Northern Gas Networks

A22.o - Pressure Management

Engineering Justification Paper

Contents

1. Summary table

Name of Project	Pressure Management Intervention Programme		
Scheme Reference	*A22.o.NGN*		
Primary Investment Driver	Asset Health & Environmental		
Project Initiation Year	2026/27		
Project Close Out Year	2030/31		
Total Installed Cost Estimate (£)	*£9.79m*		
Cost Estimate Accuracy (%)	*+/-5%*		
Project Spend to date (£)	*£0m*		
Current Project Stage Gate	*Specific delivery identification*		
Reporting Table Ref	*CV4.12 Shrinkage, C5.06 Other Capex*		
Outputs included in GD3 Business Plan	*As per BDPTs above, impact of programme in shrinkage forecasts and proposed targets*		
Spend Apportionment (£m)	**RIIO-GD2**	**RIIO-GD3**	**RIIO-GD4***
	£8.87m	£9.79m	c. £8-11m

**Expecting all investments listed for RIIO-GD3 to complete in RIIO-GD3. RIIO-GD4 cost estimate based on indicative asset health spend in RIIO-GD3*

2. Executive summary

Northern Gas Networks run a specialist pressure monitoring and control team who, for the last 10 years, have been monitoring the <7 bar systems in our network. The same team centrally manage the low pressure-controlled systems to minimise leakage. The data gathered is used by operational and planning teams to ensure the network is running efficiently and as designed.

To facilitate this, we have c5000 data loggers and controllers across our network which gather pressure data and systems to relay this to our central management system. Since the introduction of the 'Fit and Forget' loggers installed originally in RIIO-GD1, we have implemented a successful strategy of replace and upgrade to ensure the data keeps flowing and we are up to date with the latest technology.

In RIIO-GD2 we have been refreshing all our existing pressure controls, expanding our pressure controls to a further 10 areas in our network, and renewing all data loggers in our other district governors. The work in RIIO-GD2 gave us a more real time vision of governor pressures, but we want to take this further by renewing all of our network loggers using the latest available technology and fitting new points where needed. We will also be upgrading some of our most active district governors with additional monitoring such as slam shut activation notification, flow indication and intruder detection. Finally, so we can digest the amount of real time data, we will upgrade our systems to get the best value out of the real time data we receive.

The above will give us a better understanding of how the networks are performing, give us early warning of potential failure and improve the security of our lower tier assets. It will also allow us to minimise system pressures, which has significant leakage reduction benefits as detailed later in the paper.

Centralised remote monitoring has been an enormous leap towards creating a smarter network, but being dependent on battery power alone, we currently still only monitor pressure. With new low power technology, batteries are a much more viable and cost-effective power source overall. In RIIO-GD2 we have worked with manufacturers to look at this and we are now confident that we can improve our system to include flow monitoring, safety device monitoring and intruder alarms. The introduction of these additional components will be limited and will be installed strategically to sites based on vulnerability and criticality criteria.

Overall, our preferred strategy to continue our successful approach from RIIO-GD2 will result in average system pressures on our network being circa. 9 millibar lower by the end of RIIO-GD3 than a counterfactual do minimum, resulting in significant leakage savings, as detailed in the following sections.

	Intervention type	Total Workload	Unit Cost inc. overheads	Capital expenditure (£m)					
				26/27	27/28	28/29	29/30	30/31	Total
Replace Logger	Replacement	200	£1,450.00	£58,000.00	£58,000.00	£58,000.00	£58,000.00	£58,000.00	£290,000.00
Replace Profile with Logger	Replacement	100	£1,658.80	£33,176.00	£33,176.00	£33,176.00	£33,176.00	£33,176.00	£165,880.00
Maintain Profiler	Refurbishment	400	£1,740.00	£139,200.00	£139,200.00	£139,200.00	£139,200.00	£139,200.00	£696,000.00
Replace Profiler	Replacement	400	£8,120.00	£649,600.00	£649,600.00	£649,600.00	£649,600.00	£649,600.00	£3,248,000.00
Monitoring Upgrades	Addition	800	£1,983.60	£634,752.00	£634,752.00	£317,376.00	£0.00	£0.00	£1,586,880.00
Validation Logger Replacement	Replacement	2000	£1,276.00	£510,400.00	£510,400.00	£510,400.00	£510,400.00	£510,400.00	£2,552,000.00
Logger Post Replacement	Replacement	200	£1,740.00	£69,600.00	£69,600.00	£69,600.00	£69,600.00	£69,600.00	£348,000.00
System Solution	Replacement	1	£904,800.00	£90,480.00	£361,920.00	£361,920.00	£90,480.00	£0.00	£904,800.00
Total	**All**	**4,101.00**	-	**£2,185,208.00**	**£2,456,648.00**	**£2,139,272.00**	**£1,550,456.00**	**£1,459,976.00**	**£9,791,560.00**

Table 1 RIIO-GD3 Pressure management preferred capital expenditure profile

3. Introduction

This Engineering Justification Paper (EJP) details our proposals for investment on our Pressure Management Assets during RIIO-GD3 and acts as a narrative to be used in conjunction with the accompanying Cost Benefit Analysis (CBA). It explicitly follows Ofgem's guidance and is set out in accordance with the headings therein.

Our Pressure Management Assets are a critical part of our efforts to reduce leakage and require ongoing maintenance, repair, refurbishment, and replacement to ensure we manage increasing environmental risks. During RIIO-GD2 we have undertaken a programme of works to maintain, modernise or replace our existing pressure control equipment as well as install remote pressure management in further networks based on efficacy. This has allowed us to reduce our average system pressure and thereby reduce carbon emissions relating to leakage significantly across the 5 years of RIIO-GD2. In RIIO-GD3 we are looking to maintain pressure control where it remains effective and use new technology to improve our monitoring capability to enhance physical security and security of supply.

This engineering paper aims to outline the justification for our proposed RIIO-GD3 Pressure Management investment, detailing our asset management decision making process; during which we analyse risk, value and the trade-off between different intervention options. It explains the drivers for investment, the inputs and assumptions used in our CBA and how our proposed investment benefits our customers and stakeholders.

4. Equipment summary

NGN employ a specialist Pressure Management Team who use a pressure monitoring system to monitor network performance. To do this we currently have 2,180 governor and 2500 network logger points across our governor sites and low-pressure pipeline, which feedback to this central system. As well as pressure monitoring, the data collected is used to ensure our network models are as accurate as they can be through a process of validation.

In RIIO-GD2 the governor controllers and loggers were all either modernised or replaced. We expect most of this to remain serviceable through RIIO-GD3. There was some replacement of network points, but a lot of the work done on these were battery changes, so the equipment is expected to be beyond life expectancy in RIIO-GD3.

The control equipment used in the LP network is a mix of the common technology solution and some new controllers called AirCom, which we have developed in partnership with one of our suppliers. The upgrades to the technology equipment were completed during RIIO-GD2, which will ensure the systems continue to be operable into RIIO-GD3.

Both systems work in a similar way. There is a combination of forecast demand data and a feedback loop on a downstream logger to determine the optimum pressure to run the networks at throughout each day. This means we can run networks at lower pressures, significantly reducing leakage while ensuring a reliable supply.

Control equipment is not as viable on smaller networks, so the c900 sites we have on live control are limited to some of the larger towns and cities in our network where there is the most benefit to the environment.

In areas without control, it is still important to monitor the systems. We do this using a mixture of devices from suppliers such as Technology, YZ Systems and Abriox to provide basic inlet and outlet monitoring from district governors.

Then throughout our network we have further network loggers which take regular downstream pressure readings from the pipeline. Primarily these are used for validation, but we use this downstream intelligence to try and identify any flow or pressure anomalies which could indicate water ingress or other network constraints.

Examples of Network Validation Loggers

Figure 2 Examples of network loggers

We also have a small number of units installed on some of our MP and IP sites which complement the inlet data retrieved form district governors to monitor and validate our other below 7 bar systems.

5. Problem / opportunity statement

As a gas transporter, it is well understood that the effects of unburned methane leakage contribute the greatest portion of our overall carbon footprint. The benefits of reducing leakage include reduced carbon emissions and a lower number of escapes. This has a benefit to the customer of reduced bills and societal and environmental benefits. Leakage is calculated using the industry standard shrinkage model and is by far our biggest environmental impact as detailed in Business Plan section 4.5 and Environmental Action Plan section 3. There are three main methods of leakage reduction:

Replacement - The 30-year programme is underway to replace our old iron pipes but this is not expected to be completed until 2032. Currently our networks contain a significant number of metallic mains, meaning leakage reduction is still vital. (Mains replacement is covered in a separate paper).

Monoethylene Glycol (MEG) treatment – This method of leakage reduction was implemented in the 1980s and was effective in controlling the number of emerging leaking joints which were caused by characteristic changes between manufactured town gas and mineral methane gas. MEG is not part of this proposal.

Pressure reduction – The approach to leakage control covered by this paper is through managing pressure. By minimising pressure in networks with leaks, the volume of gas which will pass through any escape path is reduced, minimising the quantity of un-burnt methane entering the atmosphere. This paper details the process used to determine how to optimise pressure controls in our network.

Pressure management is a balance between ensuring system pressures are high enough to meet demand to ensure security of supply, especially during periods of peak demand during certain times of the day and in cold periods, and are minimised otherwise to reduce leakage emissions. The investments and technology discussed in this EJP will allow us to optimise the network to meet these conflicting requirements.

We categorise our networks based on metallic proportion. Any network or sub-network which has a proportion greater than 5% metal is considered a 'mixed material' system and, dependent on operating pressure and length, will be considered for some form of pressure control. Proportions below 5% are considered as 'All PE' and will be allowed to operate at their full operating pressure all year around as these networks leak much less than networks with more significant metallic mains proportions.

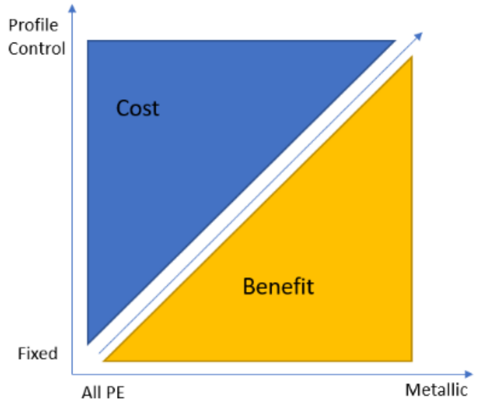

Figure 2 Benefit cost trade-off of pe and metallic networks

There are different pressure control strategies available to us. The general approach is the more metallic pipes and the higher pressure in the network, the greater the benefit of controlling the pressures in the network.

The figure demonstrates there is a place for each type of pressure control strategy, and it is not a one size fits all approach.

We will evaluate the CBA annually to identify the optimal pressure control strategy considering progress of the mains replacement programme (Repex) given the life of the asset.

The pressure management strategies available are listed below in ascending order of having no ability to control pressure to having full control of pressure:

Fixed 1:20 settings – Represented by the orange line below, this is what is used in networks which are either small or have few remaining metallic mains. In this scenario, the governors are fixed at their full operating pressures all year round. This minimises the cost where the benefit of control is extremely limited.

Seasonal settings – Represented by the blue line below, seasonal settings involve visiting sites twice a year to manually adjust governor pressures for winter and summer. These visits are to simply reduce the pressure setting in summer when demand is low and to raise it again in winter to cover higher demand. This method is used in larger mixed systems requiring significant operating pressure containing over 5% metallic mains.

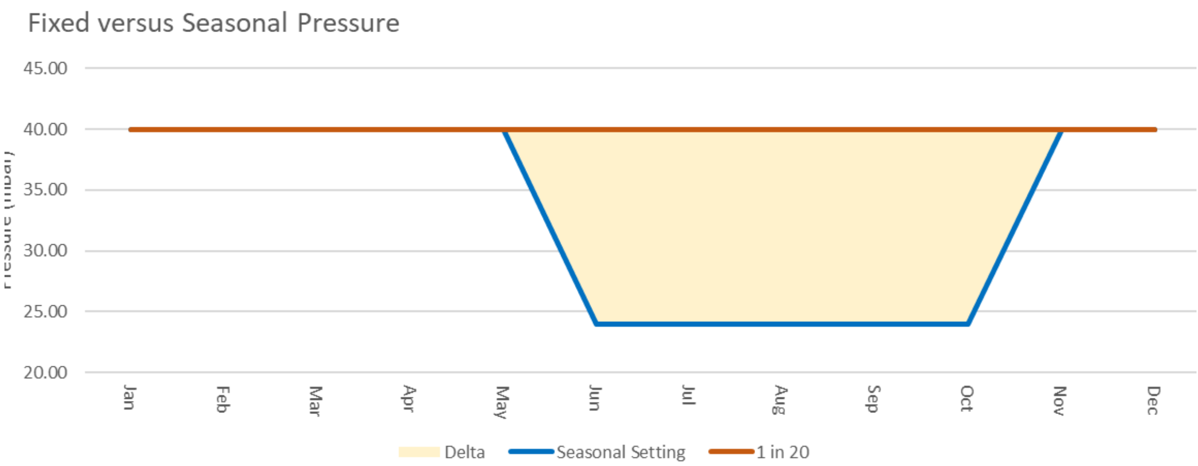

Figure 3 Fixed versus seasonal pressure

Profile control – This is the most effective method of control which allows us to alter the pressure at any time without the need to visit the site. The system comprises three main components:

- **An actuator** – An arrangement of pneumatic and electrical actuators and related mechanical safety overrides which can be used to control the pressure of the governor.

- **Datalogger and control unit** – This is the brains of the system. The datalogger reads the pressure from the outlet or the control pilot of the governor and compares it to a setpoint pressure profile. It is then able to adjust the actuator to dynamically set the governor to the desired pressure setting.

- **Communications module –** This is used to control the system remotely. We take a download of the actual pressure data each night and then use a demand forecast to set a pressure profile to be followed the next day.

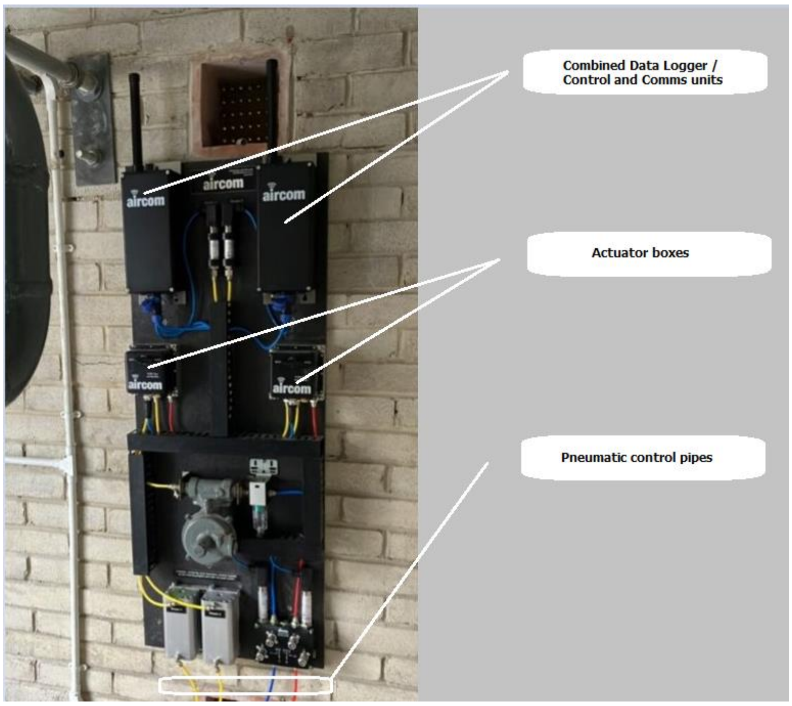

Figure 4 Newly installed control board

The new control boards have communication built into the Logging and control, reducing the number of components.

The chart below shows the benefit of profiling illustrating the reduction in average pressure on a typical winter day in comparison to a fixed 1 in 20 setting of 4o mBar.

For this illustration 80% of peek day demand has been used.

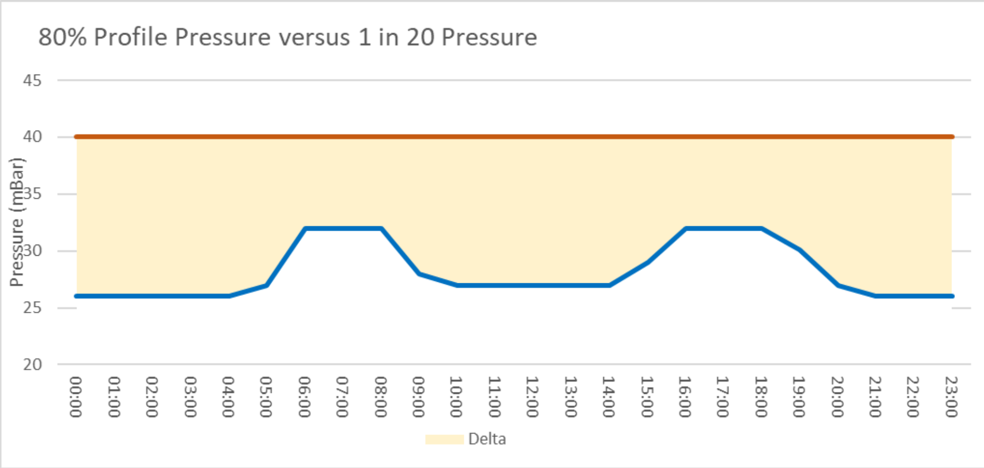

Figure 5 80% Profile Pressure versus 1 in 20 Pressure

Having two-way communication and control of the sites gives the following benefits:

- 24/7 access to pressure data from the control site
- Minimised effects from complex re-enforcements
- The ability to control network pressure to assist with pressure related incidents.

This is a more complex system to operate and is more expensive to maintain. Remote pressure control remains reserved for our biggest networks where the environmental benefit is greater.

For us to be able to manage the networks efficiently (we need to be able to ensure the effects of pressure control are as desired) we use additional data loggers to provide assurance that the correct balance of control and demand has been achieved. We have two types of loggers:

Network loggers - A dedicated pressure control team use loggers connected to the network at strategic points downstream of the governor supply. These 'Network data loggers' are also used to validate the networks. Close monitoring of these network loggers can and has previously given an early indication of developing network issues which if not acted upon could result in customers having poor pressure or loss of supply.

Governor data loggers - We have loggers fitted to district governors as it is fundamental to our leakage calculations. All our dataloggers are types which can send data remotely. Profile systems have built in telematics which means a separate logger is not needed.

Having a daily stream of data means we can conduct basic health checks on governor control daily. Any control faults with governor control are passed to our maintenance department for resolution as soon as they are identified. Previously this was only done during part of a 4-6 weekly visit, during which, the governor may have been relying on safety devices.

In RIIO-GD3, NGN will use our data logging in more ambitious ways by looking at emerging technologies to acquire data more frequently to get a real time picture of how the network is operating. We are also looking at emerging technology to provide additional intelligence such as flow data which, in combination with other sensors, will support us in real time monitoring to identify issues early and potentially prevent supply and other incidents.

Finally, although not a new development, many of the new loggers we have had fitted support the addition of intrusion detection. Having this facility adds an extra layer of security for little cost.

What is the outcome that we want to achieve?

From our stakeholder research (for example, see Insight 1, 9 and 10 from Appendix A3 below) we know that network reliability and cost remain key priorities for our stakeholders. Customers also value the importance of improving resilience against extreme weather, such as storms. From the risk analysis in Section 5 of this document, for this group of assets environmental (carbon) followed by compliance risk are the main risk drivers.

We know that our customers expect value for money and that we need to make the right investment decisions for both our existing and future customers. We have proposed four objectives covering risk, cost, service, and uncertainty. These will be used to determine how successful each option considered is at delivering against our customers' expectations.

What we heard	Appendix A3
Keeping bills as low as possible continues to be domestic and SME (Small Medium Enterprise) customers' top priority, however stakeholders are supportive of investment to respond to significant challenges of climate resilience and decarbonisation. Balancing the trade-off between investing now to future-proof and minimising expenditure to prioritise essentials poses a challenge.	Insight 1
Customers expect our top sustainability commitment to be keeping our infrastructure resilient. This means continuing to reliably supply customers in the short and long term, regardless of climatic conditions and impacts experienced by interconnected sectors (such as telecommunications, road networks etc). As customers are satisfied with the performance and availability of our services, they prefer us to maintain service levels at levels similar to today and asked for us to reduce future risk with targeted investments to enhance removal, reduction, resistance and recovery strategies.	Insight 9
The impact of climate change requires us to proactively reduce the vulnerability of networks to storms, particularly in rural areas, and a collaborative, cross-network approach. 'Preventing supply interruptions from extreme weather by providing back up power' was the most highly valued service improvement among billpayers in our Customer Value Perception study (on average, respondents were willing to pay £0.53pp at 75%).	Insight 10

Table 2 Customer Insights

Risk objective: to maintain total risk to the same level as the starting position of RIIO-GD3 (plus or minus 10%)

We want to manage total risk

We know that our customers value safety and reliability as their number one priority within the RIIO-GD3 period. In addition, we want to manage increasing risks to provide a safe working environment for our operatives and avoid loss of supply events. A key element of risk is also leakage emissions, of which a key driver is average system pressures. We will aim to maintain risk throughout RIIO-GD3 to plus or minus 10% from the RIIO-GD3 starting position. However, we understand the need to balance this ambition with service and cost constraints.

We are on track to meet our NARM target in RIIO-GD2. RIIO-GD3 is considered to be a roll-over price control so we have seen no need to take a step change approach to risk and have therefore adopted a risk objective that is consistent with that adopted in RIIO-GD2.

Efficiency objective = to minimise RIIO-GD3 spend over and above RIIO-GD2 levels

We know that our customers expect us to invest their money wisely and efficiently to enable a reduction in their bills. To do this we need to make sure we maximise value from our existing assets before we replace them However, we must understand the whole life cost of the decisions we make to ensure we are doing the right thing both now and in the future. As risk is rising sharply in RIIO-GD3, it is expected that we will need to intervene on more assets than we have during RIIO-GD2 to meet our objectives around managing total risk. To avoid escalating costs we therefore need to think of pioneering solutions to ensure we are delivering value for money for our customers. Whilst our RIIO-GD3 spend exceeds our RIIO-GD2 spend at a total level, it is only a marginal increase and includes provisions to take advantage of new technological improvements and to upgrade our remote monitoring systems. This will allow us to have better real-time data on our network and to identify network issues as they are arising and before they escalate into significant problems so as large scale loss of supply events.

Our aim at the outset is to maintain spend relating to asset health in RIIO-GD3 broadly in line with RIIO-GD2 levels, where this is possible.

Our objective in RIIO-GD2 was to maintain cost. However, the objectives we are setting out are becoming increasingly conflicted with one another as we move into RIIO-GD3. For example, increasing rises in risk and supply interruption from deterioration in the asset health of our assets, alongside obsolescence and compliance are key drivers for additional investment in RIIO-GD3, over and above the levels we saw in RIIO-GD2. We view maintaining risk and service levels and delivering a reliable, safe, and compliant network for customers as a higher priority than maintaining cost at RIIO-GD2, given the evidenced need for additional investment which is explored in our options appraisal. We are continually committed to providing a balanced programme of work and delivering value for customers. We have therefore updated our efficiency objective in RIIO-GD3 to minimise cost in RIIO-GD3 over and above RIIO-GD2 levels.

Service objective = to maintain supply interruptions to the same level as the starting position of RIIO-GD3 (plus or minus 10%)

We want to continue to provide exceptional service

The key service measure for our governor assets is the total expected number of supply interruptions. Table 1.06 of the 2023/24 Regulatory Reporting Pack (RRP) submission highlights that our current customer satisfaction scores for unplanned interruptions are exceeding the targets set by Ofgem (9.37 target against our actual performance of between 9.543 and 9.650 between 2022 and 2024). We therefore consider that current service levels are acceptable to our customers and provide a suitable benchmark.

As the regulatory landscape is likely to broadly remain the same in RIIO-GD3, adopting risk and service level objectives that are consistent with that adopted in RIIO-GD2 seems appropriate. Other Reliability metrics outlined in Table 1.06 of 2023/24 RIIO-GD2 RRP demonstrate that we are currently operating a highly reliable network. Our aim therefore to maintain our RIIO-GD2 industry leading service levels in RIIO-GD3.

Certainty objective = to ensure our investments pay back within 16 years

We will protect our customers from future uncertainty

To ensure the investments we make in RIIO-GD3 are right for both our existing and future customers, and to avoid the risk of asset stranding, we must ensure that our investments offer a payback before either the asset life or a point in time where future uncertainty could reduce the forecasted benefits, whichever is the smallest time period. The RIIO-GD3 Business Plan Guidance states that a 16-year payback period is appropriate for the GD sector (page 45)[1], meaning that any new, refurbished or replaced equipment that pays back within this time frame will be deemed suitable for investment. We comfortably meet this objective with out pressure management proposals and they represent a no regrets value for money investment for customers.

[1] https://www.ofgem.gov.uk/publications/riio-3-business-plan-guidance

Compliance objective = to ensure we are compliant with legislation relevant to each asset class

We want to ensure compliance with all relevant health and safety, or technical regulations.

During RIIO-GD3 we are required to undertake several interventions for compliance reasons. Failure to maintain our pressure control assets risks non-compliance with the Pressure Systems Safety Regulations (PSSR) which is mandated by the Health and Safety Executive (HSE). Remote monitoring of our systems and investments included in this EJP are a key component of our compliance strategy.

How will we understand if the spend has been successful?

A key metric reported in RRP and our Environmental Action Plan annual updates is the shrinkage, which is by far our biggest environmental impact. Pressure management, which allows us to keep average system pressures as low as possible whilst ensuring security of supply during peak demands, is a key contributor to this. Without ASP minimisation, which is driven by the investments proposed here, the shrinkage targets we have proposed will not be achieved.

5.1. Narrative real-life example of problem

The below case studies highlight narrative real-life examples of the problems being addressed through the proposed investments in this paper.

CASE STUDY 1 – HALIFAX FACTORY INCREASES PRODUCTION

In 2024, a factory in Yorkshire increased its production which led to a local supply issue in the immediate area. This was temporarily overcome by increasing district pressure, supporting the factory, but this in turn will have increased potential leakage impact in the area.

The pressure control team had a logger installed close to the factory to see in detail, how the increased load was affecting the network and with this information, were able to lower the pressure to a level which kept the factory running, with a reduced potential of localised leakage. This was all completed with minimum impact on the factory which is a significant player in the local economy.

CASE STUDY 2 – CREEPING PRESSURE IN MIDDLESBROUGH

Having around 7000 datapoints to monitor can be challenging but the team have developed a series of reports which will indicate if there is anything which is beginning to fall outside of its defined limits. Typically pressure control are looking at leakage levels on the low-pressure system, but in the summer of 2024 the team noticed that one of the inlets looked to be higher than normal. Under closer inspection it was observed that the inlet during low demand conditions had been gradually rising. It was also noted that it was affecting several sites. Although there had not been a breach, it was clear that if left the site may breach the networks pressure limits, so an emergency job was raised to investigate. Within 2 days the issue was discovered to be a problem with one of the regulators feeding the system. This was repaired and the network returned to its normal overnight pressure.

CASE STUDY 3 – ADDITIONAL VALUE FOR MONEY

Everything we deliver is funded by the people of the towns, cities and other communities in our area who use gas as a reliable source of fuel for cooking and heating. It is therefore imperative that we keep our network clean and safe and ready for the future which is why we have a replacement plan. But mains replacement can be an expensive process.

> This is why NGN have produced a CBA for insertion. By calculating what the environmental effects of increasing a governor pressure with the cost to the customer of an alternative open cut scheme, we can make significant cost savings and reduce the need for the disruptive roadworks. Because we control the pressure in our networks, the environmental cost of these increases is negligible as the slightly higher pressure is only needed for short times on only the coldest days.

5.2. Project boundaries

The boundary of spend proposed by this justification paper includes capital investment on the assets listed in Section 4. It includes all necessary project costs such as site selection, procurement of materials, construction, commissioning, and overheads. It does not include any operational costs such as routine maintenance, battery replacements or airtime. It also does not include any upgrades to district governors or any other type of logger such as those used for cathodic protection.

Validation

In RIIO-GD1 NGN invested in the complete renewal of validation loggers from 'fit on demand manual download'. Types to remote 'fit and forget' loggers which gave us data daily from across the network regardless of validation requirements. This has been incredibly useful when investigating network issues such as water ingress and has in fact been used to predict water ingress in some cases.

In RIIO-GD2, we worked to maintain the fleet of remote loggers either by replacing them or replenishing batteries to extend their life, but this has become increasingly difficult.

Also, as the networks developed though replacement and growth, some of the validation points are no longer in optimal positions.

In RIIO-GD3, we are proposing that we replace any devices which have not been renewed already in RIIO-GD2. Rather than like-for-like, our ambition is to utilise the latest technology to capture real time data, meaning we will have greater visibility of what our networks are doing now, rather than what they did yesterday.

To get the best value, we will carry out a review of the current logger positions and carry out works to remove, renew install or relocate posts as required.

Validation loggers	Units	Unit Cost	Total
Replace old Validation Loggers	2000	£ 1,276.00	£ 2,552,000.00
Install / replace Posts	200	£ 1,740.00	£ 348,000.00

Table 3 Validation loggers / posts preferred units and costs

Pressure control

Pressure control remains the most effective method of leakage reduction. NGN currently have 36 networks with profiling fitted, which is around 900 district governor sites and 80% of the metallic mains in our low pressure systems. In RIIO-GD3 some of these systems will be reaching their end of life, so after an ongoing site-by-site assessment of the continued benefit, the proposal is we will replace some of the ageing fleet with the new real time controllers we have developed in RIIO-GD2. This assessment will be carried out in the event of failure or annually during seasonal settings.

Where the assessment shows it to not be viable to replace a profiler which has reached end of life, we will replace the profiler with a datalogger.

Pressure control material costs	Units	Unit Cost	Total
Remove profiling and make logging only	100	£ 1,658.00	£ 165,880.00
Replacement of parts (refurb)	400	£ 1,740.00	£ 696,000.00
Full replacement	400	£ 8,120.0	£ 3,248,000.00

Table 4 Pressure control preferred units and costs

Governor dataloggers

In RIIO-GD2, we replaced all our ageing datalogger fleet. Throughout, we used the best equipment available. Some of the loggers fitted in years 1 and 2 will be beyond their expected lifespan by the end of GD3 so we expect there will be a need to replace some devices. Where possible we will be replacing these with IOT type loggers which can report in real time with a lifespan of 10 years or more.

In addition to this, we hope to enrich our monitoring on some of our more strategic sites to include data such as access monitoring, slam-shut or relief sensing and new low pressure flow sensors which are coming to market.

Governor logger material costs	Units	Unit Cost	Total
Enhanced monitoring upgrades	200	£ 1,450.00	£ 290,000.00
Real time data upgrades	800	£1,983.60	£ 1,586,880.00

Table 5 Governor logger preferred units and costs

Real time data monitoring

Finally, in RIIO-GD2, we are aiming to trial systems which can provide richer presentation of real time data combining all pressure tiers; a full end to end monitoring system. In RIIO-GD3 we aim to fully adopt such a system ensuring all Cyber security and innovation findings are applied.

This will give us real a real time indication of issues as they occur in the network and help us plan better for the future, whatever that brings. This could potentially prevent and/or reduce the impact of loss of supply events, as well as support early leak and fault identification to ensure efficient and cost-effective resolution.

To do this we plan to integrate our low-pressure data with some of our higher-pressure data, with all the advanced alarm and alert management advantages this brings, giving us an end-to-end view of our gas network.

This, with the combination of real time monitoring and additional sensors, will validate the distribution of gas throughout our system from offtake to distribution.

Futureproofed network monitoring solution project one-off cost: **£904,800**

6. Probability of failure

The Probability of Failure (PoF) is the probability an asset will fail at a given point in time. There are two main types of assets in this area - data loggers and controllers. An explanation of the types of failure and rate of failure are detailed below:

Types of Failure

- **Data loggers –** data loggers are quite reliable, but we do have problems with battery failures, transducer failures and older devices can simply stop working. Validation loggers specifically will suffer GPRS failure and occasional physical damage.

- **Remote pressure management equipment** – These devices may lose site communication, experience battery failure and/or the solar panel gets damaged/stolen. If a profiled site fails, the regulator will default to its safety mode which is the 1 in 20 setting. This older equipment has a standard lifespan of around 8 years. These sites have been partly renewed or replaced in RIIO-GD2. Due to the age of the older equipment, this will continue to in RIIO-GD3 so that by the end of RIIO-GD3 we should aim to have very little of the older equipment remaining.

  Newer controllers are expected to be far more resilient, being serviceable up-to 10 years or beyond as there is no solar panel or any external parts.

Rate of Failure

- **Remote pressure management equipment** – Older equipment fitted in RIIO-GD1 is currently around 10 years old. We are getting faults from these sites more frequently due to general wear and tear. We have completed some replacement work in RIIO-GD2 for sites and areas where we have specific reliability issues. The new equipment is less complex and less prone to failure.

  In networks where a pressure management strategy is still beneficial in RIIO-GD2 we will need to replace or refurbish the existing equipment to ensure it remains operational.

- **Validation loggers –** Some of the existing validation loggers have been in place since RIIO-GD1 and are already well beyond their normal asset life. We expect these will fail through electrical failure and will need to be replaced in RIIO-GD3. In most cases, devices fitted in RIIO-GD2 are expected to last throughout RIIO-GD3.

- **Governor Loggers –** Governor loggers are more critical to our process, therefore in RIIO-GD2 we renewed the entire fleet. Those replacements done in the first 2 years of RIIO-GD2 were older types with a 5-year asset life. Subsequent installs were newer types which are expected to last beyond 5 years. We are therefore expecting fewer governor logger failures in RIIO-GD3 which will be limited to those earlier devices.

6.1. Probability of failure data assurance

Profilers' likelihood of failure: The proposal for existing profilers is that we will continue to maintain them where it is practical to do so or to replace them with the new solution. Where it is not economical to do either we will fit a logger to maintain the dataflow and sufficient coverage we need across our network. Given that we are successfully delivering a similar approach in RIIO-GD2, we are confident that this will be successful and sufficient in RIIO-GD3.

7. Consequence of failure

For each pressure management system failure type there is a Consequence of Failure (CoF).

The following consequence measures illustrate the wide-reaching impact of the asset interventions outlined in our RIIO-GD3 capital expenditure programme:

Environmental risk: The projected reduction in shrinkage gas is the only quantifiable “benefit” used to calculate the present value in all pressure management scenarios stated in our CBA . The agreed industry standard model provides a robust methodology to value the change in risk attributed to each pressure management scheme.

Failure of our pressure systems would mean we cannot mitigate network leakage or minimise the average volume of gas lost per escape.

Customer risk: Our license condition states that to ensure supply assurance in the event of extreme demand surges we must flow gas to meet 1 in 20 peak day requirements. Without pressure management systems in place all network pressures will increase to their 1 in 20 settings. This would increase the likelihood of asset fractures and supply interruptions.

Compliance risk: Without logging equipment we cannot quantify the amount of shrinkage gas lost in our network. Certain settlement transactions with shippers are based on shrinkage volumes. Such purchases form part of our contractual obligation to shippers as stated in the uniform network code.

Financial risk: The volatility of the wholesale market ensures that we are currently susceptible to price fluctuations when making our mandatory shrinkage purchases.

Not having the appropriate pressure systems in place could also increase the following financial risks:

- Increased maintenance costs in dealing with escapes, including labour and repair.
- Complaints and compensation costs associated with supply interruption.
- Fines linked to not mitigating the damage caused in the event of us not being able to achieve our escape targets.
    - In 2010 we were fined £900k for failing to comply with SSC D10 paragraph 2(g) of our license

Health & safety risk: Being able to maintain low operating pressures, when possible, will help preserve our assets integrity. This will reduce the number of escapes that our maintenance colleagues must attend.

8. Options considered

Types of intervention

Maintenance and repair – Daily monitoring and quick re-active repair to ensure that performance is optimised, and the assets reach their expected life.

Refurbishment – As profile equipment reaches between 5 and 8 years, sites will need to have some new equipment fitted. Where components can be replaced with new technology, this will be considered but only if economical or innovation adds more benefit.

Replacement – Installation of a new asset to replace an existing asset, often because of poor condition. This would only be considered reasonable if a new, more efficient/reliable solution became available.

Addition – Installation of a new asset on our network to provide extra pressure management capability usually in response to a CBA assessment. An example of this would be installation of new pressure profilers throughout a network that previously was managed via seasonal settings or clocks.

Removal – Where we no longer require an asset, or we can manage our network in a more efficient manner we decommission the asset from our network.

Future Energy Pathways

We have gone with the default assumption of current assumed proportion of methane and carbon dioxide in natural gas projected forwards due to uncertainties in the potential energy pathways and because this is reflective of the current gas quality legislation. However, we acknowledge that significant changes to gas demand or the allowed methane content of gas, for example due to the blending with or conversion to hydrogen, would impact the benefits of our investments.

Given the significant benefits to leakage reduction of our preferred strategy compared to a do minimum counter factual, the benefits case for our proposal would not be materially impacted by any feasible blending scenario over the 16 years from the start of RIIO-GD3.

We have therefore not explicitly modelled changes in the methane content of gas in our CBAs, as overall gas demand and the change in CO2 content of the gas is not expected to be different enough to materially impact the NPV, Payback & Option Ranking of our preferred investment programme. Our chosen programme represents value for money over a 20-year period regardless. The investments also ensure that we are compliant with relevant legislation. Our strategy therefore represents a no regrets investment programme that is consistent with net zero and will deliver value to customers whether a hydrogen or electrification pathway is chosen.

How we make asset decisions

We aspire to make conscious decisions that are balanced across our asset portfolio to ensure we can leverage the most value out of our assets. In making conscious decisions we can evaluate the risk we hold as a business and the impact it has on our strategic objectives. Asset management relies on accurate data. During RIIO-GD2 we have been working to improve our data and the way we capture and store this information, so it can be used to benefit our decision-making process. We use a wide range of asset data, global values such as the cost of carbon and specific values such as the loss of supply, costs from our updated unit cost analysis. Technical experts analyse options and set constraints (such as a constraint with the objective of maintaining risk) within our Decision Support Tool which maximises the value of our investments for the given constraints. The assets covered under Pressure Management in this EJP do not directly fall under the NARM methodology and are therefore not directly included in in our DST. However, the principles we have applied in this area are the same. We have used Ofgem's Cost Benefit Analysis template to compare the Net Present Value (NPV) of each option against the baseline option to determine the most suitable capital programme in RIIO-GD3. The diagram above is a simplified representation of this process.

Figure 6 How we make decisions

Options analysis

To assess the viability of all considered options, we used the industry standard shrinkage and leakage model (SLM) to estimate the within year leakage emissions when implementing each investment scenario. The feasibility of each project is quantified by estimating our annual emissions under the baseline and comparing them to the relative reduction in emissions estimated under each proposed scenario. All within-year projected emissions assume that our gas composition is 77.31% methane. The estimated reduction in emissions have been converted to societal costs using the non-traded price of carbon dioxide, provided by Ofgem.

Repex and MEG saturation have been held constant across all scenarios in the industry standard model used. Subsequently, forecast shrinkage reductions across each scenario can be attributed to each pressure management strategy.

The assumed life of a logger and all pressure control equipment is on average 8 years under all scenarios which are industry recognised through use. Consequently, this CBA is carried out over an 8-year payback period. For information on our expected workload under each scenario refer to the RIIO-GD3 cost tab in the accompanying CBA template.

Ofgem CBA Template Assumptions

For all CBAs in our RIIO-GD3 submission, we used an assumed weighted average cost of capital (WACC) of 3.92% based on Ofgem guidance (a real average basis). We have assumed a depreciation Acceleration Factor of 100% across all CBAs and scenarios, i.e. no additional acceleration of depreciation. For Capex CBAs we have assumed a capitalisation rate of 33.7% based on our Totex forecasts in BPDTs and 100% for Repex CBAs. First year of expenditure outflow is set to 2027 in all scenarios for consistent relative NPV calculations. This is in line with Ofgem guidance for RIIO-GD3 and the approach taken in RIIO-GD2. We consider that the plausible ranges of these parameters would not materially affect CBA outcomes and have provided only one version of templates with these consistently applied (as they can be adjusted by Ofgem in any case).

We have not provided direct Opex associated with each CBA scenario as it would require us to artificially and subjectively divide up our maintenance and repair expenditure into each sub-asset class (CBA) and make a judgement on how this would be affected by each scenario. We do not record or report data at this level and we have no robust basis on which to provide it. In reality, maintenance and repair teams attend to multiple asset classes in single visits as part of an efficient function. Instead, we have provided the objectively calculated VF Financial risk, which is based on agreed industry NARM based calculations for estimating impacts on Opex under each CBA scenario. For those asset groupings not covered by NARM we have only included benefits and impacts of key benefits e.g. leakage. We consider this to be a more robust and objective approach to our CBAs. We have completed the NARM monetised risk memo lines from values in the NARM BPDT for baseline and preferred where they are available and relevant.

8.1. Baseline - Do minimum/nothing

This scenario assumes that pressure management strategies are not undertaken, including seasonal settings. We bypass and remove all profile equipment and operate at 1:20 pressures. We will continue to replace data loggers when they fail to ensure we are compliant with our leakage calculation requirements. Operational expenditure under the baseline is the cost to cover logger faults across all sites when they occur.

This would result in a substantial increase in carbon emissions. This is equivalent to the deferral option.

8.2. First option summary – Maintain current strategy (preferred option)

This option is a benefit tested either repair or replace profilers across our network. Where there is too little benefit of controls then the profiler will be replaced with a logger. We will also maintain existing dataloggers and proactively replace validation loggers which were not replaced in RIIO-GD2. Where we have metallic pipes in systems without controls we will continue applying seasonal settings.

This is the preferred option resulting in better monitoring and a balance of value for a reduction in carbon emissions.

8.3. Second option summary – Seasonal only

This scenario also assumes all sites with profiler in RIIO-GD1 have the profiler removed and instead have a logger installed. Governor and validation loggers will still be replaced if needed. The only difference is operational expenditure under this scenario includes costs to cover logger faults and 2 annual visits to apply summer and winter settings.

Although not quite as severe as the baseline, this would also result in a significant increase in carbon emissions.

8.4. Third option summary - 10 additional networks

Installation of new profile equipment in a further 10 low pressure networks. All other elements of this scenario are the same as the elements stated in Option 1, the maintain current strategy scenario.

This option may reduce carbon emissions slightly further but with a significant increase in cost that does not represent value for money for customers.

8.5. Options technical summary table

The table below summarises the total number of networks with pressure control equipment under each investment scenario included in our CBA.

Option	Strategy	Number of Networks				Number of interventions				
		Fixed at 1:20	Seasonal Setting	Profiled	Total	Replace Logger	Replace Profiler with Logger	Maintain Profiler (refurb)	Replace Profiler	Install New Profiler
0	Baseline - Do Minimum Counterfactual	265	0	0	265	200	900	0	0	0
1	Maintain current strategy (preferred)	147	82	36	265	200	100	400	400	0
2	Seasonal only	147	118	0	265	200	900	0	0	0
3	Additional Networks	147	72	46	265	200	0	450	450	93

Table 6 Options summary table

The table below summarises the total capital costs and outlines the workload required under each investment scenario included in our CBA.

		Options - Costs							
		0 - 1:20 Only		1 - Maintain		2 - Seasonal Only		3 - Do More	
	Unit Cost	Units	Total	Units	Total	Units	Total	Units	Total
Replace Logger	£ 1,450.00	200	£ 290,000.00	200	£ 290,000.00	200	£ 290,000.00	200	£ 290,000.00
Replace Profiler with Logger	£ 1,658.80	900	£ 1,492,920.00	100	£ 165,880.00	900	£ 1,492,920.00	0	£ -
Maintain Profiler (refurb)	£ 1,740.00	0	£ -	400	£ 696,000.00	0	£ -	450	£ 783,000.00
Replace Profiler	£ 8,120.00	0	£ -	400	£ 3,248,000.00	0	£ -	450	£ 3,654,000.00
Install New Profiler	£ 9,407.60	0	£ -	0	£ -	0	£ -	93	£ 874,906.80
	Totals -		**£ 1,782,920.00**		**£ 4,399,880.00**		**£ 1,782,920.00**		**£ 5,601,906.80**

Table 7 Options costs summary table

Below are four additional areas of spend which will be done alongside the above. Validation loggers in RIIO-GD2 was proposed independently of pressure control. In RIIO-GD3 we have included it here for clarity.

Other Deliverables	Unit Cost	Units	Total
Monitoring Upgrades	£ 1,983.60	800	£ 1,586,880.00
Validation logger replacement	£ 1,276.00	2000	£ 2,552,000.00
Replacement Logger Posts	£ 1,740.00	200	£ 348,000.00
System Solution	£ 904,800.00	1	£ 904,800.00
	Totals -		**£ 5,391,680.00**

Table 8 Other deliverables summary table

All unit costs are standardised across all scenarios. Any variance in cost between scenarios can be attributed to the differences in required workload under each investment choice.

Unit Costs are based on costs and estimates provide by current suppliers.

The table below details the unit costs associated with each investment area.

Investment Area	Cost description	Cost Split	Unit Cost
Governor Dataloggers	Replacements	Capex	£ 1,450.00
	Replace Profiler with Logger	Capex	£ 1,658.80
	Airtime	Opex	£ 150.00
Profilers	Install New Profiler	Capex	£ 9,407.60
	Replace Profiler	Capex	£ 8,120.00
	Maintain Profiler(Refurb)	Capex	£ 1,740.00
	Fault Visits	Opex	£ 172.00
	Batteries and Airtime	Opex	£ 400.00
Monitoring upgrades	Attachment of additional instruments	Capex	£ 1,983.60
Validation	Validation logger replacement	Capex	£ 1,276.00
	Replacement Logger Posts	Capex	£ 1,740.00
	Airtime	Opex	£ 150.00
System Solution	Migrate / Enhance Monitoring system	Capex	£ 904,800.00

Table 9 Unit costs split

9. Business case outline and discussion

9.1. Key business case drivers description

As outlined in section 8 above, we analysed three options:

Option 1 – Maintain current strategy (preferred)
Option 2 – Seasonal only
Option 3 - 10 additional networks

We have assessed the net present value of each investment scenario utilising Ofgem's CBA template by comparing the capital and operational costs associated with each scenario and modelling the impact of each scenario on average system pressure, and therefore leakage, as calculated by the industry standard Shrinkage and Leakage Model (SLM) used for emissions reporting.

All alternative scenarios are compared to the baseline counterfactual of do minimum. The baseline position outlines what we expect our annual shrinkage position to be assuming minimal pressure control equipment.

One of the primary aims of reducing pressure is to reduce risks relating to gas escapes and shrinkage reduction is the only quantifiable "benefit" used to calculate the present value of each project. The agreed industry standard SLM model is the most robust way to make a valuation assessment. We have not captured additional benefits in the NPVs from reduced loss of supply risk and potential maintenance and repair savings from more robust monitoring of the system form the proposed investments. The below tables and graphs summarise the average system pressures and their leakage impact in GWh as modelled through the industry standard SLM.

		End of GD2	GD3				
Scenarios		**2025/26**	**2026/27**	**2027/28**	**2028/29**	**2029/30**	**2030/31**
0 - Do Minimum	**NO (GWh)**	108.90	103.93	102.59	100.40	97.60	94.36
	NE (GWh)	119.06	114.15	113.42	111.73	109.24	106.16
	TOTAL (GWh)	227.96	218.08	216.01	212.13	206.84	200.52
	ASP (mb)	32.22	31.83	34.30	36.77	39.22	41.69
1 - Maintain (Preferred)	**NO (GWh)**	108.90	103.93	98.39	92.79	87.35	82.16
	NE (GWh)	119.06	114.15	108.26	102.36	96.53	90.83
	TOTAL (GWh)	227.96	218.08	206.65	195.16	183.88	172.99
	ASP (mb)	32.22	31.83	32.06	32.27	32.48	32.68
2 - Seasonal Only	**NO (GWh)**	108.90	103.93	99.86	95.45	90.94	86.44
	NE (GWh)	119.06	114.15	110.16	105.81	101.20	96.46
	TOTAL (GWh)	227.96	218.08	210.02	201.26	192.14	182.90
	ASP (mb)	32.22	31.83	32.84	33.84	34.84	35.83
3 - Do More	**NO (GWh)**	108.90	103.93	98.22	92.47	86.92	81.63
	NE (GWh)	119.06	114.15	108.16	102.19	96.29	90.55
	TOTAL (GWh)	227.96	218.08	206.38	194.66	183.21	172.19
	ASP (mb)	32.22	31.83	32.00	32.15	32.30	32.44

Table 10 Scenarios average system pressure (ASP) and leakage impacts

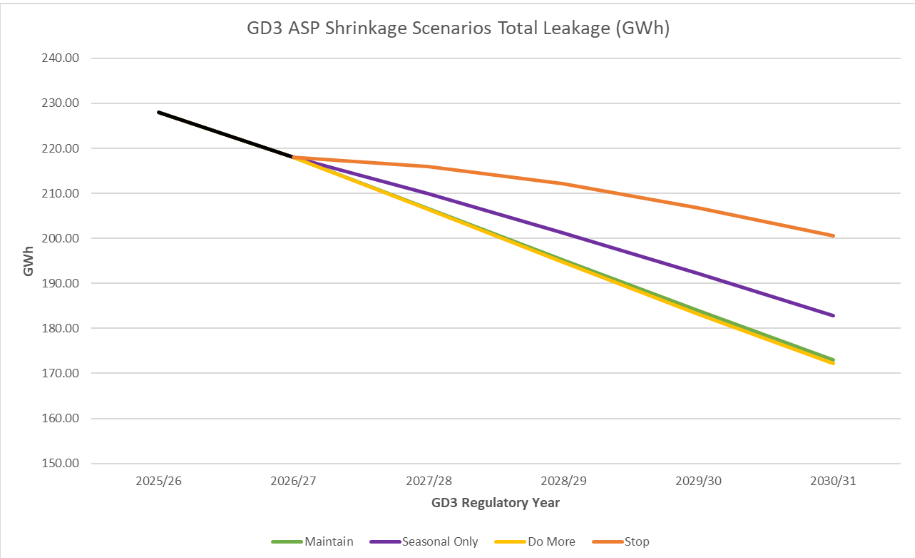

Figure 7 Scenarios leakage impacts

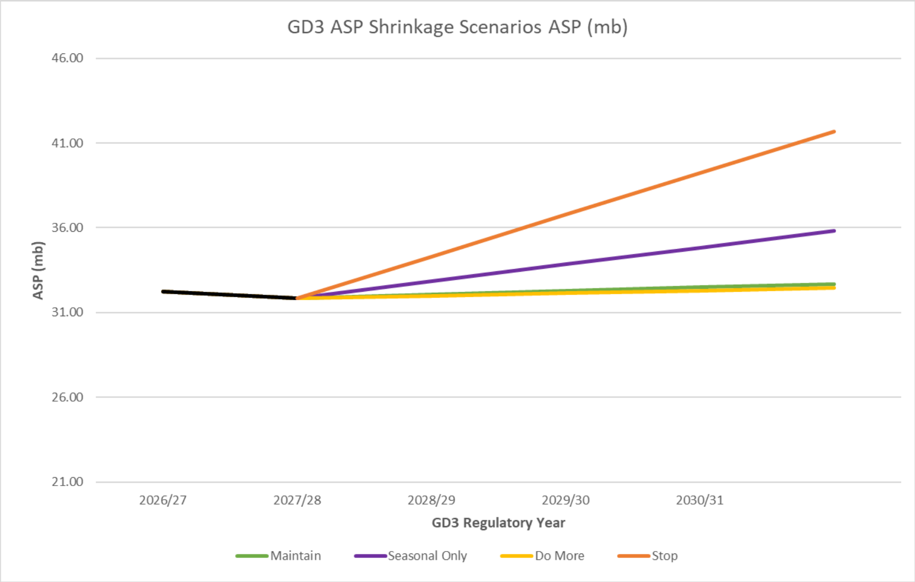

Figure 8 Scenarios average system pressure (ASP) impacts

The figure below shows that over the 10-year asset life of our profile equipment, the scenario which maintains current systems is comparable to the one that adds 10 additional profiled networks with the regards to highest cumulative net present value. Compared to the baseline, all options show a positive net present value. This illustrates the high importance pressure management has on operational efficiency.

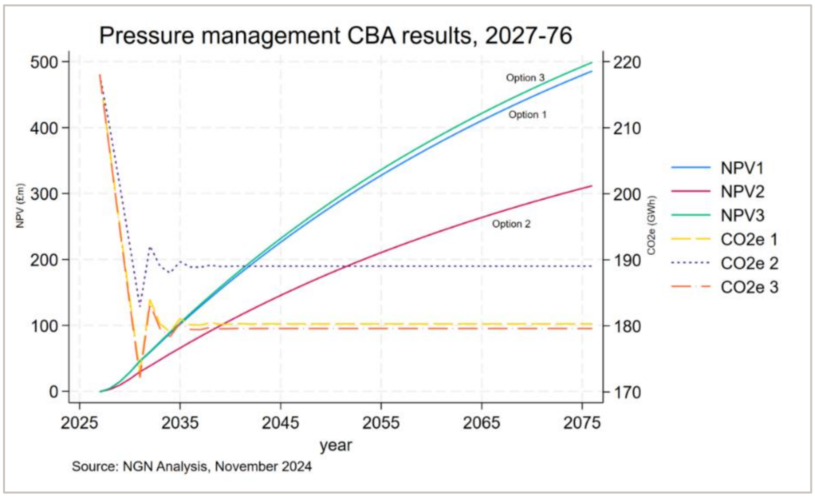

Figure 9 Net present value of each option and CO2e saved relative to the baseline scenario

This illustrates the importance our pressure control equipment in mitigating our business carbon footprint and is a key reputational priority of our company. It is also important to note that, as stated in the uniform network code, we are responsible for purchasing gas to replace the gas lost through shrinkage. Consequently, all shrinkage efficiencies contribute to a direct cost reduction in shipper purchases and therefore customer bills too.

The estimated carbon savings referenced are dependent upon our mains replacement programme delivering their forecast replacement, which we have consistently delivered since 2002 and expect to continue to do so till completion in 2032. All figures above assume that our gas composition is predominantly methane and utilises the conversion factors in the Ofgem CBA template. Given the significant NPV of our investment programme, we have not carried out any sensitivity analysis on this as it would not materially impact the results or recommendations.

9.2. Business case summary

The table below details the headline business case metrics to allow a high-level comparison of the options:

Option	Description	Total NPV Compared to Baseline (£m)						Payback (years)	Preferred Option
		2035	2040	2045	2050	2060	2070		
-	Baseline	-	-	-	-	-	-	N/A	N
1	Preferred	69.72	115.02	155.93	192.86	256.04	308.30	2	Y
2	Do More	45.23	74.31	100.53	124.18	164.64	198.10	2	N
3	Do Less	70.91	117.44	159.50	197.48	262.51	316.29	2	N

Table 11 Summary of CBA outputs

10. Preferred option scope and project plan

Deliverables

- Replacement of governor loggers which are expected to fail (c.200 units)
- Upkeep replacement or decommissioning of existing pressure controls (900 units)
- Replacement of any remaining old network loggers (2000 units)
- Enhanced Monitoring of sites (c800 Units)
- An improved (Smarter) monitoring system

District Governors

- Real time suitability assessments of all current profile control equipment
- Remove, maintain or replacement of equipment based upon suitability.
- Replacement of any failed logger equipment on district governors

Validation

- Replacement of any Validation loggers which have not been replaced in GD2
- Replacement of around 200 posts where the existing is no longer fit for purpose or badly located.

Digital enhancements

- Introduction of new battery powered sensors onto sites such as Flow, Slam shut monitoring and intruder alarms.
- Development of a new monitoring solution with business procedures to handle the above and incorporate findings from projects such as the SIF Smart Grid Project.
- Maintain systems Cyber security to an appropriate level which is proportional to the criticality of the function.

Overall this will result in average system pressures on our network being circa. 9 millibar lower by the end of RIIO-GD3 than a counterfactual do minimum resulting in significant leakage saving, as detailed later

10.1. Preferred option

The preferred option is Option 1 – Pressure Management: Maintain current strategy as outlined in section 9 above. This strategy has been successfully employed in RIIO-GD2 and we propose to continue this in RIIO-GD3, whilst making use of the latest technological developments and innovations to ensure our monitoring system is fit for purpose and robust.

10.2. Asset health spend profile

The table below details the intervention workloads, and our capital expenditure plans under our preferred RIIO-GD3 strategy scenario.

	Intervention type	Total Workload	Unit Cost inc. overheads	Capital expenditure (£m)					
				26/27	27/28	28/29	29/30	30/31	Total
Replace Logger	Replacement	200	£1,450.00	£58,000.00	£58,000.00	£58,000.00	£58,000.00	£58,000.00	£290,000.00
Replace Profile with Logger	Replacement	100	£1,658.80	£33,176.00	£33,176.00	£33,176.00	£33,176.00	£33,176.00	£165,880.00
Maintain Profiler	Refurbishment	400	£1,740.00	£139,200.00	£139,200.00	£139,200.00	£139,200.00	£139,200.00	£696,000.00
Replace Profiler	Replacement	400	£8,120.00	£649,600.00	£649,600.00	£649,600.00	£649,600.00	£649,600.00	£3,248,000.00
Monitoring Upgrades	Addition	800	£1,983.60	£634,752.00	£634,752.00	£317,376.00	£0.00	£0.00	£1,586,880.00
Validation Logger Replacement	Replacement	2000	£1,276.00	£510,400.00	£510,400.00	£510,400.00	£510,400.00	£510,400.00	£2,552,000.00
Logger Post Replacement	Replacement	200	£1,740.00	£69,600.00	£69,600.00	£69,600.00	£69,600.00	£69,600.00	£348,000.00
System Solution	Replacement	1	£904,800.00	£90,480.00	£361,920.00	£361,920.00	£90,480.00	£0.00	£904,800.00
Total	**All**	**4,101.00**	-	**£2,185,208.00**	**£2,456,648.00**	**£2,139,272.00**	**£1,550,456.00**	**£1,459,976.00**	**£9,791,560.00**

Table 12 Summary of CBA outputs

The total forecast capital expenditure for Pressure Management has been included within this CBA.

10.3. Investment risk discussion

This is a large asset class. All the existing assets within the network in this asset class have been installed across RIIO-GD1 and RIIO-GD2 and have expected life spans between 5 and 10 years. Individual failures are simple and inexpensive to resolve, and systematic failure is highly unlikely so there is limited risk associated with failure.

There are multiple system suppliers, but components are often system specific so a failure of a part which is no longer available would result in a decision to replace the system at that site.

Experience has shown that delivery of projects of this type requires close monitoring which is why the team responsible for monitoring is also involved with delivery.

10.4. Project plan

Deliverables are broken into six categories for planning purposes, in most cases, these are as simple as site selection, purchasing and installation. Installation will take time due to the number of units so purchasing is typically done in batches. This also means we can take advantage of any developments in technology during the period.

For the system solution, this will follow a system delivery path which will be scoped and designed carefully before delivery begins with testing and go live are expected to be in years 3 & 4.

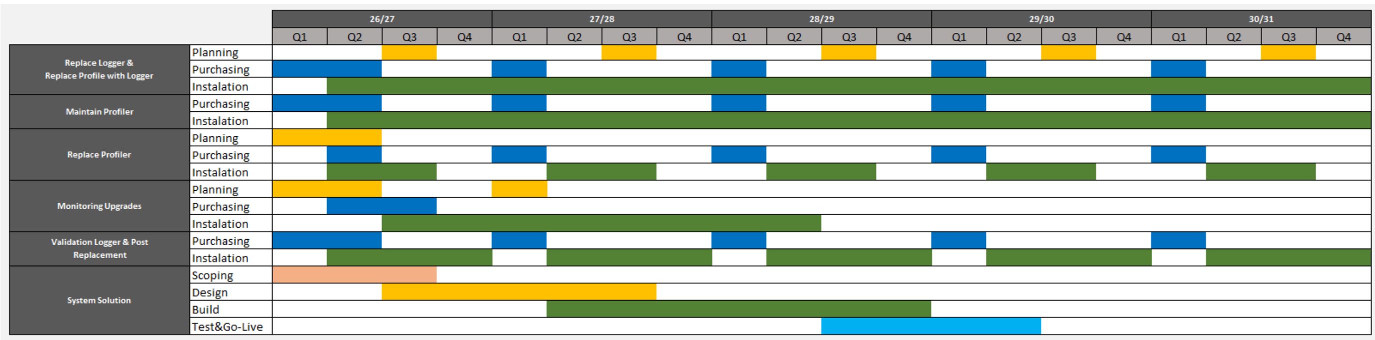

Figure 10 Project plan

10.5. Key business risks and opportunities

This proposal aims to remove risks which may occur due to insufficient understanding of network dynamics by not just maintaining our current data assets but building on them with layers of additional data and visibility.

We remain committed to maintaining a low level of methane emissions through the process of pressure control, and we additionally aim to remove some security and supply risks inherent to our processes.

There are risks associated with the total number of units being delivered in the program, this is due the large volume of small units which has been a challenge in the past.

However, as timelines are not critical, delays would not result in any significant impact, especially as failures would always remain a small percentage of the overall fleet. Costs are expected to be relatively standard across the period.

If we cannot achieve the entire program, then units can be reduced, this would result in poorer performance but would not impact in terms of demand or wider operation.

To reduce the risk, we intend to do as much of preparation as possible at the end of RIIO-GD2. Things like R&D and procurement can be done well ahead of delivery. We will also look to deliver the high-volume work as early as possible meaning if it does over-run, it will still be done within RIIO-GD3 and means we get maximum value from the enhanced monitoring.

We discuss in Chapter 5 of our Business Plan how we are mitigating against the immediate risks facing our business in the RIIO-GD3 period. In terms of network asset management, we have identified asset condition deterioration, obsolescence, and compliance – all of which are relevant to the odorant and metering interventions set out in our preferred strategy. There are also wider considerations which indirectly impact on our investment decisions. Our Workforce and Supply Chain Resilience Strategy (Appendix A7) sets out our plans to tackle potential future skills shortages. Whilst we are not envisaging specific skills shortages in the RIIO-GD3 period thanks to our long standing commitment to ensuring we have a 24/7, highly skilled workforce, we do need to ensure that our longer term investment proposals are deliverable given the future challenges we may face as an industry. This strategy also discusses how we ensure that we have a resilient supply chain that can withstand shocks and unforeseen circumstances. This is also an important consideration given the limited supplier and resource pool facing increased demand as we move towards Net Zero.

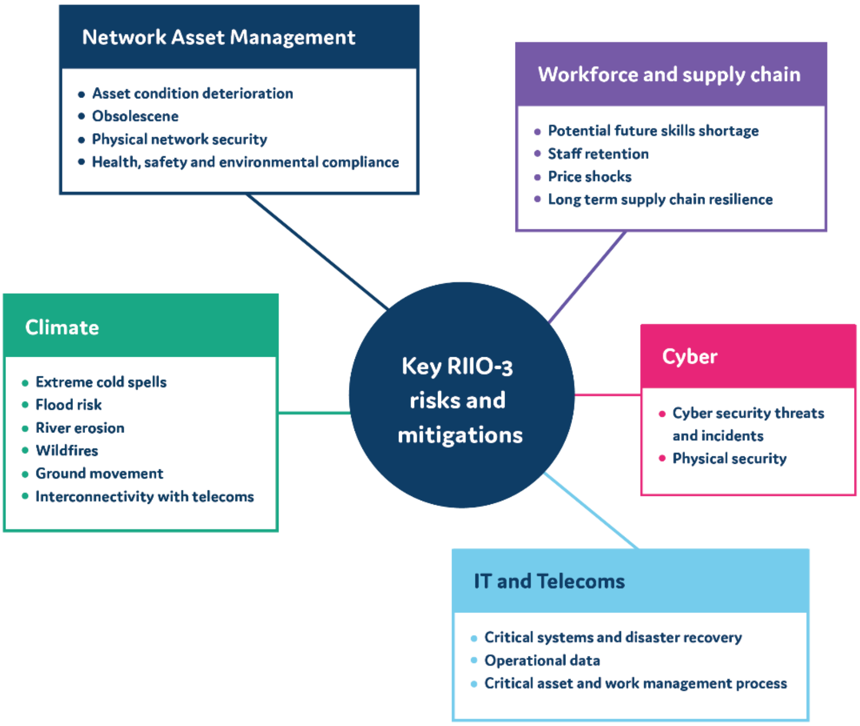

Figure 11 RIIO-GD3 Key Risks and Mitigations

10.6. Outputs included in RIIO-GD2 plan

In RIIO-GD2 we set out the following:

Replacement of parts on our existing control sites – this was completed, and we went beyond by replacing 100 of our existing profilers with the newer type.

Installation of 10 further networks – completed again using the new controllers.

Profilers do require intervention from time to time, and some are now old so we expect we will need to replace some profilers and, there will be some replacement parts needed for others to extend their life.

Replacement of all governor loggers – this was done, but some of the devices used earlier in the program only had 5-year lifespan so will need replacing in RIIO-GD3 too.

Replacement and servicing of validation loggers, this was completed on a reactive basis in RIIO-GD2, anything which was replaced should remain good in RIIO-GD3, but we are expecting to replace more substantial numbers in RIIO-GD2 as many of the loggers will be well over five years old.