Victorian Transmission System

August 10, 2022

Asset Performance & Lifecycle Plan

1. Introduction

1.1. Purpose

This Asset Performance & Lifecycle Plan presents a summary of the key aspects of management activities with respect to the Victorian Transmission System (VTS).

The Plan presents a summary of the key technical aspects of the management activities for VTS and provides an overview of the condition of the VTS and the proposed programs and projects to maintain and improve safety, integrity and reliability.

The Plan is a collaborative document where operational excellence process owners provide assessments of the performance of the asset and detail any necessary actions required to meet or maintain the assets key objectives.

1.2. Scope

This document is specific to the group of APA assets that collectively form the Victorian Transmission System. The Asset Performance and Lifecycle Plan includes the capital programs necessary to maintain the reliability, safety and integrity of the VTS to ensure the capability to meet customer requirements.

Expansion projects and routine operations (operating expenditure) are not reported in this Plan.

1.2.1. Asset Overview

The VTS comprises of approximately 2,267 km of high-pressure gas transmission pipelines throughout Victoria, made up of 51 pipelines under 46 individual licences.

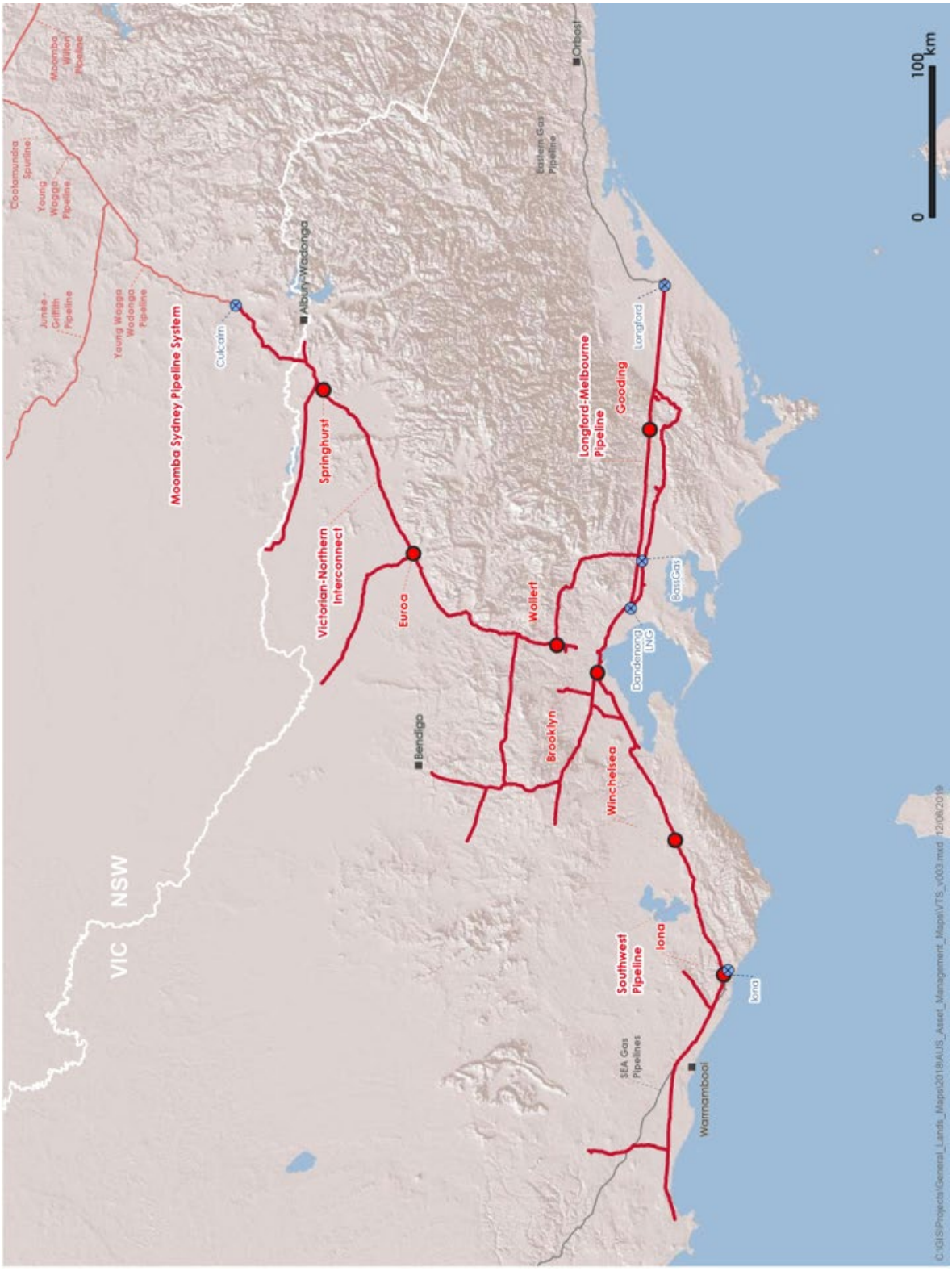
Almost all the natural gas consumed in Victoria is transported through the VTS. The VTS serves a total consumption base of approximately two million residential consumers and approximately 60,000 industrial and commercial users throughout Victoria.

The VTS supplies gas to the Melbourne metropolitan area and to a number of regional centres including Corio (near Geelong), Ballarat, Bendigo, Wodonga, Koonoomoo and Echuca. The Laverton North, Somerton, Valley Power (Loy Yang B), Jeeralang and Newport gas-fired power stations are all supplied from the VTS.

The main VTS pipelines and compression facilities include:

- Longford to Melbourne Pipeline (Longford-Dandenong-Wollert) with compression at Gooding.
- South West Pipeline (SWP) (Port Campbell-Geelong-Brooklyn) with compression at Winchelsea and Brooklyn.
- Northern Lateral and NSW Interconnect (Wollert-Wodonga-Culcairn) with compression at Wollert, Euroa and Springhurst.
- Western Transmission System (WTS) (Iona-Portland) with compression at Iona.

Further detail about VTS is presented in Appendix A, a VTS overview is also provided in **Error! Reference source not found.**.


Moomba Sydney Pipeline System
Springhurst
Victorian-Northern Interconnect
Euroa
Wollert
Brooklyn
Bendigo
Wincheisea
Southwest Pipeline
Iona
Warrnambool
SEA Gas Pipelines
Longford-Melbourne Pipeline
Gooding
Longford
Orbost
Eastern Gas Pipeline
Dandenong LNG
BassGas
Culcairn
Albury-Wodonga
Young Wagga Wodonga Pipeline
Junee - Griffith Pipeline
Young Wagga Pipeline
Coolamunda Spurline
Moomba Wilton Pipeline
VIC
NSW
0
100 km

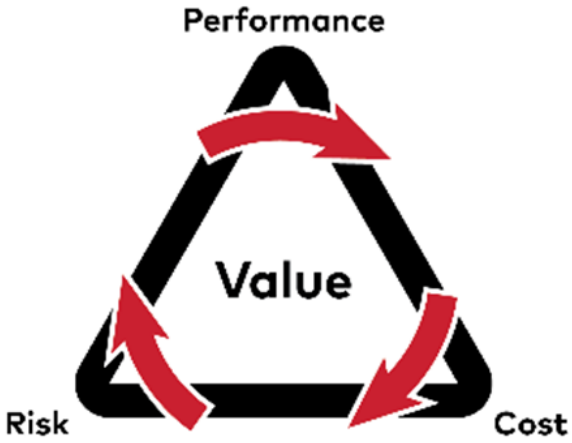
2. APA Asset Management

2.1. Policy and Framework

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.

Asset Management is systematic and coordinated activities and practices through which APA optimally and sustainably manages its assets and asset systems, their associated performance, revenues, risks, and expenditures over the asset life cycles for the purpose of achieving its organisational strategic plan.



Under the Asset Management Policy, APA's Asset Management (AM) Department is the custodian for all of APA's owned assets nationally, including the Victorian Transmission System. The Department works in close association with VTS leadership and operational teams.

2.2. Asset Management Responsibilities

The Asset Management 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, and Midstream operations
- 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.

The VTS Plan is written specifically for the VTS Access Arrangement and reflects the outcomes from the ongoing management of the assets under the normal lifecycle planning processes carried out across APA.

2.3. Operational Excellence

Operational excellence embraces principles and tools to create sustainable improvement within an organisation. It is a continuous improvement methodology on removing waste, focussing on value, and enhancing capability of Operations that translates to customer value.

Operational Excellence ensures APA executes its business strategy more effectively, efficiently, and consistently than its competitors, delivering maximum benefit from APA's assets for its customers and shareholders. Realising competitive advantage, best practice operations and supporting growth through the following operational excellence pillars:

- Exceeding Customer Expectations through reliable service to market and leading product offerings
- Strategic Alignment of business priorities realising long term business value whilst balancing risk, cost, and performance
- Performance monitoring and management against SMART metrics
- Innovation and Continuous Improvement aligned with value-ease and benefits realisation framework
- High Performing Teams where APA have access to the right people at the right time, working in a positive culture and a positive employee experience.

Figure 1 Operational Excellence Framework

As shown above, the Operational Excellence Framework includes effective application of business processes across the six operational excellence pillars.

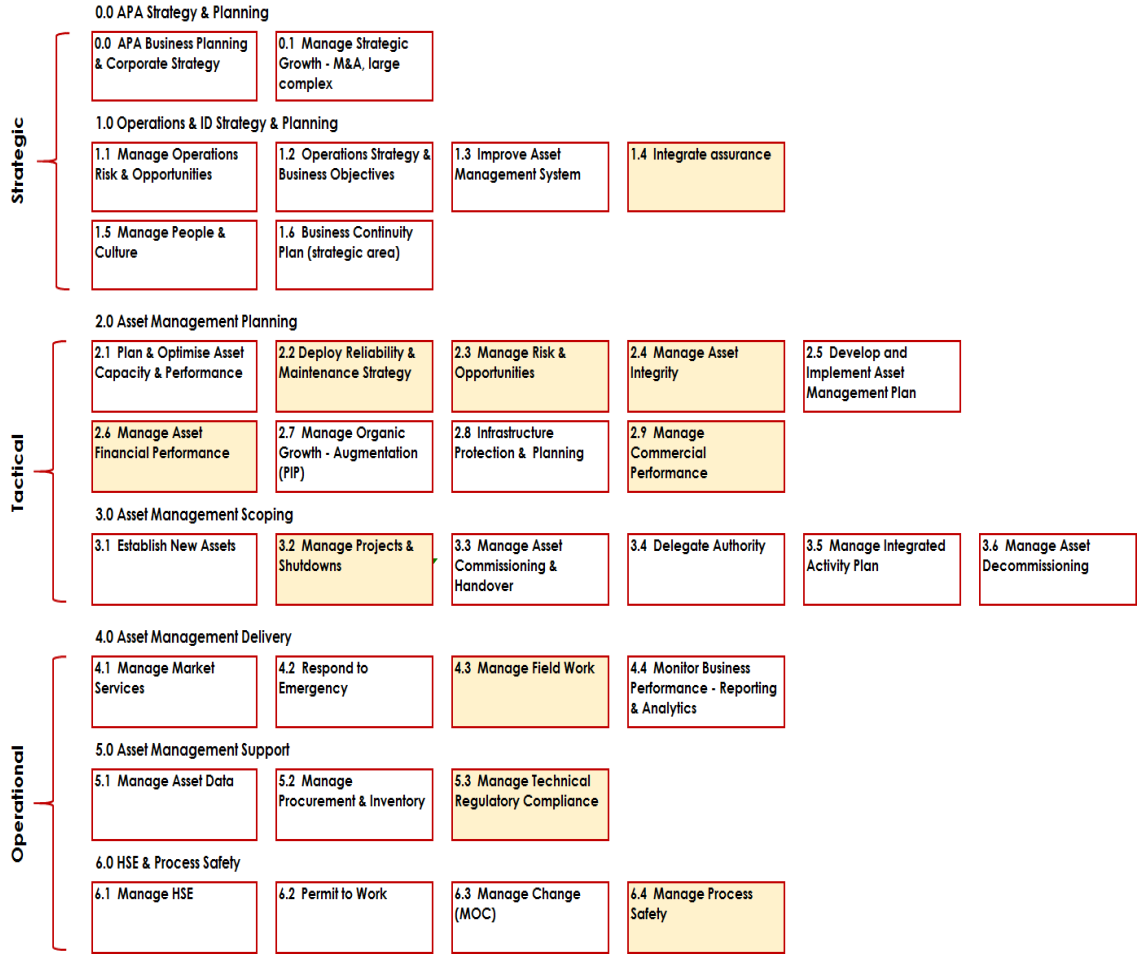
2.4. Operational Excellence Processes

APA's operational excellence processes cover three broad categories: strategy and planning; asset management planning; and operational asset management delivery. Thirty-four key processes have been defined that integrate to ensure the assets are operated, maintained, and improved to maximise value in a safe, compliant, and effective manner. The purpose of defining these processes is to ensure:

- Clear alignment of purpose
- Clear ownership of key processes
- Integration of activities across teams to minimise risk and waste
- Prioritisation of improvement initiatives (roadmaps and governance).

The below table links to the approved definition for each process. Definitions include the approved purposes and deliverables for each process as well as the agreed key performance metrics used to measure performance of each across APA Operations.

Figure 2 Operational excellence processes



The processes highlighted in yellow are the 10 key processes monitored monthly at the asset performance meetings. Key processes are described in section 2.

2.5. Asset Management Operating Rhythm

APA's approach to asset management for each asset follows an operating rhythm with key tasks and milestones at each stage. The operating rhythm covers day-to-day monthly, quarterly and annual activities. The asset management operating rhythm is presented in the figure below.

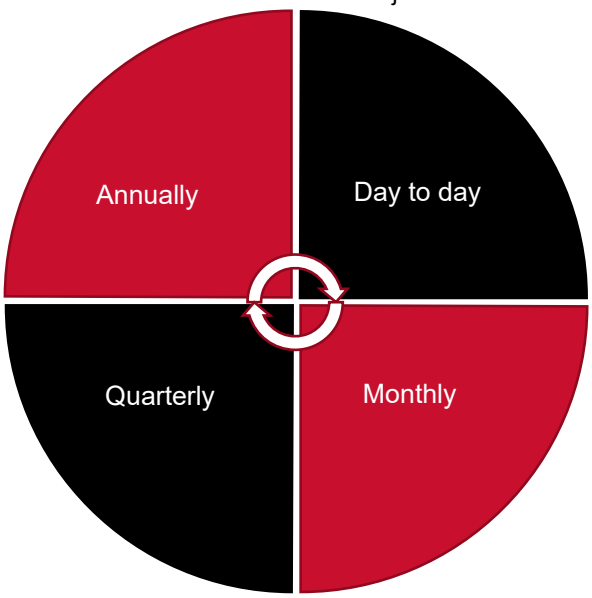
Figure 3 Asset Management operating rhythm

Asset Management Plan

- Scan the environment
- Review Business Objectives
- Review the asset
- Life cycle workshop
- Update business plan, risk register and forward budget cycle

Asset Champion

- Integrates stakeholder interests into decision-making
- Integrating knowledge base across functional experts
- Support integrated decision-making
- Drive function teams to Asset Mission
- Support activities that support mission and objectives



Asset Deep dive

- Integrated team – connect and team health check
- Refresh asset mission
- What's changed or likely to change
- Risk register refresh
- Large scale intervention required in any key areas

Asset Performance Review

- Integrated team – connect and team health check
- Refresh asset mission
- What's changed or likely to change
- Risk register refresh
- Large scale intervention required in any key areas

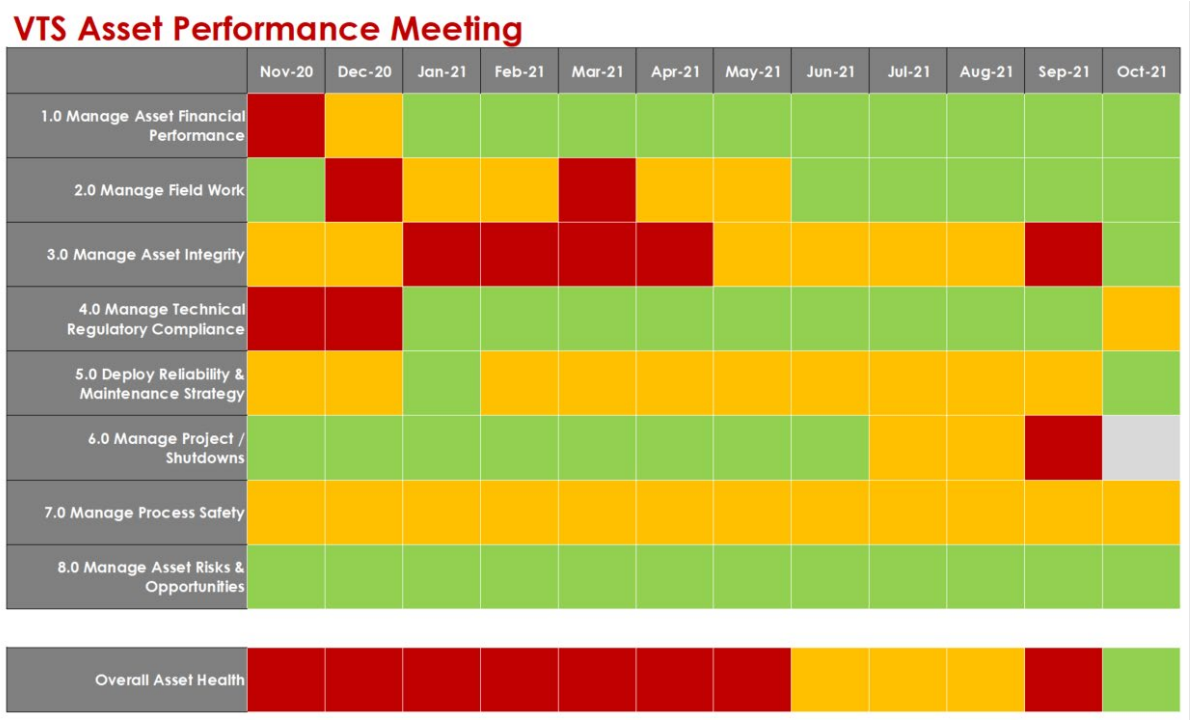
2.6. Asset Performance Monitoring

Performance monitoring is critical for driving strategic business decision making practices to achieve operational excellence.

Performance requirements:

- Key Performance Indicators for each asset applicable processes are monitored and reviewed at frequencies defined in the relevant process definition.

Each asset's management team consider corrective action where an asset's performance indicates it is not meeting its strategic objectives.



2.7. Asset Lifecycle Management

Lifecycle management involves the identification and treatment of risk/opportunities and the allocation of APA's Stay-in-business (SIB) capital budget over a 20-year window.

It is a tactical component of the Operational Excellence Framework supporting process 2.1 Develop & Implement Asset Management Plans. The processes are typically initiated under 2.3 Manage Asset Risks and Opportunities where physical and performance issues provide threats to the safe and reliable operation of the assets are identified.

2.7.1. Project Identification and Selection

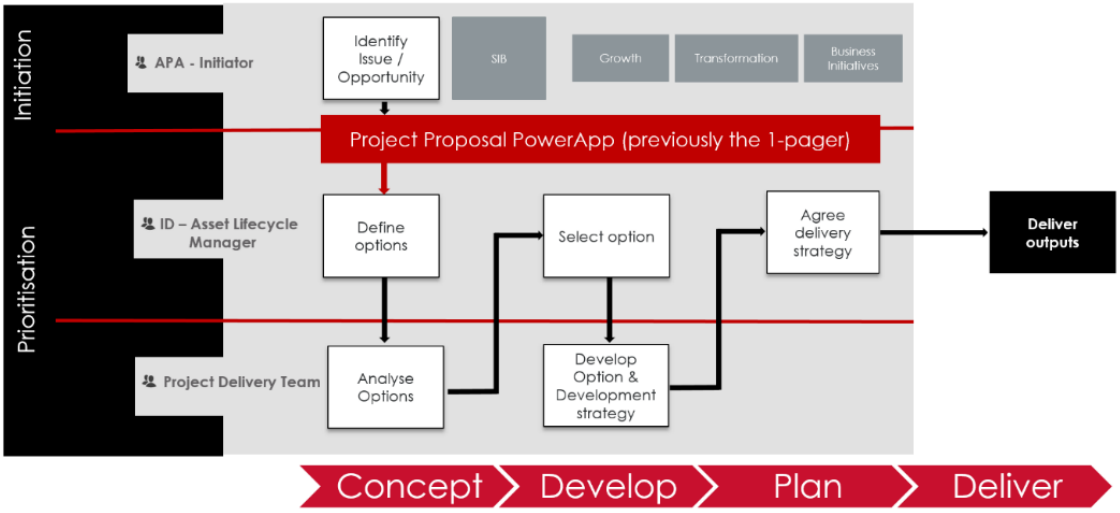
Operational data and integrity inspections provide much of the long-term planning, however, the process accepts additional proposals from the operating departments. These typically relate to short- and medium-term integrity-based activities, operating hours-based overhauls, asset condition rectification and risk management mitigation initiatives.

SharePoint databases manage this information, and the input is through a proposal form which has been specifically designed to collect the information to enable a thorough understanding of the scenario and its impact for processing.

Where the issue is complex additional information in the form of a business case may be attached. Additionally, opportunities to improve the assets may also be received. These are managed in parallel to the risk-based projects and utilise similar assessment criteria.

The following process map shows the high level approach that is applied to new proposed projects.

Figure 4 Project identification and selection process map



Project initiatives typically originate from three sources:

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

The initiator provides as much information as possible to enable the projects to be understood and 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 stay-in-business category have an obvious solution as they typically relate to strategic projects or direct replacement. Where there are multiple solutions (or options) these are assessed against cost and benefits (risk reduction) and a preferred solution is selected.

2.7.2. Project Ranking

All proposed projects undergo risk assessment during the identification stage 1.0, however this is re-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 broadly aligned with that used under

AS2885.6 Pipelines - Gas and liquid petroleum Pipeline safety management but incorporates additional criteria.

As an additional 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.

Ranking results are subject to review with the local Asset Manager and may be adjusted to optimise the approach for a specific year.

2.7.3. Risk Assessment

Proposed VTS replacement (stay-in-business) programs and projects have been subject to a risk assessment that supports the prioritisation of those programs identified as needing investment.

The risk assessment and management process is described in Section 4.2 and the individual risk assessments prepared for each of the proposed stay-in-business programs and projects are presented in the business cases.

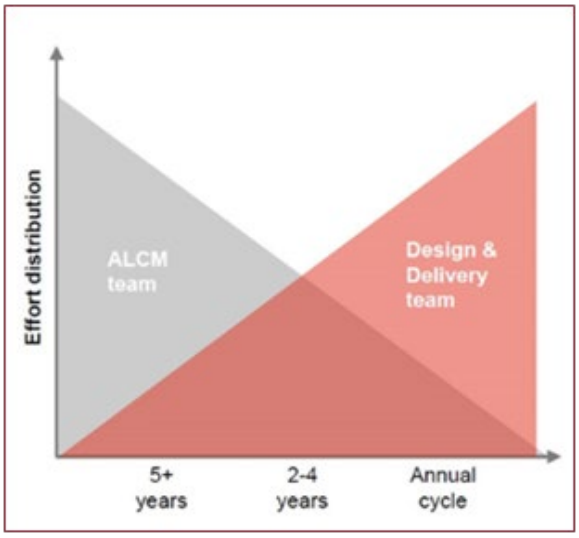
2.7.4. Delivery Management

Capital projects are typically delivered by APA's Project Design & Delivery team, within the Engineering and Planning business unit. Projects may also be delivered by the Infrastructure Construction group or by Operations & Maintenance depending on the nature of the project.

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 to ensure scope, schedule and budget milestones are being met.

The Lifecycle team takes any variations into consideration and where required will add projects to or defer projects from the annual scope. Figure 5 describes the project lifecycle process.

Figure 6 – Project lifecycle process overview



The lifecycle team receive projects as proposals which are then assessed and prioritised into a 5 year schedule.
The lifecycle team also maintain a 20 year view of longer term project budgets but the 5 year view is more relevant to the access arrangement rhythm.
One of the key objectives of the lifecycle team is to ensure that projects being funded are important and will address the objective. As such the lifecycle team maintains line of site of each project to ensure cost and scope remain relevant and would be considered prudent expenditure.

Design and delivery team assigns resources to design and develop solutions which are then scheduled for delivery. As the projects are delivered or paused (e.g. awaiting maintenance windows) the team then get tasked with the next project.

3. Asset Summary

3.1. Description of VTS and services provided

The VTS as at 30 June 2021 comprises of approximately 2,267 km of high pressure gas transmission pipelines throughout Victoria, made up of 51 pipelines under 46 individual licences.

Almost all the natural gas consumed in Victoria is transported through the VTS. The VTS serves a total consumption base of approximately 2 million residential consumers and approximately 60,000 industrial and commercial users throughout Victoria.

The VTS supplies gas to the Melbourne metropolitan area and to a number of regional centres including Corio (near Geelong), Ballarat, Bendigo, Wodonga, Koonoomoo and Echuca. The Laverton North, Somerton, Valley Power (Loy Yang B), Jeeralang and Newport gas-fired power stations are all supplied from the VTS.

The main VTS pipelines and compression facilities include:

- Longford to Melbourne Pipeline (Longford-Dandenong-Wollert) with compression at Gooding.
- South West Pipeline (SWP) (Port Campbell-Geelong-Brooklyn) with compression at Winchelsea and Brooklyn.
- Northern Lateral and NSW Interconnect (Wollert-Wodonga-Culcairn) with compression at Wollert, Euroa and Springhurst.
- Western Transmission System (WTS) (Iona-Portland) with compression at Iona.

Gas transmitted through the VTS is supplied primarily by Esso/ BHP and injected into the VTS at the Longford injection point. Other gas supplies are sourced from the BassGas injection point at Pakenham and from the Iona injection points at Port Campbell. A small portion of gas can enter the VTS through the Interconnect pipeline from NSW, the Eastern Gas Pipeline (VicHub) and the Tasmanian Gas Pipeline (TasHub).

From the Longford and BassGas injection points, gas is transported to the Dandenong and Wollert city gate regulating stations on the outskirts of Melbourne via a partially duplicated 750 mm diameter trunk line. The Gooding compressor station, located along the trunk line between Longford and Dandenong, has four compressor units.

The Wollert city gate regulating station supplies the VTS 600mm diameter pipeline feeding into the distribution networks in metropolitan Melbourne. The Dandenong city gate directly feeds the distribution networks owned by Multinet Gas and Australian Gas Networks and also feeds the APA VTS gas transmission system 750mm diameter trunk pipeline to Brooklyn.

Gas from Iona can also enter the trunk pipelines from Brooklyn. The Dandenong to Brooklyn pipeline supplies gas to the AusNet Services distribution network and to a number of Multinet Gas and Australian Gas Networks (AGN) delivery points. Approximately two thirds of Melbourne's gas demand is met through the Dandenong city gate and one third through the Wollert and Brooklyn city gates.

The VTS extends north from the Wollert city gate to Bendigo, Echuca, Koonoomoo and Wodonga through an extensive network of pipelines with diameters ranging from 150 to 400 mm including

looped sections of the Melbourne to Wodonga Pipeline (PL101) known as Victorian Northern Interconnect Expansion (VNIE).

APA VTS owns compressor stations located at Gooding, Iona, Wollert, Euroa, Springhurst, Brooklyn and Winchelsea. The network extends from Brooklyn Compressor Station to Corio (near Geelong) in the south and to Ballarat/Bendigo in the north.

VTS supplies a number of gas powered generators (GPG) at Laverton North, Somerton, Valley Power, Jeeralang and Newport.

3.2. Asset Mission

The VTS Asset Mission is to carefully manage operational complexities and regulatory outcomes to safeguard our ability to provide cost effective and reliable gas to new and existing customers throughout Victoria.

3.3. Asset condition

Age

- VTS pipelines have an average service life of 33.5 years but range in age from 6 years to 65 years.

Condition of assets

- Several of our ageing assets in high consequence areas require increases in inspection resolution and frequency.
- Managing asset integrity is a key focus of the proposed program

Urbanisation and encroachment.

- APA VTS is facing increasing expectations from government, customers and internally (with our recent shifts to national discipline based policies) to mitigate risks of urban encroachment.
- Continued urban growth is expected to present ongoing encroachment challenges that require focused planning, pipeline safety management, corridor protection and recoverable works effort.

What are the reasons for the increase in forecasts?

APA are responding to increased risk factors;

- VTS is an ageing asset and more integrity management is required to maintain integrity
- Increasing encroachment by urban development of our assets.

APA is now using high resolution inline inspection tools to assess asset integrity.

- Although it initially costs more to perform inline inspections it has the following benefits;
    - Inline inspections are the industry preferred method for confirming pipeline integrity (as they are a more comprehensive and accurate assessment of pipeline condition).
    - As inline inspections provide a superior assessment of asset condition the cost of direct assessments is reduced, this is due to inline inspection-targeted physical inspections

rather than quantitative physical inspections required for similar confidence from direct assessments.
  - Inline inspection also identifies more defects so the repair campaign may appear to cost more but completing will improve remaining life confidence for the next remaining life period and there will be fewer defect to contend with next time.

APA policy changes;

- Inline inspection frequency has been adjusted from 15 to 10 yearly which is as per national asset integrity strategy.
- Legacy practices that no longer meet modern day expectations are being addressed.
- We are applying the process safety principles of "As low as reasonably practicable".

4. Asset Management Planning

Key aspects of asset management planning applied to each asset including VTS are discussed below.

4.1. Reliability & Maintenance Strategy (Engineering & Planning)

The purpose of the Reliability and Maintenance Strategy process definition is to ensure equipment is available when needed while minimising business risk of equipment failure through the effective and efficient implementation of reliability and maintenance strategies.

Applying Reliability Centred Maintenance (RCM) principles to maintenance strategy development will allow us to generate fit for purpose strategies that align with asset/business criticality. Doing the right tasks at the right time, on the right equipment will increase reliability reducing preventable reactive maintenance, as well as improving availability.

The program to implement RCM is the subject of stay-in-business Business Case 307 Reliability Centred Maintenance.

Note: AER draft decision rejected the RCM business case, as a result maintenance will remain a combination of OEM recommendations and APA standardised maintenance practices.

4.2. Asset Risk (Asset Management)

APA's risk management framework has been developed to comply with *AS2885.3 Pipelines - Gas and liquid petroleum, Part 3: Operation and maintenance* for the operation of the assets and utilises a standard risk assessment matrix which is consistent with *AS2885.6 Pipelines - Gas and liquid petroleum Pipeline safety management*. The framework aligns with international standard ISO 31000 (2018) Risk Management and has been developed in accordance with industry best practice.

The risk management framework is designed to support the management of our assets to:

- Identify, assess and manage risks
- Create clear ownership and accountability for risks and opportunities
- Ensure adequate knowledge and capability is applied to risk assessment activity
- Escalate and create visibility of risks, controls and control performance, and

Integrate risk into decision making through risk appetite and acceptance criteria. The risk management approach assesses the impact of risk using the following impact categories.

Impact category	Description
Health & Safety	Injuries, illness or death of employees, contractors or members of the public
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.
Operational Capability	Disruption in our operations (supply or services)
People	Impact size, engagement, capability of our Staff.
Compliance	Non-compliance with operating licences, legal, regulatory, contractual obligations, debt financing covenants or reporting / disclosure requirements
Reputation & Customer	The view of APA from its stakeholders, customers, investors, regulators, governments and the community.
Financial	APA Group Balance sheet, P&L impact (cumulative or one off) Asset Revenue, Cost impact (cumulative or one off).

4.3. Asset Integrity (Engineering & Planning)

The purpose of Manage Asset Integrity is to maintain the physical life of our assets to ensure the safety of our employees, contractors and the public and security of supply. Many transmission assets are exposed to corrosion, cracking, fatigue, stress related failure, vibration, wear and tear, third party damage and other degradation.

Managing asset integrity is an important focus in the proposed programs for the VTS.

Integrity related programs include stay-in-business Business Case 258 Pipeline Integrity and Business Case 259 VTS Unpiggables.

4.4. Integrated Activity Plan (Engineering & Planning)

The purpose of the Integrated Activity Plan process definition is to facilitate the efficient and safe management of a program of works that have a material impact on transmission capacity, grid operability and resource availability.

The Integrated Operations Centre (IOC) manages the maintenance schedule using the Maximo maintenance scheduling system. The Maximo maintenance schedule is used to plan the work program (up to 90 days ahead) and issue work permits before work commences. If it is a critical asset, IOC liaises with AEMO to minimise operational disruptions.

Integrated Activity Planning is linked to another planning function - Projects / Shutdowns (Engineering & Planning / Infrastructure Construction). The purpose of Manage Projects and Shutdowns is to deliver project work enabling asset reliability improvements efficiently and safely, revenue growth and major maintenance, in alignment with all stakeholder expectations, customer requirements and asset strategies.

4.5. Procurement & Inventory (Procurement Transmission & Power)

The purpose of the Procurement and Inventory processes to provide strategic and operational supply chain (inventory management, purchasing and logistics) services and strategic procurement services where they are needed, to maximise asset performance and enable assets to meet their objectives.

4.6. Regulatory Compliance (Asset Management)

The purpose of Regulatory Compliance is to ensure all assets are being managed and operated in accordance with legislative obligations.

APA VTS Annual (Safety) Report is submitted in accordance with the requirements of Section 11(c) Pipelines Regulations 2017 (Vic). This Report has been attached in 2020/21 VTS Annual Pipeline Report for the Victorian Transmission System

4.7. Process Safety (Engineering & Planning)

The purpose of Process Safety is to assure the safety of our people and the public from any major accident event as a result of an unplanned/uncontrolled harmful substance or energy release.

Process safety relates to controls at compressor stations and making them ‘fail-safe’. This reduces opportunity for a process to result in loss of containment (release of methane). This includes improvements underway on control systems and station vents at compressor stations –.

The compressor station upgrade program (SIB Business Case 205 Compressor Station Vent Upgrade) seeks to upgrade the vents at Longford, Springhurst, Brooklyn, Wollert B and Gooding Compressor Stations to mitigate risk of vent ignition.

5. VTS Replacement (Stay-in-Business) programs and projects

5.1. Overview

The majority of proposed replacement/ stay-in-business programs are ongoing and continue over several access arrangement periods.

Capital expenditure in the current period saw increased focus on asset integrity and the deferral of other projects

The key areas of investment for the 2023-2027 access arrangement period addressing increased risk from an ageing asset in tandem with continuing urban encroachment adjacent to APA assets. These factors together have increased the risks and consequences

APA national approach / greater focus on integrity has identified the need to address asset integrity of unpiggable pipelines on the VTS.

5.2. Drivers for Investment

APA VTS manages assets to ensure compliance with National Gas Rules, Victorian Government legislation and regulations and relevant Australian and international standards.

The primary drivers for replacement/ SIB capital expenditure

- Safety
- Reliability
- Integrity
- Regulatory obligations

These drivers are subject requirements set out in:

- Victorian Government legislation
- Australian Standards
- International Standards
- AEMO Service Envelope Agreement.

5.2.1. Victorian Government Legislation

Victorian Government legislation includes:

- Pipelines Act 2005
- Pipelines Regulations 2017 (Vic).
- Pipeline licences for [46/47] pipelines on the VTS
- Gas Safety Act 1997
- Gas Safety (Safety Case) Regulations 2018
- Victorian OH&S Act 2004
- OH&S Regulations 2018
- Electrical Safety Act 1998
- Electrical Safety (Installation) Regulations 2009
- Electrical Safety (General) Regulations 2019

The pipeline operates under a safety case regime in accordance with the Gas Safety (Safety Case) Regulations 2017 and has a safety management system in place in accordance with the regulations.

APA operates and maintains the VTS and its associated facilities in accordance with AS2885.3 and other relevant standards.

5.2.2. Industry Standards

Australia Standard (AS) 2885 Pipelines—Gas and liquid petroleum is a series of standards that provide important principles, practices and practical guidelines for use by competent persons and organisations involved in the operation and maintenance of high-pressure petroleum pipelines.

AS 2885 has evolved and expanded in order to meet the requirements of the Australian industry to reduce the cost of construction pipeline as well as maintain the existing high standards of safety and reliability.

The Standard has seven parts:

- AS 2885.0: General requirements
- AS 2885.1 Design and construction
- AS 2885.2: Welding
- AS 2885.3: Operation and maintenance
- AS 2885.4: Submarine pipeline systems
- AS 2885.5: Field pressure testing
- AS 2885.6: Pipeline safety management.

Alignment of operations with AS 2885 reflects good industry practice.

5.2.3. Service Agreement Envelope with AEMO

APA VTS has a Service Envelope Agreement with AEMO. AEMO operates the VTS - both the Declared Wholesale Gas Market ("DWGM") and the physical asset. AEMO schedules all gas flows

APA VTS owned and maintained the VTS assets that are operated by AEMO.

Under the Service Envelope Agreement with AEMO we guarantee "all-year-round" ability to deliver the required demand/ capacity.

5.3. Justification of stay-in-business programs and projects

The VTS stay-in-business programs and projects are justified under NGR, rule 79. The stay-in-business capital expenditure is necessary to

- to maintain and improve the safety of services; or
- to maintain the integrity of services; or
- to comply with a regulatory obligation or requirement; or
- maintain capacity to meet levels of demand for services existing at the time the capital expenditure is incurred (as distinct from an expansion of pipeline capacity).

The business cases for the stay-in-business programs and projects justify the need for undertaking replacement, upgrades or overhauls of VTS assets. The proposed APA VTS stay-in-business programs and projects are driven by safety, integrity and reliability and regulatory obligations and reflect good industry practice.

The replacement business cases are structured as follow:

- Provide background for the program and project
- Identify the program and project need/ driver including
    - Relevant legislation and alignment with regulatory obligations
    - Meeting Australian (and international) standards
    - Meeting good industry practice
- Risk assessment
    - Aligns with APA's Risk policy
- Identification of options
    - All options are compared to a "Do Nothing" option.
    - Do nothing can be 'run-to-failure' of the assets
    - For replacement expenditure, do nothing is often not a credible option as it risks breaching regulatory obligations and standards regarding safety, integrity and reliability

- Assessment of options
  - Assessment is based on comparing the outcomes if the identified risks are not addressed compared to undertaking options to mitigate the risks
  - Assessment of options uses ALARP as a benchmark
- Identify the preferred option following assessment of options
  - Forecast the cost of the option and breakdown into cost components
- Justification of preferred option against Rule 79.
- Discussion of benefits to customers and consumers of the preferred option.

5.4. Summary of programs and projects

APA risk assessed the VTS assets and collated the required expenditure into 32 business cases which have also been grouped by access arrangement class. A summary of the access arrangement class estimates is provided below in the table below.

Table 1 VTS proposed replacement (stay-in-business) capital expenditure ($2022)

AA Class	Sum(23:27)	23	24	25	26	27
Compressor Stations	$8,475,000	$200,000	$1,550,000	$1,250,000	$1,200,000	$4,275,000
Gas Quality	$300,000	$0	$0	$0	$0	$300,000
Integrity Inspection	$38,361,733	$5,456,733	$10,615,000	$8,990,000	$8,200,000	$5,100,000
Other - long life	$9,280,000	$707,400	$2,722,400	$3,110,078	$1,472,400	$1,267,722
Other - short life	$13,810,860	$843,000	$787,000	$4,250,000	$5,080,860	$2,850,000
Pipelines	$31,598,788	$10,322,568	$16,476,220	$1,480,000	$1,880,000	$1,440,000
Receipt & Delivery Points	$507,475	$100,000	$100,000	$100,000	$100,000	$107,475
Total	**$102,333,856**	**$17,629,701**	**$32,250,620**	**$19,180,078**	**$17,933,260**	**$15,340,197**

Table 2 - VTS AA6 Business Cases

Business Case	AA Class	Sum(23:27)	23	24	25	26	27
BC203 WCS A Decommissioning	Compressor Stations	$750,000	$0	$50,000	$700,000	$0	$0
BC204 BCS 8,9 & 10 Decommissioning & 11 Upgrade	Compressor Stations	$750,000	$0	$0	$50,000	$700,000	$0
BC205 Compressor Station Vent Upgrade	Compressor Stations	$1,975,000	$0	$0	$500,000	$500,000	$975,000
BC211 Iona CS Aftercooler upgrade	Compressor Stations	$0	$0	$0	$0	$0	$0
BC212 Battery Chargers	Other - long life	$1,000,000	$35,000	$365,000	$200,000	$200,000	$200,000
BC216 Wollert CG, T74 & T119 PRS Instrument Air	Receipt & Delivery Points	$0	$0	$0	$0	$0	$0
BC220 T33 LV03 Pit Installation	Other - short life	$330,860	$0	$0	$0	$330,860	$0
BC224 DCG Gas Quality	Gas Quality	$0	$0	$0	$0	$0	$0
BC225 Control Valve Positioner Replacement	Receipt & Delivery Points	$507,475	$100,000	$100,000	$100,000	$100,000	$107,475
BC227 SMS Aerial Photography	Other - short life	$200,000	$0	$0	$200,000	$0	$0
BC230 Encroachment-High Consequence Areas	Pipelines	$2,200,000	$0	$0	$880,000	$880,000	$440,000
BC235 Turbine Overhaul	Compressor Stations	$5,000,000	$200,000	$1,500,000	$0	$0	$3,300,000
BC239 Emergency Response	Other - short life	$6,100,000	$0	$0	$3,000,000	$3,100,000	$0
BC242 BCS Unregulated Bypass	Other - long life	$0	$0	$0	$0	$0	$0
BC244 CP Replacement	Other - long life	$1,162,322	$232,400	$232,400	$232,400	$232,400	$232,722
BC249 Hazardous Area Rectification	Other - long life	$890,000	$215,000	$100,000	$200,000	$290,000	$85,000
BC258 Pipeline Integrity	Integrity Inspection	$27,641,733	$4,156,733	$9,285,000	$6,900,000	$5,200,000	$2,100,000
BC259 VTS Unpiggables	Pipelines	$26,798,788	$10,322,568	$16,476,220	$0	$0	$0
BC260 Liquids Management	Gas Quality	$300,000	$0	$0	$0	$0	$300,000
BC263 Pipe Support Replacement	Other - short life	$850,000	$0	$0	$250,000	$250,000	$350,000
BC264 HMI Upgrade	Other - long life	$720,000	$20,000	$700,000	$0	$0	$0
BC267 BCS Unit 12 Inlet Filter Upgrade	Compressor Stations	$0	$0	$0	$0	$0	$0
BC271 Type B	Other - long life	$1,960,000	$0	$460,000	$500,000	$500,000	$500,000
BC275 Mainline Isolation Valve Upgrade	Pipelines	$2,600,000	$0	$0	$600,000	$1,000,000	$1,000,000
BC307 Reliability Centred Maintenance	Other - short life	$0	$0	$0	$0	$0	$0
BC309 Arc Flash	Other - long life	$1,250,000	$125,000	$375,000	$250,000	$250,000	$250,000
BC314 Critical Spares	Other - short life	$2,100,000	$0	$0	$0	$0	$2,100,000
BC317 Station Control Logic Review & Rectification	Other - long life	$2,027,678	$40,000	$260,000	$1,727,678	$0	$0
BC328 Waterbath Heater Integrity	Other - short life	$2,000,000	$200,000	$400,000	$400,000	$1,000,000	$0
BC329 Facility Pipework Integrity	Integrity Inspection	$9,290,000	$600,000	$600,000	$2,090,000	$3,000,000	$3,000,000
BC330 Low Value Preventative & Reactive Maintenance	Other - long life	$2,500,000	$683,000	$617,000	$400,000	$400,000	$400,000
BC331 Pipeline Fracture Resistance Assessment	Integrity Inspection	$1,430,000	$700,000	$730,000	$0	$0	$0
Total	**Compressor Stations**	**$102,333,856**	**$17,629,701**	**$32,250,620**	**$19,180,078**	**$17,933,260**	**$15,340,197**

The remainder of Section 5.4 provides business case scope overviews.

5.4.1. BC203 WCS A Decommissioning ($0.75m)

Note: This business case has been revised from the WCS A Process Safety draft submission after incorporating AEMO feedback on post WORM WCS A utilisation forecasts. Draft submission funding request was $1.3m.

The aim of this project is to improve the safety and reliability of the Wollert Compressor Station A (WCS A) by addressing the following process safety issues:

- Unit isolation valves are fail-last rather than fail-safe configuration
- Check valves are required to prevent reverse flow and compressor reversal related failures
- Hazardous area and Type B are both currently non-compliant

The successful solution will address the above risks. The project was deferred earlier to address other priorities that emerged during the access arrangement period.

The following options have been considered:

Option 1: Do-Nothing - continue to operate without addressing risks

Option 2: Replace compressor packages and associated balance of plant

Option 3: Replace and upgrade necessary equipment for process safety concerns

Option 4: Develop end-of-life plan then decommission (Preferred option)

5.4.2. BC204 BCS 8, 9 & 10 Decommissioning & 11 Upgrades ($0.75m)

Note: This business case has been revised from the Brooklyn CS Upgrade draft submission after incorporating AEMO feedback on post WORM BCS utilisation forecasts. Draft submission funding request was for $10.3m, APA has deferred unit 11 scope into the next AA period.

The aim of this project is to improve the reliability and safety of the Brooklyn Compressor Station by addressing the following issues:

- Safety and Process Control system are obsolete
- Unit 8 & 9 have obsolete (relay logic) unit control systems
- Unit 9 & 10 have obsolete (PLC) unit control systems
- Unit 8, 9, 10, 11 enclosure fans require upgrade
- Unit 8, 9, 10, 11 fuel gas systems are obsolete
- Unit 8, 9, 10, 11 exhaust stacks are severely cracked and corroded

The objective of this project is to select the most practical solution(s) to address the above issues whilst ensuring future predicted capacity demand can be met.

The following options have been considered:

Option 1: Do Nothing

Option 2: Total Replacement

Option 3: Station upgrade to ensure life past 2031.

Option 4: Develop end of life plan to decommission 8,9 & 10, reschedule remaining upgrades in CY28-32. (Preferred option)

5.4.3. BC205 Compressor Station Vent Upgrade ($1.975m)

The aim of this business case is to address issues with several compressor station vents. The existing station vents at five compressor stations are not acceptable if ignition occurs with personnel, or the public within the heat flux zone. Each station needs to be assessed and vent modifications installed. The objective of this business case is the risk reduction to ALARP.

The following options have been considered:

Option 1: Do Nothing Option

Option 2: Upgrade to Vent Stacks at Compressor Stations (recommended option)

5.4.4. BC211 Iona CS Aftercooler Upgrade ($0)

Note: This business case has been rejected by AER due to AEMO feedback which recommended the new operating pressures at IONA reduced the need for cooler upgrade. Draft submission funding request was for $3.2m. APA accepted the decision and has deferred this scope into the next AA period.

The Iona Compressor Station has a power output constraint due to insufficient cooling of process gas during the summer months. This project is for the installation of a larger, more capable gas aftercooler to ensure the full capacity of the station can be realised.

The following options have been considered:

Option 1: Do Nothing Option

Option 2: Augmentation of existing cooling

Option 3: Replacement of existing cooler with larger model (recommended option)

5.4.5. BC212 Battery Charger Upgrades ($1m)

Note: This business case has been rejected by AER unless APA provide more detail of the age of the equipment being replaced. APA is resubmitting after updating the business case with the requested information.

Battery chargers and batteries are used as an UPS (uninterruptable power supply) that protects sensitive electronic control and monitoring electronic equipment from grid voltage fluctuations and also provides safe and reliable performance during grid power outages. Periodically the batteries and chargers require replacement to ensure the ongoing protection of the electronic equipment and safe reliable operation and monitoring of the site.

Battery Charger replacement for backup power control for the following stations:

- Springhurst CS
- Euroa CS
- Winchelsea CS
- Wandong PRS
- Newport

The following options have been considered:

Option 1: Do Nothing Option

Option 2: No alternative identified

Option 3: Replace battery charging systems (recommended option)

Key Benefits:

- Assist to maintain reliability of supply for customers and consumers during grid power outages.
- Reduce the likelihood of site comms failures as if these components fail the control and monitoring functionality is lost until the failed components can be replaced (regardless of grid power availability).

5.4.6. BC216 Wollert CG & T74/T119 PRS Instrument Air ($0)

Note: This business case has been rejected by AER due to emission reduction not being adequate justification for the expenditure with the prudent expenditure criteria in place for VTS AA. Draft submission funding request was for $1.596m, APA accepts the decision and has deferred this project into the next AA period.

The Wollert City Gate & T74/T119 PRS uses Instrument Gas which vents to atmosphere causing a safety hazard and unnecessary greenhouse gas emissions. The project is to convert the Wollert CG & T74/T119 PRS to instrument Air.

The following options have been considered:

Option 1: Do Nothing Option

Option 2: Convert the Wollert City Gate and T74/T119 PRS to Instrument Air (recommended option)

5.4.7. BC220 T33 LV03 Pit ($0.331)

It is standard APA practice to have all bypass valves installed above ground, however both bypass valves for LV03 on T33 pipeline are currently buried and cannot be accessed for maintenance and/or inspection (per T33-22 and T33-08-05).

A small pit currently exists around LV03 for limited access. A new larger pit will be constructed to current standards to allow safe and unrestricted access for LV03 and both bypass valves, which will reduce workplace hazards related to confined space entry and exit.

These bypass valves permit effective isolation of T33 pipeline as well as protecting LV03 from being re-opened from a high-pressure differential event. Without the bypass valves being in a functional and accessible state, the capacity to protect LV03 and isolate T33 pipeline is compromised.

Option 1: Do nothing

Option 2: Replace 3 valve pits with one large valve pit (recommended option)

5.4.8. BC224 Dandenong City Gate Gas Quality ($0)

Note: This business case has been rejected by AER due to AEMO feedback that DCG temperature is adequate as is and therefore a waterbath heater is not currently required. Draft submission funding

request was for $1.379m, APA accepts the decision and has deferred this project into the next AA period.

Problem: Inadequate gas temperature requirements of NGR rule 288 injecting into the T16 pipeline due to no gas heating equipment installed at the Dandenong City Gate.

Affects: Inability for AEMO to ensure the quality of the gas entering the T16 pipeline complies with the gas quality Standards as set out in the AEMO procedures, enforced by law.

Impact: gas that does not meet the AEMO gas quality standards requires notifications and potentially curtailment, it may be damaging to the T16 pipeline and/or pose a public risk if for example condensate reaches consumer assets.

Successful solution will: Install suitable gas heating in line with the requirements of the NGR, rule 288.

The following options have been considered:

Option 1: Do Nothing Option

Option 2: Install a gas heater compliant with the requirements of NGR rule 288 (recommended option)

5.4.9. BC225 Control Valve Positioner Replacement ($0.508m)

Ageing electro/pneumatic equipment with increasing likelihood of failure. The positioners are used to control the positioning of flow control valves, failure of the device will impact gas flow which can lead to a failure to supply. The impact varies per site with some sites having redundancies to reduce the impact of individual failures although those redundancies will involve equipment of the same vintage

Successful solution will maintain the life and maintainability of the equipment and reduce likelihood of failures resulting in loss of supply or ability to efficiently manage system line pack.

The following options have been considered:

Option 1: Do Nothing Option

Option 2: Replace all the older DVC5000 series positioners as a single project.

Option 3: Staged replacement of positioners over 5-year period. (Recommended option)

5.4.10. BC227 SMS Aerial Photography ($0.2m)

The Australian Standard for transmission pipelines AS2885.1 (sec 2) requires that a Safety Management Study (SMS) is to be conducted as a minimum every five years to identify location specific and non-location risks along the entire length of the pipeline. The identification of land use changes and population density is a fundamental input to the SMS and is best performed by aerial photography with feature identification.

The following options have been considered:

Option 1: Do nothing. Use existing outdated photography (5 years old)

Option 2: Compile new Aerial photography (recommended option)

5.4.11. BC230 Encroachment High Consequence ($2.2m)

The project is to ensure the safety of the public and the pipeline by reducing the risks associated with third party interference causing damage to high pressure pipelines. Some of the VTS pipelines need physical or operating changes to ensure risk levels are acceptable due to urban encroachment. These pipelines involve those with the high consequence surroundings associated with fully developed urban areas, proposed urban development areas and areas with specific sensitivity.

The following options have been considered:

Option 1: Do Nothing Option

Option 2: Protective slabbing

Option 3: Lower the pressure of the pipeline to reduce the consequences and modes of failure

Option 4: Combination of option 2 & 3 (recommended option)

Option 5: Replace the pipeline

5.4.12. BC235 Turbine Overhaul and Minor Upgrades ($5m)

Turbine Overhaul of:

The T4002 gas turbine engines in Gooding Unit 3 and Unit 2 are expected to reach overhaul runtime during the period 2023-2027.

The T6102 gas turbine engine at Springhurst may reach overhaul runtime during the end of the 2023-2027 period if flows south increase.

It is expected that the WORM project completion will result in lower utilisation of the Brooklyn CS Unit 11 and 12 (Centaur T4002) engines meaning they will not require overhaul in this time period. If utilisation continues at current levels the engine will reach run time towards the end of the 2023-2027 period.

The overhaul of the engine is a relatively simple process and will permit another 30,000 hours of engine life.

During the event of an overhaul often small upgrades to incorporate service bulletins to improve reliability or address a safety concern.

The following options have been considered:

Option 1: Do Nothing

Option 2: Complete Overhaul at Recommended Life

Option 3: Overhaul Based on Inspection (recommended option)

5.4.13. BC239 Emergency Response Equipment ($6.1m)

Note: AER reduced funding as they wanted further justification on APA decision to not getting uncertified inventory tested and certified. APA requested $7.62m in the draft submission but is accepting the reduction, has deferred the reduction into the next AA period and will investigate opportunities for re-certifying our inventory.

The VTS is required to maintain emergency response and recovery equipment and material in order to deliver timely management and recovery from pipeline events. The inability to efficiently and effectively respond and repair pipeline damages could result in prolonged loss of supply to customers and greater risks of Health & Safety and Environmental impacts from emergency scenarios to workforce and neighbouring communities.

The following options have been considered:

Option 1: Do Nothing Option

Option 2: Third Party Emergency Response (Hot Tap Equipment only)

Option 3: Purchase Emergency Pipe and Equipment (recommended option)

5.4.14. BC242 BCS Unregulated Bypass Upgrade ($0)

Note: AER rejected all BCS business cases due to AEMO feedback of reduced BCS criticality post WORM. APA accepts that the requested $0.342m in draft submission has been rejected and has deferred this project into the next AA period.

The BCS Station bypass is currently setup to be manually regulated by throttling across either of the 2 x plug valves (6237 and 6234 drawing reference – 1200-PA-005). This has the potential of over-pressuring the 2800Kpa pipeline from the T56 or T24 which operates at a Maximum Allowable Operating Pressure (MAOP) 7,400 kPa pipelines. It is not standard APA practice to manually throttle valves over such a large pressure differential due to the reliance on the technician skill in such an approach significantly increases the risk of error and over pressurisation. Over-pressurisation can lead to pipe rupture. This procedural means is not an acceptable method for pressure regulation.

The aim of this project is to totally remove any possibility of a safety breach associated with manual regulation of the BCS station bypass pipeline. To achieve this aim, the station bypass pipeline upstream of Valve 6234 will be disconnected and blinded.

The AER has approved similar works on other assets in the Access Arrangement.

The following options have been considered:

Option 1: Do Nothing

Option 2: Cut and shut station bypass (recommended option)

5.4.15. BC243 Security Physical (now part of SOCI Program Scope)

5.4.16. BC244 CP Replacement ($1.162m)

The cathodic protection system comprises of many components. Over time these components fail, deplete or require augmentation. This business case is the supporting evidence for the capex investment required to maintain the integrity of the 2,200km of buried transmission pipeline.

The following options have been considered:

Option 1: Do Nothing Option

Option 2: No alternative identified

Option 3: Replace and upgrade the cathodic protection system (recommended option)

5.4.17. BC249 Hazardous Area Rectification ($0.89)

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

To meet the requirement of AS/NZS 60079, a Hazardous Area Verification Dossier HAVD is a fundamental requirement which details the compliance and safety of the electrical equipment installed within hazardous area at all APA sites. The majority the APA VTS sites now have an HAVD that complies with the preliminary requirements of AS/NZS 60079.

Audit and inspections of APA VTS sites has been completed and equipment not installed/conforming to the Australian Standards, and therefore requiring rectification, have been identified. Rectification of these non-conformances will reduce the identified risks to APA personnel and the business as it is a statutory requirement that the sites should be compliant to the mentioned standard.

The following options have been considered:

Option 1: Do Nothing Option

Option 2: Complete the identified rectification of electrical equipment not conforming to the requirements of the Australian Standards. (recommended option)

5.4.18. BC258 Pipeline Integrity ($27.642m)

The aim of the Integrity Management Program is to ensure that Victorian Transmission System buried gas pipelines remain fit for safe and reliable service. The integrity management program for buried transmission pipelines includes:

- Inline inspections
- Direct assessments
- Verification and remediation excavations.

Execution of the integrity management program allows APA to:

- Periodically review the condition of each pipeline
- Use the inspection data to recalibrate remaining life modelling
- Apply efficient targeted remedial action campaigns.

The following options have been considered:

Option 1: Do Nothing Option

Option 2: Integrity Management Program (recommended option)

5.4.19. BC259 VTS Unpiggables ($26.799m)

The aim of the unpiggables program is to convert unpiggable pipelines on the Victorian Transmission System to be suitable for pigging (inline inspection by intelligent pig).

The objective is to improve certainty for calculating remaining life for unpiggable pipelines that do not meet APA acceptable risk tolerance.

Pipeline remaining life is initially calculated using conservative corrosion rate modelling. However, when numerical remaining life thresholds are reached, periodic physical inspection and assessment is required to meet APA integrity policy and ensure continued safe reliable operation.

Inline inspection (pigging) is considered the most efficient method to identify pipeline defects and enable a targeted repair campaign. However (older) pipelines were sometimes constructed without launchers or receivers (i.e. unable to be pigged).

Several of these pipelines have either reached or exceeded a typical inline-inspection interval (typically 10-15 years). Inspection is now required to ensure asset integrity is adequate for continued safe operation.

The objective of this project is to conform with APA pipeline integrity policy and ensure safe reliable operation of the Victorian Transmission System unpiggable pipelines using one of the following actions:

- Modify unpiggable pipelines that do not meet APA acceptable risk tolerances to enable inline inspection
- Pressure reduce or decommission pipelines that are no longer viable to leave in service.

The following options have been considered:

Option 1: Do nothing – ALARP assessment required (continued direct assessment of unpiggable pipelines)

Option 2: Address remaining life uncertainty using APA unpiggable strategy. (recommended option)

5.4.20. BC260 Liquids Management ($0.3m)

Note: AER rejected all BCS business cases due to AEMO feedback of reduced BCS criticality post WORM. APA accepts that the requested $0.6m in draft submission has been partially rejected and has deferred the BCS scope into the next AA period.

The aim of this business case is to ensure liquids removed from pipeline systems in accordance with Gas Safety Regulations.

The objective of this business case is to upgrade existing liquids management systems to the APA standard design. Scope for the 2023-2027 period is as follows;

- Brooklyn liquids management system upgrade
- Wollert liquid level indicator upgrade

The implemented solution will be as per completed upgrades to date and consist of a low risk, low cost asset without the need of pressure vessels and other high maintenance equipment.

The following options have been considered:

Option 1: Do Nothing Option

Option 2: Upgrade of existing liquids management systems (recommended option)

5.4.21. BC263 Pipe Support Replacement ($0.85m)

Replacement of inferior pipe supports with modern design to prevent corrosion at locations:

- Dandenong City Gate (100% complete)
- Various compressor and city gate stations (Brooklyn complete)
- Pig traps (75% complete)

The following options have been considered:

Option 1: Do Nothing Option

Option 2: Replace Pipe Supports (recommended option)

5.4.22. BC264 HMI ClearSCADA Upgrade ($0.72m)

Human Machine Interface (HMI) software on existing sites is not compatible with APA standard, the software is installed in standard computers and due for replacement. Maintenance technicians and engineers, used for diagnostics and plant re-instatement after shutdown. Failure of HMI computer results in inability to fault find or re-instate the plant after shutdown, resulting on extended duration of the outage. The successful solution will provide standardised HMI equipment and increased reliability of the HMI.

The following options have been considered:

Option 1: Do Nothing Option

Option 2: Upgrade to Local HMI's to Clear SCADA by schedule (recommended option)

5.4.23. BC267 BCS Unit 12 Inlet Filter Upgrade ($0)

Note: AER rejected all BCS business cases due to AEMO feedback of reduced BCS criticality post WORM. APA accepts that the requested $0.6m in draft submission has been rejected and has deferred into the next AA period.

The Brooklyn Compressor Station Unit 12 (BCS12) has a single process gas inlet filter. This filter was procured from another APA VTS compressor station (Bulla Park) to reduce cost of BCS12 installation in 2007.

The filter has consumable elements that require cleaning/replacement when they become fouled. In order to perform this maintenance activity, the vessel must be isolated from gas, depressurised, purged of hydrocarbons and then the confined space must be entered by a technician.

There are 5 main problems with the existing BCS 12 inlet filter:

Availability of BC12 is lost whenever this filter requires cleaning as there is only one filter for the unit

Maintainability of the filter is restricted by the performance of the isolation valves, should they pass gas the confined space atmosphere fit for human occupation cannot be maintained and thus the maintenance cannot be performed.

Maintainability of the filter. The filter housing is difficult to clean due to the associated safety concerns. The means of confined space rescue is severely inhibited by design of entry and elevated platform.

Performance of the filter is limited to 10µm whereas the standard APA design for inlet filters for process gas for Solar Turbine packages are 3µm and 99% efficiency for all solid and liquid particles greater than 1µm. This is the specification set by Solar Turbines International.

Reliability of the compressor seal is influenced by the cleanliness of the process gas. A 10µm filter on the inlet side will result in larger particles being compressed with the process gas. 'Dirty gas' has contributed to dry seal failures for gas compressors nationally. The result is an immediate shutdown with a loss of plant up to least six weeks.

The following options have been considered:

Option 1: Do Nothing Option

Option 2: Replacement of the BCS12 Filter (recommended option)

5.4.24. BC271 Type B Compliance ($1.96m)

APA has received instruction from the Safety Case regulator (ESV) that gas fired appliances are required to comply with AS3814 (See Appendix for email from ESV).

APA operates about 34 Type B appliances (compressors, heaters and generators) constructed from 1977 onwards and have identified the following issues;

Most Type B Appliances over 7 years old would not currently comply with AS3814

Compliance with AS3814 can impact safety and integrity of gas fired appliances

If a noncompliant Type B appliance component fails, an (unplanned) full upgrade of the affected appliance to Type B compliance is required.

Successful solution will: Upgrade the appliances to comply with AS3814 and ESV requirements

The following options have been considered:

Option 1: Do Nothing Option

Option 2: Replace all old Heaters, Gas Generators and Compressors with new, compliant equipment

Option 3: Complete the AS3814 audits on the affected appliances and rectify non-compliances. (recommended option)

5.4.25. BC275 VTS Mainline Isolation Valve Upgrade ($2.6m)

Note: AER reduced funding as they wanted further justification on APA decision to not overhauling in service mainline valves. APA requested $3.6m in the draft submission but is accepting the reduction and deferred the reduction into the next AA period. APA will assess cost versus benefit and associated risks of replacing valves compared with overhauls further in the design phase and provide the findings in the next AA submission.

The aim of this project ensure that Victorian Transmission System pipeline mainline isolation valves are able to operate safely and reliably when required. The objective of this project is to target with remedial actions all mainline isolation valves in a high consequence areas with any of the following issues:

- The mainline valve has internal leaks or internal friction which prevent the valve from isolating gas flow as per AS2885 requirements.
- The mainline valve has external leaks
- The mainline valve is located in residential property

The following options have been considered:

Option 1: Do Nothing Option

Option 2: Overhaul the existing isolation valve

Option 3a: Replace the existing isolation valve (recommended option)

Option 3b: Install new mainline valve in a safer location and decommission existing isolation valve (recommended option)

5.4.26. BC307 Reliability Centred Maintenance ($0)

Note: AER rejected the $2.25m requested by APA as they were not convinced that the investment would realise maintenance/operational savings. APA has accepted this decision and has removed the RCM scope from VTS AA SIB.

Existing maintenance tasks have never been rationalised in accordance with equipment criticality or reliability. They are mostly defined from rudimentary OEM manuals or replicated from seemingly similar assets without consideration of asset criticality or application. Detail is discretionary depending on the project team and handover quality. Subsequently many tasks are not fit for purpose. Currently we have tasks that are either not required or simply do not proactively prevent trips / downtime and or increase MTBF. We are not currently utilising our operations and maintenance resources in the most efficient manner nor are they aligned to safety, reputational and commercial goals.

Applying RCM principles to maintenance strategy development will allow us to generate fit for purpose strategies that align with asset/business criticality. Doing the right tasks at the right time, on the right equipment will increase reliability reducing preventable reactive maintenance, as well as improving availability.

The following options have been considered:

Option 1: Do Nothing Option

Option 2: Complete RCM strategy development on VTS transmission assets (recommended option)

5.4.27. BC309 Arc Flash Risk Mitigation ($1.25m)

Interim results of an Arc Flash Study highlighted an existing risk at a high portion of reviewed APA sites in line with the 2018 standard. This is when an arc fault develops while personnel are operating or working on high energy electrical equipment. This has been risk assessed as High risk (approved July 2021). To reduce risk to within the APA risk appetite short medium and long term work items have been identified.

The following options have been considered:

Option 1: Do Nothing Option

Option 2: Complete Arc Flash studies and implement recommendations (recommended option)

5.4.28. BC314 Critical Spares ($2.1m)

APA endeavours to maintain adequate critical spares inventory to enable prompt recovery from critical compressor station equipment failures and avoid prolonged Victorian Gas Transmission System

capacity impacts. However, due to recent reductions in critical spare availability (i.e. increased procurement lead-times), the availability of critical spares has dramatically reduced.

The aim of this business case is to ensure to the extent practicable that Victorian Transmission System compressor stations remain able to recover in a timely manner after critical equipment failures.

The objective of this business case is address long lead critical sparing vulnerabilities to reduce the consequence of compressor station equipment failures.

The following options have been considered:

Option 1: Do Nothing Option

Option 2: Engage Third Parties (OEMs/Suppliers) to hold spares for the VTS

Option 3: Increase In-House Inventory of Critical Spares (recommended option)

5.4.29. BC317 Station Control Logic Review and Rectification ($2.028m)

Throughout their years in service the older compressor stations on the Victorian Transmission System have received numerous functionality and capacity upgrades, generally equipment or function changes also require station control system logic review and amendment. Historically the functional safety review of the control logic was focused on the impact of the changes, however a more thorough (holistic) logic review has recently been mandated by the APA process optimisation team to ensure the functional logic is failsafe and compliant. In addition, the existing control system hardware is obsolete and requires replacement to address control system hardware failure risks.

The aim of this project is to ensure that Victorian Transmission System compressor station control systems are failsafe and compliant. The objective of this project to replace the station control system hardware and also conduct HAZOP and LOPA assessments to ensure the installed logic is complaint and failsafe at the following locations;

CY18-CY22	CY23-CY27
Brooklyn CS	Gooding CS
Wollert CS	

The following options have been considered:

Option 1: Do Nothing Option

Option 2: Replace station control system with modern equivalent and perform holistic logic review (recommended option)

5.4.30. BC328 VTS Waterbath Integrity ($2m)

Note: AER rejected the $2m APA requested in the draft decision as they felt the expenditure was covered in OPEX, however APA finance have provided explanation around the capitalisation of this scope and APA will be requesting the same amount in the final submission.

The aim of this project is to ensure compliance with APA integrity policy and maintain the waterbath heater equipment to a safe and dependable standard.

Waterbath heaters require periodic internal inspection to meet Type B requirements and ensure safe reliable operation.

The objective of this project is to schedule waterbath heater internal inspections that verify condition and identify risks and manage accordingly, which in turn improves certainty of remaining life and related supply confidence.

Note: Previously these inspections were treated as operational expenditure but recent reviews identified that they should be capitalised.

The following options have been considered:

Option 1: Do nothing – ALARP assessment required

Option 2: Assess waterbath heaters to fixed schedule

Option 3: Assess waterbath heaters to RBI schedule (recommended option)

5.4.31. BC329 VTS Facility Pipework Integrity ($9.29m)

Facility pipework remaining life is confirmed with periodic physical assessment to meet APA integrity policy and ensure continued safe reliable operation. The integrity of unpiggable buried piping and above ground insulted piping cannot be easily determined. For such buried and insulated facility pipework where no simple assessment methods exist, excavation (digs) and insulation removal, combined with visual inspection and non-destructive testing (NDT) are generally considered the most efficient method to identify facility pipework faults and enable a targeted repair campaign.

The aim of this project is to ensure compliance with APA integrity policy and maintain the facility pipework to a safe and dependable standard.

The objective of this project is to schedule physical condition verification assessments which will identify risks and allow the actual condition to be known and managed accordingly. This will in turn improve certainty of remaining life and related supply confidence.

The following options have been considered:

Option 1: Do nothing – ALARP assessment required

Option 2: Assess facility pipework to fixed schedule

Option 3: Assess facility pipework to RBI schedule (recommended option)

5.4.32. BC330 Low Value Preventative & Reactive Maintenance ($2.5m)

A recent review of Victorian transmission system operational expenditure identified maintenance activities and urgent procurement items that should be capitalised. These tasks are mission critical to reduce risk of non-compliance, equipment failure or enable transmission operations field personnel to respond quickly, safely and efficiently to ensure VTS assets remain safe and reliable. The aim of this business case is to move to capitalise this expenditure.

Successful solution will:

Ensure the ongoing timely and efficient execution of low value maintenance and upgrades by allocating funds to the following;

Reactive upgrades (urgent replacement of obsolete components)

Procurement of tools and equipment for transmission operations field staff

Minor facility upgrades (e.g. renovation or asbestos removal managed by operations)

The following options have been considered:

Option 1: Do Nothing Option

Option 2: Allocate funding for preventative maintenance & reactive upgrades/tooling (recommended option)

6. Appendix

Appendix A 2020/21 VTS Annual Pipeline Report for the Victorian Transmission System

This document is submitted to Energy Safe Victoria annually, it provides a good overview of VTS assets, the risks identified and how APA is addressing them.