illness or permanent total disability of employees and contractors or members of the public	Fatality arising from systemic failure of APA safety or multiple fatalities of employees and contractors or members of the public
		Psychological illness resulting in inability to return to work for 1-2 months or 1 accepted claim in a month	Psychological illness resulting in inability to return to work for 3-6 months or 2-3 accepted claims in a month	Psychological illness resulting in total inability to return to work or >3 accepted claims in a month	Psychological illness resulting in Fatality	
2. Environment (including heritage) Environmental harm or adverse effect on ecosystem i.e. the surroundings in which APA operates, including natural, built and Aboriginal cultural heritage, soil, water, vegetation, fauna, air and their interrelationships		One or a combination of the following consequences: - onsite and impacting < 1 ha - no remediation needed - impact continues for < 1 wk	One or a combination of the following consequences: - onsite and impacting > 1 ha - able to be remediated easily - impact continues for <1 yr	One or a combination of the following consequences: - offsite and impacting < 1 ha - able to be remediated with some difficulty - impact continues for <5 yrs	One or a combination of the following consequences: - offsite and impacting > 1 ha - able to be remediated with difficulty - impact continues for <10 yrs	One or a combination of the following consequences: - offsite and impact is widespread (>1ha) - unable to be remediated - impact is irreversible or lasts >10 yrs
		Impact that causes negligible or no damage to heritage	Temporary and repairable impact or infringement to heritage	Permanent but repairable impact or infringement to heritage	Temporary but irreparable impact or infringement to heritage	Permanent and irreparable impact or infringement to heritage
3. Operational Capability Disruption in our operations (supply or services)		**Transmission** Unplanned interruption of < 5 days to the delivery of non-firm services	**Transmission** Unplanned interruption of: - ≥ 5 days to the delivery of non-firm services (including bi-directional, reverse flow or backhaul services) - < 1 day to the delivery of firm services	**Transmission** Unplanned interruption of ≥ 1 day but < 1 month to the delivery of firm services	**Transmission** An interruption of ≥ 1 month but < 1 year to the delivery of firm services	**Transmission** An interruption of more than 1 year to the delivery of firm services
		Networks Unplanned loss of service to <100 domestic/I&C corporate customers less than 100 Minor property damage	**Networks** Unplanned loss of service to - 100 - 1,000 customers - a demand customer (>10TJ pa)	**Networks** Unplanned loss of service to greater than - >1,000 customers - multiple demand customers (>10TJ pa) - to a single high risk site, without alternate supply options, (hospital, nursing home, home on life support)	**Networks** Unplanned loss of service to: - a regional area or greater than > 10,000 customers - a demand customer (>10TJ pa)with customer loss of revenue or infrastructure damage - to multiple high risk sites without alternate supply options (hospitals, nursing homes, homes on life support) Extensive property damage	**Networks** Unplanned loss of service to: - a metropolitan area - multiple demand customer (>10TJ pa)with customer losses of revenue or infrastructure damage
		Power - Loss of customer load (firm capacity) equivalent to 2hrs – 1 day or - 100% loss of non-firm contracted supply for 1day – 2days	**Power** - Loss of customer load (firm capacity) equivalent to 1day – 1wk or - 100% loss of non-firm contracted supply for 2days – 2wks	**Power** - Loss of customer load (firm capacity) equivalent to 1wk – 2wks or - 100% loss of non-firm contracted supply for 2wks – 1mth	**Power** - Loss of customer load (firm capacity) equivalent to 2wks – 1mth or - 100% loss of non-firm contracted supply for >1mnt or - Loss of single asset availability resulting in liquidated damages	**Power** - Complete loss of customer load (firm capacity) for > 1mth or - Loss of multiple asset availability resulting in liquidated damages
4. People Impact size, engagement, capability of our Staff		Little or no impact on individual or team engagement	Some impact on team or site engagement / minor site level complaints or breaches	Some impact on Business unit engagement / rising complaints or breach levels / some staff turnover	Some serious complaints or breaches / Staff turnover rising	Increasing serious complaints and breaches/ High staff turnover
5. Compliance Non-compliance with operating licenses, legal, regulatory, contractual obligations, debt financing covenants or reporting / disclosure requirements.		Immaterial non-compliance which can be resolved internally in < 3 months	Non-compliance which can be resolved in 3 - 12 months. Issuance of formal notice.	Non-compliance reportable to a regulator with potential for regulatory investigation or fines	Non compliance resulting in major fines, restrictions, potential of loss of license or licence variations	Multiple areas of non-compliance / breaches with loss of one or more operating licenses, prosecution of directors or officers of APA.
		Non-compliance with a contractual obligation - negotiations required	Non-compliance with a contractual/legal obligation(s) - arbitration required	Non-compliance with a contractual/legal obligation(s) - results in litigation	Permanent loss of major/material contract	Permanent loss of multiple material contracts
			Review event under debt financing obligation addressed through consultation with lender	Immaterial breach of covenant under debt financing obligation reportable to lender	Material breach of covenant under debt financing obligation reportable to lender	Event of Default under debt financing obligations leading to acceleration of drawn debt facilities
6. Reputation & Customer The view of APA from its stakeholders, customers, investors, regulators,		Isolated adverse: - local media comment or articles on APA - low levels of detrimental social media comments	Sustained: - adverse local media articles on APA - detrimental social media comments	Sustained adverse national: - media articles on APA - viral social media Multiple negative reports by financial analysts	Considerable, prolonged adverse national coverage (social and media) / Sustained negative reports by financial analysts / ASX Trading halt	Considerable and prolonged adverse international coverage (social and media) on APA and energy industry / Suspension from ASX
governments and the community.			One off negative reports by financial analysts			
		Some decline in customer satisfaction recoverable in <12 months	Some decline in customer satisfaction recoverable in >12 months	Sustained deterioration in customer satisfaction / Small contract arbitration	Sustained deterioration in customer satisfaction or loss of one top 10 customer / Major contract arbitration	Sustained deterioration in customer satisfaction or loss of multiple top 10 customers
7. Financial	**APA Group** Balance sheet, P&L impact (cumulative or one off)				Permanent downgrade of either credit rating by a single notch	Permanent downgrade of either credit rating by two or more notches (to sub-investment grade)
		≤ $15M	$16M - $30M	$31M - $60M	$61M - $250M or potentially outside market guidance	> $250M or major impact on market guidance
	Asset Revenue, Cost impact (cumulative or one off)	≤ $1M	$1M-$5M	$5M-$20M	$20M-$50M	>$50M

Appendix C: AMP ALIGNMENT RATING

Alignment to Asset Objectives

AMPAlignment	Description	Examples
5	Board level endorsed, APA strategy/strategic imperative	Unpiggables, MSP SCC, MWP CP Augmentation
4	High priority initiatives linked to an endorsed improvement program or key strategic issue in an AMP or required for compliance (APA Policy, customer contract, legislation)	GGP reliability improvements, Regulatory Compliance, 10 year Integrity plan, Hours based Overhauls, HA Rectification, EC functional improvements
3	Immediate business benefit and alignment with accepted division wide initiatives to address known / systematic issues, improve operability/efficiency, safety	Aggregated equipment obsolescence programs, Vic Battery Chargers, control system upgrades, Maximo upgrades, Online Sim
2	Provides medium term benefits to the business that are logical to progress	Enterprise Analytics. Power BI dashboards, O&M Tools & equipment
1	Low urgency but provides longer term benefits to the business	Tools to trend long term equipment performance, Team one-off initiatives