Australian Gas Networks

Attachment 9.12

Telemetry Business Cases

Final Plan 2023/24 – 2027/28

July 2022

Contents

1. Capex V.06.OP – SCADA End of Life Replacement

1.1 Project approvals

Table 1-1: Project approvals

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1.2 Project overview

Table 1-2: Project overview

Description of the problem / opportunity	AGN uses a supervisory control and data acquisition (SCADA) system to monitor and report on the gas flow, pressure, and temperature of gas in real time. We currently have SCADA at 154 critical sites in the Victoria and Albury network. This includes city gate stations, regulating stations and fringe of grid sites. 36 of these sites also allow remote control of pressure. The effective operation of our SCADA system is necessary to ensure we have visibility of the network. In turn this improves our ability to manage our assets in a safe and reliable way and address any issues on the network as they arise. The information provided through our SCADA system is also used in planning future investments to allow us to prudently invest in our network and is crucial to our mandatory compliance and operational reporting activities. A functioning SCADA system is vital to AGN meeting its obligations in the Victorian Gas Distribution System Code, which requires us to use all reasonable endeavors to ensure minimum prescribed pressures are maintained at gas delivery points.[1] SCADA is also critical to providing safe and reliable network service to our customers in accordance with AS 4645 and AS 2885. SCADA equipment typically has a technical life of around 10 years. We are required to maintain our SCADA equipment in line with AS 60079, which sets the industry standards for the maintenance of electrical equipment in explosive atmospheres. Within the next five years, remote terminal units (RTUs) at 39 sites will need to be replaced. In addition, 42 sites require cabinet replacement, and 23 sites require transmitter replacement. This equipment will be at or beyond the original equipment manufacturers' (OEM) technical design life. The age of SCADA equipment is a good indicator of its condition. The older the asset, the more likely it is to fail. Where an asset is beyond the technical design life, there is also limited support and replacement parts for equipment. Having end-of-life and unsupported SCADA increases the likelihood of the SCADA system failing and a pressure incident affecting the safety and reliability of services to customers. We have conducted a desktop review and found that 19 sites also have old electrical equipment (such as junction boxes and wiring) that do not meet the Hazardous Areas requirements under AS 3000:2018. We have an ongoing proactive replacement program for SCADA, under which we will address these end-of-life and non-compliance issues. This business case considers the merits of continuing this proactive program or moving to reactive replacement only.
Untreated risk	As per risk matrix = **High**

[1] Gas Distribution System Code, Ver 14.0, p 52

Options considered

Option 1 – Move to a reactive repair and replace on failure approach for SCADA equipment (zero capex upfront)

Option 2 – Continue the proactive replacement program for SCADA equipment ($2.4 million)

Proposed solution

Option 2 is the recommended option. This will:

- minimise the risk of the SCADA system failing, leading to a pressure related event, and the associated safety and operational impacts;
- maintain visibility of key network assets to allow timely diagnosis and rectification of network and asset performance issues before problems arise;
- maintain pressure control of existing controlled SCADA sites to prevent pressure incidents to maintain the safety and reliability of services to customers;
- provide visibility of our critical network assets, allowing us to maintain the risk of those assets failing at 'as low as reasonably practicable' (ALARP)
- replace end of life assets with the contemporary equivalent which in most cases has significantly improved functionality;
- improve our compliance with safety and reliability standards (AS 4645, 2885 and 60079, GDS code etc.), good industry practice, and our Asset Management Strategy; and
- provide critical information about our network assets to allow prudent and efficient investment in our network over the long term.

Estimated cost

The forecast direct cost (excluding overhead) during the next AA period (July 2023 to June 2028) is $2.4 million.

$'000 real 2021	2023/24	2024/25	2025/26	2026/27	2027/28	Total
SCADA replacement	654	460	440	444	397	**2,394**

Basis of costs

All costs in this business case are expressed in real unescalated dollars in June 2021 unless otherwise stated.

Tables may not sum due to rounding.

Alignment to our vision

Replacing end of life and non-compliant SCADA equipment proactively aligns with the following aspects of our vision:

- *Delivering for Customers* as replacement of end of life and non-compliant SCADA equipment will ensure the continued reliability of supply and mitigate the risk of pressure related events, and ensure safety of public.
- *Sustainably Cost Efficient* as the cost of replacing end of life and non-compliant SCADA as part of a proactive planned program is the lowest sustainable cost of managing the risk of a significant failure of the SCADA system as it is lower cost than a reactive replace on failure program.

Consistency with the National Gas Objective and Rules (NGO and NGR)

NGR 79(1) – the proposed solution is consistent with good industry practice, several practicable options have been considered, and market rates have been tested to achieve the lowest sustainable cost of providing this service.

NGR 79(2) – the proposed capex is justifiable under NGR 79(2)(c)(i), (ii) and (iii), as it is necessary to maintain and improve the safety of services, maintain the integrity of services, and comply with regulatory obligations.

NGR 74 – the forecast costs are based on the latest market rate testing and project options consider the asset management requirements as per the Asset Management Strategy. The

	estimate has therefore been arrived at on a reasonable basis and represents the best estimate possible in the circumstances.
Treated risk	As per risk matrix = **Low**
Stakeholder engagement	Our customers have told us their top three priorities are price/affordability, reliability of supply, and maintaining public safety. They also told us they expect us to deliver a high level of public safety and are satisfied that this is the current practice. This proposed SCADA end of life replacement program is designed to ensure the network operates in line with good industry practice, safety standards and compliance requirements, thereby helping to maintain a safe and reliable service to our customers. The proposed solution to replace these assets at the end of their technical lives will also help to maintain the reliability of gas supply at the lowest sustainable cost.
Other relevant documents	• Asset Management Strategy – AGN Victoria and Albury (400-PL-AM-0003, Rev1)

1.3 Background

We use the SCADA system to monitor and report the gas flow, temperature and critical pressures at 154 sites across the Victoria and Albury network in real time. SCADA also allows us to control pressure at some sites.

The effective operation of our SCADA system is required to ensure we have real time visibility of the network, thereby:

- minimising the risk of the SCADA system failing and leading to a pressure related event, and the associated safety and operational impacts;
- increasing the timeliness of the diagnosis and rectification of a failing or failed critical network assets, thereby minimising the safety and operational impacts;
- allowing us to maintain the risk of those assets failing at 'as low as reasonably practicable' (ALARP);
- allowing us to comply with our reporting obligations;
- improving our ability to comply with safety and reliability standards (AS 4645, 2885 and 60079, Gas Distribution System Code2 etc);
- providing critical information about our network assets to allow prudent and efficient investment in our network over the long term;
- helping ensure accurate billing information for our customers; and
- assisting in minimising unaccounted for gas (UAFG) losses.

SCADA equipment typically has a technical life of around 10 years. We are required to maintain our SCADA equipment in line with AS 60079, which sets the industry standards for the maintenance for electrical equipment in explosive atmospheres.

[2] A functioning SCADA system is vital to AGN meeting its obligations in the Victorian Gas Distribution System Code, which requires us to use all reasonable endeavors to ensure minimum prescribed pressures are maintained at gas delivery points.

We have an ongoing SCADA end of life replacement program, whereby we will typically replace any assets that are at the end of their technical lives and/or are in poor condition. As part of this program, we also address any non-compliance issues where prudent and efficient to do so.

RTUs are an integral component of the SCADA system. They are used to collect and code data into a format that is transmittable and transmit the data back to a central station. During the next access arrangement (AA) period (2023/24 to 2027/28), RTUs at 39 critical sites will be replaced as they are beyond the end of their technical design life. As part of the end of life replacement program, we will also replace cabinets at 42 sites and transmitters at 19 sites. The age of SCADA equipment is a good indicator of its condition. The older the asset, the more likely it is to fail. Where an asset is beyond the technical design life, there is also limited support for, and replacement parts for equipment.

Having end of life and unsupported SCADA, increases the likelihood of the SCADA system failing and a pressure incident affecting the safety and reliability of services to customers. We have conducted a desktop review and found that 19 of the 154 sites also have old electrical equipment (such as junction boxes and wiring) that do not meet the hazardous areas requirements under AS 3000:2018.

We therefore propose to replace the end-of-life equipment and address the hazardous area compliance requirements as part of the ongoing program for the next AA period (2023 to 2028).

1.4 Risk assessment

Risk management is a constant cycle of identification, analysis, treatment, monitoring, reporting and then back to identification (as illustrated in Figure 1-1). When considering risk and determining the appropriate mitigation activities, we seek to balance the risk outcome with our delivery capabilities and cost implications. Consistent with stakeholder expectations, safety and reliability of supply are our highest priorities.

Figure 1-1: Risk management principles

Our risk assessment approach focuses on understanding the potential severity of failure events associated with each asset and the likelihood that the event will occur. Based on these two key inputs, the risk assessment and derived risk rating then guides the actions required to reduce or manage the risk to an acceptable level.

Our risk management framework is based on:

- AS/NZS ISO 31000 Risk Management – Principles and Guidelines;
- AS 2885 Pipelines-Gas and Liquid Petroleum; and
- AS/NZS 4645 Gas Distribution Network Management.

The Gas Act 1997 and Gas Regulations 2012, through their incorporation of AS/NZS 4645 and the Work Health and Safety Act 2012, place a regulatory obligation and requirement on us to reduce risks rated high or extreme to low or negligible as soon as possible (immediately if extreme). If it is not possible to reduce the risk to low or negligible, then we must reduce the risk to as low as reasonably practicable (ALARP).

When assessing risk for the purpose of investment decisions, rather than analysing all conceivable risks associated with an asset, we look at a credible, primary risk event to test the level of

investment required. Where that credible risk event has an overall risk rating of moderate or higher, we will undertake investment to reduce the risk.

Seven consequence categories are considered for each type of risk:

1. **Health & safety** – injuries or illness of a temporary or permanent nature, or death, to employees and contractors or members of the public
2. **Environment** (including heritage) – impact on the surroundings in which the asset operates, including natural, built, and Aboriginal cultural heritage, soil, water, vegetation, fauna, air, and their interrelationships
3. **Operational capability** – disruption in the daily operations and/or the provision of services/supply, impacting customers
4. **People** – impact on engagement, capability, or size of our workforce
5. **Compliance** – the impact from non-compliance with operating licences, legal, regulatory, contractual obligations, debt financing covenants or reporting / disclosure requirements
6. **Reputation & customer** – impact on stakeholders' opinion of AGN, including personnel, customers, investors, security holders, regulators, and the community
7. **Financial** – financial impact on AGN, measured on a cumulative basis

Note that risk is not the sole determinant of what investment is required. Many other factors such as growth, cost, efficiency, sustainability, and the future of the network are also considered when we develop engineering solutions. The risk management framework provides a valuable tool to manage our assets, and prioritise our works program, however it is not designed to provide a binary (yes/no) trigger for investment.

As prudent asset managers, we apply our experience and discretion to manage and invest in our distribution networks in the best interests of existing and potential customers.

A summary of our risk management framework, including definitions, has been provided in Attachment 9.5 of the Final Plan.

The primary risk event identified for end of life and non-compliant SCADA equipment is equipment failure, coinciding with a failure in the facility, which would go undetected as a result. The undiagnosed failure of a primary supply regulator facility or other strategic asset, or pressure excursion can interrupt supply to thousands of customers, or in severe cases, can lead to an overpressure incident that has the potential to cause serious injury. It could also lead to network system running in high pressures within the network and higher Unaccounted for Gas (UAFG).

The untreated risk[3] rating associated with end of life and non-compliant SCADA equipment is presented in Table 1-3.

Table 1-3: End of life and non-compliant SCADA equipment risk assessment – untreated risk

Untreated risk	Health & Safety	Environ-ment	Operations	People	Compliance	Rep & Customer	Finance	Risk
Likelihood	Occasional	Remote	Occasional	Unlikely	Occasional	Unlikely	Unlikely	Moderate
Consequence	Significant	Minor	Significant	Minor	Significant	Significant	Significant	
Risk Level	Moderate	Negligible	Moderate	Low	Moderate	Moderate	Moderate	

[3] Untreated risk is the risk level assuming there are no risk controls currently in place. Also known as the 'absolute risk'.

The overall risk is rated moderate, however the untreated risk is not considered to be ALARP, as replacing end of life assets is a practicable risk mitigation. Further, if end of life assets are not replaced and increasing volumes of assets are left in situ for a long time, the overall risk rating will only increase.

1.5 Options considered

We have considered the following options to address the risks associated with end of life and non-compliant SCADA equipment. These options are:

- **Option 1** – Reactively repair and replace on failure
- **Option 2** – Continue the proactive replacement program

These options are discussed in the following sections.

1.5.1 Option 1 – Reactively repair and replace on failure

Under this option, we will continue to monitor SCADA equipment on an annual basis as part of the current preventive maintenance program[4]. However, proactive replacement would not undertaken. Equipment would only be repaired or replaced when it fails.

With this option, the volume of SCADA equipment replacements undertaken in the next five years would be directly driven by the number of breakages/outages experienced on these assets. While it is not possible to predict with accuracy the number of failures that will occur over the next five years, given many assets are approaching their 10-year-end of life replacement cycles, the likelihood of failure is expected to be higher than during the current AA period if not treated proactively.

Given the cost of reactive replacement is significantly more expensive than proactive replacement, the potential cost of works during the next five years is significantly greater than the proposed proactive works program if widespread asset failure arises.

Should asset failure be lower than expected, the overall cost of reactive SCADA equipment replacements may be less than forecast. However, the residual risk associated with these assets will not be addressed, as several aged and/or obsolete SCADA assets will remain in the network. AGN's Asset Management Strategy and risk management framework requires AGN to address all risks rated as high, and reduce them to low or ALARP. A reactive approach would not achieve this.

These potentially higher costs and unaddressed residual risk are not tolerable for AGN or our customers. An entirely reactive 'replace on failure' approach to managing SCADA equipment is not consistent with good asset management practice, and therefore not consistent with NGR 79(1)(a).

1.5.1.1 Cost assessment

With this option, the unit costs incurred would certainly be higher. Corrective activities are likely to incur higher costs compared to planned activities due to:

- additional travel costs (planned activities allow us to share travel costs across different activities at the same location);
- increased likelihood of overtime and shift penalties (planned activities allow us to optimise staff rostering);

[4] The maintenance program includes inspecting, testing, calibrating, cleaning and verifying functionality and calculations for all equipment. Maintenance is not part of this business case. It is part of the operating expenditure forecast.

- additional costs for expedited freight;
- additional costs for removing crews from other planned work to address a corrective maintenance requirement and then remobilising to complete the previous planned work; and
- potential additional cost due to damage to downstream equipment (which might be customers' equipment) resulting from over-pressuring upstream facilities.

We may also incur unplanned operating expenditure, as failures could lead to interruption to supply requiring additional customer liaison, and customer relights. Interruption to supply could also costs AGN and its customers in foregone revenues.

It is a generally accepted asset management principle that delivery of proposed works reactively is significantly more expensive than undertaking proactive program of work. In any event, costs associated with a predominantly 'replace on failure' works program would not *be such as would be incurred by a prudent service provider acting efficiently, in accordance with accepted good industry practice, to achieve the lowest sustainable cost of providing services.*[5]

1.5.1.2 Risk assessment

Moving to a replace on failure approach for SCADA equipment will sufficiently not mitigate the risk associated with end of life and non-compliant SCADA equipment. This is inconsistent with our risk management framework, which requires risk to be reduced to low or ALARP.

Table 1-4 shows the residual risk associated with technically obsolete SCADA equipment if Option 1 is pursued.

Table 1-4: Option 1 – Reactive replacement of end of life and non-compliant SCADA equipment risk assessment

Option 1	Health & Safety	Environ-ment	Operations	People	Compliance	Rep & Customer	Finance	Risk
Likelihood	Occasional	Remote	Occasional	Unlikely	Occasional	Unlikely	Unlikely	Moderate
Consequence	Significant	Minor	Significant	Minor	Significant	Significant	Significant	
Risk Level	Moderate	Negligible	Moderate	Low	Moderate	Moderate	Moderate	

Under this option, the primary risk event of SCADA equipment failure, coinciding with a failure in the facility, would go undetected (or would at least not be detected in a timely manner).

The overall risk would remain moderate, driven by the potential for health and safety and operational impacts that could result from the undiagnosed failure of a primary supply regulator facility or other strategic asset, or pressure excursion. It also would not address the current non-compliance of 19 of our SCADA sites with AS 60079.

In summary, Option 1 would do little to address the likelihood and the potential consequence of a significant SCADA system failure, which could in turn lead to:

- the undiagnosed failure of a primary supply regulator facility leading to a pressure related event, and the associated safety and operational impacts;
- untimely diagnosis and rectification of a failing or failed critical network asset, thereby exacerbating the safety and operational impacts;

[5] NGR 79(1)(a).

- non-compliance with OEM recommendations, our risk management framework and safety and reliability standards (AS 4645, 2885 and 60079, Gas Distribution System Code etc) by not reducing network risk to ALARP;
- imprudent and inefficient investment in our network over the long term; and
- excessive UAFG losses.

1.5.1.3 Alignment with vision objectives

Table 1-5 shows how Option 1 aligns with our vision objectives.

Table 1-5: Alignment with vision – Option 1

Vision objective	Alignment
Delivering for Customers – Public Safety	N
Delivering for Customers – Reliability	N
Delivering for Customers – Customer Service	N
A Good Employer – Health and Safety	N
A Good Employer – Employee Engagement	-
A Good Employer – Skills Development	-
Sustainably Cost Efficient – Working within Industry Benchmarks	N
Sustainably Cost Efficient – Delivering Profitable Growth	-
Sustainably Cost Efficient – Environmentally and Socially Responsible	N

Option 1 would not align with our objective of *Delivering for Customers* or *A Good Employer*, as it would not address the safety or reliability impacts that could result from the undiagnosed failure of a primary supply regulator facility or other strategic asset, or pressure excursion.

Option 1 would also not align with our objective of remaining *Sustainably Cost Efficient* as it is not the least cost option of addressing the risks associated with end of life and non-compliant SCADA equipment. It is also not consistent with industry standards as it is inconsistent with the OEMs' recommendations and does not conform to the requirements of the Victoria Gas Distribution System Code. It is therefore inconsistent with our objective of working within industry benchmarks.

1.5.2 Option 2 – Continue the proactive replacement program

Under this option, we would continue with the ongoing proactive replacement of our SCADA equipment and associated components that have reached the end of their technical design life (on average around ten years) to maintain SCADA monitoring and control of our network.

We will replace RTUs at 39 critical sites across the network as well as cabinets at 42 sites and transmitters at 23 sites across the network. We will also upgrade 19 SCADA sites that have old electrical equipment (such as junction boxes and wiring) that do not meet the hazardous area requirements under AS 3000:2018.

1.5.2.1 Cost assessment

The estimated direct capital cost of Option 2 is $2.4 million. This estimate is based on current material and labour rates for new installations.

Table 1-6: Cost estimate – Option 2, $'000, real 2021

Option 2	2023/24	2024/25	2025/26	2026/27	2027/28	Total
SCADA equipment end of life replacement	654	460	439	444	397	**2,394**

1.5.2.2 Risk assessment

Option 2 reduces the risk associated with end of life and non-compliant SCADA equipment from moderate to low.

Table 1-7: Option 2 – Proactive replacement of end of life and non-compliant SCADA equipment

Option 2	Health & Safety	Environ-ment	Operations	People	Compliance	Rep & Customer	Finance	Risk
Likelihood	Remote	Remote	Remote	Remote	Remote	Remote	Remote	Low
Consequence	Significant	Minor	Significant	Minor	Significant	Significant	Significant	
Risk Level	Low	Negligible	Low	Negligible	Low	Low	Low	

Proactively replacing end of life and non-compliant SCADA equipment in the network reduces the likelihood and the potential consequence of a significant SCADA system failure. This is consistent with the requirements of our risk management framework.

1.5.2.3 Alignment with vision objectives

Table 1-8 shows how Option 2 aligns with our vision objectives.

Table 1-8: Alignment with vision – Option 2

Vision objective	Alignment
Delivering for Customers – Public Safety	Y
Delivering for Customers – Reliability	Y
Delivering for Customers – Customer Service	Y
A Good Employer – Health and Safety	Y
A Good Employer – Employee Engagement	-
A Good Employer – Skills Development	-
Sustainably Cost Efficient – Working within Industry Benchmarks	Y
Sustainably Cost Efficient – Delivering Profitable Growth	-
Sustainably Cost Efficient – Environmentally and Socially Responsible	Y

Option 2 would align with the AGN objective of *Delivering for Customers*, as it would address the public safety and reliability risks associated with a significant failure of the SCADA system leading to an undiagnosed failure of a primary supply regulator facility with potential for network pressure event or the extended response to containment of emergency situations.

Option 2 would also align with the AGN objective of remaining *Sustainably Cost Efficient* as it is the least cost option of addressing the high risk associated with end of life and non-compliant SCADA equipment. It is also consistent with industry standards as conforms to the requirements of the Victoria Gas Distribution System Code. It is therefore consistent with AGN's objective of working within industry benchmarks.

1.6 Summary of costs and benefits

Table 1-9 presents a summary of how each option compares in terms of the estimated cost, the residual risk rating, and alignment with our vision objectives.

Table 1-9: Comparison of options

Option	Estimated cost ($ million)	Treated residual risk rating	Alignment with vision objectives
Option 1	Zero upfront capex	High	Does not align with *Delivering for Customers* and *Sustainably Cost Efficient*
Option 2	2.4	Low	Aligns with *Delivering for Customers* and *Sustainably Cost Efficient*

1.7 Recommended option

The proposed solution is Option 2. This option provides for necessary expenditure to proactively replace end of life and non-compliant SCADA equipment.

1.7.1 Why is the recommended option prudent?

Option 2 is the most prudent option because it:

- minimises the risk of the SCADA system failing, leading to a pressure related event, and the associated safety and operational impacts;
- increases the timeliness of the diagnosis and rectification of a failing or failed critical network asset, thereby minimising the safety and operational impacts;
- allows us to maintain the risk of those assets failing at 'as low as reasonably practicable' (ALARP);
- allows us to maintain site security for remote critical sites
- allows us to comply with our reporting obligations;
- improving our ability to comply with safety and reliability standards (AS 4645, 2885 and 60079, Gas Distribution System Code etc);
- providing critical information about our network assets to allow prudent and efficient investment in our network over the long term;
- assisting in minimising unaccounted for gas losses;
- is consistent with good industry practice, our Asset Management Strategy, and the risk management framework;
- it is consistent with AGN's vision and values; and
- the lowest cost option to reduce the risk to low or ALARP.

1.7.2 Estimating efficient costs

Key assumptions made in the cost estimation for the SCADA equipment replacement program include:

- costs are based on historical expenditure noting that these works are standard practice;
- OEM contractual rates for spares and labour that are part of our services agreements are utilised;
- other estimates are derived from contractual rates of vendors; and
- resource costs are based on other similar projects ongoing at present or in previous access arrangement periods.

The proposed program is scheduled to be carried out over a five-year period from 2023 at an average of five per year.

Table 1-10 presents a breakdown of the SCADA equipment replacement program by cost category.

Table 1-10: Cost estimate – Option 2, $'000 real 2021

Option 2	2023/24	2024/25	2025/26	2026/27	2027/28	Total
Labour	344	210	200	201	187	**1,142**
Materials	310	250	239	243	210	**1,252**
Total	**654**	**460**	**439**	**444**	**397**	**2,394**

1.7.3 Consistency with the National Gas Rules

In developing these forecasts, we have had regard to Rule 79 of the NGR. With regard to all projects, and as a prudent asset manager, we give careful consideration to whether capex is conforming from several perspectives before committing to capital investment.

NGR 79(1)

The continued proactive replacement of our SCADA equipment is consistent with the requirements of NGR 79(1)(a). Specifically, we consider that the capital expenditure is:

- **Prudent** – The expenditure is necessary to deliver gas safely and reliably to the downstream network and ensure accurate billing information for our customers. Proactive replacement of end of life and non-compliant SCADA equipment is therefore prudent and necessary to continue to supply services. The proposed risk treatment is consistent with accepted industry practice and current design standards and is proven to address the risk of a significant failure of our SCADA system. Several practicable options have been considered to address the risk. The proposed expenditure is therefore consistent with that which would be incurred by a prudent service provider.

- **Efficient** – The cost estimates for this project are based on historical average actuals for similar type jobs where SCADA components have been upgraded or replaced. The ability to maintain minimum supply pressures will be enhanced by being able to monitor and control pressures on a real time basis. Less consumer calls or complaints of poor pressures can be anticipated, and the maintaining the ability to control pressures to lower the overall pressure in the network will contribute to minimising unaccounted for gas. The proposed expenditure can therefore be considered consistent with the expenditure that a prudent service provider acting efficiently would incur.

- **Consistent with accepted and good industry practice** – The proposed expenditure follows good industry practice by ensuring that existing safety risks are addressed to low or ALARP and in line with current industry practice and design standards. The proposed capital expenditure is therefore such as would be incurred by a prudent service provider acting efficiently, in accordance with accepted good industry practice.

- **To achieve the lowest sustainable cost of delivering pipeline services** – The sustainable delivery of services includes reducing risks to ALARP and maintaining reliability of supply, whilst achieving the lowest sustainable costs by undertaking the works in line with the relevant useful life and adopting proven new and emerging technologies and techniques that reduce long-term costs. The proposed project will assist in maintaining the operating integrity of city gates stations and DRSs, which in turn contributes towards achieving the lowest sustainable cost of delivering the reference service by minimising costs associated with onsite response to maintain the network. This project is therefore consistent with the objective of achieving the lowest sustainable cost of delivering services.

NGR 79(2)

The proposed capex is justifiable under NGR 79(2)(c), as it is necessary to:

- Maintain the safety of services (NGR 79(2)(c)(i)) – Not addressing the risk of end of life and non-compliant SCADA equipment results in an unacceptable safety risk for customers and our staff, network integrity issues, disruption to customer supply and potential uncontrolled release of gas. The continued proactive replacement of our SCADA equipment has proven to reduce the risk of a significant SCADA system failure and will allow us to maintain a level of service consistent with customer expectations. Moreover, this is the most cost-efficient solution to reduce the identified risk and is therefore consistent with good industry practice.

- Maintain integrity of services (NGR 79(2)(c)(ii)) – Continued proactive replacement of our SCADA equipment will minimise supply interruption and potential loss of supply to gas consumers.

- Comply with a regulatory obligation or requirement (NGR 79(2)(c)(iii)) – The proposed expenditure will ensure compliance and with obligations and requirements under the Gas Distribution System Code to use all reasonable endeavours to maintain the minimum pressure at distribution supply points. This is achieved by ensuring the continuity of electronic data from monitoring these pressures. Moreover, the proposed expenditure specifically addresses non-compliance of SCADA equipment with hazardous areas as identified in AS 50079.

NGR 74

The forecast costs are based on the latest market rate testing and project options consider the asset management requirements as per the AGN Victoria and Albury Asset Management Strategy (400-PL-AM-0003, Rev1). The estimate has therefore been arrived at on a reasonable basis and represents the best estimate possible in the circumstances.

Glossary			
AA	Access Arrangement	HIA	Housing Industry Association
ACQ	Annual Contract Quantities	HSE	Health Safety Environment
AER	Australian Energy Regulator	HyP	Hydrogen Park
AGIG	Australian Gas Infrastructure Group	I&C	Industrial and Commercial (customers)
AGN	Australian Gas Networks	ILI	In Line Inspection
AHC	Australian Hydrogen Centre	KPI	Key Performance Indicator
AMP	Asset Management Plan	LPG	Liquid Petroleum Gas
AMS	Asset Management Strategy	MDQ	Maximum Daily Quantity
ARENA	Australian Renewable Energy Agency	MFP	Multifactor Productivity
ARS	Ancillary Reference Service	MGN	Multinet Gas Networks
capex	Capital Expenditure	MRP	Market Risk Premium
CBD	Central Business District	Next AA period	2023/24 to 2027/28
CSIRO	Commonwealth Scientific and Industrial Research Organisation	NGL	National Gas Law
Current AA period	2018 to 2022	NGR	National Gas Rules
DBP	Dampier Bunbury Pipeline	opex	Operating Expenditure
DCVG	Direct Current Voltage Gradient	PMC	Periodic Meter Change
DP	Delivery Point	RBA	Reserve Bank of Australia
DRP	Debt Risk Premium	RRG	Retailer Reference Group
EBSS	Efficiency Benefit Sharing Scheme	SCADA	Supervisory Control and Data Acquisition
EDD	Effective Degree Day	SL CAPM	Sharpe-Lintner Capital Asset Pricing Model
ESCV	Essential Services Commission of Victoria	TAB	Tax Asset Base
ESV	Energy Safe Victoria	TFP	Total Factor Productivity
FFO	Funds from operations	TJ	Terajoule/s
GDB	Gas Distribution Business	TRIFR	Total Recordable Injury Frequency Rate (the number of total recordable injuries per million hours worked)
GJ	Gigajoule/s	UAFG	Unaccounted for Gas
GSP	Gross State Product	VGNSR	Victorian Gas Networks Stakeholder Roundtable
HDPE	High-Density Polyethylene	WPI	Wage Price Index

Appendix A – Comparison of risk assessments for each option

Untreated risk	Health & Safety	Environ-ment	Operations	People	Compliance	Rep & Customer	Finance	Risk
Likelihood	Occasional	Remote	Occasional	Unlikely	Occasional	Unlikely	Unlikely	Moderate
Consequence	Significant	Minor	Significant	Minor	Significant	Significant	Significant	
Risk Level	Moderate	Negligible	Moderate	Low	Moderate	Moderate	Moderate	

Option 1	Health & Safety	Environ-ment	Operations	People	Compliance	Rep & Customer	Finance	Risk
Likelihood	Occasional	Remote	Occasional	Unlikely	Occasional	Unlikely	Unlikely	Moderate
Consequence	Significant	Minor	Significant	Minor	Significant	Significant	Significant	
Risk Level	Moderate	Negligible	Moderate	Low	Moderate	Moderate	Moderate	

Option 2	Health & Safety	Environ-ment	Operations	People	Compliance	Rep & Customer	Finance	Risk
Likelihood	Remote	Remote	Remote	Remote	Remote	Remote	Remote	Low
Consequence	Significant	Minor	Significant	Minor	Significant	Significant	Significant	
Risk Level	Low	Negligible	Low	Negligible	Low	Low	Low	

Appendix B – List of SCADA sites for remediation

Site requiring hazardous area upgrades	Planned for
MACAULAY RD	2023
MERRIGUM CITY GATE	2023
MOE CITY GATE	2023
MONSBENT B7	2023
Norske Skog	2024
NORTH St ALBURY	2024
PRESTON OUTSTATIONS	2024
RICHMOND OUTSTATIONS	2025
RUTHERGLEN CITY GATE	2025
SHEPPARTON CITY GATE	2025
TATURA CITY GATE	2026
TONGALA CITY GATE	2026
TRAFAGAR CG	2026
TRARALGON CG	2027
WANGARATTA	2027
WANGARATTA EAST CG	2027
WEST MELBOURNE	2028
WODONGA CITY GATE	2028
YARRAWONGA CG	2028

Site requiring transmitter replacements	Planned for
ECHUCA CG	2023
GIRGARRE CG	2023
KYABRAM CG	2023
MERRIGUM CITY GATE	2023
ROCHESTER CG	2023
SHEPPARTON CITY GATE	2023
TATURA CITY GATE	2023
TONGALA CITY GATE	2024
TRAFAGAR CG	2024
TRARALGON CG	2024
PRESTON OUTSTATIONS	2024
MERNDA (WHITTLESEA) CG	2024
BROADFORD	2025
EUROA CITY GATE	2025
MONSBENT B7	2025
WODONGA CITY GATE	2025
CHILTERN CITY GATE	2025
OFFICER CG	2026
RUTHERGLEN CITY GATE	2026
WANGARATTA EAST CG	2026
YARRAWONGA CG	2026
KILMORE CITY GATE	2026
LAURIMER PARK	2026

Site requiring cabinet upgrade	Planned date
DUNNS RD	2023
EARIMIL DVE	2023
EAST ST	2023
ECHUCA CG	2023
ELIZABETH DRIVE	2023
EVELYN ST	2023
FRANKLIN RD	2023
GILCHRIST ST	2024
GILLINGHAM RD	2024
GIRGARRE CG	2024
HALL RD	2024
HAMPTON PARK CG	2024
HENDERSON RD	2024
HINKLER DVE	2024
HODDLE ST	2025
HUGHES PDE FR	2025
HUON PK RD	2025
IRVINE ST (Ex Duggan)	2025
JOHNS ST	2025
KEON PARK	2025
KILMORE CITY GATE	2025
KooWeeRup Rd Fringe	2026
KYABRAM CG	2026
LATROBE UNI	2026
LAURIMER PARK	2026
LINDRUM RD	2026
MERRIGUM CITY GATE	2026
MOE CITY GATE	2026
MONSBENT B7	2026
NARRE WARREN	2027
NAVARRE DVE	2027
Norske Skog	2027
OFFICER CG	2027
O'HERNS RD	2027
PAKENHAM NTH	2027
PARK ST EAST	2028
PARK ST WEST	2028
PASCAL RD	2028
PRESTON OUTSTATIONS	2028
PURTON RD	2028
QUEENSWHARF RD	2028
RAILWAY PLACE EAST	2028

2 Capex V.07.OP – Fringe of Grid SCADA and Communications

2.1 Project approvals

Table 2-1: Project approvals

Prepared by	Flora Malekpour, VIC AA Engineer, APA group
Reviewed by	Chris Culph, Manager Electrical Systems, APA Group
Approved by	Mark Beech, Executive General Manager Network Operations, AGIG

2.2 Project overview

Table 2-2: Project overview

Description of the problem / opportunity	AGN uses a supervisory control and data acquisition (SCADA) system to monitor and report on the gas flow, pressure and temperature of gas in real time. We currently have SCADA at 153 critical sites in the Victoria and Albury network. These includes city gate stations, regulating stations and fringe of grid sites. 36 of these sites also allow remote control of pressure. This business case proposes the continuation of a well-established program of work expanding the amount of real-time information we have for use in managing pressure in our network. As our infrastructure footprint expands, we need to continue to expand the number of SCADA sites to ensure we are able to effectively monitor and control network pressures. We do this by adding SCADA at strategic sites at the edges of the network or "fringe of grid locations". At present there are 70 locations across the network that will be critical to maintaining pressure and services for our customers over the next 5-10 years and would benefit from the addition of SCADA. We have also identified 169 regional and rural locations where communications are unreliable due to poor network data coverage. The addition of SCADA and reliable communications at the identified fringe of grid sites is critical to allow us to meet our regulatory obligation in the Victorian Gas Distribution System Code (Code) to use all reasonable endeavours to ensure minimum prescribed pressures are maintained at gas delivery points[6]. Extending our SCADA and communications capability at fringe of grid locations will help us: • maintain the delivery pressure of gas from the distribution system to ensure that the minimum supply pressure is maintained at distribution supply points, fringe points and the outlet of the meter; and • provide guidance for the settings of regulator outlet pressure. This project was previously proposed and approved by AER in the current AA period[7]. AER approved the project on the basis it met NGR rules 79(1) and 79(2)(ii)[8].

[6] Gas Distribution System Code, Ver 14.0, p 52
[7] Business Case V08

[8] AER - Access arrangement final decision - Envestra - Part 2 - March 2013, page 91.

Untreated risk

As per risk matrix = Moderate (not ALARP)

Options considered

Option 1 – Routine maintenance activities and reactive installation of temporary data loggers at network fringe points when a poor pressure problem is identified ($0 million upfront capex).

Option 2 – Address high priority SCADA and communications deficiencies in rural and regional locations by:

- continuing the ongoing SCADA fringe of grid program by installing new SCADA points at the [redacted] highest priority sites; and
- improving network coverage in rural and regional areas by installing 4G signal boosters at [redacted] locations.

($1.8 million).

Option 3 – Address all identified known SCADA and communications deficiencies in fringe of grid areas, installing new SCADA sites at [redacted] identified sites, and installing 4G signal boosters at [redacted] locations with poor network coverage ($3.8 million).

Option 2 is the proposed solution. Option 2 will:

- minimise the risk of the SCADA system failing, leading to a pressure related event, and the associated safety and operational impacts;
- allow timely responses to emergencies;
- maintain visibility of key network assets to allow timely diagnosis and rectification of network and asset performance issues before problems arise;
- provide visibility of our critical network assets, allowing us to maintain the risk of those assets failing at 'as low as reasonably practicable' (ALARP);
- provide a more cost effective, proactive and responsive monitoring of the network by eliminating the need to undertake periodic programs of reactive on-site data logging;
- improve our compliance with safety and reliability standards (AS 4645, 2885 and 60079, GDS code etc.), good industry practice, and our Asset Management Strategy;
- provide critical information about our network assets to allow prudent and efficient investment in our network over the long term; and
- achieve the highest risk reduction deliverable in the time frame.

Estimated cost

The forecast direct cost (excluding overhead) during the next AA period (July 2023 to June 2028) is $1.8 million.

$'000 real 2021	2023/24	2024/25	2025/26	2026/27	2027/28	Total
SCADA fringe of grid	295	295	295	295	295	**1,475**
4G comms boosters	66	66	68	68	70	**338**
Total	**361**	**361**	**363**	**363**	**365**	**1,813**

Basis of costs

All costs in this business case are expressed in real unescalated dollars at June 2021 unless otherwise stated.

	Tables may not sum due to rounding
Alignment to our vision	Installing SCADA facilities at regional towns and network fringe points proactively aligns with the following aspects of our vision: • *Delivering for Customers* as installation of new SCADA and communications equipment at our network fringe points as part of a proactive planned program will ensure the continued reliability of supply and mitigate the risk of pressure related events, and ensure safety of public and personnel; and • *Sustainably Cost Efficient* as the cost of the installation of new SCADA and communications equipment at our network fringe points as part of a proactive planned program is the lowest sustainable cost of managing the risks of poor supply or loss of supply incidents, compliance and safety issues.
Consistency with the National Gas Objective and Rules (NGO and NGR)	**NGR 79(1)** – the proposed solution is consistent with good industry practice, several practicable options have been considered, and market rates have been tested to achieve the lowest sustainable cost of providing services (Rule 79(1)(a)). **NGR 79(2)** – proposed capex is justifiable under NGR 79(2)(c)(i), (ii) and (iii), as it is necessary to maintain and improve the safety of services, maintain the integrity of services, and comply with regulatory obligations. Safety will be increased by improved response when network pressures fall below minimum levels, and by eliminating the need for operations personnel to work in confined spaces to manually change pressure recording equipment. The integrity of service is the ability to maintain minimum supply pressures which will be enhanced by being able to monitor pressures on a real time basis. Less consumer calls or complaints of poor pressures can be anticipated. It is a requirement of the Code that 'a distributor must use all reasonable endeavours to maintain sufficient distribution system pressures to ensure the minimum pressure is maintained at the distribution supply point'. Real time pressure monitoring will assist AGN to continue to meet this regulatory obligation by providing electronic data that will improve the responsiveness of actions to control pressures within the network. **NGR 74** – the forecast costs are based on the latest market rate testing and project options consider the asset management requirements as per the Asset Management Strategy. The estimate has therefore been arrived at on a reasonable basis and represents the best estimate possible in the circumstances.
Treated risk	As per risk matrix = **Low**
Stakeholder engagement	Our customers have told us their top three priorities are price/affordability, reliability of supply, and maintaining public safety. They also told us they expect us to deliver a high level of public safety and are satisfied that this is the current practice. The proposed solution to address high priority SCADA and communications deficiencies in rural and regional locations is designed to ensure the network operates in line with good industry practice, safety standards and compliance requirements, thereby helping to maintain a safe and reliable service to our customers. This solution will also help to provide and maintain a high reliability of gas supply at the lowest sustainable cost by augmenting the remote pressure monitoring capability of the AGN networks.
Other relevant documents	• Asset Management Strategy – AGN Victoria and Albury (400-PL-AM-0003, Rev1)

2.3 Background

We use the supervisory control and data acquisition (SCADA) system to remotely monitor and report the gas flow, temperature and critical pressures across the Victoria and Albury network in real time. SCADA also allows us to control pressure at some sites.

We currently have 153 SCADA sites across the network, including at 68 city gate stations, 40 district regulating stations (DRSs) and 40 fringe points at the edge of the network. Pictures of typical SCADA sites are provided at Appendix C.

The effective operation of our SCADA and communications system is required to ensure we have real time visibility of the network, thereby:

- minimising the risk of the SCADA system failing, leading to a pressure related event, and the associated safety and operational impacts;
- increasing the timeliness of the diagnosis and rectification of a failing or failed critical network asset, thereby minimising the safety and operational impacts;
- allowing us to maintain the risk of those assets failing at 'as low as reasonably practicable' (ALARP);
- allowing us to comply with our reporting obligations;
- improving our ability to comply with safety and reliability standards (AS 4645, 2885 and 60079, Gas Distribution System Code9 etc);
- providing critical information about our network assets to allow prudent and efficient investment in our network over the long term;
- helping ensure accurate billing information for our customers; and
- assisting in minimising unaccounted for gas losses.

Over the past 10 to 15 years we have established a program of work designed to expand the amount of real-time information we have for use in managing pressure in our network. As our infrastructure footprint expands, we need to continue to expand the number of SCADA sites to ensure we are able to effectively monitor, and sometimes control pressure, for the entirety of our network. We do this by adding SCADA at strategic sites at the edge of the network or "fringe of grid locations". This will help us to meet our obligations and avoid issues similar to recent pressure events such as those examples provided in Appendix D.

We continue to monitor the expansion of the network and identify strategic sites across the network. A strategic site is one that will be critical to maintaining pressure and services for our customers over the next 5-10 years, and would benefit from in would benefit from the addition of SCADA for monitoring and control. Our recent desktop assessment identified 70 sites that meet these criteria.

Customers served by strategic sites could be affected by (low or high) pressure events, and any safety or operational impact would have an extended response time due to the reactive nature of the identification of the problem. Perhaps more importantly, as the network continues to expand these sites will no longer be at the edge of our network and become more central. This means real time monitoring and control through SCADA will be integral to the provision of gas services to our customers.

We have also identified 169 regional and rural locations where communications are unreliable due to poor network data coverage. Sub-standard communications infrastructure

[9] A functioning SCADA system is vital to AGN meeting its obligations in the Victorian Gas Distribution System Code which requires us to use all reasonable endeavours to ensure minimum prescribed pressures are maintained at gas delivery points.

leads to delayed or missing data, and means insufficient SCADA monitoring and control is available in these 'blackspot' areas.

2.4 Risk assessment

Risk management is a constant cycle of identification, analysis, treatment, monitoring, reporting and then back to identification (as illustrated in Figure 2-1). When considering risk and determining the appropriate mitigation activities, we seek to balance the risk outcome with our delivery capabilities and cost implications. Consistent with stakeholder expectations, safety and reliability of supply are our highest priorities.

Figure 2-1: Risk management principles

Our risk assessment approach focuses on understanding the potential severity of failure events associated with each asset and the likelihood that the event will occur. Based on these two key inputs, the risk assessment and derived risk rating then guides the actions required to reduce or manage the risk to an acceptable level.

Our risk management framework is based on:

- AS/NZS ISO 31000 Risk Management – Principles and Guidelines;
- AS 2885 Pipelines-Gas and Liquid Petroleum; and
- AS/NZS 4645 Gas Distribution Network Management.

The Gas Act 1997 and Gas Regulations 2012, through their incorporation of AS/NZS 4645 and the Work Health and Safety Act 2012, place a regulatory obligation and requirement on us to reduce risks rated high or extreme to low or negligible as soon as possible (immediately if extreme). If it is not possible to reduce the risk to low or negligible, then we must reduce the risk to as low as reasonably practicable (ALARP).

When assessing risk for the purpose of investment decisions, rather than analysing all conceivable risks associated with an asset, we look at a credible, primary risk event to test the level of investment required. Where that credible risk event has an overall risk rating of moderate or higher, we will undertake investment to reduce the risk.

Seven consequence categories are considered for each type of risk:

1. **Health & safety** – injuries or illness of a temporary or permanent nature, or death, to employees and contractors or members of the public
2. **Environment** (including heritage) – impact on the surroundings in which the asset operates, including natural, built and Aboriginal cultural heritage, soil, water, vegetation, fauna, air and their interrelationships
3. **Operational capability** – disruption in the daily operations and/or the provision of services/supply, impacting customers
4. **People** – impact on engagement, capability or size of our workforce
5. **Compliance** – the impact from non-compliance with operating licences, legal, regulatory, contractual obligations, debt financing covenants or reporting / disclosure requirements

6. **Reputation & customer** – impact on stakeholders' opinion of AGN, including personnel, customers, investors, security holders, regulators and the community
7. **Financial** – financial impact on AGN, measured on a cumulative basis

Note that risk is not the sole determinant of what investment is required. Many other factors such as growth, cost, efficiency, sustainability and the future of the network are also considered when we develop engineering solutions. The risk management framework provides a valuable tool to manage our assets, and prioritise our works program, however it is not designed to provide a binary (yes/no) trigger for investment.

As prudent asset managers, we apply our experience and discretion to manage and invest in our distribution networks in the best interests of existing and potential customers.

A summary of our risk management framework, including definitions, has been provided in Attachment 9.5 of the Final Plan.

The primary risk event identified for insufficient SCADA and communications equipment is an inability for AGN to detect a pressure related event or failure of a primary supply regulator facility or other strategic asset, which could interrupt supply to customers. The absence of monitoring equipment may also lead to load growth being under-detected, impacting the timing of augmentation works. Further information on these types of events is provided in Appendix D.

The untreated risk[10] rating associated with insufficient SCADA and communications equipment in rural and regional areas is presented in Table 2-3.

Table 2-3: Risk rating – untreated risk

Untreated risk	Health & Safety	Environ-ment	Operations	People	Compliance	Rep & Customer	Finance	Risk
Likelihood	Frequent	Remote	Frequent	Unlikely	Frequent	Frequent	Unlikely	Moderate
Consequence	Minor	Minor	Minor	Minor	Minor	Minor	Minor	
Risk Level	Moderate	Negligible	Moderate	Low	Moderate	Moderate	Moderate	

The overall risk is considered moderate. While the impact of not detecting pressure events and/or load growth at the fringe of the network is only minor, we would be at risk of frequent supply interruptions and compliance/reputation risk if no monitoring is present, and we allow service to decline. The moderate risk in this instance is not considered ALARP, as installing SCADA and comms equipment is a practicable and cost-effective mitigation measure.

2.5 Options considered

We have considered the following options to address the risks associated with undetected pressure events or under-detected load growth at network fringes:

- **Option 1** – Routine maintenance activities and reactive installation of temporary data loggers at network fringe points when a poor pressure problem is identified.
- **Option 2** – Address high priority SCADA and communications deficiencies in rural and regional locations by:

[10] Untreated risk is the risk level assuming there are no risk controls currently in place. Also known as the 'absolute risk'.

- continuing the ongoing SCADA fringe of grid program by installing new SCADA at the 30 highest priority sites; and
- improving network coverage in rural and regional areas by installing 4G signal boosters at 169 locations.

- **Option 3** – Address all identified known SCADA and communications deficiencies in fringe of grid areas, installing SCADA at 70 identified sites, and installing 4G signal boosters at 169 locations with poor network coverage.

2.5.1 Option 1 – Routine maintenance activities and reactive installation of temporary data loggers at network fringe points as required

Under this option, AGN will manage risk via a program of monitoring network pressures under three or six-monthly routine maintenance activities at critical sites.

This option involves the installation of temporary data loggers at network fringe points when a poor pressure problem is identified. This approach at fringe points is a reactive program, which means it does not provide real time notification of when pressures fall below minimum levels. It also provides a less accurate measure of load growth on the network.

An entirely reactive approach to manage pressure and flow monitoring requirements in regional areas is not consistent with good asset management practice, and therefore not consistent with NGR 79(1)(a).

2.5.1.1 Cost assessment

This option would move from the proactive monitoring of network pressures and move to a reactive approach whereby AGN would wait for staff of customers to report a safety or operational issue. This would necessarily interrupt services and could lead to an extended outage.

While this would require zero upfront capex costs, there would still be operational costs associated with the reactive installation of temporary data loggers at network fringe points where a poor pressure problem is identified.

Table 2-4 provides a cost breakdown for installing and maintaining [redacted] temporary data loggers over the next ten years (the typical asset life for SCADA and data logging equipment).

Table 2-4: Cost estimate – Installing and maintaining 30 temporary data loggers, $'000 real 2021

Description	Unit cost	Total
Labour and construction	[redacted]	90
Materials	[redacted]	270
Servicing and battery replacement	[redacted]	45
Total	[redacted]	**405**

With Option 1, the unit costs incurred would almost certainly be higher. Corrective activities are likely to incur higher costs compared to planned activities due to:

- non-compliance with regulatory requirements including Australian standards and the Victorian Gas Code;
- continued ongoing operational costs of reactively installing temporary data loggers at network fringe points once customer complaints are received;
- potential additional cost associated with damage to downstream equipment (which might be customers' equipment) resulting from over-pressuring upstream facilities;
- additional costs for removing crews from other planned work to address a corrective maintenance requirement and then remobilising to complete the previous planned work;
- increased likelihood of overtime and shift penalties (planned activities allow us to optimise staff rostering);
- additional costs of processing of data from data loggers into central electronic systems;
- reactive augmentation planning to provide quick-fix solutions; and
- supply outages or restrictions to groups of consumers resulting from unidentified areas where pressures are below the minimum.

2.5.1.2 Risk assessment

The entirely reactive solution proposed under Option 1 will do little to address the risk associated with having no SCADA monitoring in rural/regional areas. Any pressure drops and consequent asset failures will go undetected until complaints are raised of routine maintenance is performed.

Therefore, the risk outcome of this option will remain moderate (not ALARP). This is inconsistent with our risk management framework, and good industry practice.

The residual risk associated with Option 1 is shown in Table 2-5.

Table 2-5: Risk assessment – Option 1

Option 1	Health & Safety	Environ-ment	Operations	People	Compliance	Rep & Customer	Finance	Risk
Likelihood	Frequent	Remote	Frequent	Unlikely	Frequent	Frequent	Unlikely	Moderate
Consequence	Minor	Minor	Minor	Minor	Minor	Minor	Minor	
Risk Level	Moderate	Negligible	Moderate	Low	Moderate	Moderate	Moderate	

2.5.1.3 Alignment with vision objectives

Table 2-6 shows how Option 1 aligns with our vision objectives.

Table 2-6: Alignment with vision – Option 1

Vision objective	Alignment
Delivering for Customers – Public Safety	N
Delivering for Customers – Reliability	N
Delivering for Customers – Customer Service	N
A Good Employer – Health and Safety	-
A Good Employer – Employee Engagement	-

Vision objective	Alignment
A Good Employer – Skills Development	-
Sustainably Cost Efficient – Working within Industry Benchmarks	N
Sustainably Cost Efficient – Delivering Profitable Growth	-
Sustainably Cost Efficient – Environmentally and Socially Responsible	N

Option 1 would not align with AGN's objective of *Delivering for Customers or A Good Employer*, increased risk to security of supply and reliability which result in more customers' complaints. Failing to provide SCADA monitoring facilities for our networks in regional areas could lead to the undiagnosed equipment malfunction with potential for network over-pressure event or inadequate gas supply to the network.

Option 1 would also not align with AGN's objective of remaining *Sustainably Cost Efficient* as it is not the least cost option of addressing the risks associated with inability of SCADA monitoring facilities in regional area networks. It is also not consistent with industry standards as it does not conform to the requirements of the National Gas Market Code, or the Victoria Gas Distribution Code. It is therefore inconsistent with our objective of working within industry benchmarks.

2.5.2 Option 2 – Address high priority SCADA and communications deficiencies in rural and regional locations

Under Option 2, we will install new SCADA sites[11] at the 30 highest priority rural and regional locations on the network as outlined in Appendix B, including those areas:

- experiencing high demand growth;
- where augmentation may be required in the near future;
- where there is currently no remote monitoring capability (e.g. large country towns); and
- at network supply points where there is currently no remote monitoring capability.

This approach will increase efficiency by eliminating the need to install data loggers on a reactive basis and undertake reactive augmentation planning on a quick-fix basis. The delivery rate of six sites per year is consistent with the current SCADA program. We will also install 4G signal boosters at sites with poor coverage.

2.5.2.1 Cost assessment

The estimated direct capital cost of Option 2 is $1.8 million. This estimate is based on current material and labour rates for complete new SCADA site installations.

Table 2-7: Cost estimate – Option 2, $'000 real 2021

	2023/24	2024/25	2025/26	2026/27	2027/28	Total
SCADA fringe of grid	295	295	295	295	295	1,475

[11] The establishment of a new SCADA site requires not only the procurement and installation of the main electrical, control and instrumentation (EC&I) components, but also the site works and other hardware components such as cabinets. Later lifecycle costs such as end of life replacement costs will be lower as they are mainly only EC&I replacements.

4G comms boosters	66	66	68	68	70	338
Total	**361**	**361**	**363**	**363**	**365**	**1,813**

2.5.2.2 Risk assessment

Option 2 reduces the risk associated with insufficient SCADA and communications equipment in rural and regional areas from moderate to low. The residual risk outcomes for this option are shown in Table 2-8.

Table 2-8: Risk assessment – Option 2

Option 2	Health & Safety	Environ-ment	Operations	People	Compliance	Rep & Customer	Finance	Risk
Likelihood	Unlikely	Remote	Unlikely	Unlikely	Unlikely	Unlikely	Remote	Low
Consequence	Minor	Minor	Minor	Minor	Minor	Minor	Significant	
Risk Level	Low	Negligible	Low	Low	Low	Low	Low	

Proactively installing new SCADA and communications equipment in rural and regional areas of the network reduces the likelihood and the potential consequence of low network pressures not being detected as well as other pressure events and supply issues.

While Option 2 does not achieve the lowest risk reduction of the options considered, it is consistent with the Victorian Gas Distribution Code requirements, and reduces the risk to low, and is therefore consistent with our risk management framework, as well as current industry practice and design standards.

2.5.2.3 Alignment with vision objectives

Table 2-9 shows how Option 2 aligns with our vision objectives.

Table 2-9: Alignment with vision – Option 2

Vision objective	Alignment
Delivering for Customers – Public Safety	Y
Delivering for Customers – Reliability	Y
Delivering for Customers – Customer Service	Y
A Good Employer – Health and Safety	-
A Good Employer – Employee Engagement	-
A Good Employer – Skills Development	-
Sustainably Cost Efficient – Working within Industry Benchmarks	Y
Sustainably Cost Efficient – Delivering Profitable Growth	-
Sustainably Cost Efficient – Environmentally and Socially Responsible	Y

Option 2 would align with our objective of *Delivering for Customers*, as it would address the security of supply and reliability risks associated with not installing effective SCADA and communications capability in rural and regional areas of the network. It will reduce the risk of pressure deviations (either high or low) not being identified, with potential for network pressure event or the extended response to containment of emergency situations.

Option 2 would also align with our objective of remaining *Sustainably Cost Efficient* as it is the least cost option of addressing the risks associated with not installing effective SCADA and communications capability in rural and regional areas of the network. It is also

consistent with industry standards and conforms to the requirements of the Victorian Gas Distribution Code and industry standards, and is therefore consistent with our objective of working within industry benchmarks.

2.5.3 Option 3 – Address all identified known SCADA and communications deficiencies in fringe of grid areas

Under Option 3, we will install new SCADA sites[12] at [redacted] identified strategic sites. We will also install 4G signal boosters at sites with poor coverage. Essentially, Option 3 is the same as Option 2, however the delivery rate is significantly higher than historical levels, at [redacted] sites per year.

2.5.3.1 Cost assessment

The estimated direct capital cost of Option 3 is $3.8 million. This estimate is based on current material and labour rates for new installations.

Table 2-10: Cost estimate – Option 3, $'000 real 2021

	2023/24	2024/25	2025/26	2026/27	2027/28	Total
SCADA fringe of grid	688	688	688	688	688	3,442
4G comms boosters	66	66	68	68	70	338
Total	**754**	**754**	**756**	**756**	**758**	**3,780**

2.5.3.2 Risk assessment

Option 3 reduces the risk associated with insufficient SCADA and communications equipment in rural and regional areas from moderate to low. The residual risk outcomes for this option are shown in Table 2-11.

Table 2-11: Risk assessment – Option 3

Option 3	Health & Safety	Environ-ment	Operations	People	Compliance	Rep & Customer	Finance	Risk
Likelihood	Unlikely	Remote	Unlikely	Unlikely	Unlikely	Unlikely	Remote	Low
Consequence	Minor	Minor	Minor	Minor	Minor	Minor	Significant	
Risk Level	Low	Negligible	Low	Low	Low	Low	Low	

Proactively installing effective SCADA and communications equipment in rural and regional areas of the network reduces the likelihood and the potential consequence of low network pressures not being detected as well as other pressure events and supply issues.

Of the options considered, Option 3 is consistent with the Victorian Gas Distribution Code requirements, achieves the greatest risk reduction for a reasonable cost, reducing the risk to low. It is therefore consistent with our risk management framework, as well as current industry practice and design standards.

2.5.3.3 Alignment with vision objectives

Table 2-12 shows how Option 3 aligns with our vision objectives.

Table 2-12: Alignment with vision – Option 3

[12] The establishment of a new SCADA site requires not only the procurement and installation of the main electrical, control and instrumentation (EC&I) components, but also the site works and other hardware components such as cabinets. Later lifecycle costs such as end of life replacement costs will be lower as they are mainly only EC&I replacements.

Vision objective	Alignment
Delivering for Customers – Public Safety	Y
Delivering for Customers – Reliability	Y
Delivering for Customers – Customer Service	Y
A Good Employer – Health and Safety	-
A Good Employer – Employee Engagement	-
A Good Employer – Skills Development	-
Sustainably Cost Efficient – Working within Industry Benchmarks	Y
Sustainably Cost Efficient – Delivering Profitable Growth	N
Sustainably Cost Efficient – Environmentally and Socially Responsible	Y

Option 3 would align with our objective of *Delivering for Customers*, as it would address the security of supply and reliability risks associated with not installing effective SCADA and communications capability in rural and regional areas of the network. It will reduce the risk of pressure deviations (either high or low) not being identified, with potential for network pressure event or the extended response to containment of emergency situations.

Option 3 would not align with our objective of remaining *Sustainably Cost Efficient* as it is not the least cost option of addressing the risks associated with insufficient SCADA and communications equipment. A significant ramp up in resources would be required to deliver 14 sites per year, which may come at a premium given resourcing constraints in Victoria.

2.6 Summary of costs and benefits

Table 2-13 presents a summary of how each option compares in terms of the estimated cost, the residual risk rating, and alignment with our vision objectives.

Table 2-13: Comparison of options

Option	Estimated cost ($ million)	Treated residual risk rating	Alignment with vision objectives
Option 1	Zero upfront capex	High	Does not align with *Delivering for Customers, A good Employer* or *Sustainably Cost Efficient*
Option 2	1.8	Low	Aligns with all relevant vision objectives
Option 3	3.8	Low	Aligns with *Delivering for Customers*, but does not align with *Sustainably Cost Efficient*

2.7 Recommended option

Option 2 is the proposed solution. This option provides for necessary expenditure to install SCADA additional monitoring facilities for additional [redacted] sites, and the upgrade of [redacted] communications sites with inadequate network coverage across the network over the 5 years.

While it does not provide the highest risk reduction, it does reduce the residual risk to low, doing so at a considerably lower cost than Option 3. The delivery rate of [redacted] sites per year is consistent with current levels, which means we do not need to ramp up resourcing significantly.

2.7.1 Why is the recommended option prudent?

Option 2 is the most prudent option because it:

- reduces the risk of a pressure event going undetected, and the associated safety and operational impacts;
- enables timely responses to emergencies;
- maintains visibility of key network assets to allow timely diagnosis and rectification of network and asset performance issues before problems arise;
- provides visibility of our critical network assets, allowing us to maintain the risk of those assets failing at 'as low as reasonably practicable' (ALARP);
- provides a more cost effective, proactive and responsive monitoring of the network by eliminating the need to undertake periodic programs of reactive on-site data logging;
- improves our compliance with safety and reliability standards (AS 4645, 2885 and 60079, GDS code etc), good industry practice, and our Asset Management Strategy; and
- provides critical information about our network assets to allow prudent and efficient investment in our network over the long term.

2.7.2 Estimating efficient costs

Key assumptions made in the cost estimation for the SCADA and communications fringe of grid program include:

- costs based on historical expenditure noting that these works are standard practice;
- estimates derived from contractual rates of vendors to be utilised;
- resource cost based on other similar projects ongoing at present or in previous access arrangement periods; and
- original equipment manufacturer contractual rates for spares and labour that are part of our services agreements.

Table 2-14 presents a breakdown of the installation of additional SCADA and communications equipment by cost category.

Table 2-14: Cost estimate – Option 2, $'000 real 2021

Option 2	2023/24	2024/25	2025/26	2026/27	2027/28	Total
Labour	227	227	228	228	230	**1,140**
Materials	134	134	135	135	135	**673**
Total	**361**	**361**	**363**	**363**	**365**	**1,813**

2.7.3 Consistency with the National Gas Rules

In developing these forecasts, we have had regard to Rule 79 of the NGR. With regard to all projects, and as a prudent asset manager, we give careful consideration to whether capex is conforming from a number of perspectives before committing to capital investment.

NGR 79(1)

The proposed solution is prudent, efficient, consistent with accepted and good industry practice and will achieve the lowest sustainable cost of delivering pipeline services:

The continued proactive installation of SCADA and communications equipment in our rural and regional areas of the network is consistent with the requirements of NGR 79(1)(a). Specifically, we consider that the capital expenditure is:

- **Prudent** – The expenditure is necessary to deliver gas safely and reliably to the downstream network in regional areas and ensure customers' satisfaction. Proactive installation of pressure monitoring equipment at fringe network sites provides an enhanced opportunity for incident response and aids the efficient use of capital by providing more accurate and complete data for input to augmentation planning. This option is therefore prudent and necessary to continue to supply services. The proposed risk treatment is consistent with accepted industry practice and current design standards and is proven to address the risk of pressure events and the subsequent impact on customers. Several practicable options have been considered to address the risk. The proposed expenditure is therefore consistent with that which would be incurred by a prudent service provider.

- **Efficient** – The cost estimates for this project are based on historical average actual costs of performing similar work within the last few years. The ability to maintain minimum supply pressures at regional area networks will be enhanced by being able to monitor pressures at fringe points. Poor network pressures and inadequate gas supply can be anticipated and as a result, less calls or complaints will be received from consumers. The proposed expenditure can therefore be considered consistent with the expenditure that a prudent service provider acting efficiently would incur.

- **Consistent with accepted and good industry practice** – The proposed expenditure follows good industry practice by taking advantage of technology to improve visibility of asset performance. Real time pressure information provides up-to-date data which can be used to inform a variety of asset management tasks and functions, from quick response to incidents to better planning of augmentation projects. This will ensure us that existing safety risks are addressed to low and in line with current industry practice and design standards. The proposed capital expenditure is therefore such as would be incurred by a prudent service provider acting efficiently, in accordance with accepted good industry practice.

- To **achieve the lowest sustainable cost of delivering pipeline services** – The sustainable delivery of services includes reducing risks to low and maintaining reliability of supply, whilst achieving the lowest sustainable costs by undertaking the works in line with emerging technologies and techniques that reduce long-term costs. Remote monitoring of pressures and electronic storage of pressure data will assist to minimise in-field costs associated with poor pressure complaints and inadequate gas supply, and will allow better planning of augmentation projects. This project is therefore consistent with the objective of achieving the lowest sustainable cost of delivering services.

NGR 79(2)

The proposed capex is justifiable under NGR 79(2)(c), as it is necessary to:

- **Maintain the safety of services (NGR 79(2)(c)(i))** – Not addressing the risk of limited SCADA monitoring and communications capability in rural and regional areas of the network results in an unacceptable safety risk for customers and our staff, network integrity issues, high risk to security and reliability of gas supply to customers. The continued proactive installation of effective SCADA and communications equipment in rural and regional areas has proven to reduce the risk of low pressure network by the ability to monitor pressures on a real time basis and will allow us to maintain a level of service consistent with customer expectations. Moreover, this is the most cost efficient solution to reduce the identified risk and is therefore consistent with good industry practice.

- **Maintain integrity of services (NGR 79(2)(c)(ii))** – Continued proactive installation of effective SCADA and communications equipment in rural and regional areas of the network will minimise poor pressures, supply interruption and potential loss of supply to gas consumers.

- **Comply with a regulatory obligation or requirement (NGR 79(2)(c)(iii))** – The proposed expenditure will ensure compliance and with obligations and requirements under the Victorian Gas Distribution System Code to use all reasonable endeavours to maintain the minimum pressure at distribution supply points. This is achieved by ensuring the continuity of electronic data from real time monitoring these pressures.

NGR 74

The forecast costs are based on the latest market rate testing and project options consider the asset management requirements as per the Asset Management Strategy. The estimate has therefore been arrived at on a reasonable basis and represents the best estimate possible in the circumstances.

Appendix A – Comparison of risk assessments for each option

Untreated risk	Health & Safety	Environ-ment	Operations	People	Compliance	Rep & Customer	Finance	Risk
Likelihood	Frequent	Remote	Frequent	Unlikely	Frequent	Frequent	Unlikely	Moderate
Consequence	Minor	Minor	Minor	Minor	Minor	Minor	Minor	
Risk Level	Moderate	Negligible	Moderate	Low	Moderate	Moderate	Moderate	

Option 1	Health & Safety	Environ-ment	Operations	People	Compliance	Rep & Customer	Finance	Risk
Likelihood	Frequent	Remote	Frequent	Unlikely	Frequent	Frequent	Unlikely	Moderate
Consequence	Minor	Minor	Minor	Minor	Minor	Minor	Minor	
Risk Level	Moderate	Negligible	Moderate	Low	Moderate	Moderate	Moderate	

Option 2	Health & Safety	Environ-ment	Operations	People	Compliance	Rep & Customer	Finance	Risk
Likelihood	Unlikely	Remote	Unlikely	Unlikely	Unlikely	Unlikely	Remote	Low
Consequence	Minor	Minor	Minor	Minor	Minor	Minor	Significant	
Risk Level	Low	Negligible	Low	Low	Low	Low	Low	

Option 3	Health & Safety	Environ-ment	Operations	People	Compliance	Rep & Customer	Finance	Risk
Likelihood	Unlikely	Remote	Unlikely	Unlikely	Unlikely	Unlikely	Remote	Low
Consequence	Minor	Minor	Minor	Minor	Minor	Minor	Significant	
Risk Level	Low	Negligible	Low	Low	Low	Low	Low	

Appendix B – List of SCADA sites for upgrade

B.1: Priority SCADA sites

Priority	Suburb	Site
1	IVANHOE	SOUTH WEST IVANHOE
2	TYABB	GERALD ST
3	HASTINGS	HIGH ST
4	MORWELL	PORTERS RD (AUST CHAR)
5	LYNDHURST	ABBOTTS RD
6	FAIRFIELD	YARRA BEND PARK RD
7	LANGWARRIN	NORTH RD
8	SHEPPARTON (KIALA)	SOUTHERN TOWN FRINGE
9	BAIRNSDALE	TOWN FRINGE
10	PAYNESVILLE	TOWN FRINGE
11	LANGWARRIN	WEST OF LANGWARRIN REG
12	MORNINGTON PENINSULA	BETWEEN RAINIER AND EASTBOURNE
13	PAKENHAM	NTH EAST
14	SANDHURST OR SKYE	NTH EAST OF HALL RD
15	WODONGA	FRINGE AROUND SOUTH WEST
16	WODONGA	FRINGE AROUND SOUTH EAST
17	LALOR	EAST LALOR
18	WARRAGUL	TOWN FRINGE
19	PAKENHAM	NEAR CARDINIA RD, BETWEEN RAIL AND BYPASS
20	TYABB	TOWN FRINGE
21	BRUNSWICK	NTH EAST AREA?
22	KOO WEE RUP	KOO WEE RUP TOWN FRINGE
23	CRIB POINT	TOWN FRINGE
24	MOAMA	TOWN FRINGE
25	CRANBOUNRE	WEST CRANBOURNE
26	ALBURY	SOUTH EAST OR NORTH EAST TOWN FRINGE
27	ALBURY	WESTERN TOWN FRINGE
28	SHEPPARTON	NORTHERN TOWN FRINGE
29	HEALESVILLE	TOWN FRINGE
30	TRAFALGAR	TOWN FRINGE

B.2: Additional sites identified for SCADA

Network Nos	Network	Number of fringes
H04	FAIRFIELD	1
H25	LYNDHURST	1
H35	MORWELL	1
H36	SALE	1
H37	TRARALGON	1
H38	MAFFRA	1
H39	HASTINGS	1
H41	TYABB/ SOMERVILLE/ PEARCEDALE	1
H46	DOCKLANDS	1
H50	BROADFORD	1
H51	SEYMOUR	1
H52	BENALLA	1
H53	WANGARATTA	1
H56	ROSEDALE	1
H58	DROUIN	1
H61	TATURA	1
H62	KYABRAM	1
H63	GIRGARRE/STANHOPE	1
H64	ROCHESTER	1
H65	MERRIGUM	1
H66	TONGALA	1
H69	DARNUM	1
H70	MOE	1
H71	CHURCHILL	1
H73	EUROA	1
H75	PUCKAPUNYAL	1
H76	WANGARATTA EAST	1
H77	KALKALLO/DONNYBROOK/MERRIFIELDS	2
H78	BEVERIDGE	1
H80	WANDONG	1
H91	YARRAGON	1
H93	RUTHERGLEN/COROWA	1
H94	YARRAWONGA/MULWALA	1
H95	COBRAM/NUMURKAH	2
H96	CHILTERN/HOWLONG	2
H97	TOCUMWAL/BAROOGA	1
H98	FINLEY	1
	TOTAL	**40**

B.3: Sites requiring signal boosters

Site	Target completion
ALMA RD	2023
APPLEGUM CT	2023
Archbold St Fringe	2023
ARCHER ST	2023
Armadale St Fringe	2023
ASHMORE RD	2023
AUSTIN HOSPITAL	2023
BAIRNSDALE CTM (Bristol 1)	2023
BAIRNSDALE RTU1	2023
BAIRNSDALE RTU2	2023
BANGALAY AVE	2023
BAYVIEW RD	2023
Bedford ct Fringe	2023
BENALLA CITY GATE	2023
BERWICK CG	2023
BEVERIDGE CG	2023
BROADFORD	2023
BROOME CT	2023
Brougham St	2023
BROWNS RD	2023
CARMICHAEL ST	2023
Centenary Dr Fringe	2023
CHAFFEY DVE	2023
CHAGALL PDE	2023
CHILTERN CITY GATE	2023
CHURCHILL CG (Switchback)	2023
COBRAM CG	2023
COLLINGWOOD ST	2023
CRANBOURNE RD	2023
DANDENONG TS Origin.	2023
HENTY GS	2023
URANQUINTY GS	2023
CULCAIRN GS	2023
DARNUM CG	2024
DAWSON ST	2024
Donnybrook CG	2024
DROUIN CG (Main Sth Rd)	2024
DRYBURGH ST	2024
DUNNS RD	2024
EARIMIL DVE	2024
EAST ST	2024
EASTBOURNE RD	2024

Site	Target completion
ECHUCA CG	2024
ELIZABETH DRIVE	2024
EUROA CITY GATE	2024
EVELYN ST	2024
FED SQUARE	2024
Finley FR	2024
FIRMANS LANE	2024
FITZSIMMONS LANE HP	2024
FITZSIMMONS LANE NORTH	2024
Forster St	2024
FRANKLIN RD	2024
GEORGE ST	2024
GILCHRIST ST	2024
GILLINGHAM RD	2024
GIRGARRE CG	2024
HALL RD	2024
HAMPTON PARK CG	2024
HEALESVILLE CG	2024
HENDERSON RD	2024
HINKLER DVE	2024
HODDLE ST	2024
ILLABO	2024
Gundagai South Fringe	2024
Holbrook Road Fringe	2024
HOME RD	2025
HUGHES PDE FR	2025
Hull Rd	2025
Hume St	2025
HUON PK RD	2025
IRVINE ST (Ex Duggan)	2025
JACKA ST	2025
JOHNS ST	2025
KEON PARK	2025
KILMORE CITY GATE	2025
KLAUER ST	2025
KOONOOMOO CG	2025
KooWeeRup Rd Fringe	2025
KYABRAM CG	2025
LANGWARRIN	2025
LATROBE UNI	2025
LAURIMER PARK	2025
LINDRUM RD	2025
Longwarre	2025

Site	Target completion
LYNDHURST CG	2025
MARTHA LINK	2025
MACAULAY RD	2025
McLachlan St	2025
MELROSE DR	2025
MERIDIAN FRINGE	2025
MERNDA (WHITTLESEA) CG	2025
MERRIGUM CITY GATE	2025
MOE CITY GATE	2025
MONSBENT B7	2025
Mooroopna	2025
TUMUT GS	2025
Temora Fringe	2025
WALLENBEEN GS	2025
BOMEN GS	2025
NARRE WARREN	2026
NAVARRE DVE	2026
Nexus Dr	2026
Norske Skog	2026
NORTH St ALBURY	2026
NOVA CG	2026
OFFICER CG	2026
O'HERNS RD	2026
OLD DOOKIE	2026
ORANGE GROVE	2026
PAKENHAM NTH	2026
PARK ST EAST	2026
PARK ST WEST	2026
PASCAL RD	2026
PLENTY MANNA GUM Walk	2026
PRESTON OUTSTATIONS	2026
PURTON RD	2026
QUEENSWHARF RD	2026
RAILWAY PLACE EAST	2026
RAINIER AVE	2026
REX AVE	2026
RICHMOND OUTSTATIONS	2026
ROCHESTER CG	2026
ROSEDALE CITY GATE	2026
RUSSELL ST	2026
RUTHERGLEN CITY GATE	2026
SALE	2026
SALE FRINGE (Franklin St)	2026

Site	Target completion
SALERNO WAY	2026
DUNNS RD	2026
KOORINGAL RD FR	2026
REDHILL ROAD	2026
SACKVILLE ST	2026
SEYMOUR	2026
SHEPPARTON CITY GATE	2027
STATION ST MAFFRA FR	2027
STAWELL ST	2027
STEWART DR	2027
STEWART ST	2027
SUNNYSIDE CR	2027
SYCAMORE ST	2027
TALLAROOK	2027
THEWLIS Rd	2027
TATURA CITY GATE	2027
Tocumwal FR	2027
TONGALA CITY GATE	2027
TRAFAGAR CG	2027
TRAMWAY RD	2027
TRARALGON CG	2027
TUCKERS RD	2027
Trawalla Rd Fringe	2027
VAUGHAN TCE	2027
WALLAN	2027
WANGARATTA	2027
WANGARATTA EAST CG	2027
WARRAGUL CG	2027
WATSONIA RD & IBBOTSON	2027
WELLINGTON ST	2027
WEST MELBOURNE	2027
WHEELER ST	2027
WODONGA CITY GATE	2027
WOOLEYS	2027
YALLAMBIE RD	2027
YARRAGON CG	2027
YARRAWONGA CG	2027
BOMBALA GS	2027
COOMA GS	2027
Adelong Fr	2027
Gundagai GS	2027
Total	**169**

Appendix C – Pictures of typical SCADA units

Appendix D – Examples of supply incidents addressed by SCADA

July 2021 - Poor / no gas supply reports from 44 customers in the Wollert area during an evening peak.

Modelling indicated that around 1,400 customers had poor or no gas supply. The root cause identified to be a combination of high growth in the area and a valve that had been inadvertently left closed. The presence of an RTU in the growth area would have given real time visibility of supply and alerted us to low gas pressures prior to this incident. This would have allowed for a proper investigation to be carried out and the valve to be opened before the supply event occurred.

August 2020 - A recently commissioned fringe RTU picked up pressures lower than 140 kPa (the minimum design pressure) in the Laurimar Park Network.

Low pressures detected by a fringe RTU indicated that growth in the area was occurring more quickly than expected. This information allowed us to bring forward an augmentation to ensure the network would be able to meet the 2021 winter peak.

Had this RTU not been in place, there is a risk the pressure drop would not have been detected, leading to poor supply and/or outages during peak demand times. Early detection of the pressure issues meant we could conduct the necessary works proactively, allowing us to schedule resource efficiently to do the work. A reactive approach (i.e. responding to customer complaints or asset failure) would have been significant less efficient and more disruptive to customers.

April 2020 - High outlet pressures at one of the district regulators in the Melbourne CBD

There are eight DRS sites in and around the Melbourne CBD. Until recently, only two of these sites had SCADA. In April 2020, we became aware of high pressure anomalies in the CBD network that were occurring during low load periods overnight.

The lack of SCADA at six of the eight sites meant it was extremely difficult to identify which DRS was producing the high outlet pressures. Several sites were visited to work out which one that was causing the issue. There was limited data available at the two sites in the CBD which had SCADA. We therefore had to place pressure recorders at the six unmonitored sites to allow us to identify the cause of the problem.

While manual placement of pressure recorders is effective, it is a slow and reactive method of managing potential supply issues. Thankfully, supply pressures in this case did not exceed MAOP, and we were ultimately able to detect and address the faulty DRS. However, the Melbourne CBD was at a heightened risk of supply disruption during the time it took to detect the root cause of the pressure increases.

Installation of SCADA at the six unmonitored CBD sites is currently underway, which will give us visibility of the performance of all the DRS in the CBD. This will enable us to respond to future high outlet pressures, or any other issue, in a timelier manner.

Glossary			
AA	Access Arrangement	HIA	Housing Industry Association
ACQ	Annual Contract Quantities	HSE	Health Safety Environment
AER	Australian Energy Regulator	HyP	Hydrogen Park
AGIG	Australian Gas Infrastructure Group	I&C	Industrial and Commercial (customers)
AGN	Australian Gas Networks	ILI	In Line Inspection
AHC	Australian Hydrogen Centre	KPI	Key Performance Indicator
AMP	Asset Management Plan	LPG	Liquid Petroleum Gas
AMS	Asset Management Strategy	MDQ	Maximum Daily Quantity
ARENA	Australian Renewable Energy Agency	MFP	Multifactor Productivity
ARS	Ancillary Reference Service	MGN	Multinet Gas Networks
capex	Capital Expenditure	MRP	Market Risk Premium
CBD	Central Business District	Next AA period	2023/24 to 2027/28
CSIRO	Commonwealth Scientific and Industrial Research Organisation	NGL	National Gas Law
Current AA period	2018 to 2022	NGR	National Gas Rules
DBP	Dampier Bunbury Pipeline	opex	Operating Expenditure
DCVG	Direct Current Voltage Gradient	PMC	Periodic Meter Change
DP	Delivery Point	RBA	Reserve Bank of Australia
DRP	Debt Risk Premium	RRG	Retailer Reference Group
EBSS	Efficiency Benefit Sharing Scheme	SCADA	Supervisory Control and Data Acquisition
EDD	Effective Degree Day	SL CAPM	Sharpe-Lintner Capital Asset Pricing Model
ESCV	Essential Services Commission of Victoria	TAB	Tax Asset Base
ESV	Energy Safe Victoria	TFP	Total Factor Productivity
FFO	Funds from operations	TJ	Terajoule/s
GDB	Gas Distribution Business	TRIFR	Total Recordable Injury Frequency Rate (the number of total recordable injuries per million hours worked)
GJ	Gigajoule/s	UAFG	Unaccounted for Gas
GSP	Gross State Product	VGNSR	Victorian Gas Networks Stakeholder Roundtable
HDPE	High-Density Polyethylene	WPI	Wage Price Index