Pressure Management Maintenance

Engineering Justification Paper (SGN-GD3-EJP-DST-010)

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Distribution Network Planning SGN

SGN

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1 Summary Table

Table 1: Ofgem Project Summary Table

SGN Pressure Management	Pressure Management System Maintenance		
Scheme Reference	SGN-GD3-EJP-DST-010		
Primary Investment Driver	Asset Health/Environmental		
Project Initiation Year	2026		
Project Close Out Year	2031		
Total Installed Cost Estimate (£)	£11.2m		
Cost Estimate Accuracy (%)	6%		
Project Spend to date (£)	£0		
Current Project Stage Gate	N/A		
Reporting Table Ref	5.06 Other Capex		
Outputs included in RIIO-GD3 Business Plan	Yes		
Spend apportionment	GD2	GD3	GD4
	£0	£11.2m	£0

All expenditure above 23/24 prices

2 Executive Summary

1 Pressure Management and Logger systems are a key component of the distribution network and are used to efficiently control network gas pressures and use communication networks to remotely control governor settings and avoid in person site visits to carry out manual pressure adjustments of pressure regulating equipment. The system is a critical tool in ensuring SGN optimise pressures limiting excess pressure in the system. To facilitate the necessary capital investment in the continued maintenance and replacement of these pressure management systems in Scotland and Southern, SGN are requesting a total of £11.2m across the RIIO-3 price control period, facilitating a maintenance programme and workload equating to an estimated 21,900 interventions across RIIO-3. This paper will explore in detail, the reasons behind an ongoing maintenance and replacement programme for pressure management systems, and what the likely impacts would be if it were to be abandoned. It will consider various options and the reasoning behind SGNs preferred plan.

2 Failure to maintain this programme would result in pressure management systems eventually failing, with an associated rise in outlet pressures at Pressure Reduction Installation (PRI) sites across SGN. Average System Pressures (ASP) are a key element of the mains leakage calculation within the Shrinkage and Leakage Model (SLM), and the significant increases in pressure associated with failed pressure management systems could increase SGNs reportable leakage by approximately 34.6 GWh per annum, equating to 42,435 tCO2e/annum (or equivalent to 37,000 cars off the road/annum). Continuing to maintain these systems is therefore fundamental to SGN's drive towards net zero.

3 The main driver for this proposal is to continue the current programme of maintenance on SGNs pressure management systems, which are vital in maintaining lower average system pressures and as a consequence, lower mains leakage volumes. It is for this reason that no formal CBA has been submitted. A review of the capital costs should primarily be compared against the environmental benefits of the programme and the significant increases in leakage volumes that would occur if these systems were allowed to fail. SGN are requesting an ex-ante funding mechanism across GD3 to enable efficient pressure management systems on the distribution system to be effectively maintained. Supply chain availability remains the primary risk to programme delivery. This can be mitigated through early visibility of workload volumes to allow Maintenance teams and delivery partners to plan effectively. The full list of project risks can be found in Key Business Risks/Opportunities.

4 Table 2 sets out the varying annual costs for the pressure management maintenance programme for RIIO-3 and reflects the changing number of predicted annual interventions required as more pressure management components require some form of maintenance.

Table 2: Project Expenditure Profile (23/24 Prices incl Overheads)global

Year	26/27	27/28	28/29	29/30	30/31	Total
Spend (£m)	2.2	2.2	2.0	2.3	2.5	11.2
Forecast Volumes	3,695	3,781	4,221	5,165	5,038	21,900

5 Table 3 reflects the allowances granted for a reduced programme in GD2, which only concerned the maintenance of SGN's self-learn profile systems.

Table 3: GD2 Expenditure and Workload Profile

Year	21/22	22/23	23/24	24/25	25/26	Total
Spend (£m)	0.8	0.8	0.8	0.8	0.8	4.0
Forecast Volumes	4,028	4,028	4,028	4,028	4,028	20,140

6 As we look to form our plans and develop our strategy for the next price control GD3, we have engaged with support from our Independent Stakeholder Group (ISG) with a wide range of our customers and stakeholders to better understand what their needs are and what they expect from us. We have responded, challenging ourselves to focus on the projects that prioritise safety and resilience, while delivering most value to our customers. This document should be read in conjunction with our GD3 Business plan, section C2 Customer and Stakeholder priorities. This section provides a greater level of detail of our approach to customer and stakeholder engagement.

3 Introduction

7 Pressure management systems control outlet pressures on over 80% of SGNs low-pressure network (approx. 58,000km of LP mains). To continue to operate these networks safely, efficiently and reliably, it is likely that the current programme of profiling and logger equipment maintenance and replacement workload in GD3 would need to continue, with the addition of necessary funding to maintain the operation of the Remote Pressure Management Electronic Actuator sites (Southern only) and the new systems and power sources required to operate the 4G comms at profiled sites following removal of Wholesale Line Rental (WLR) services.

8 Well maintained, efficient pressure management is key in ensuring SGN can continue to produce industry leading low average operating pressures and limit annual environmental emissions.

9 In GD2, there have been two major developments that have led to the expansion of business requirements in this area, in RIIO-3. These are:

- Installation of innovative Pressure Management Electronic Actuator system on 270 DG sites (Southern)
- Removal of Wholesale Line Rental (WLR) in 2025

10 The rollout of the innovative Pressure Management systems has driven a necessary increase in business expenditure to maintain and replace, both the power supplies to this equipment, and the datalogging systems required to monitor. Meanwhile, the removal of WLR will see the abolition of traditional Public Switched Telephone Network (PSTN) copper phoneline communications, on which the vast majority of SGNs profiling systems operate and rely. In GD2, SGN have instigated a comprehensive programme to re-fit all profiled sites with modern 4G communications equipment to enable the profilers to continue to control network pressures, once the PSTN lines have been removed. In GD3, this equipment will require ongoing maintenance and replacement of power sources.

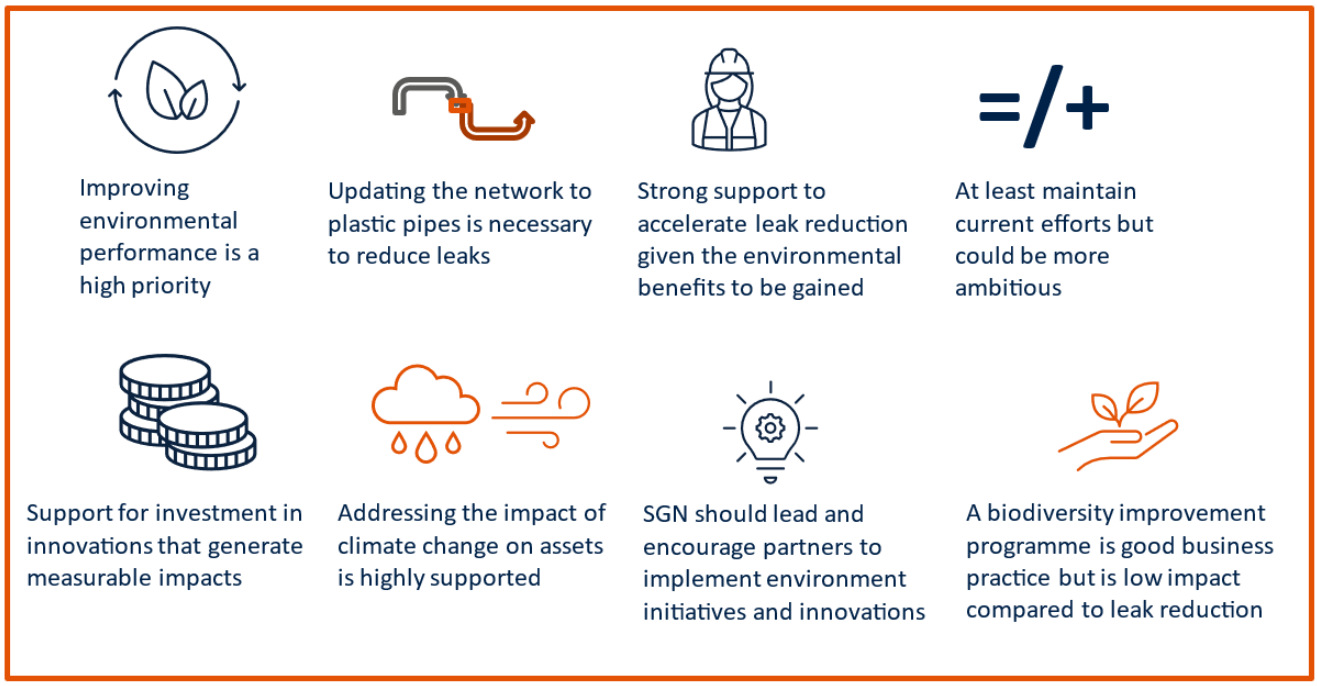
11 Pressure management systems are made up of individual components which over time will require remediation or replacement. Replacement of individual components can be driven by operational condition, environmental impacts, obsolescence, operation/usage, end of life (e.g., batteries), manufacturers' recommended replacement life cycle, compliance with relevant legislation (ATEX/UKEX, DSEAR) and SGN policy/procedures including T/PM/MAINT2 (Parts 1 – 3) – Management Procedure for the Maintenance of Pressure Reduction Installations.

12 **Note – Pressure Management Electronic Actuator Systems are not installed in Scotland as the RIIO-2 Price Control Deliverable (PCD) funding this programme is a Southern Licence Obligation only.**

13 SGNs GD3 Environmental Action Plan (EAP), specifically the 'Customer and Stakeholder Insights' section, explains in detail the outputs from the recent stakeholder engagement sessions and discussions with the Independent Stakeholder Group (ISG), highlighted in Figure 1 below. Utilising insight triangulation for high confidence, it summarises the main findings as:

- *"The majority of customers and stakeholders believe improving environmental performance is important with over a third rating it as 'very important'."*
- *"When considered for more investment, improving environmental performance is a high priority and generally ranked third by both customers and stakeholders. Of all the impacts we make on the environment, customers and stakeholders believe reducing gas leaks should be our key focus, with other environmental initiatives having a lower impact in comparison."*

Figure 1 – Summary of Stakeholder Priorities in RIIO-3



4 Equipment Summary

Profiling and Logger Systems:

14 Gas profiling and logger systems are a key component of the distribution network and are used to efficiently control network pressures, minimise leakage and in this way ensure SGN minimise the environmental impact through necessary operational activities. Systems are operated by using either a pre-programmed variable PRI setting or through continuously monitoring the network low point via a communication network (in GD3, 4G GSM Comms and Gascore). This allows network pressures to be optimised, which reduces gas leaks, shrinkage costs and environmental and societal impact. The systems incorporate an alarm warning system which alerts a central control system when a set point is detected, and this allows investigation into potential failures immediately.

15 The systems allow users to understand the dynamics of gas distribution through the network from PRIs to 'sense point' dataloggers and provide the critical operational information to facilitate necessary changes in system pressure to maintain security of supply whilst minimising environmental impact through excess and unwarranted system pressure.

16 The loggers require an annual calibration and ATEX visual inspection and, in general, this is carried out off site at local maintenance depots; batteries can be replaced during routine maintenance of the loggers.

17 SGN currently have logger systems and/or gas profiling fitted across Intermediate Pressure (IP), Medium Pressure (MP) and Low Pressure (LP) networks. There are profilers and loggers fitted to approx. 1,613 PRIs (Pressure Reduction Installations) and 694 sense points within SGN, across 120 LP networks.

18 The equipment is designed to be used in isolation from other manufacturers equipment due to the unique design of each system.

Figure 2: Typical Gas Profiler and Logger System

Figure 2 details a typical gas profiler and logger system.

Figure 3: Typical Profile Control System

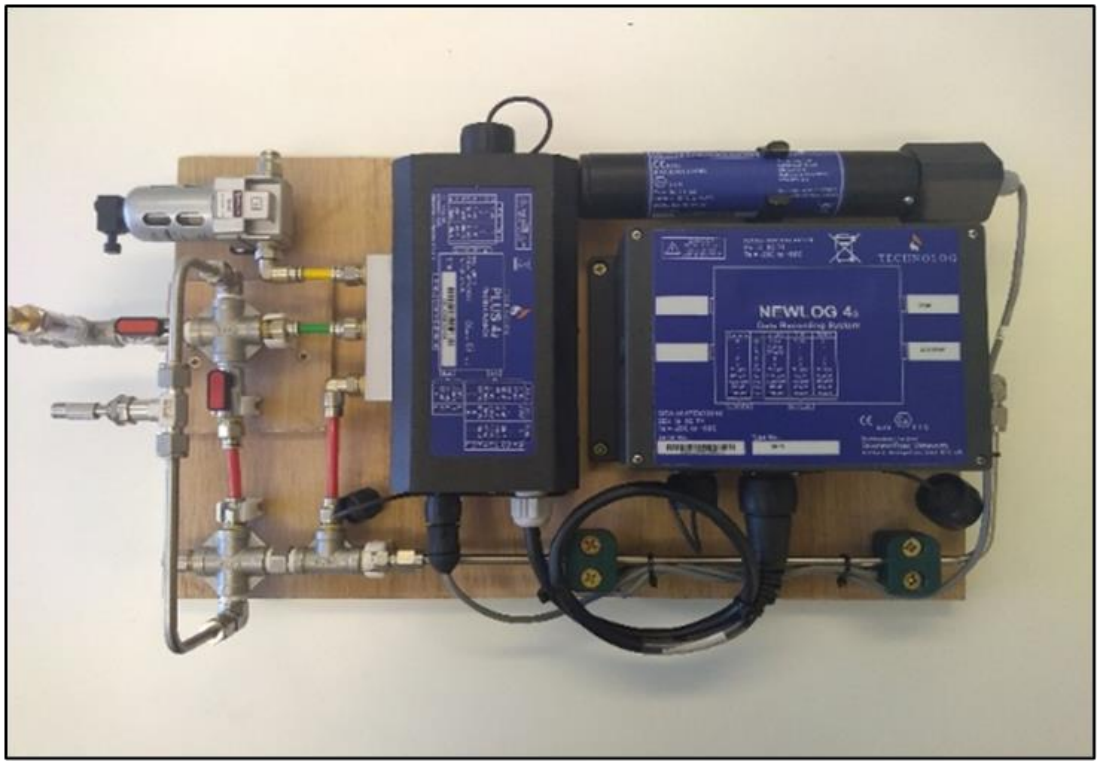


Figure 3 shows the control element of a profiled pressure management system.

Figure 4: Profile Control Sense Point/Reference Point

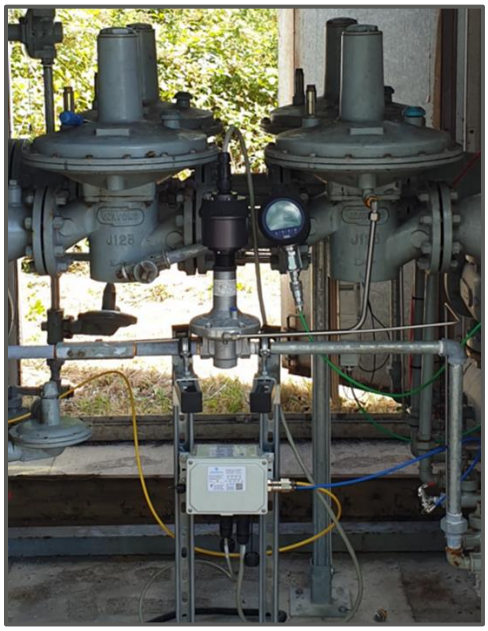
Figure 4 highlights the controlling sense (low) point logger configuration.

Electronic Actuator Systems (Southern Only):

19 The Remote Pressure Management Electronic Actuator system is a product of a National Innovation Allowance (NIA) project in RIIO-GD1, and SGN were granted funding through a RIIO-2 Price Control Deliverable (PCD), to install 270 systems across low-pressure networks within the South of England. The system has three separate modular components, the pressure regulating actuator, the control box, and on a number of sites, a wi-fi comms system. Upon commissioning, the system can be pre-programmed to perform at up to sixteen different pressure settings throughout a 24-hour period, and with bespoke seasonal settings throughout the year, ensuring that excess pressure is limited during low-demand periods, whilst maintaining security of supply, without the requirement to visit site seasonally.

20 The Electronic Actuator Pressure Management systems operate using a Valve Regulated Lead Acid (VRLA) battery pack with a design lifespan of 4 years, therefore SGN could expect to replace the power source on each site within the GD3 price control period. Also, the ongoing annual charges for data hosting and communications (SIM) will amount to £0.05m. 220 'clocking only' sites fitted with Abriox dataloggers will also require one battery change each in GD3, alongside an annual recalibration.

Figure 5: Remote Pressure Management Actuator and Control System



21 Figure 5 shows a typical configuration of the Remote Pressure Management Electronic Actuator system, currently being installed on 270 District Governor sites across the South of England. The image highlights the actuator and control unit.

Replacement Comms Battery on Profiled Sites (Following WLR Removal):

22 By 2025, all of SGN's Profilers and Loggers will have switched to a new 4G GSM communications system, following the removal of Wholesale Line Rental (WLR) PSTN phonelines. Previously, the residual power needed to operate the modem units was supplied through the phoneline, but the new comms system will require battery power. The power source for this system has a maximum design lifespan of 3-4 years, and the control unit itself has a design lifespan of up to 10 years, therefore SGN can expect to replace the battery pack twice during the price control period, and potentially the control unit on each site, once within the same period. As the Control Unit is new to the industry, it is not proposed to include these costs within this paper as product lifespan could in all likelihood run into GD4, but this may need to be addressed under some form of volume driver mechanism if significant numbers require replacement during RIIO-3.

23 There are a total of 4,614 Profiler, Sense Point and Logger sites, across both Scotland and Southern, that will require an ongoing maintenance programme throughout RIIO-3, to ensure these pressure management systems can function effectively and continue to operate the low-pressure networks as efficiently as possible.

Figure 6: Image of GSM Comms Replacement Unit

24 Figure 6 shows an image of the 4G communications (Cello M) unit, required to replace existing PSTN lines and maintain effective communication between profiled sites and the control platform, following removal of Wholesale Line Rental services in 2025.

5 Problem Statement

Why are we doing this work and what happens if we do nothing?

25 Leakage from SGN's distribution network forms approximately 95% of total Shrinkage, which in turn contributes 97% of SGN's carbon footprint (figures obtained from SGNs 23/24 Annual Environmental Report). The Climate Change Act 2008 (2050 Target Amendment) Order 2019 amended the Climate Change Act 2008 by introducing a target for at least a 100% reduction of greenhouse gas emissions (compared to 1990 levels) in the UK by 2050. New targets were recently agreed at the COP 26 conference in Glasgow when world leaders signed the Global Methane Pledge to reduce Methane emissions by 30% of 2020 levels, by 2030, so it is imperative that GDN's actively seek methods with which to control and limit network leakage. A key driver enabling this reduction, which SGN can influence, is control of average source pressures from above ground assets through efficient pressure management systems.

26 Failure to maintain and replace those assets could have the following impacts:

- Failure to replace expired battery power packs in electro-clocks could lead to a loss of supply to customers due to clocks being stuck on their reduced night settings when demand increases the next morning.
- Failure to replace failing profilers and expired battery power packs in profile controlled low-pressure gas networks could lead to the slam-open safety system operating resulting in unnecessarily inflated pressures.
- Failure to replace batteries powering the Electronic Actuator systems would lead to the equipment failing to its high setting resulting in unnecessarily inflated pressures.
- Failure to replace the battery packs and control units operating the new 4G comms systems would lead to profilers firing the slam-open safety systems, due to a lack of a predicted set-point pressure profile, and once again lead to unnecessarily inflated pressures.
- The consequences of excess system pressure would lead to:
    - Increased environmental emissions.
    - Potential increase in the number of Public Reported gas Escapes (PRE's) as networks will be operating at higher pressures.

What is the outcome that we want to achieve?

27 SGN wish to continue with the current gas profiling and logger system replacement programme, along with the additional workstreams to maintain the Remote Pressure Management installations, and the new communications systems, to ensure SGN can continue to operate networks in a safe, reliable, and efficient manner, and ensure these works will enable the continuation of remote monitoring and adjustment of Pressure Reduction Installations (PRI).

28 SGN will continue to follow the equipment manufacturer's guidelines on asset life and through ongoing maintenance and survey programmes, will ensure that this funding is spent efficiently.

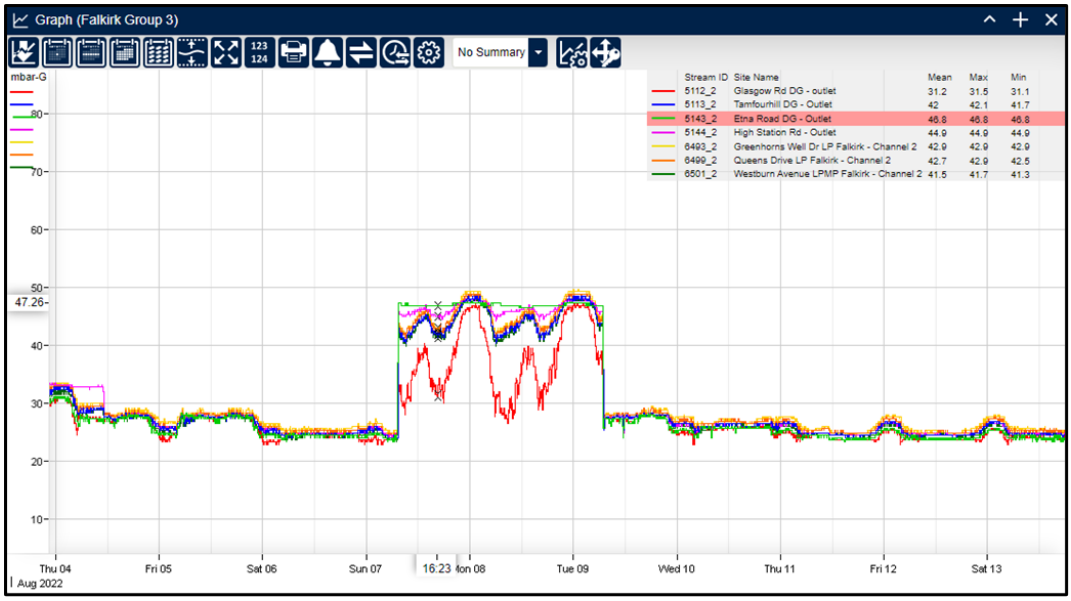
How will we understand if the spend has been successful?

29 The success of the programme and investment will be measured through completion of gas profiling and logger system replacement works in accordance with manufacturer's instructions and guidelines and within the estimated unit rate for the works. The equipment is purchased at published prices directly from the manufacturers ensuring lowest cost. This success will be measurable through SGNs Average System Pressures (ASP), reported annually through RRP and within the Shrinkage and Leakage Model (SLM). SGN have for many years maintained industry leading average pressures on low-pressure systems, and these allowances will enable a continuation of this outperformance, limiting environmental emissions.

5.1 Narrative Real-Life Example of Problem

30 The example below details a real life example of the problems that the requested allowances seek to resolve. The pressure chart in Figure 7 below, shows an image from SGNs GasCore system, taken from the Falkirk low-pressure network, in Scotland. The chart shows the effect of a profiler battery failure at Etna Road District Governor. As the battery begins to fail on Sunday 7th, the governor outlet pressure increases steadily from approx. 24mbarg., to 47mbarg. All other District Governor pressures within the profile group are dragged up at periods of lower demand, significantly increasing network pressures and leakage, as a consequence.

Figure 7: Example of Impact of Profiler Battery Failure



31 Other issues are driven by accelerated equipment failure in coastal locations due to excessive corrosion causing more frequent failures. Also, battery lifespan is impacted by usage (i.e., how often the component is requested to operate) and prolonged periods of cold weather. These impacts are continuously monitored and addressed by SGNs Maintenance teams.

5.2 Project Boundaries

32 The spend boundaries associated with this proposal incorporate the costs of purchasing and replacing approximately 21,900 components required to ensure the efficient operation of SGNs pressure management systems, across RIIO-3. The operational requirements at each individual site could range from minor battery changes to full system replacements. This is an ongoing programme of maintenance, which it is expected, will extend beyond RIIO-3.

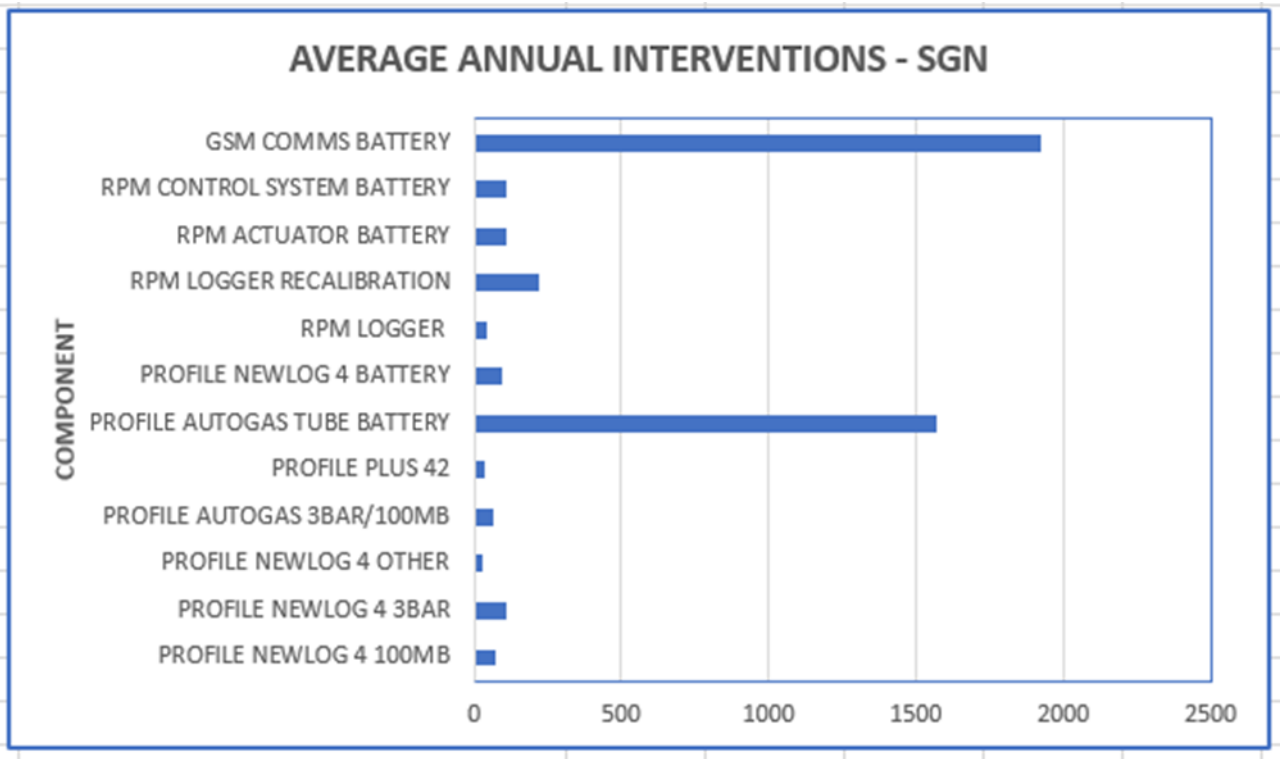
33 The spend boundaries of this proposal do not incorporate any additional pressure management installation projects (i.e., this funding request will not be used to expand SGNs pressure management programme to any District Governor sites or networks not currently pressure managed). It is solely to fund the ongoing maintenance of SGNs current pressure managed District Governor and Datalogger population.

6 Probability of Failure

34 Failure rates for components, including power sources and dataloggers, related to legacy profiling systems, have been developed over many years of installation in the field. Failures are logged and collated by SGNs Maintenance teams, and this data informs the estimates within this EJP (average values over the last three years).

35 For Remote Pressure Management Electronic Actuator systems and replacement GSM comms systems (post WLR removal), manufacturer recommended design lifespans have been used to forecast potential numbers of necessary interventions across RIIO-3.

Figure 8: Average Annual Pressure Management Maintenance Interventions



36 The figures in Figure 8 equate to a total of 4,380 interventions/annum on average, or 21,897 across the 5-year RIIO-3 price control period. In reality, due to the new technology currently being installed (RPM Electronic Actuator Systems and GSM (WLR) Comms), it is expected that more interventions will be required towards the latter part of RIIO-3.

6.1 Probability of Failure Data Assurance

37 Failure data for profiled pressure management systems has been logged and collated for many years. This along with the operational experience of SGNs Maintenance Engineers working with and maintaining profiled low-pressure systems for over 30 years, provides a high level of confidence in the failure data and proposed programme of replacement works.

38 However, the forecast workloads and costs for maintenance of the new Remote Pressure Management Electronic Actuator systems, and the replacement GSM communications system, are based on manufacturer recommended design lifespans, and are therefore subject to a greater degree of uncertainty. It is to be expected that the design operational life of any component/technology is based on bench testing/workshop conditions, therefore this could be considered to be at the higher end of expected lifespan, considering these components will now be experiencing a range of environmental conditions out in the field. As these systems

are being installed in GD2, the GD3 price control period will provide a firmer understanding of real life operational lifespans.

39 It is for this reason SGN have estimated a potential 6% variance in total project costs. This variance would account for a 10% increase or reduction in necessary replacement workload associated with the maintenance of the Remote Pressure Management Electronic Actuator systems, and the GSM communication systems, across GD3.

40 Our robust methodology provides confidence that our investment is aligned to address the probability of failure highlighted in this paper.

7 Consequence of Failure

41 The consequences of failure for gas pressure management systems can vary depending on the type of component that has failed. In general, the consequences can be described as follows:

Loss of supply to customers

42 In general, the failure of this equipment does not lead to loss of supply on a large scale. However, in some circumstances, profile and logger systems can fail causing temporary interruption to customers. Due to the varying nature of the gas networks, the impact of failure is affected by the size of the network, number of sources (DGs), the number of customers and gas demand at the time.

Safety impact of failure

43 The consequence of not replacing failing gas profiling systems and depleted logger batteries within the low-pressure network would lead to an increase in network pressures and associated increase in leakage volumes, and potentially additional public reported escapes / gas in building events. It is not possible to determine how many PREs or gas in building occurrences are solely attributable to higher network pressures, but it is accepted that there exists a correlation between higher pressures and increased leakage. Therefore, considering a worst case scenario, higher system pressures could possibly result in an increased likelihood of fire/explosion and associated injury or loss of life.

Environmental impact

44 The consequence of not replacing failing gas profiling systems and depleted logger batteries within the low-pressure network would lead to higher network pressures causing more frequent gas leaks (lost gas from the network) causing an increase in damaging environmental emissions (Methane). Methane is a highly damaging Greenhouse Gas (GHG) and is currently estimated to be 86% more potent than CO_2 (over a 20-year horizon). Increased attendance at additional public reported escapes could lead to road closures and disruptions to transport networks causing wider societal impact.

45 Analysis has indicated that an additional 42,435 tCO2e would be released per annum through increased leakage if the systems were allowed to operate at higher pressures than necessary. This analysis is based on predicted increases in leakage volumes per annum if pressure management systems were to be removed from all PRIs across SGNs three Local Distribution Zones (LDZ). These increases assume that each governor would operate at seasonal Maximum Operating Pressure (MOP) with no additional pressure control.

Table 4: Increase in Leakage Volumes (No Pressure Management Programme)

Local Distribution Zone	Increase in Leakage/Annum – Networks on Fixed Seasonal Settings (GWh)	Increase in Leakage/Annum – Networks on Fixed Seasonal Settings (tCO2e)
Scotland	12.45	15,270
Southern	22.10	27,105
SGN	34.55	42,375

46 Table 4 highlights the level of increased leakage per annum, and across a 5-year period, if all efficiently pressure managed networks were not maintained and allowed to fail (default to fixed/seasonal settings).

8 Options Considered

47 Section 8 will define the four options under consideration for this essential workstream in GD3.

- Option 1 (100%) will highlight SGNs preferred option and describe the reasons behind this proposal.
- Option 2 (Do Less) will investigate the likely impacts of moderating the pressure management maintenance programme in GD3.
- Option 3 (Do More) is not viable as Option 1 will maintain 100% of SGNs pressure management systems.
- Option 4 (Do Minimum) will investigate the potential to defer spending in this area until GD4.

48 We have spent time to cost up options where we feel there will be value added to the decision-making process. Where options are less likely to be pursued, we have chosen to present higher level costs, without the breakdown.

49 Further detail on the four options considered can be found below:

8.1 Option 1 – Preferred Option (Maintain 100% of Pressure Managed Sites)

50 This option is a continuation of current operational practices, and looks to, where possible, replace components that are reaching the end of life, utilising pre-set alarm notifications and local knowledge/experience, to enable the pressure management system to continue to function efficiently.

51 For legacy profiling systems, costs have been derived from average actual replacement numbers and the latest supplier costs. Costs for Electronic Actuator systems and GSM comms units are based on supplier design lifespan and latest manufacturer prices.

52 An extension of the current programme of pre-emptive replacement would enable SGN to continue to operate pressure managed networks in a safe, reliable, and efficient manner throughout RIIO-3, limiting reportable mains leakage volumes to a minimum under the current calculation methodology.

53 The primary benefits to the continuation of this ongoing programme of pressure management maintenance relate to SGNs ability to keep system pressures as low as possible whilst maintaining security of supply and thereby limiting reportable leakage from low pressure mains. If this programme were to be stopped or curtailed, system pressures would increase and emissions from these assets would significantly rise in GD3. In addition, SGN Maintenance teams would then need to visit each site four times per annum, to manually adjust governor pressures to meet seasonal demand, significantly increasing vehicular emissions.

8.2 Option 2 – Do Less (Reduce Pressure Management by 50%)

54 Option 2 (Do Less), would seek to reduce the current maintenance programme by half, and leave only the largest mixed material networks on some form of pressure management. The number of sites/networks scheduled for removal of pressure management systems would then be decommissioned and placed on fixed seasonal settings. All equipment costs for this option are as stated in Option 1.

55 Any benefits derived from not having to maintain these systems in GD3, would need to be balanced against the following costs:

- Decommissioning costs for removal of pressure management and communications systems and re-configuration of District Governor pipework.

- Additional ongoing Opex to enable Maintenance teams to visit these sites four times per annum to manually adjust pressures to meet seasonal demand and reduce excess pressure within the systems.
- Increase in leakage from these systems due to higher average pressures creating negative environmental (Methane) and financial (cost of Carbon) impacts.

8.3 Option 3 – Do More (Not Applicable)

56 As Option 1 looks to maintain 100% of SGNs currently pressure managed sites and networks, a 'Do More' option is not applicable.

8.4 Option 4 – Do Minimum (Defer to RIIO-4)

57 SGN would point to the significant increases in annual leakage that would be driven by a programme of managed failure of pressure management systems. An inability to replace failing components on the various pressure management systems that SGN operate, would lead to low-pressure networks eventually being stripped of pressure management equipment and placed on widespread fixed seasonal settings, resulting in increases in average system pressures and consequently associated environmental emissions.

58 It is also worth noting that the operational nuances related to integrated pressure management systems, mean that an entire low-pressure network system, no matter how large, would need to be de-commissioned on failure of the first District Governor system within that network. Estimates of the environmental impact of pressure management removal at SGN level are estimated to be approximately 34.6 GWh/annum on failure of all currently pressure managed systems (Section 7; Table 4). There would also be an ongoing operational cost to manually apply seasonal pressure reductions to these sites, to ensure the environmental impact was limited in its severity.

8.5 Options Technical Summary Table

59 We have presented four options considered to solve the problem described in section 3. Table 5 below is a simple comparison of these options, detailing first and last year of projected spend, number of interventions and total project cost (£m) in 23/24 prices.

Table 5: Options Technical Summary Table

Option Title	First Year of Spend	Final Year of Spend	Volume of Interventions	Investment Design Life (Yrs)	Total Cost (£m)
1. Maintain 100% (Preferred)	2026	2031	21,900	10	11.2
2. Reduce 50% (Do Less)	2026	2031	10,950	10	5.6
3. Do More (Not Applicable)	N/A	N/A	N/A	N/A	N/A
4. Do Minimum (Defer to RIIO-4)	N/A	N/A	0	N/A	N/A

All expenditure above 23/24 prices

60 Table 5 highlights a summary of the range of options considered, with high-level descriptions and individual costings.

8.6 Options Cost Summary Table

61 Table 6 below highlights the breakdown in project costs, workloads and estimated cost accuracy for the various areas of investment (Project Element) within this proposal.

Table 6: Options Cost Summary Table

Project Element	Project Options											
	Preferred – Costs (£m), Workload and Accuracy			Do More – Costs (£m), Workload and Accuracy			Do Less – Costs (£m), Workload and Accuracy			Do Minimum – Costs (£m), Workload and Accuracy		
Profiled Systems	4.4	9900	0%	N/A	N/A	-	2.2	4950	0%	0.0	0	-
RPM Electronic Actuator	0.5	2400	+/-10%	N/A	N/A	-	0.3	1200	+/-10%	0.0	0	-
GSM Comms Systems	6.3	9600	+/-10%	N/A	N/A	-	3.1	4800	+/-10%	0.0	0	-
Totals	11.2	21900	+/-6%	N/A	N/A	-	5.6	10950	+/-6%	0.0	0	-

All expenditure above 23/24 prices

62 SGN are confident in the accuracy of estimated costs for maintenance of legacy profiled systems in both Scotland and Southern. These systems have been in operation on low-pressure networks for 30+ years in certain regions and the operational limitations of individual components are well known and understood. Conversely, Remote Pressure Management Electronic Actuator systems and the new GSM comms replacement systems are new to the industry and costs/workloads are based solely on manufactures design lifespan. It is for this reason that SGN estimate a project cost accuracy of +/- 6%, based on a 10% variance in potential workload and spend for both elements.

9 Business Case Outline and Discussion

63 Pressure Management systems are a key component of the distribution network and are used to efficiently control network gas pressures. The systems utilise communication networks to remotely control equipment and avoids in person site visits to carry out manual pressure adjustments of pressure regulating equipment. The system allows network pressures to be optimised which reduces gas leaks, shrinkage costs and environmental and societal impact. The systems incorporate an alarm warning system which alerts a central control system when a pre-determined set point is detected, and this enables immediate investigation.

64 Pressure Management systems are made up of a number of individual components which can be affected by several variables. Replacement of individual components can be driven by condition, obsolescence, operation/usage, end of life (e.g., batteries), manufacturers' recommended replacement life cycle, compliance with relevant legislation (ATEX, DSEAR) and SGN policy/procedure. The consequences and impacts associated with failing pressure management systems are detailed in Section 7 and described again below.

- Failure to replace failing profilers and expired battery power packs in profile controlled low-pressure gas networks could lead to the slam-open safety system operating resulting in unnecessarily inflated pressures.
- Failure to replace batteries powering the Electronic Actuator systems would lead to the equipment failing to its high setting resulting in unnecessarily inflated pressures.
- Failure to replace the battery packs and control units operating the new 4G comms systems would lead to profilers firing the slam-open safety systems, due to a lack of a predicted set-point pressure profile, and once again lead to unnecessarily inflated pressures.

The consequences of excess system pressure would lead to:

- Increased environmental emissions.
- Potential increase in the number of Public Reported gas Escapes (PRE's) as networks will be operating at higher pressures.

65 Several options have been considered and these are detailed in Section 8 and the Technical Summary table above. SGNs optimal solution for GD3 is a to undertake a proactive programme of replacement works that ensures the distribution network continues to operate in a safe, reliable, and efficient manner in-line with customer and stakeholder expectations.

66 To continue to operate the network in a safe, reliable, and efficient manner, SGN propose a continuation of the current programme of pro-active pressure management maintenance and replacement workloads in RIIO-3. In the Scotland and Southern networks, it is proposed to seek investment of £11.2m to replace an estimated 21,900 pressure management system components, across RIIO-3.

9.1 Key Business Case Drivers Description

67 The following options have been considered within this investment proposal:

- **Preferred Option (Maintain 100% of Pressure Management Systems**) – Replacement of pressure management system components, as part of an ongoing, proactive programme of works, will ensure SGN continue to operate networks in a safe, reliable, and efficient manner, whilst minimising environmentally damaging emissions.
- **Do Less Option** – Cutting the current pressure management maintenance programme by half would reduce the Capex requirement accordingly, but also drive cost increases required to decommission existing pressure management systems, fund ongoing site visits (4/annum/site) to adjust pressures to meet seasonal demand, and also see leakage volumes and costs increase significantly.

- **Do More Option** – Not applicable as preferred option seeks to maintain 100% of systems currently operating under pressure management systems.
- **Do Minimum (Not Recommended)** – A 'Do Nothing' (Do Minimum) proposal would effectively end the proactive maintenance and replacement programme for pressure management components across SGN, leading to the eventual decommissioning of all systems. Therefore, on failure of an individual pressure management system, the entire network would be placed on fixed seasonal settings, requiring quarterly visits from maintenance teams, and drive a significant increase in SGNs system pressures and mains leakage volumes.

9.2 Business Case Summary

68 The summary table below provides headline business case metrics to enable a high-level comparison of the options.

69 This project is driven by the necessity to operate SGNs networks in a safe, reliable, and efficient manner.

Table 7: Business Case Summary

Option Title	Cost (£m)	Preferred Funding Mechanism	Leakage Increase 2031 (GWh/annum)	Leakage Increase 2031 (tCO2e/annum)
100% Maintenance (Preferred)	11.2	Ex-Ante	0.00	0
Do More	N/A	N/A	N/A	N/A
50% Maintenance (Do Less)	5.6	Ex-Ante	17.28	21,218
Defer to RIIO-4 – Do Minimum	0	N/A	34.55	42,435

All expenditure above 23/24 prices

10 Preferred Option Scope and Project Plan

10.1 Preferred Option

70 **Option 1: 100% Maintenance of Pressure Management Systems** - It is proposed to invest £11.2m within the Scotland and Southern distribution gas networks to undertake a proactive programme of pressure management system component replacements across SGN. SGN are proposing to replace an estimated 21,900 individual pressure management components/systems throughout RIIO-3.

10.2 Asset Health Spend Profile

71 Table 8 below, details the likely annual spend profile for the proposed maintenance programme for pressure managed systems across SGN and spilt into the Scotland and Southern LDZ, in GD3 (£m).

Table 8: Asset Health Spend Profile (23/24 Prices)

Year	26/27	27/28	28/29	29/30	30/31	Total
SGN (£m)	2.16	2.16	2.04	2.31	2.52	11.19
Scotland	0.72	0.71	0.67	0.78	0.88	3.76
Southern	1.44	1.45	1.37	1.53	1.63	7.44

72 The annual variances reflect the differing expected interventions required to maintain the new equipment currently being installed in GD2, namely the Electronic Actuator systems and the GSM comms units. These annual interventions have been forecast using supplier design lifespan and as the majority of these systems will be installed over the latter part of GD2, so potential interventions ramp up towards the latter end of GD3.

10.3 Investment Risk Discussion

73 The GSM communications replacement for copper PSTN phonelines is currently being deployed by all GDNs across the UK. There is a risk associated with the ability to replace any failing components on these systems in GD3, if and when demand for these components peaks. Although the actual failure modes and timelines remain unknown at this stage, SGN Maintenance teams will work closely with manufacturers and track performance closely, to minimise this potential impact.

74 Average System Pressures (ASP) are a significant factor within the mains leakage calculation in the SLM. The lower a GDN can control District Governor outlet pressures, the lower the network ASP will be, reducing the calculated volume of annual leakage attributable to said network. This calculation has been used to report on mains leakage since the beginning of RIIO in 2013, but with the advent of advanced methane detection technologies, RIIO-GD3 may see an eventual transformation from the current mains leakage calculation to a methodology which looks to utilise 'real life' emissions measurement (DPLA). Although SGN maintain there is a definite association between higher system pressures and increased leakage which will persist even with this change to the methodology, once any new methodology is embedded and operational, there may be less of a requirement to manage pressures on certain networks in future.

75 The key risks associated with the proposed programme of maintenance in GD3 are:

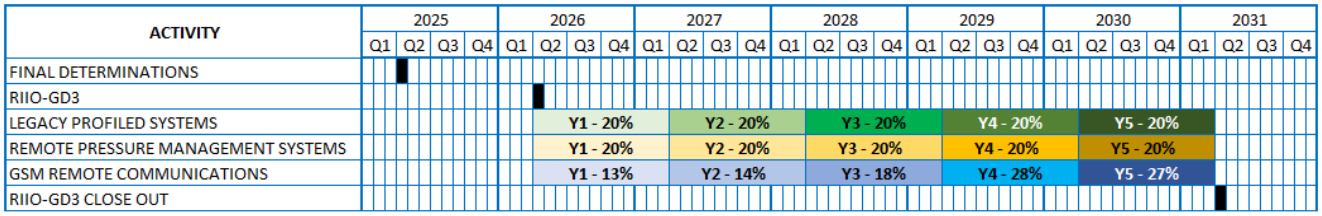
- Availability of replacement GSM communications components on failure, across the UK networks.

- Potential adaptation of the mains leakage calculation methodology driven by DPLA, may alter the reportable leakage on each low-pressure network, prompting a review of the necessity to manage pressures on an individual network basis.

10.4 Project Plan

76 There is no set project plan in relation to maintenance of Pressure Management systems, as this is an ongoing, rolling process through consecutive years. However, the plan below (Figure 9) highlights when and what percentage of interventions we expect through GD3, based on historical evidence and manufacturer design operational lifespans.

Figure 9: Project Plan/Estimated Interventions



77 The above highlights the forecast staggered workload driven by estimated interventions to maintain an operational GSM communications system at all profiled sites, driven by the current planned installation dates and manufacturers design operational lifespan for individual components.

10.5 Key Business Risks and Opportunities

78 Key risks to the successful delivery of an ongoing maintenance programme for pressure management systems in RIIO-3 are listed below in Table 9.

Table 9: Key Business Risks/Opportunities

Risk	Impact	Likelihood	Mitigation	Comments
The systems included in this proposal that are new to the UK gas industry (RPM Electronic Actuator and GSM Comms), have replacement rates (interventions) based on manufacturer design operational lifespans. There is a risk that these may be found to be inaccurate once the systems are deployed on the network for a period of time.	Low	<=10%	Based on historical evidence from legacy profiled pressure management systems, although components in certain geographical areas seem to have shorter operational life than is specified, other regions see these systems outperform stated lifespan. It is expected that component failures will level out to a degree with no significant variance from values stated.	Maintenance teams will track and log all failures on these novel systems to build an evidence base on which to formulate any necessary future funding requests.
All UK GDNs operate profiled pressure management systems to varying degrees, and all will require replacements components for the new GSM comms systems at broadly the same time in GD3 (based on manufacturer design operational lifespan). There is a small risk that production could be overwhelmed by demand at certain times, increasing lead times and risking system failure.	Low	<=5%	SGN are in regular contact with the manufacturer through the current installation programme of works, with the rollout of the systems ahead of schedule. This dialogue will continue to ensure that any supply issues are communicated immediately and actions to avoid significant increases in system pressure caused by comms failure, are taken swiftly (place DG sites on clocked settings).	The manufacturer of these systems has worked within the gas industry for many years and has a robust and reliable supply chain. This document should be read in conjunction with our GD3 Business plan, Document SGN-GD3-SD-03: Workforce and Supply Chain Resilience Strategy.

10.6 Outputs included in RIIO-GD2 Plans

79 In the RIIO-GD2 Business Plan, SGN requested £3.9m (18/19 prices) to maintain the existing profiled pressure management systems for five years. The RIIO-GD2 proposal did not need to account for Remote Pressure Management Electronic Actuator systems, or power supplies for GSM communications systems.

Appendix A – Acronyms

Table 10: Acronyms

Acronym	Meaning
ASP	Average System Pressure
SLM	Shrinkage and Leakage Model
LP	Low Pressure (<75mbarg)
WLR	Wholesale Line Rental
PSTN	Public Switched Telephone Network
ATEX	Atmospheres Explosibles (EU Regulation)
UKEX	Equipment and Systems for use in Explosive Atmospheres (UK Regulation)
DSEAR	Dangerous Substances and Explosive Atmospheres Regulations (2002)
IP	Intermediate Pressure (2 barg – 7 barg)
MP	Medium Pressure (>75 mbarg – 2 barg)
PRI	Pressure Reduction Installation
VRLA (Battery)	Valve Regulated Lead Acid
COP	Conference of the Parties
GDN	Gas Distribution Network
PRE	Public Reported Escape
GSM (Comms)	Global System for Mobile (communications)
RPM	Remote Pressure Management
LDZ	Local Distribution Zone
DG	District Governor
T/PM/MAINT	Maintenance of Pressure Reduction Installations (SGN Management Procedure)