SGN

Network Asset Management Strategy

December 2024

Contents

Executive Summary

1 Our Network Asset Management Appendix provides a summary of our asset strategy for each of the primary asset classes in which we group our investment plans set out below. This strategy ensures that we balance our legal obligations to maintain safety and reliability while maintaining a clear focus on value for money delivered.

- **Iron Mains Replacement (Repex).** The replacement of remaining metallic mains in our network with polyethylene (PE) pipes that are safer and more resilient. We will replace 4,875 km of mains in total and categorise our programme into three parts: Category A, a mandatory mains programme defined by the Health and Safety Executive (HSE); Category B a mandatory safety driven programme driven by Pipeline Safety Regulations (PSR 1996); and Category C a precautionary programme driven by the need to reduce the safety risk posed by a cohort of assets. Section B sets out a £2,083.6m investment programme (compared to £1,325.3m in GD2).
- **Multiple-occupancy Buildings (MOBs).** Section C sets out how we have reflected on the recommendations of the Grenfell Inquiry to inform a GD3 programme with a more robust pro-active replacement programme to sit alongside the reactive workload that we need to undertake when an asset fails unexpectedly with a £247.6m investment plan (compared to £99.8m in GD2). Our programme has placed an increasing focus on Complex Distribution Systems (CDS).
- **Distribution integrity for assets operating below 7-bar.** In Section D we set out our strategy for a £115.73m investment plan for assets operating below 7bar. The interventions are planned based on the resilience and safety of the network and include programmes to tackle Reinforcement, Overbuilds, Network Valve Replacement and Network Pressure Management amongst others.
- **Governors** An ongoing programme of replacing and repairing a proportion of the over 32,000 governors that we have operating on our network, a large proportion of which are operating beyond their design life. Our investment programme is £65.17m (compared to £66.28m in GD2) and set out in Section E.
- **Local Transmission System.** Is a critical national infrastructure asset requiring targeted intervention to offset ongoing asset deterioration and maintain performance. Section F sets out our strategic approach, investing £198.9m (compared to £225.7m in GD2) ensuring safety and reliability in this critical asset class.
- **Electrical and instrumentation.** Our strategy requires £70.78m (compared to £48.62m in GD2) of investment in telemetry, metering and odorisation equipment located on our transmission network. As we transition to green gases, we are investing in our Biomethane Network Entry Facilities to provide adequate capacity for new entrants. Further details can be found in Section G.

2 To identify the appropriate intervention, we use our 4R's strategy. When an asset fails, we carry out an immediate repair to the asset in order to maintain supplies. When we have evidence that a more significant intervention is required (i.e. through failures or site inspections) we assess the options of refurbishing, replacing or rebuilding the asset. The intervention is determined by a detailed assessment of the asset and a whole life-cycle cost comparison of the alternative options. For our network assets (not including mains or risers) the impact of this is set out in the table below.

Table 1: Network asset workloads under the 4Rs approach

Network Area	Interventions	Repair	Refurbishment	Replace	Rebuild
Distribution < 7 Bar	# of interventions	3,270	16,522	8,513	228
	Cost of interventions £m	**4.49**	**45.32**	**13.45**	**46.42**
Transmission > 7 Bar	# of interventions	1,335	6,349	978	21
	Cost of interventions £m	**2.96**	**57.22**	**12.73**	**75.70**

Source: SGN investment categorised into the 4Rs.
Note, the table does not include opex figures which would significantly increase the repair column values.

3 As the table demonstrates, there is a broad scale of intervention types within our Capex programmes throughout our asset base. The actual intervention, and hence the cost, will be highly asset-specific particularly as you reach the replace and rebuild levels.

4 Our plan has been supported by 31 investment decision packs (IDPs) which contain 35 cost benefit analysis (CBAs) that cover 85% of our total investment.

Section A Overview and approach

5 Our energy network is part of the UK's critical national infrastructure, providing six million people with gas supplies across the south of England and Scotland, as well as serving 116,000 Industrial and commercial customers. This essential service keeps them all safe and warm, day in and day out. Ongoing investment in our ageing assets is essential to maintain safety and security of supply for all our customers.

6 This document explains how we will ensure best in class asset stewardship, which requires £2.6bn of investment over the next Gas Distribution Network (GDN) price control period (GD3). This will enable us to continue to provide safe and reliable gas supplies to customers today while preparing for society's future decarbonised energy needs.

7 Our strategy, which covers Network Asset Risk Measures (NARM) and non-NARM assets on our network, is driven primarily by safety, compliance and risk management to ensure that we continue to supply gas safely and reliably to both domestic and commercial customers across GD3 and beyond.

A.1 Stakeholder engagement

8 Our core GD3 business plan activities are driven by securing compliance with regulation and by ensuring we deliver on what is valued by our stakeholders. To understand their priorities and investment expectations, we conducted comprehensive customer and stakeholder engagement. We presented customers and stakeholders with a complete overview of our performance across seven key areas and asked them to rate the importance of each area and their appetite for additional investment in this area. The results of this survey are presented in Chapter 2 of our main business plan document.

9 The survey indicates that:

- Our stakeholders consistently ranked 'Acting safely' and 'Keeping the gas flowing' as their top priorities. 'Acting safely' was rated the highest across all customer and stakeholder groups. Our good safety performance was generally recognised, and the majority felt that maintaining existing levels would be sufficient.
- 'Keeping the gas flowing' was ranked as the second most important priority by customers and third by stakeholders. While considering core to our role, both groups expressed satisfaction with our current performance and indicated no need for increased investment in this area.
- In terms of appetite for investment, customers and stakeholders believe we are performing well and therefore the majority feel maintaining existing levels would be sufficient - although if more investment in safety is required then this should be a top priority. Some network stakeholders are aware of an increasing number of safety incidents and therefore believe more investment is necessary.
- Most customers and stakeholders believe developing low carbon energy solutions is important, although it is considered lower importance than most other priorities. However, it is ranked the second priority for increasing investment by both customers and stakeholders.
- Customers and stakeholders agree our plans for low carbon energy are going in the right direction and have the right level of ambition. The whole system approach is supported, understanding a range of low carbon energy solutions will be necessary to suit different regions or areas. This supports our ongoing focus on increasing access to biomethane in GD3.

A.2 Outcomes and commitments

10 Our Network Asset Management Strategy (NAMS) will support delivery of a number of our GD3 outcomes and associated commitments, that will contribute to us achieving Ofgem's Secure and Resilient Supplies Outcome. These are summarised in the figure below and detailed in Chapter 5 of our main business plan document.

Figure 1: SGN GD3 Outcomes and commitments

SGN RIIO-GD3 Outcomes	SGN RIIO-GD3 Commitments
Secure and resilient supplies	
Our network transports gas safely and reliably to meet the demands of our customers in all scenarios	We will maintain our network, so there is no deterioration in its performance or reliability We will continue to look after the health and safety of our employees by targeting a maximum working day of 12 hours by the end of GD3
Our network is ready to transport clean energy to our customers	We will establish processes that allow us to safely and reliably blend more green gas into our network We will implement a framework to assess alternatives to natural gas when refurbishing or replacing supplies to high rise multiple occupancy buildings
We are resilient to a range of external shocks and stresses	We will introduce a measure for climate resilience and establish a standard baseline from which we will monitor our progress We will meet or exceed the Enhanced Cyber Assessment Framework

A.3 Asset management approach

11 SGN's network asset management strategy is driven by the requirement to promote asset health and long-term operational resilience across our network, so that we can continue to supply gas safely and reliably to domestic and commercial customers across GD3 and beyond. Our asset management plan and associated investment requirements maintain compliance with established legal obligations and regulations and that we only carry out a substantial intervention on assets that are risk of breaching those obligations and our ability to serve our customers safely and reliable.

12 We are an ISO:55001 accredited company with an externally audited asset management system with the last audit concluding in Spring 2024. We have a longstanding asset management approach which started with PAS55 accreditation, the forerunner to ISO:55001, before establishing our current accreditation. This approach demonstrates that we have a long recognised system that establishes, implements, maintains, and improves the asset management process for each asset class.

13 In addition to this accreditation, and to enable our ambition as a leader in asset management, we have also undertaken an independent deep dive review with the Woodhouse Partnership. Following this investigation and in assessment of our current approach, we have been deemed to be operating 'beyond competent' in asset management maturity. Our work with this group demonstrates our aim to be class leading in asset management with a robust plan to improve processes and continually improve our practices.

14 Our intervention proposals have been built from our well developed and established asset management process and, as such, are complementary to our long-term asset management ambitions. During GD2, we have continued to develop, improve and expand on best practices developed in specific asset classes and we have rolled out this use in others. We are able to leverage our experience working with these processes over a number of years to forecast and define workloads across all of our asset classes.

15 Our decision making is based on data, for more information on this approach please see Section A.4.

16 Having set the objectives of our strategy, to minimise the cost to customers and ensure we invest as efficiently as possible to maintain our critical assets we use the 4Rs strategy summarised below. We start by recognising that we:

- **Repair –** assets when they fail. This is to ensure that supplies to customers are not affected, and that the system continues to work to supply gas safely. This intervention is normally conducted by our maintenance and operations teams as part of their day-to-day activities. If a repair becomes difficult to justify from either a safety or economic perspective, then we start to consider further investment.

17 Using our asset management processes, data collected from either repairs or in surveys, we then consider if there is a need for further investment. To do this we look at the cost of maintaining the asset, understanding its current performance,

building in degradation and analysing consequences of failure to get an assessment of what intervention is best suited to each asset. Often this revolves around the wider situation, such as if the asset is on a site with wider issues that need to be factored into any plans, or if it is standalone in terms of our concerns.

18 Once this assessment has been undertaken, we can then understand where the best value would be gained from a more invasive intervention. We will always consider the least cost intervention first, but always plan to deliver the best value over the whole asset life cycle. From that assessment we consider:

- **Refurbishment of an asset –** this is typically the case where the asset has a suitable level of integrity and is normally a preferred option when the rest of the surrounding assets are still fit for purpose and only one or a few components need attention. A good example of this is where a component or site needs painting or a regulator needs specialist attention that goes beyond normal maintenance;
- **Replacement of an asset –** often for a component of a larger installation. This is otherwise known as a targeted investment where the rest of the wider site is still in good condition, or any risks can be resolved through refurbishment. An example of this is replacing pre-heating on a Pressure Reduction Station (PRS), where the rest of the components, such as filters and pressure control remain in good condition; and
- **Rebuild of site or system**. This is the most severe level of intervention and is only considered when a lesser intervention is not appropriate. Often this is considered when there are multiple components that have inadequate integrity, have compliance issues, or where it is not safe or economic to replace a single component in isolation due to legacy issues in the way the asset was built. A good example here would be when a PRS is rebuilt when there is a combination of heating, filtration, and pressure control integrity concerns.

19 This process relies on engineering judgment and a detailed understanding of the site to generate a number of potential interventions, otherwise known as the long list. Using the data outlined above and cost information gathered from historical projects, or detailed design information, we can undertake an assessment to understand where the greatest value lies.

20 For more complex replacement and rebuild interventions, multiple stages of design and options assessment will be undertaken before a final preferred solution is decided. Further changes may then take place as we move from preferred solutions to detailed design and delivery. The detail of this process is summarised, where possible, within the optioneering contained within our Engineering Justification Papers (EJPs).

21 Due to the bespoke nature of our projects, our asset management strategy relies on external contracting at all stages. We are always striving to build an efficient and sustainable supply chain, and we continue working with industry to improve the supply chain resilience, reducing inefficiencies and optimising cost management. We are confident that the changes we plan for our procurement process, coupled with the enhancements which were put in place during GD2, will allow us to deliver the entire scope of our GD3 capital investment programme efficiently and on time. We provide additional information on our supply chain strategy in document SGN-GD3-SD-03: Workforce and Supply Chain Resilience Strategy.

A.4 The use of data and the Condition Monitoring (CM/4) process

22 Data is at the heart of our asset management process and is essential to making targeted interventions that maintain the overall health of the network and, as a result, is in the best interest of customers. We can split our data into two groups, ***leading*** and ***lagging*** indicators.

- A leading indicator is one where we proactively seek out data in an effort to understand the condition of the asset. From the data we can infer the likelihood of failure that allows us to proactively undertake an intervention before the asset were to fail. Good examples of this approach would be a CM/4 inspection, a Rep/3 riser survey or a Maint15 (crossing) survey. The output from these leading indicator surveys would be an assessment of the suitability of the asset to continue in use from which we can understand any potential need to undertake an intervention; and
- A lagging indicator would be a fault or repair report which would only happen after the asset has failed. Examples of lagging indicators are mains repairs, fault reports (from our telemetry system) and Public Reported Escapes (PREs). Lagging indicators can be extremely useful when understanding the performance of an asset. In certain circumstances, such as for buried unmaintained[1] assets like iron mains lagging indicators are the only source of data.

23 In 2015, SGN implemented a formal condition monitoring and assessment programme known as SGN/PM/CM/4 Part 1, which includes a detailed inspection of all above-ground assets at least every 12 years. This process includes close inspection

[1] An unmaintained asset is an asset that has no associated maintenance and/or inspection regime. It will still be subject to repair if it fails and is still considered within legislation.

of pipework under lagging and pipe supports and through wall transitions. Any defects are fully assessed and quantified, prior to the remediation of any critical defects.

24 With our established CM/4 survey programme, we believe that we are leaders in our approach to gathering quality information on asset condition and performance which gives us confidence in the decisions we are making. With this enhanced process now in operation for approaching 10 years, we have established a significant data resource on our asset bases from which we can plan, prioritise and programme interventions in line with our 4Rs strategy outlined in the above Section (A.3).

A.5 NARM measured risk

25 NARM is a consistent way of measure risk on the network. It takes into account of risk from failure and the consequences on customers and the public. It also provides a valuable measure for identifying whether the asset base is deteriorating or improving over time, depending on the interventions undertaken. Additionally, it can be used in optioneering to understand value of investments and whole-life costs.

26 In our GD3 commitments, our sixth commitment states *we will maintain our network, so there is no deterioration in its performance.* Whilst we can use our NARM model to assess these criteria, we have not used it to gauge our investment total and set our goals. In our view, there still needs to be further development of the model to allow it to better reflect our understanding of asset performance and mirror our asset management processes.

27 NARM is an area of continual development, and significant strives forward have been made over the course of GD2. However, there is still some way to go in its maturity in use beyond reporting, where it has considerable value in comparing and categorising levels of investment.

28 The table below shows how the measure of risk changes over three steps. The first step shows the impact if no intervention takes place, the second step shows the impact of mandatory HSE Repex and the third step shows the additional impact of further interventions additional to the mandatory HSE Repex programme. In line with our commitment, there is an overall reduction from the start of GD3 (first column) to the end of GD3 after all interventions (final column).

Table 2: Statement on current risk, risk removal and end state of the networks

(All figures in R£m)	Without intervention			With outside of NARM (A3) interventions			With NARM measured interventions (A1)	
Network	GD3 Start	Deterioration	GD3 End	Mandatory HSE Repex -NARMs Impact	Other Non-NARM	GD3 End	NARMs Impact	GD3 End
Southern	753.92	82.38	836.30	70.89	7.00	758.41	52.20	706.20
Scotland	444.29	53.17	497.46	20.41	5.64	471.40	47.32	424.08

Source: NARM commentary and model

29 Using this measure, we can see that in the table above we are arresting deterioration in the network when considering both mandatory HSE Repex and other work. If we exclude mandatory HSE Repex then our network risk increases. The NARMs impact from additional interventions is insufficient to offset the deterioration in the asset base.

30 It should be noted, however, that while the NARMs methodology helps to provide a consistent point of comparison, it is a general model and framework for assessment and it should never supersede on the ground knowledge and expertise. Secondly, there are disparities between asset classes that still need to be addressed. As such, while it remains a useful tool for assessing performance, it is not an appropriate tool for decision making purposes. Further information on the NARMs methodology is provided in the NARM BPDT Supporting Commentary (SGN-GD3-NAR-02).

A.6 Planning and future requirements

31 When determining the necessary investment in our network, SGN is required to comply with two key legislative principles. The Gas Act requires us to maintain an efficient, co-ordinated, and economical system of gas supply and the Gas Safety Management Regulations (GSMR 1996) requires that we maintain the appropriate pressure to ensure safe consumption of gas by our end customers. Under GSMR as the transporter we are identified as the duty holder who must have established adequate arrangements to minimise the risk of a supply emergency and established adequate arrangements to ensure that the gas conveyed will be at an adequate pressure when it leaves the system that we operate[2]. To comply with this final condition, we maintain a network that enables this under peak 1:20 conditions as defined under the Uniform Network Code (UNC) and within our Licence (Standard Special Condition A9).

32 As the duty holder, we have to ensure the safety of customers on our network, and this includes supplying gas to them within safe operating pressure parameters on a 1-in-20 worst winter. This ensures the safety and resilience of supply. To achieve this, we have to plan against established evidence. We cannot plan investment against policy intent and ambition and maintain compliance with our legal obligations.

33 As the duty holder, we, therefore, consider all scenarios and plan according to a reasonable interpretation of customer demand evidence based on an assessment of load requirements from our >7bar forecasting process, as well as a bottom-up assessment of the load required from our <7bar planning processes. This then sets the design parameters for our networks, and we plan accordingly to manage the peaks in demand safely to ensure that customers are able to secure the gas supplies they need. Failing in this objective can lead to a loss of supply in the worst winter periods which will endanger life.

34 While we recognise that the Future Energy Scenarios identify a significant reduction in demand and suggest an associated reduction in peak demand, a reduction in expenditure can only be realised if there is an absolute commitment to disconnect customers and de-energise specific areas of the network. This would require a legislative change, and until this time we need to avoid the deterioration of the network to a point that safety is jeopardised. This requires us to continue to invest to repairing assets that can be economically repaired and replace those highest-risk assets.

35 It should also be noted that we do not anticipate that we will require any volume or capacity-related investment in the >7bar network in the GD3 period. At <7bar level, we include low levels of load-related investment. This investment at the less than 7 bar level will be determined according to changing domestic and industrial loads at that local level (i.e., new industrial or house developments). Such investment projects are necessary to maintain the network in line with our legal obligations and we have proposed they should be covered through a volume driver.

A.7 Summary of our strategy

36 The remainder of this document provides a summary of our asset strategy for each of the primary asset classes in which we group our investment plans. Each area will include a mix of NARM and non-NARM assets.

- **Mains Replacement (Repex).** We are systematically replacing the remaining metallic mains in our network with PE pipes that are safer and more resilient. During GD3 we will replace 4,875 km of mains in total. The programme is driven by the requirements of the HSE, and we categorise it into three parts (i) category A, mandatory mains that are enforced by the HSE; (ii) Category B, mandatory safety driven programme driven by The PSR 1996; and (iii) Category C - precautionary programme driven by the need to reduce the safety risk posed by cohort of assets not included within the mandatory programme. The total cost of our iron mains replacement programme (Repex) in GD3 is £2,083.6m and is set out in more detail within Section B.
- **Supplies to MOBs.** Our assets associated with MOBs supply around one-third of the overall customers connected to our network. Alongside these assets are a new class of asset known as CDS, which cover large scale commercial MOBs such as shopping centres, hospitals, sports stadiums and railway stations. Our replacement activities span both a longstanding programme of proactive replacement based on risk (75%), and a reactive workload when an asset unexpectedly fails (25%) and an increasing focus on CDS. The total cost of our MOBs programme in GD3 is £247.6m. This is set out in Section C.
- **Governors.** Our distribution governor strategy is the continuation of an established programme of repairing and replacing governors across our network. There are over 7,000 district governors and 26,000 service governors many of which have exceeded their design life of 40 years. We have an ongoing programme across the three pressure tiers in GD3 investing £65.17m. This is set out in Section E.

[2] https://www.legislation.gov.uk/uksi/1996/551/schedules/made

- **Distribution integrity for assets operating below 7 bar.** Our distribution integrity strategy for our other assets operating below 7bar, not included in the sections above (mains, services, risers and governors). The interventions are planned based on the resilience and safety of the network and include programmes to tackle Reinforcement, Overbuilds, Network Valve Replacement and Network Pressure Management amongst others. The total cost of our Distribution Integrity (<7 bar) programme in GD3 is £115.73m and covers the workload detailed in Section D.
- **Local Transmission System.** Our Local Transmission System (LTS) is the backbone of our network, taking gas from the National Transmission System (NTS) and delivering into our Local Distribution Zones (LDZs), as well as providing metering, filtration, heating and odorisation of the gas. This is a critical national infrastructure asset which requires targeted intervention to keep them operating in a safe and reliable manner and requires comprehensive maintenance plan combining predictive, preventative and reactive intervention to offset ongoing asset deterioration and improve performance. Our strategy requires £198.9m of investment in GD3 and is detailed in Section F.
- **Electrical and instrumentation.** Our electrical and instrumentation (E&I) assets, which include telemetry, metering and gas quality analysers, are located on our transmission network, primarily at our offtakes and Pressure Reduction Stations (PRS) and Above Ground installations (AGI). As we transition to green gases, we are investing in these assets on our Biomethane Network Entry Facilities and Hilltop sites to support communications infrastructure. Our strategy requires £70.78m of investment in GD3 and is detailed in Section G.

37 Please note, the business plan guidance requests that we cover lead and non-lead assets, this terminology is more specific to electricity and not immediately transferable to Gas Distribution. We have completed our strategy at the Primary Asset Level, before completing IDPs at the secondary and tertiary levels where applicable, and we consider this to have the appropriate equivalence to the referenced terminology of lead and non-lead assets.

38 Our Statutory independent Undertaking's (SIUs) are not covered within this document, they are covered within the SIU strategy document (SGN-GD3-SD-11) and supporting documents.

39 The following links to other strategy documents are also made in this document:

- Document SGN-GD3-SD-05: Innovation Strategy;
- Document SGN-GD3-SD-01: Environmental Action Plan (EAP);
- Document SGN-GD3-SD-02: Climate Resilience Strategy; and
- Document SGN-GD3-SD-03: Workforce and Supply Chain Resilience Strategy.

Section B Mains replacement programme (Repex)

40 In this section we set out our strategy for replacing the metallic mains within our network to reduce the risk associated with their failure and ensure we maintain high standards of network safety. Repex is the expenditure associated with replacing metallic mains and services with PE pipes. In this section we provide:

- Section B.1 – Introduction to the mains replacement programme. This sets out background to the iron mains replacement programme and how policy changes impacted the workload that we have to deliver in GD3;
- Section B.2 – GD2 experience and expectations for GD3 – Delivering Tier 1. Focused on the experience of delivering in GD2 with a particular focus on Tier 1 Repex delivery in the Southern region that has experienced unique challenges;
- Section B.3 – GD2 experience and preparing for GD3 – Repair and replacement. For Tier 2 and Tier 3 mains in particular there have been specific changes in workload expectations and interactions with emergency and repair;
- Section B.4 – Process for decision making – sets out the decision-making process for workload outside of the Tier 1 replacement programme;
- Section B.5 – Our Repex strategy for GD3 covering (i) Mandatory Repex HSE Enforcement Policy work; (ii) Mandatory PSR workload; and (iii) a precautionary programme of high volume and increasing risk assets;
- Section B.6 – Summary of Workloads and Costs; and
- Section B.7 – Proactive mains replacement decision tree.

41 We are currently forecasting that at the start of GD3, 58,088km, 80% of our network will have been converted to PE. Based on the current HSE policy, we have 5,590km Tier 1 mains that need to be replaced through the HSE enforced programme by 2032. We also have 3,494km of larger iron mains and 4,789km of steel mains remaining in our networks.

B.1 Introduction to the mains replacement programme

42 From the start of GD3, there will be seven years remaining in the replacement programme that was developed in 2001 to replace all iron mains within 30m of a building within 30 years.

43 Iron (including cast, spun, and ductile iron) was the predominant material used in the gas distribution network until the early 1970s, however, iron mains can degrade over time and can pose a significant health and safety risk. The replacement of iron mains with PE began in the 1970s and is set out in the MJM Report (SGN-GD3-ECR-01, pg 8 to 10).

44 The gas industry has progressively removed the higher-risk pipes to prioritise customer safety and to lower the risk of a gas incident in the quickest possible way. The approach to replacing them has evolved over time and initially was largely in response to catastrophic incidents. An incident is a result of a pipe failure leading to a gas in-building (GIB) event which subsequently ignites causing a gas explosion and resulting in fatalities, serious injury, and substantial building damage.

45 Since the early 1990s, statistical risk modelling has been used to inform decision-making. This has been influenced by different HSE and Ofgem policies that have been applied and changed over time, which have determined the type of projects that have been prioritised over the subsequent funding periods.

46 The current approach was borne out of the 30/30 programme introduced in 2002, the aim of which was to decommission all iron mains that lay within 30m of a habitable building within 30 years as these were determined to be the highest risk at the time. In 2013, this approach was further refined to focus on smaller mains of up to 8" in diameter, considered to pose a higher risk, rather than removing all cast iron pipes within the vicinity of the property.

47 The HSE has set a mandatory requirement for all predominately Tier 1 mains to be replaced by the 2032 target. It removed large diameter mains (>8" diameter) from the enforcement policy in 2013, with the replacement of larger diameter mains being determined through cost-benefit analysis.

48 The policies and regulatory approach have evolved over time and changed the nature of the projects delivered in the different regulatory periods. The population of mains that remain are quite different to those replaced in the past, which needs to be understood and considered in both the way in which we deliver the GD3 programme, and the funding allocated to deliver it. The MJM Report (SGN-GD3-ECR-01, Appendix I and Appendix II) provides a detailed overview of the history of HSE and regulatory changes that have impacted the Repex programme and the workload that has been implemented, initially by Transco and then by SGN.

49 Our asset management approach has evolved alongside the changes in policy and regulation. At the start of the 30/30 programme in 2002 the networks decommissioned iron mains in risk order, one pipe at a time. However, this was incredibly

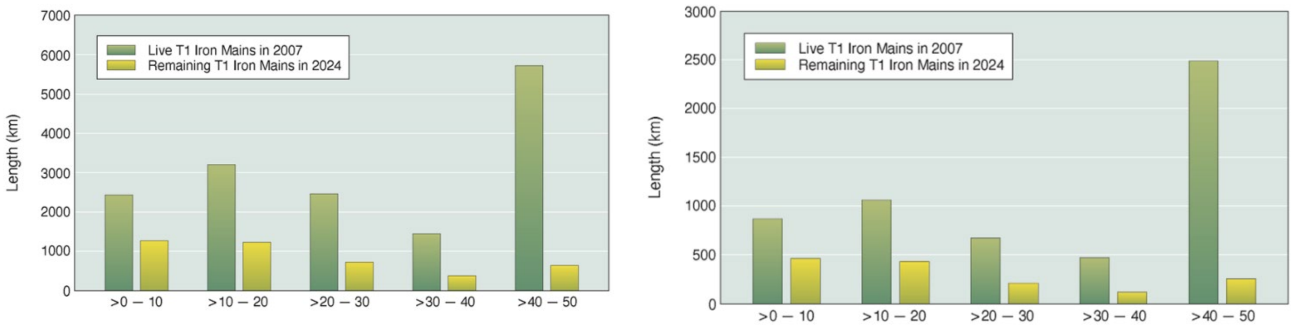
inefficient and often led the networks to return to the same estate across multiple years to decommission the next lowest pipe causing considerable disruption and inefficient delivery. After that initial phase in 2007/08 and during most of the rest of the 30/30 programme, the network has been replaced on a basis of 20% of the workload delivered being of the highest risk mains, typically identified at the start of any given year and given the term 'mandatory'. The rest of the replacement 80% volume was discretionary and gave the name '20/80 approach'.

50 The asset management approach we have used in current and previous price controls has been to construct our projects around a high-risk main that must be decommissioned, and then combine this with lower-risk mains in the vicinity to build a sensible sized project allowing for a more efficient contracting approach. The size of projects is dictated by financial controls, engagement with local authorities (LAs) relating to streetworks permitting and notices of direction, and project management controls so that we deliver the work as efficiently as possible, while maximising the length of iron mains replaced.

51 As shown in the MGM report, this approach has significantly reduced the risk associated iron mains in an efficient way. Figure 2 below shows the change in risk over time according to risk score band (where the highest band is the highest risk asset).

Figure 2: SGN GDNs - Comparison of Tier 1 Iron Mains (2007 v 2024) – Length by Risk Score Band

Southern | **Scotland**



Source: MJM analysis of SGN data

52 The above figure demonstrates that we have focused on removing significant levels of risk from our network and that the highest-risk pipes no longer form the largest cohort of assets (by length) in the network. This has generated the best outcome for customers by targeting those highest risk assets first.

53 The remaining mandatory pipes are typically further away from properties and therefore have a lower risk. However, targeting the highest risk pipes first has changed the characteristics of the remaining pipes. As these are typically further away from properties, they are more likely to enter new street space environments that introduce new challenges (such as more road crossings, or within the road), be a changing type of iron mains material (such a ductile iron that has a lower risk score), and/or have new challenges associated with the type of buildings nearby but outside of 30m (hospitals, schools etc).

54 More recently, a review into the iron mains replacement programme undertaken by the Department for Energy, Security and Net-Zero (DESNZ) has concluded that the Tier 1 programme, as it currently exists, has had significant benefits from both a safety and environmental perspective and should be continued. Following this recommendation the HSE undertook and confirmed that the Tier 1 programme should continue through to its conclusion in 2032, which we are committed to delivering.

55 On the 9 October 2024 the HSE published a draft enforcement policy[3]. Our business plan has not been calibrated to align with this updated draft policy, and before we are able to do so there are several points of clarification that we need to establish with the HSE to promote consistency across the industry. These will be secured over the coming months, and we propose an opportunity for an adjustment is provided at the draft determination stage, with further refinement through a GD3 reopener should it be required.

B.2 GD2 experience and preparing for GD3 – Delivering Tier 1

56 In this section we provide an overview of where we start the GD3 period and why, focussing on the experience that we have had in GD2, the lessons we have learnt as a result, and how these flow through into our expectations for GD3. In GD2 we have experienced two very separate environments according to the geographical region in which we operate. In Scotland

[3] HSE published: Proposed Revisions to the Iron Mains Enforcement Policy, on 9th October 2024

we have delivered the decommissioned length set within the Licence up until the cap. This places us in a strong position for continuing to deliver as we progress into GD3.

57 Contrastingly, in Southern, we have faced significant challenges delivering our Repex programme. We have a GD2 programme target of 3,001 km, however, in the first three years of the GD2 period we have fallen short of our annual targets and forecast in our 2023/24 Regulatory Reporting Pack that we may be 220km short at the end of the GD2 period. The funding for any length not delivered will be returned to customers through the use of a volume driver, so the customers are not paying for work that has gone undelivered.

58 As set out in the Workforce and Supply Chain Resilience Strategy (SGN-GD3-SD-03) and in the main business plan (case study, Chapter 5 and lessons learnt, Chapter 1) a part of the reason for these challenges in our Southern network is the significant challenges in securing the skilled resources needed to deliver our Repex programme in an affordable manner. The highly competitive environment has resulted in us having a shortfall in resources and paying considerably more for resources that we have secured to deliver the programme than in previous price control periods. The premium for new entrants has been found to be 30%[4] on average.

59 As explained in the Cost Assessment and Benchmarking Appendix (SGN-GD3-SD-08), the movement to the GD2 price control created a funding gap between the allowances provided and the cost to delivery. We looked to drive efficiencies within our supply chain, however this caused an exodus of contractor availability. In an effort to secure and stabilise the contractor base, we put forward work packages that contained relatively more productive work to attract new entrants to the market.

60 However, this could only have been a short-term measure, and the overall workload has become clearly more challenging to deliver, and this has reduced the productivity of teams involved, leading to higher costs per meter decommissioned. This has significantly slowed our replacement programme and means that we need more contractor resources to do the same work. In GD2, we have found that the length of main decommissioned by an operative has fallen by approximately 25%[5], figure 3.

61 This is shown in the figure to the right which is taken from our Cost Assessment and Benchmarking Strategy document where we have undertaken an assessment of the productivity impact of complexity factors and the remaining workload necessary to be undertaken in GD2.

62 It is the combination of limited resources and the difference in the remaining population of mains which explains why we have fallen behind our GD2 target and exceeded our cost allowance.

Figure 3: Repex Tier 1 Productivity Trend – metres/hour/per team

Source: SGN analysis

63 We cannot decommission an equivalent length of main at the same cost as we have done previously as projects are taking longer to complete and therefore require more resource to do so and that resource is coming at a higher cost.

64 While we continue to make significant efforts to strengthen our supply chain, we have also enhanced the resilience of our contractor base by investing in increased support for our contractors. As a result, from the middle of the price control, we began assigning more complex work to contractors. This shift has led to a decrease in productivity and an associated rise in costs.

65 In order to build a better understanding of the remaining workload and the challenges that we can anticipate in GD3, MJM (SGN-GD3-ECR-01) undertook an independent assessment of our remaining workload and assessed the different types of mandatory (predominately Tier 1) mains remaining. It identified seven complexity drivers that are increasingly represented in the remaining workload. These are summarised in the table 3.

[4] SGN Internal analysis – Analysis of new entrants compared to incumbents during GD2 Repex recovery
[5] SGN Internal analysis - Reference Section F5 of Cost Assessment Appendix

Table 3: Network configurations of the different types of Tier 1 iron mains remaining

Remaining types of mains	Brief description / explanation
Road crossings	Extra cost and time due to complete or partial road closure
Isolated mains	Geographically remote from other pipes so not included in previous projects
Stubs	Short lengths of pipe <3m in length connected to Tier 2 or Tier3 iron pipes
Service density	Mains expensive to replace due to time taken to deal with connected services (density >9 services per 100m)
Long services	The long services impact on asset replacement time as they cannot be inserted and must be open cut
Riser proximity	Risers within 25m of assets which would also require replacement
Cross road services	Customer services that connect with the customer by crossing a road requiring a complete or partial road closure

Source: MJM Repex report

66 MJM's analysis shows that of the remaining population of pipes, 65% in our Southern network have one or more configuration factors while in our Scotland network it is 45%. Many of the remaining pipes exhibit more than one of these network configurations factors, particularly in Southern where 25% show two or more.

67 This is making the replacement programme more complex to deliver and increasing the time and resource required to complete the same amount of decommissioning in the time available to us. This is further exacerbated by the location of the mains and the need for enhanced planning and stakeholder engagement with LAs because we need to work in areas that are:

- Adjacent to sensitive locations such as schools and hospitals;
- In traffic sensitive locations such as high streets and main roads;
- In London where there are additional restrictions such as 'red routes'[6]; and/or
- In areas where there are high numbers of MOBs.

68 These factors can add time and resource to the programme as they require us to work closely with the Highways Authorities (HA) and LAs to agree scheduling arrangements and measures to minimise disruption.

B.3 GD2 experience and preparing for GD3 – Repair and replacement

69 We have experienced approximately a 50% increase in annual repair workloads in GD2. We have evaluated factors behind this increase extensively to enable us to effectively forecast the number of repairs across GD3 and understand implications for the mains replacement.

70 Repair workloads are driven by reports of gas escapes by the public and the drivers for these calls can be grouped into circumstantial drivers, that impact the timing of when a gas escape is likely to be called in, and condition drivers, that impact the likelihood of a gas escape over time. We have commissioned a report with BearingPoint to understand the drivers for mains repairs and to see if there are other influencing factors, this can be found in SGN-GD3-ECR-02.

71 For circumstantial drivers, these are factors that impact whether a gas main which already has a propensity to leak is likely to be noticed and called in as a gas escape. These factors are largely weather dependent and include;

- First, network pressure rises when air temperatures are lower and demand is higher. The higher the network pressure is, the more that gas escapes from mains and therefore the more likely that buildup is detected and therefore called in;
- Second, dry and cracked ground is less likely to hold the leaking gas underground and around the main than wet ground is. As such we know that precipitation, or the lack of, is a crucial factor which leads to leaking mains being called in gas escapes being called in; and

6 Red routes are major roads in TFLs transport infrastructure and carry 30% of the cities traffic (Source: Red routes - Transport for London)

- Third, ground moves during periods of prolonged dry and or cold weather, which in turn stresses pipes causing fractures and additional joint leakage.

72 Conditional drivers in contrast are driven by the rate of asset deterioration. The metallic assets that makes up our network are constantly in contact with a corrosive atmosphere and soil types, leading them to decay over time. The result is a loss of material that corrodes or degrades the pipe wall and creates the potential for the pipe wall to fail either through a pinhole corrosion, a collapse of the main or fracture relating to the loss of beam strength. Additionally, we know from the construction of these types of main, where pipe lengths are jointed every 3m, that joints can also fail due to either bolt corrosion or the gasket material degrading.

73 The BearingPoint report also found that human factors have influenced the number of repairs that have been undertaken. They found that as a result of a safety incident and a renewed focus on safety, operatives have been undertaking an increased number of repairs. BearingPoint has concluded that an additional level of diligence will endure into the future.

74 The conclusion from this report is that we should see a continuation in the high number of repairs in the network, but that there is no reason to anticipate the steep increase will continue past current levels. The second conclusion is that the network is in worse condition than previously understood which is driving a substantial increase in the levels of repairs than in the immediate past. This has been incorporated into the forecasts of repair workload going forward.

75 In terms of conditional drivers, we have commissioned two independent pieces of work to understand the level of conditional degradation within the network.

76 The rate of repair is an important determinant not only in the direct operating cost of having to complete that repair work, but also in terms of the associated risk of that pipe and whether it is important that it should be replaced or not. In GD2 we have seen a surge in repair work undertaken and have therefore undertaken significant scrutiny of the factors that have driven the need for that repair work. These include;

- The DNV study on Cast Iron Mains integrity assessment report (SGN GD3-ECR-009). The outcome of this assessment identified that of the 15 plus techniques that could be used to inspect a pipe, none were suitable for use with iron distribution mains re-emphasising the need for failure data to infer the condition of the mains;
- DNV study on mains deterioration rates and scenario analysis (SGN GD3-ECR-011). This study took a view of deterioration on a pipe-by-pipe basis to build a model that could be used to predict failure rates in the future. This model was then leveraged to produce a scenario analysis based on a number of possible replacement scenarios;
- ICS undertook an update of some of the factors used within the NARM methodology, notably on mains deterioration rates. The assessment used a number of statistical methods to conclude that metallic mains are deteriorating between 1% and 2% per annum, depending on the cohort of main. The output of this work has been fed into our NARM model; and
- BearingPoint repair forecast and cost analysis (SGN-GD3-ECR-02). This study focused on the analysis of the SGN specific repair data to try and build a forecast of repair volumes in GD3. This enhanced the assessment undertaken by both DNV and ICS, by investigating factors that influence the volume of repairs alongside more detailed SGN data to help understand how we can forecast in the short term.

77 In addition, and given its importance, we also undertook substantial internal analysis looking at the drivers for repairs. What we can infer from the above information is that when the rate of asset replacement falls significantly below the rate of asset deterioration, there will be a corresponding increase in calls to the emergency number to report a gas escape, along with the associated repair requirement. As set out in the business plan (Chapter 5), we have seen an increase in repair workload for all tiers. We have seen around a 50% increase in annual repair workloads in GD2

78 While this analysis is clear the circumstantial drivers (temperature and precipitation etc) have the most significant impact when considering within-month variations in escapes and associate repair workload and this impact tends to be with Tier 1 mains. There is then an increasingly important conditional driver that seems to have a greater impact on Tier 2 and Tier 3 workload. For Tier 1 we have seen an increase in repair workload due to safety-related events and associated updates to policies and procedures. However, we anticipate that this will be a resetting of expectations and that the downward trend in repair volume will continue during GD3 as the Repex programme continues to replace iron pipes with more robust PE pipes. Our replacement rates far outstrip the level of deterioration, and we therefore expect a reduction in the number of repairs over GD3. BearingPoint estimates that Tier 1 repairs will fall by 70% over the GD3 period as a result of our replacement programme.

79 For Tier 2 and Tier 3 however we have also seen an unanticipated increase in the repair workload. As gas mains are buried assets, it is challenging to directly assess their condition without digging them up, as found by the DNV integrity assessment

report (SGN GD3-ECR-009). We therefore need to infer their condition from data that we collect, i.e. a lagging indicator as described in section A.4. One of the crucial pieces of data, outside of the physical parameters of the main (such as diameter, material and installation date), is that of failure and repair information. This failure data is the primary variable when assessing the condition of the main, with more failures inferring that the main is in worse condition.

80 For other metallic mains, such as Tier 2, Tier 3 and >2” steel, we have historically not replaced significant volumes with only 0.5% of the population replaced annually over GD2. This rate is significantly lower than degradation rate and we are consequently seeing an increased number of failures. When we compare our GD3 workload, which equates to around 0.7% per annum, to the expected level of deterioration we see that failures will continue to increase in these mains categories. However, the overall number of mains repairs as it is dominated by the effect of the Tier 1 mains related failures.

81 There is additional information gathered when effecting a repair on the main as, in almost all instances, repairing the main necessitates the need to excavate and expose part of the main to allow for repair. In that specific location we can inspect the main for condition. However, we also know that the value of this information is highly limited as just beyond the extent of the excavation the condition of the main can improve or worsen in a significant way. Therefore, any condition data needs to be treated as information on that specific location and condition of the rest of the main cannot be inferred beyond that point.

B.4 Process for decision making

82 In GD2 we have developed a clear asset management process that covers Tier 2, Tier 3 and >2” steel. It is centred around reactive workload, responding to repairs, and pro-active workload. The pro-active workload is developed based on a risk assessment built on the information available to us today, from which we can drive different levels of workload.

83 As per our HSE approved management procedure PRM/1, we have an established committee within the business focused on understanding the condition of our assets and reviewing potential investments on an asset-by-asset basis. The committee is called the Condition Review Group (CRG), and it is the focal point of investment papers designed to tackle problems highlighted by either our operational colleagues or as a result of our data insights analysis.

84 The CRG assesses the integrity of an asset, usually a main, and if there is an assessment that the asset has insufficient integrity to remain in use, and is therefore at end of life, then an intervention will be planned.

85 The process undertaken by the CRG can be summarised into the following investigation steps:

- (i) A proposal from either operations or data insights resulting in the production of a report including the repair history of the main in question and the history of surrounding mains;
- (ii) A potential intervention plan is then established and costed which then is subject to a CBA;
- (iii) Using these two reports the committee is then asked to form an engineering opinion on the condition of the main, and the suitability of the intervention planned;
- (iv) Feedback may be issued if an alternative engineering approach would be preferred; and
- (v) If ratified, or modified, then a project would be issued as such to operations for delivery.

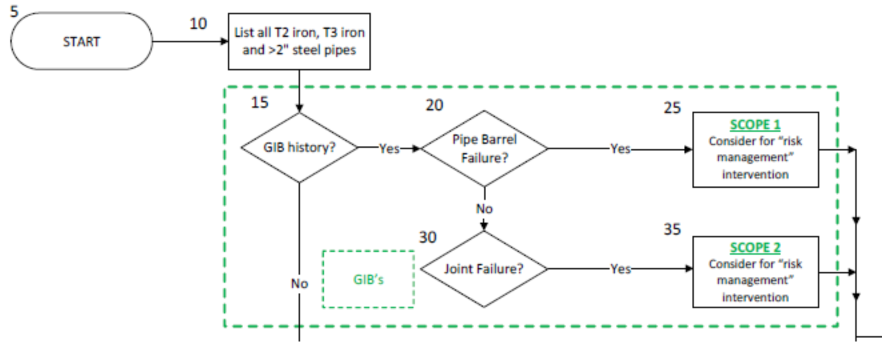
86 The output from the CRG process creates a mandatory workload that is tested against PSR Regulation 13. Where the committee has gathered evidence of mains repairs, checking it for robustness, it then carries out a condition assessment from the available information. If the main has failed the assessment against a main being in an ‘*efficient state, in efficient working order and in good repair*’ then it is clear that an intervention is required. In the majority of instances we would progress a well-balanced replacement project, but we may also consider CISBOT (a robotic intervention to apply sealant to joints) or other appropriate intervention.

87 The HSE has made it clear that when a main fails this assessment that the replacement is mandated.

88 As part of the subsequent assessment, we would also check to see if the project passes a CBA. This is based on the engineering assessment and the costs effectiveness of replacing the asset compared to the cost, environmental impact and social risk of ongoing repair. For reactive workload, this process can guide the level of intervention, but it does not preclude an intervention as it is a mandated workload.

89 In addition, we have also forecast a modest programme of proactive work based on our decision-making approach detailed within the management procedure PRM/1. Our approach considers 10 years-worth of data and uses a decision tree to rank the risk associated with all Tier 2, Tier 3 and >2” steel mains and categorise them into 10 ‘Scopes’. The extract shown in the figure below just focuses on the top two ‘Scopes’. We have included a full copy of our decision tree in Section B.7.

Figure 41: Scope 1 and 2 categorisation from the mains decision tree



90 The figure above shows that we rank the mains in risk order starting with mains that have previously led to GIB events. This is covered under 'Scope 1' and 'Scope 2', where 'Scope 1' mains have seen GIB events following either a corrosion or fracture failure and 'Scope 2' mains have seen GIB following a joint failure.

91 For mains failures that have led to GIB's we need to acknowledge that the main has failed, released gas and that gas has found a path to enter a building in substantial quantities for it to be detected. The fact that we now have a recorded instance of that happening in relation to a main, and that we know that gas readily tracks along mains when they fail, combines for us to conclude that in this situation it is more likely than not that future failures will result in GIB. On that basis we consider Scope 1 and Scope 2 mains to be of a significant safety risk and are planning on interventions.

92 In the business plan guidance there is a requirement that networks should assess whether work should be deferred into GD4, however, this slightly mischaracterises the problem, our Tier 2 and Tier 3 network is a cohort of assets which are at different states of deterioration according to the conditions that it operates under. As set out above the workload is driven by safety compliance and risk. Deferral of projects would lead to an increase in risk and breach of safety obligations.

B.5 Our strategy for iron main replacement in GD3

93 Our experience of GD2 has demonstrated the challenges in delivery for Repex Tier 1 workload, the changing requirements for Repex Tier 2 and Tier 3 and through-out we have increased our knowledge and understanding of areas of risk, such as risers and complex distribution sites (CDS). In this section we will cover how we will utilise that understanding to deliver our Repex strategy for GD3. Our Repex strategy is organised into three categories:

(a) A programme driven by HSE enforcement policy, mandating workload over a pre-determined time period – this is predominately Tier 1 main (<8" diameter);

(b) A mandatory safety-driven programme driven by The PSR 1996; and

(c) A precautionary programme is driven by the need to reduce the safety risk posed by cohort of assets not included within the mandatory programme. For example, there are circa 600,000 steel service pipes that have a significant risk associated with and need to be addressed through an efficient programme of work.

94 Our approach reflects the priorities of our customers, by ensuring that we continue to operate a safe and resilient network and investing where needed to maintain this. The investment included within our precautionary programme aligns with this by proactively targeting mains that pose a safety risk to avoid a deterioration in the performance of our network.

Category A: a programme driven by HSE enforcement policy, mandating workload over a pre-determined time period

95 This section will cover four main categories (Tier 1 iron mains, small diameter (<2") steel mains, Tier 2a iron mains and Polyvinyl Chloride (PVC) and their associated services. We set out our approach in GD3 to each of these categories.

Tier 1 iron mains and services

96 For both Scotland and Southern we have completed our workload forecasts based on our anticipated end period for GD2 and the work that needs to be undertaken to deliver the remaining workload to the end of the iron main replacement programme.

97 For the purposes of setting workloads, we have concentrated on the mains being the driver for the workload. In all instances, the associated service workloads have been calculated using service densities seen in recent history to forecast the relay and transfer workloads through GD3. To prevent repeating this process, any mains workloads included in the following sections can be considered to have associated service volumes based on this approach.

Table 4: Tier 1 mains and services delivery (km/yr)

Workload	Tier 1 Mains (km) GD2 5-year avg.	Tier 1 Mains (km) GD2 last 3-year avg.	Tier 1 Mains (km) GD3 avg.	Services (# of) GD2 5-year avg.	Services (# of) GD2 last 3- year avg.	Services (# of) GD3 avg.
Scotland	207.1	201.6	215.0	16,305	16,293	15,265
Southern	556.4	561.7	640.0	46,231	48,341	52,480
SGN	763.5	763.3	855.0	62,536	64,634	67,745

98 In our Southern network, it is currently forecast that we will shortfall in delivery by approximately 220km. While we are doing all we can to recover this position, with a significant increase in delivery to the final year of GD3 we have used the forecast shortfall as a basis to determine the population at the end of GD2 and therefore, establish our GD3 workload.

99 In our Scotland network, we have tapered off delivery in the last three years of GD2 as we would otherwise exceed the cap, it is currently forecast that we will over-deliver by approximately 15km and we have used this figure to forecast our asset population at the end of GD2 to determine our GD3 workload.

100 When considering the remaining workload, we have identified the incidence of complexity factors that were identified above and how they are aligned with the remaining workload. This was analysed by MJM and set out in the table below.

Table 51: Overview of the population of iron pipes remaining in both SGN GDNs (As of Jan 2024)

Description of asset (Configuration)	Southern Asset Count & (%)	Southern Length (m) & (%)	Scotland Asset Count & (%)	Scotland Length (m) & (%)
Road Crossing	6,298 (11%)	85,062.82 (1.0%)	2,682 (10%)	13,390.87 (1%)
Remote Assets	1,706 (3%)	230,725.60 (4.0%)	348 (1%)	39,384.56 (2%)
Stubs	963 (2%)	4,208.02 (0.0%)	335 (1%)	1,186.07 (1%)
Service Density	11,981 (21%)	1,651,536.87 (28%)	4,742 (17%)	446,865.66 (23%)
Long Services	8,338 (15%)	2,049,297.58 (35%)	2,148 (8%)	290,251.46 (15%)
Riser Proximity	4,354 (8%)	590,919.51 (10.0%)	2,535 (9%)	180,140.65 (9%)
Cross Road Services	13,766 (25%)	2,694,873.42 (46%)	5,066 (18%)	554,016.63 (29%)
Ductile Iron	12,856 (23%)	1,021,859.93 (18%)	7,480 (27%)	487,979.57 (26%)
Conventional Tier 1 Assets	24,956 (45%)	1,821,655.46 (31%)	15,107 (55%)	958,818.86 (50%)

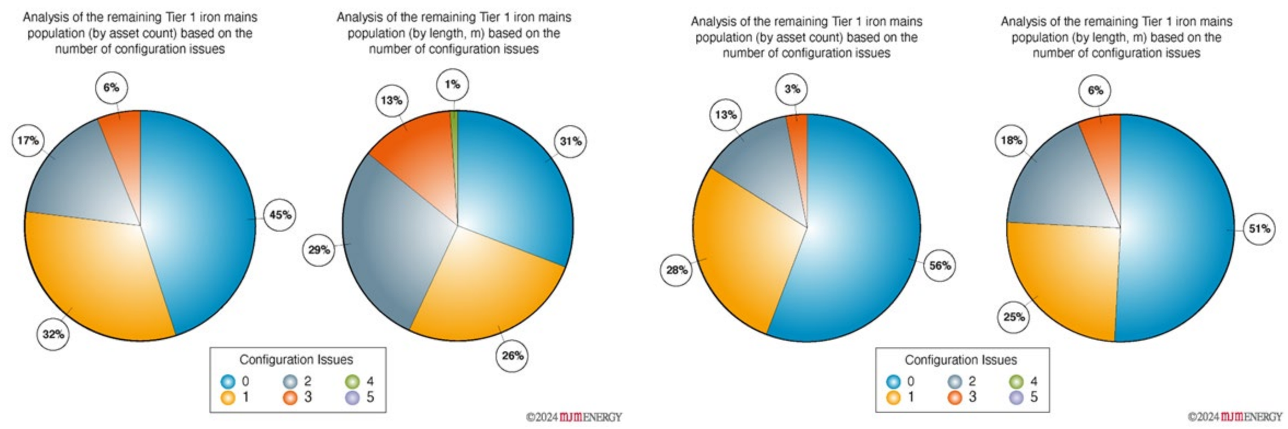
Notes
The above analysis is based on data extracted from the SGN live database.
Pipes can exhibit more than one configuration e.g. a pipe can be both remote and DI, hence percentages do not sum to 100%.
Source: MJM Energy - Historical review of Repex - SGN-GD3-ECR-01

101 From this it is clear that for the majority of complexity factors Southern has a greater incidence of complexity in the remaining workload. However, it is the impact of one or more complexity factor that we consider to have a greater impact on the costs. Furthermore, the impact on costs is not necessarily directly additive rather the combination of complexity factors increases delivery risk and the increase in delivery risk will increase the associated contractor premium until it reaches a point where the delivery risk is so high that the contractor will insist on day rates to deliver the work.

102 In Figure 5, we have shown the configuration of complexity issues in the remaining workload in both Scotland and Southern. The first graph is by asset count, the second graph is by the length (meters). When considering delivery in the GD3 period and assuming the Licence condition remains focused on meters to be decommissioned it is the second graph that is more relevant.

Figure 2: Analysis of the combination of configuration issues in the remaining Tier 1 iron mains population

Southern | Scotland



Source: MJM Energy - Historical review of Repex - SGN-GD3-ECR-01

103 These figures clearly show that for the Southern network only a third of the remaining length does not have a complexity issue, compared to almost a half for Scotland. However, for Southern, 34% of the remaining length has more than 2 points of complexity, whilst in Scotland this is reduced to 24%. Therefore, while complexity is still an issue for Scotland and will increase costs over the GD3 period, the extent of the increase is likely to be less extreme than Southern.

104 MJM has set out how this may be expected to impact costs, and this is detailed in the cost assessment appendix (SGN-GD3-SD-08). In GD3 we expect to invest £205m/yr in Tier 1 main (£38.5m/yr in Scotland and £166.6m/yr in Southern) and to invest £61.5m/yr on replacing Tier1 services (£12.9m/yr in Scotland and £48.6m/yr in Southern).

Tier 1 diameter mix

105 The Tier 1 diameter mix has been dictated by the mix of pipes tackled as part of large-scale project generation during GD2. The mains that were in that location were picked up in the project and little opportunity was found to alter the mix on an artificial level.

106 As we approach the end of the programme, the mains that remain will dictate the outturn delivery mix. Our approach, moving to zonal replacement, will also leave us to deliver the mix of mains found in that area. We have therefore forecast to deliver a diameter mix of mains that is representative of the remaining population of mains in each network.

Tier 1 services

107 Services delivered alongside the Tier 1 programme include a mix of relays and transfers for domestic and commercial properties. We have seen over the course of GD2 that service density and workload mix has fluctuated with the mains being decommissioned. We expect this variation to continue into GD3, but also note that overall, we have seen a downward trend in the total number of services being delivered.

108 We have conducted analysis which has indicated that there are positive and negative drivers that will alter service densities as we move into GD3 and the end of the programme. Negative drivers, such as having fewer properties associated with lower-risk mains may result in us seeing lower service density alongside those mains.

109 Positive influences are notable in London, where we see a high level of building congestion and expect to see a corresponding higher-than-average service density. Additionally, we know that there are a high proportion of single-sided mains that we know remain in our network that will need decommissioning in GD3, and these can also have higher service numbers.

110 However, modelling suggests that overall service density is expected to fall as we move towards the end of the programme. This modelling also suggested that there was a low level of confidence in this output and whilst we have represented this in our figures, it may be subject to a change as we outturn the work in GD3. Whilst we agree that it should continue to be covered by a volume driver, we also note that the work will need funding and that the networks do not have the ability to significantly alter the volumes delivered. We would therefore request that the cap and collar be removed for this PCD.

Small diameter mains (less than 2” in diameter)

Table 62: Small diameter steel mains and tier 2a

	<2” Steel			Tier 2a		
Workload (km)	GD2 5-year avg.	GD2 last 3-year avg.	GD3 avg.	GD2 5-year avg.	GD2 last 3-year avg.	GD3 avg.
Scotland	25.7	27.3	20.4	0.1	0.2	0.0
Southern	20.6	21.7	22.1	0.5	0.9	0.0
SGN	46.3	49.0	42.5	0.6	1.1	0.0

111 Small diameter steel mains are a mandated replacement within 12 months of being worked on, i.e. either repaired or connected to. From this definition we can establish three workload drivers:

(a) Mains that are connected to Tier 1 iron mains, and therefore need to be replaced with the iron mains programme;

(b) Mains that are repaired following failure; and

(c) Mains that are connected to following a customer connection request

112 As small-diameter steel mains are often unrecorded, we are required to forecast forward using a run rate established using historical data. This enables us to understand the required workload for GD3 for each category. For more detail on this point please see our EJP for Tier 1 iron mains (SGN-GD3-EJP-RPX-005) which details this breakdown by workload driver. We do not forecast any carry over workload from GD2 in either network.

Tier 2a mains

113 Tier 2a mains are identified using the nationally established Mains Replacement and Prioritisation System (MRPS) and a network specific Risk Action Threshold (RAT). When a pipe is deemed to have a risk score, as determined by MRPS, above the RAT we are required to decommission that main within 12 months.

114 Factors that influence the MRPS risk score are; mains failure data – where a new failure may trigger the risk score to increase; a new MRPS survey of the pipe – where new buildings or changing ground cover conditions may mean it’s more likely a failure would result in a GIB; or a change in the background zone – where there are failures on mains of a similar type and location.

115 We have not identified any Tier 2a mains so far during GD2. As such, there is no outstanding position to impact our GD3 workload. However, the HSE has highlighted that the patchwork approach to establishing the RAT for Tier 2a across the country and the zero workload in several networks means that it is looking to review this approach which could increase workload. For this reason, we have highlighted to Ofgem the need for a specific GD3 Repex reopener to cover material changes in approach as dictated by the HSE.

116 As we have little information from the HSE review, we have forecast our GD3 plan a similar basis to GD2. While this forecast has not yet been reflected in GD2, we consider it a reasonable basis to establish workload for GD3. It also allows us to consider these mains in the overall deliverability of our plan when alongside similar workloads such as Tier 2b and Tier 3 mains, which are delivered by similar resources in both networks. Tier 2a mains workloads are included in Section D.

Polyvinyl Chloride Mains (PVC)

117 PVC is a non-standard material used for main construction in the 1970’s. In the late 1990’s the HSE tasked all networks to remove mains that were made from non-standard materials. As such there were decommissioning programmes established to tackle this workload by 2002. However, the Southern network was given a dispensation from this programme as it had a large population of PVC mains that was not present anywhere else in the UK, therefore there are still PVC mains present that need to be decommissioned.

118 At the start of GD2, the HSE confirmed that these mains needed to be decommissioned by the end of 2032 to align with the Tier 1 iron programme. This was not clear at the time of the GD2 business plan submission and, as such, was not included in the workload.

119 The MJM report identifies that Southern has 199km of PVC mains while Scotland does not have any. The report highlights the difficulty of working on this type of material, which faces similar challenges to ductile iron. For example, on ductile iron and PVC mains ‘service windows’ need to be cut, rather than broken, into the inserted main to allow access for service

connections. To undertake the cutting operation, the excavation needs to be bigger which adds time, equipment and resources requirements to the replacement activities.

120 PVC also has added complications, in comparison to all other materials, as there is also difficulty in getting access inside the main when making connections, which includes for gas isolation equipment as used in everyday replacement activities. When an operative needs access, a 'tee' needs to be fitted to the main to allow for equipment, such as bags (used in flow-stopping operations), to be installed. This considerably raises the amount of time and materials taken to decommission PVC mains.

121 Additionally, it has become apparent in our operations through GD2 that the skillset to operate on such mains has dwindled and a resource gap has emerged to decommission these mains. Our supply chain partners have signalled that tackling the remaining mains in the GD3 period, or at least adopting a linear approach, would not be possible due to resource constraints and we will need increase capacity over GD3; to achieve the 2032 target, and this has dictated our approach.

122 To enable the re-skilling of resources, we propose to start with a modest but increasing workload over GD3. As competence is increased over time, we will be able to direct more resources to this workload but acknowledge that further work will be required beyond GD3. We have forecast a workload of 60km in our Southern network for GD3.

Category B: A mandatory safety driven programme driven by The Pipeline Safety Regulations (PSR 1996)

123 This section will cover Tier 2B, Tier 3, large diameter steel mains and Iron mains more than 30metres away from a property and their associated services.

Table 7: Tier 2b, Tier 3 and large diameter (greater than 2 inches) steel mains

	Tier 2B			Tier 3			>2" steel		
Workload (km)	GD2 5-year avg.	GD2 last-3 years avg.	GD3 avg.	GD2 5-year avg.	GD2 last-3 years avg.	GD3 avg.	GD2 5- years avg.	GD2 last- 3 years avg.	GD3 avg.
Scotland	4.1	4.0	7.5	0.9	1.3	2.5	8.6	8.7	11.0
Southern	7.1	10.2	14.3	3.9	3.9	8.2	15.6	18.0	16.4
SGN	11.2	14.2	21.8	4.8	5.2	10.7	24.2	26.7	27.4

Source: SGN business plan, figures taken from BPDT's. Decommissioning lengths in km

Tier 2B, Tier 3, large diameter steel mains

124 The asset management approach to this group of mains is common and covered together in this section. As we set out above, the workload for GD3 is set out by a ***reactive*** strategy, predominantly driven by representations to our CRG, and a ***proactive*** strategy, which supports the prioritisation of mains for replacement according to the level of risk currently identified, and an economic workload associated with Tier 1 projects.

125 The first two strategies are underpinned by the aforementioned management procedure PRM/1, approved by the HSE, and have been the subject of several inspections during GD2 to ensure that we are following them.

126 Our original GD2 business plan presented a higher workload based on our assessment to tackle safety issues and on the basis of environmental benefits that could be realised. This was cut back during the draft determination to a point that was based on workload run rates seen in GD1. However, during GD2 the workload assessment has been demonstrated to be short and we have had to deliver more workload for safety reasons than provided for within the price control.

127 While the NARM PCD (Price Control Deliverable) framework provides a regulatory mechanism to accommodate changing workload requirements, this settled workload volume was used to set the contracting strategy for this workload. Due to challenges in changing the contractor base in short order, we have had to deploy CISBOT to remediate some mains. This then allowed pressure to be reduced on the existing contractor base whilst we renegotiate with our delivery partners to increase resources over the GD2 period. The new contract was based on minimum as opposed to maximum lengths to be delivered and with an expectation of growth in their overall delivery capacity.

128 While the contracting workforce continues to grow, and is forecast to do so into GD3, these two factors have combined to leave us with shortfall in required delivery in Southern and such we will need to carry some of this reactive workload into GD3.It must be noted that we will over-deliver against our agreed lengths, but we have identified more reactive workload than can be delivered.

129 In Scotland we have delivered the agreed workload volumes so there is no reactive workload to carry over to GD3. While we have seen reactive workloads increase within the period, we also have been able to swap out proactive workload to deliver the additional reactive workload.

130 In GD3 we have forecast that 102.3km of ***reactive*** workload in Southern and 38.1km in Scotland covering Tier 2, Tier 3 and >2” steel mains will be required.

131 For our ***proactive*** workload programme, as set out above, we identified the highest risk mains that fall into these top two ‘Scope’ groups. This equates to 37.3km of Tier 2, 18.4km of Tier 3 and 39.3km of large diameter steel mains across both networks.

132 As new CRG projects are identified throughout the end of GD2, and into GD3, we will need to prioritise replacement based on risk within that group of mains. In doing so, we recognise that an element of substitution will need to occur within GD2 whilst delivery is restricted. However, we will be seeking to maintain the increased levels of workload through GD3.

133 An example of the proactive workload we are seeking to tackle in GD3, was the subject of an Ofgem site visit in June 2024. The project located in Wrythe Lane, Carshalton that had seen multiple failures leading to a number of GIB events. The Medium Pressure (MP) main in question was in the footpath and front gardens of properties on the north side of the road. Photos from the site are shown the proximity to houses and the risk that needed to be mitigated. More information can be found within the Other Mains and Services EJP (SGN-GD3-EJP-RPX-003).

134 In GD3 we have forecast that 62.6km of pro-active workload in Southern and 32.5km in Scotland. covering Tier 2, Tier 3 and >2” steel mains.

Figure 3: Example medium pressure mains project

Source: SGN project manager

135 The final workload driver is ***economic*** workload which is associated with Tier 1 projects. This workload occurs where Tier 1 pipes are connected to Tier 2, Tier 3 or >2” steel parent mains and it is more efficient to remove short lengths of these mains than to re-connect to them. The workload here is taken data from GD1 and GD2 Tier 1 projects to extract the average economic Tier 2, Tier 3 and >2” steel mains replacement length.

136 Without this workload length, there would be a direct increase in costs for our Tier 1 programme that would be greater than the cost of this work. It has been well established through the use of CBA, comparing the cost of replacement against the cost of multiple connections, which shows that this work is at least cost-neutral and has the ability to save substantial costs of reconnections. Additionally, it reduces the need for a significant volume of short-length projects that can have high mobilisation costs.

137 In GD3 we have forecast 19.1km of economic workload in Southern and 25.7km in Scotland, which compares to be a fraction of the percentage of length delivered in the Tier 1 programme in both networks.

Iron mains outside 30m of a property

138 Iron mains outside 30m are not part of the iron mains enforcement policy, i.e. they are deemed beyond reach of affecting a property if they were to fail. However, they are still subject to the same requirements under the PSR 1996. We are required to maintain them and if they are shown to not be in an “*efficient state, in efficient working order and in good repair”* then we must replace them.

139 Because these mains do not pose the same safety risk as those that are within 30m of a property, we do not target them through proactive workloads. However, they are still subject to the same reactive processes as described in the previous section.

140 We continue to replace this mains category through our CRG submission process. This workload is volatile and often when a problem is discovered it can mean that long lengths of main need to be replaced. This is particularly the case when mains cross farmland, woodland or other areas that are not heavily populated and as such are not under the intense scrutiny as those in heavily built-up areas.

141 However, it is possible that this mains category could see additional workload if the rollout of advanced methane detection technology (detailed in Document SGN-GD3-SD-01: Environmental Improvement Plan) identifies methane leaks which signal inadequate integrity. However, the impact of this is not yet fully understood and any forecast would be highly speculative and as such a change in this workload needs to be a consideration for a re-opener as stated in Chapter 8 of the main business plan.

142 The workloads in GD2 are low and we do not anticipate any work being carried over beyond the end of the price control. We have forecast this workload into GD3 using the run rates seen in GD2 and anticipate 1.9km /yr in Scotland and 1.4km / year in Southern.

Category C: A precautionary programme driven by the need to reduce the safety risk posed by cohort of assets not included within the mandatory programme

143 This section will cover two categories of main and their associated services (Complex Engineering Schemes (CES) and London MP) and one area of service (Bulk Services).

Bulk Services

144 Bulk services is a programme of work designed to address the growing need to remediate ageing steel services connected to PE mains installed in the 1970’s and 1980’s, a legacy of previous replacement programmes. During this timeframe it was standard practice to relay the last two metres of a service in steel rather than PE, the remaining steel asset is known as a steel tail.

145 We have identified that certain steel services would not be the subject of remediation as the metallic main in the street had already been replaced with PE. These assets can be said to have been ‘stranded’ following the legacy replacement of iron mains.

146 Concern over these assets has grown following two gas explosions in *Whale Island Way, Portsmouth* and *Gorse Park, Kincaidston, Ayrshire* both in 2021. These two incidents, both attributed to stranded steel services and the assessment of repaired assets recovered during GD2, have led us to propose a continuation of this programme in GD3.

147 In addition, we are also seeing a substantial increase in the number of GIB events following steel tail failures, which suggests that the asset base is deteriorating quickly. We consider that this warrants additional attention, and we propose to increase workloads in GD3 to help prevent failures.

148 In GD2 we secured allowance for a modest starter programme of works covering 5,250 stranded steel tails. We adopted a risk-based approach, carrying out surveys to understand the level of risk and targeting the worst-performing assets in each of our networks.

149 During our investigations when establishing the programme in GD2, we have discovered that in some instances all the steel service components have been replaced on an ad-hoc basis i.e. as a result of a relay after escape. This compares to broader network averages which are in the range of 30% to 50%[7]. This analysis reinforces the need to continue this work into GD3.

150 Based on the information gathered during GD2, and time period identified above, we can estimate based on the mains installed during that period the scale of the challenge on the network. We have estimated that we have circa 600,000 steel tails in the two networks. For scaling purposes, we relay or transfer approximately 339,000 services as part of our Tier 1 programme over a five-year period.

151 Delivery in Scotland is on track to deliver in full, with some potential for over-delivery against target.

152 In Southern, we have been impacted by the lack of contractor resources, as discussed above for Tier 1 mains delivery. To rectify this situation, we have chosen to direct a number of our new direct labour resources onto this project to ensure full delivery by the end of GD2 and are confident that targets will be met. However, we cannot ignore that this programme draws on the same resource that would otherwise be delivering the Tier 1 Repex programme and is extremely limited.

[7] Transfer ratio, as seen in our Tier 1 programme and can be used as a proxy for how many services have already been replaced.

153 As Tier 1 Repex is a mandatory programme it has to take priority and therefore, the majority of our workforce will continue to focus on completing that work. Taking this into account, and the likelihood that beyond the Tier 1 programme we would have additional resources freed up, we have chosen to continue with a programme more in line with that being delivered in GD2. We believe that by continuing to target the worst-performing assets with a slightly higher, but still modest programme, that we would be able to keep failures under control. To this end, we are requesting funding of £20.1m to remediate 10,500 services in our GD3 Bulk service programme.

London MP network

154 The London MP network is a network of 200km of metallic mains in London that operate at up to 2bar pressure. The network runs from Woking to the west of London to the Isle of Grain in the east and serves around 1.25 million customers in the south of London. The makeup of the network is a mix of Tier 2, Tier 3 and large diameter steel mains alongside sections of more recent PE mains (not included in the length above).

155 The network is almost exclusively laid in urban settings and/or thoroughfares and is as such difficult to work on as the HA's and LC's have stringent requirements before we can affect any road or lane closures to work on the network. While many other large-diameter mains are subject to similar constraints, the intensity of the scrutiny put on the designs, plans and workforce sets it apart from other similarly banded work.

156 A significant number of sections of the London MP system have been replaced since the start of GD2. Some due to catastrophic failures of the main, such as at Sandiford Road, where a replacement project was extended on several occasions due to the integrity being insufficient to make a connection to the new PE main. That particular project resulted in around 1.3km of 36" MP main being replaced, while other sections have been replaced due to similar integrity or customer concerns. By the end of GD2 we forecast that we will have replaced 7.3km of the London MP network in a reactive manner.

157 Since the middle of Year 2 we have found that there have been a significant number of network failures associated with the London MP network. This is in combination with the HSE investigating the integrity of this system, where its focus was on assessing the condition of the main to understand if it was fit to remain in service or not, has resulted in us completing a study on the potential ways of assessing the networks integrity. Please see document SGN GD3-ECR-009.

158 From the conclusion of the study, an internal review of the replacement options for this system, and in combination with and with added interest from stakeholders and the HSE, we have identified the need to start a proactive programme of replacement of the London MP network. Our optioneering has been set out in the EJP (SGN-GD3-EJP-RPX-004) and considers proactive replacement of the network over a number of price control periods, the proactive deployment of CISBOT to target joint failures and the ongoing monitoring and repair work. Given that under any future pathway or scenario, this would probably be one of the last mains to be decommissioned, as it feeds significant domestic and industrial customers in south London, our preferred option is to undertake a proactive replacement programme.

159 We are seeking funding to tackle 15km of mains in GD3, however, this is a highly complex project - for example, we cannot work in two locations on the system at the same time and we can only work during the summer period when demand is minimum due to requirements under the Safe Control of Operations (SCOs) which stipulates the need to have a workable contingency as part of any Non-Routine Operation (NRO). Given the importance of this main and the complexity of the replacement and planning process we propose to put this workload through a re-opener submission at the start of GD3 once there is greater clarity on the operating constraints that will impact our delivery model.

Complex Engineering Schemes (CES)

160 CES projects seek to identify and replace stretches of mains, which combine to form pipeline systems, that collectively have a substantial number of failures. In isolation each asset does not meet the criteria for replacement, however, when considered as a geographical unit of lots of different assets then the case for replacement becomes established. Due to their complexity across multiple asset categories, we have separated them into a distinct work package.

161 In GD1 SGN undertook work which focused on reviewing the likelihood of main failure based on a wide variety of information available in our own and wider industry systems. This work, known as Predictive Analytics (PA), found that where mains of a similar age, diameter and material type had failures, it was likely that surrounding mains would be in a similar condition and the likelihood of failure could therefore be inferred. From this we produced predicted failure rates for mains, and we have been using this information in our decision-making tools, such as the decision tree (see B.7), ever since.

162 Building on this concept and in preparation for GD3, we have undertaken work to look at mains failures over a wider area. To do this we have linked the same types of main together into pipeline systems and reviewed the collective failures on those systems. Previously, data analytics had only been undertaken on individual sections of the pipeline systems, which was based on our asset records and therefore dictated by the arbitrary digitisation process when these mains were first captured and entered into our systems.

163 The results of this analysis was profound. It showed that some of these pipeline systems have significant failure history, which was not apparent when these failures were investigated at a more granular level. An example of this demonstrated in the below table.

Table 8: Example analysis that has led to the identification of a CES project at Queensway, Glasgow

Pipe Object Number (PON)	Diameter	Material	Pressure Tier	Total recorded failures	Failures per annum
466206554	18"	Spun Iron	Medium Pressure	72	2.0
466206555	18"	Spun Iron	Medium Pressure	62	1.7
466206557	18"	Spun Iron	Medium Pressure	8	0.2
466206561	18"	Spun Iron	Medium Pressure	52	1.4
467222591	18"	Spun Iron	Medium Pressure	18	0.5
Total				**212**	**5.9**

Source: Data collected from our asset repository, Maximo

164 As can be seen in the example above, when individual sections (Pipe Object Numbers (PONs)) of this pipeline system are investigated they do not stand out in terms of the number of failures. Typically, hot spots would be identified when they breach four to five failures per year, when compared to the rest of the network. However, when the arbitrary division of the pipeline system into PONs is removed, and these pipes are amalgamated into a single pipeline system, there is a considerable number of failures that would constitute a hotspot and would have otherwise be followed up into a CRG submission.

165 From these investigations we have identified 29 potential projects across both networks where this analysis has highlighted issues with pipeline systems. From this list and following stakeholder insight, operational input and costings work we have been able to identify 12 projects which we plan to progress in GD3.

166 These projects have both strong drivers and are atypical in nature. The nature of the drivers, such as repair volume and cost will mean that they all pass the CBA with demonstrable social and economic benefits identified. However, they also constitute a high unit cost and, in our view, an atypical driver for the identification of the workload. We consider that they would be better suited for a technical assessment on that basis.

167 Of the remaining projects, where they have been more typical, they have either progressed in GD2 or will be accounted for in proposals to the CRG in due course and therefore considered in the workloads described in the above sections. The workloads identified under CES have been identified in the workload and cost tables within Section B.6 below.

B.6 Summary of workloads and costs

168 In this section we will set out our required workload volumes for each category of main and total monetary request for the GD3 period for each network. The table below sets out the workload and costs associated with the three categories of our Repex programme in our southern and Scotland networks.

Table 9: Repex workloads and costs by network (Southern)

Southern (Mains replacement activity)		km (or No. for Bulk services)				£m
		GD2 Agreed	GD2 Per annum	GD3 Total	GD3 Per annum	GD3 total cost
Category A	Tier 1	3,001.3	600.3	3,200.0	640.0	£1,076.2
	<2" Steel Mains	118.9	23.8	110.6	22.1	£23.6
	Tier 2a	6.8	1.4	0.0	0.0	£0.0
	PVC	2.0	0.4	60.0	12.0	£17.9
	Total Category A					**£1,118**
Category B	Tier 2	30.0	6.0	65.7	13.1	£68.9
	Tier 3	22.0	4.4	37.9	7.6	£63.3
	>2" Steel	110.7	22.1	80.3	16.1	£38.4
	Iron >30m	3.2	0.6	7.2	1.4	£4.2

	Total Category B					**£174.9**
Category C	London MP	0.0	0.0	15.0	3.0	£30.0
	Complex Engineering Schemes (CES)	0.0	0.0	6.7	1.3	£5.8
	Bulk Services (No. of Services)	3750	750	7500	1500	£15.2
	Total Category C					**£51.0**
	MOBS					£194.5
	All Other Repex					£111.6
	Southern Total					**1,649.8**

Table 10: Repex workloads and costs by network (Scotland)

Scotland (Mains replacement activity)		**km (or No. for Bulk services)**				**£m**
		GD2 Agreed	GD2 Per annum	GD3 Total	GD3 Per annum	GD3 total cost
Category A	Tier 1	1020.6	204.1	1075.0	215.0	£256.9
	<2" Steel Mains	128.9	25.8	101.9	20.4	£21.6
	Tier 2a	1.3	0.3	0.0	0.0	£0.0
	Total Category A					**£278.6**
Category B	Tier 2	17.1	3.4	33.2	6.6	£22.3
	Tier 3	5.0	1.0	8.2	1.6	£8.5
	>2" Steel	45.0	9.0	54.8	11.0	£17.3
	Iron >30m	8.0	1.6	9.7	1.9	£3.5
	Total Category B					**£51.6**
Category C	Complex Engineering Schemes (CES)	0.0	0.0	8.6	1.7	£7.6
	Bulk Services (No. of Services)	1500	300	3000	600	£4.9
	Total Category C					**£12.5**
	MOBS					£53.05
	All Other Repex					£38.15
	Scotland Total					**£433.9**
SGN Total						**£2,083.6**

Source: SGN business plan

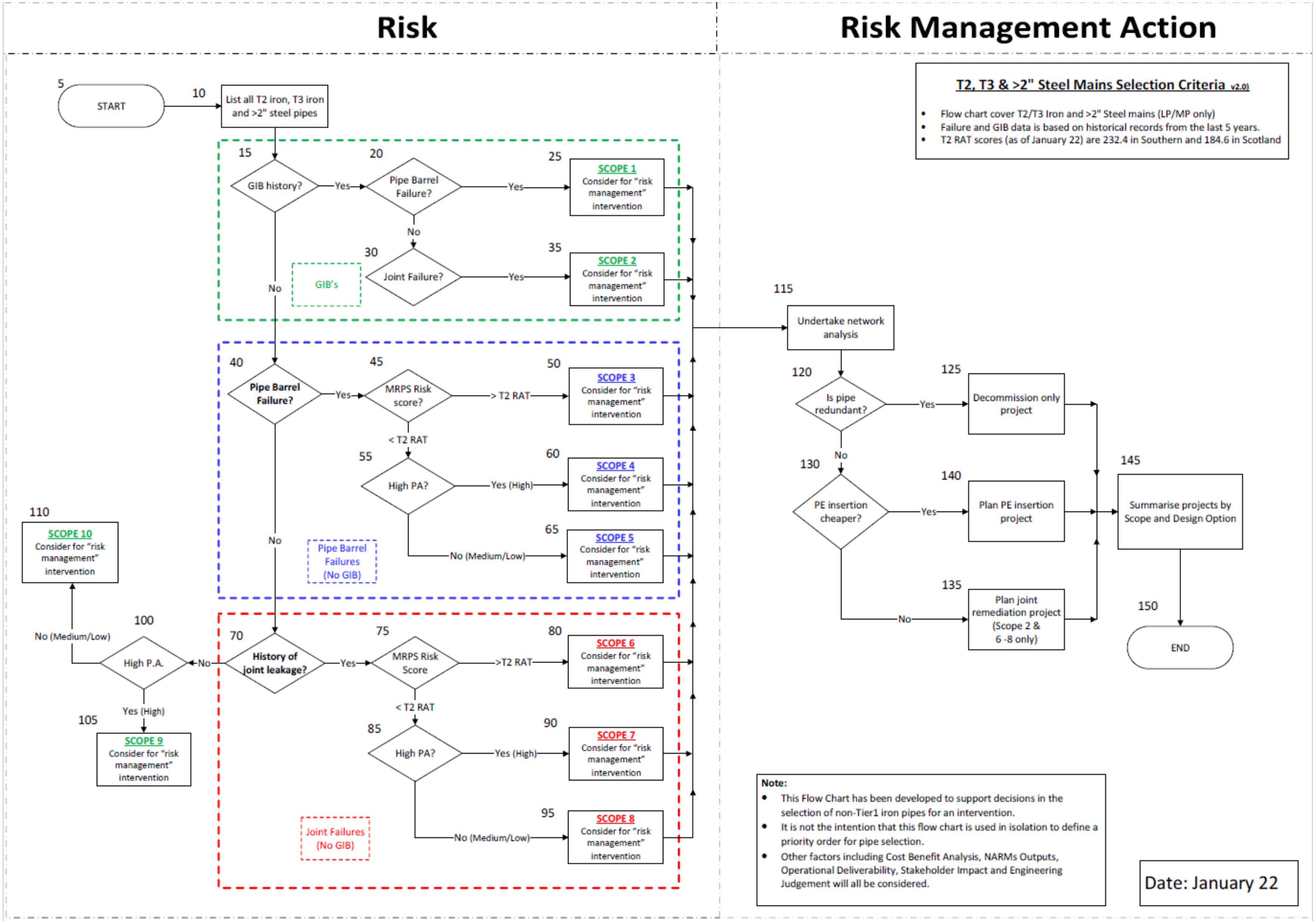
169 The Repex workloads within the Network Asset Management Strategy are supported by four EJPs and associated CBAs. These documents support our GD3 submission for each of the Repex workloads with detailed EJPs and costs for investment detailed in this document.

Table 11: List of IDP's associated with this investment area

Network	**Name / Project**	**Value (£m)**	**NPV at 16 years (£m)**	**EJP Reference**	**CBA References**
SGN	Tier 1 Mains and Services	£1,403.81	£114.19	SGN-GD3-EJP-RPX -005	SGN-GD3-CBA-(SOU/SCO)-RPX-005
SGN	Other Mains and Services	£273.26	£16.96	SGN-GD3-EJP-RPX -003	SGN-GD3-CBA-(SOU/SCO)-RPX-003
SGN	Bulk Services	£20.13	£40.23	SGN-GD3-EJP-RPX -001	SGN-GD3-CBA-(SOU/SCO)-RPX-001
Southern	South London MP	£30.02	£0.89	SGN-GD3-EJP-RPX -004	SGN-GD3-CBA-SOU-RPX-004

Source: SGN business plan

B.7 Mains decision tree



Section C Supplies to MOBs

170 This section covers the pipes and associated assets that supply MOBs, both commercial and domestic. The section includes a background and overview of the MOBs asset class, an explanation of our current position and factors that are impacting our GD3 strategy. We then discuss our GD3 programme.

C.1 Background and overview

171 This group of assets provides gas supplies to around a third of our customer base in both medium-rise and high-rise, high-risk buildings as well as commercial premises. These buildings already have greater risk associated with them than domestic houses, but the addition of gas supply assets many of which are ageing and deteriorating puts them at greater risk.

172 Most assets supplying high rise buildings were installed in the 1960's or 1970's at the time of building construction and have levels of deterioration which reflect this. We also experience issues with much younger assets, often where these are installed in coastal areas or other areas where there is significant exposure to the elements.

173 New materials and coating methods that we trialled during GD2 seek to address some of these issues so that we can extend the life of the assets that operate in these environments.

174 Part of our programme proposed for GD3 is an extension of the replacement and refurbishment programme that has been ongoing since GD1, but also includes some additional elements for associated assets including isolation valves, as well as new assets classes for the commercial MOBs which are under the term CDS.

C.2 Our current position

175 During GD2 we have continued a programme of refurbishing and replacing steel risers, started in GD1. We have seen increased levels of refurbishment year on year, due to new techniques being approved by the industry, although most installations still require full replacement to ensure they are compliant with current standards. As we are currently generating more workload, due to deterioration, through our risk model than can be delivered during GD2, we are proposing an increase in this programme in GD3.

176 We have had a programme of valve remediation focussing on high rise buildings, although we did not have funding for this within our GD2 allowances and are seeking to extend this further within our GD3 proposals.

177 The publication of The Grenfell Inquiry Report: Phase 1, in October 2019[8], resulted in the introduction of The Building Safety Act 2022[9], which changed the management of gas supplies to MOBs. This report highlighted the need for a 'Golden Thread' of information and Safety Cases for high-risk buildings, which has led to the development of building owner information packs, whereby we share details with building owners/duty holders.

178 As a result, we are reviewing our surveying programme and looking to increase its frequency to ensure that information shared is accurate and up to date. It has also meant there is a heightened awareness and focus from the building owners/duty holders, putting increased expectations on the GDN's to provide information or carry out additional work. The Act has also seen a new HSE department created – the Building Safety Regulator (BSR). This has required us to further develop our design processes, and the documentation required to submit applications to Building Control for work we propose to carry out.

179 September 2024 saw the publication of The Grenfell Inquiry Report: Phase 2[10], which has made further recommendations for Gas Transporters relating to the management of Pipeline Isolation Valves (PIVs) on MOBs, as well as the consideration of sleeving (fire stopping) on ageing pipework in some older buildings. It has also been recommended that the definition of a 'high-risk' building is urgently reviewed, to consider not just the height of the building but the usage and occupancy type, particularly where there are vulnerable occupants. This is likely to impact most MOBs supplied by gas, across both Scotland and England.

180 We are also experiencing scenarios where we need to carry out maintenance activities on legacy installations, where a full replacement is not anticipated in the near future. Building owners, duty holders and ourselves, recognise this as an essential programme, particularly for those buildings which require a safety case to be submitted to the Building Safety Regulator.

181 These building owners will often employ consultants to carry out appropriate inspections for them as well as having their own specialist staff, and as such are well informed about the gas network and industry standards. There has been a

[8] https://www.grenfelltowerinquiry.org.uk/phase-1-report
[9] https://www.legislation.gov.uk/ukpga/2022/30/contents
[10] https://www.grenfelltowerinquiry.org.uk/phase-2-report

significant amount of engagement with building owners for some years, and it has accelerated during GD2. This is positive, but increases the resources needed to engage and the maintenance work that needs to be carried out. We have therefore proposed a specific maintenance programme for GD3, which also requires an uncertainty mechanism should volumes of work be greater than anticipated.

C.3 Our MOBs strategy in GD3

182 The GD3 programme for supplies to MOBs is broader than the previous programmes we have carried out in GD1 and GD2. This is due to various factors including legislative change set out above, new asset classes and survey programmes for commercial MOBs being introduced, as revised expectations from the HSE.

MOBs Risers

183 We are proposing to continue with our programmes of steel riser replacement and refurbishment with a circa 20% increase in workload volumes, reflecting the increased workload we are generating in GD2. As this is an asset class which is of high volume and continues to deteriorate, we anticipate the workloads of both proactive and reactive replacement will continue to increase.

184 Due to the customer impact of having to repair risers reactively (i.e. in the event of a gas escape) we aim for the programme to be as proactive as possible. However reactive workload cannot be eliminated fully, and where a reactive repair situation does arise, we will always look to implement a temporary repair wherever possible to keep the customers on supply. This strategy provides time to progress designs and planning to put a planned repair in place. However, and as discussed in the business plan when discussing unplanned interruptions, certain temporary repair methods have either been withdrawn or are under industry scrutiny due to the fire rating of components. If these repair methods are withdrawn it is likely to drive further unplanned interruptions and reactive replacement.

185 In GD3 we are also proposing a programme, which will see us proactively replace all recorded PE riser installations to domestic MOBs. In GD3 the proposal includes the replacement of all high-rise PE risers, six floors and above, with the programme for GD4 covering buildings three to five storeys in height. Following research undertaken by the Building Research Establishment (BRE)[11] these assets have been deemed as a risk to fire spread, and specifically increasing the Coanda effect (where a flow of gas can stay attached to a convex surface). We would therefore be removing that risk by replacing all those PE installations, with a steel system.

186 Part of the wider programme will also include the remediation (new installation and refurbishment) of pipeline isolations valves (PIVs) on the supply mains to riser systems. We have been carrying out this programme to date on high rise buildings as an essential risk mitigation. The presence of these valves is a mandatory requirement, and although they are installed as part of replacement work, they are not always available for operation on existing buildings and installations. They can often be deemed inaccessible, typically caused by third parties, as they are located within public or private land. This can include being tarmacked, landscaped or built over or sometimes they may just need the valve chamber clearing of debris. Our proposal for GD3 seeks to extend the programme we have been carrying out on high-rise installations, to those of lower heights, where the requirement is still mandatory. The absence or inoperability of these valves was a key finding of the Grenfell Tower Inquiry: Phase 2 report[12], which also recommends that by law, the accessibility of them is checked at least once every three years, with the results being reported to the HSE.

187 A further workload being proposed is for maintenance programme of existing installations to ensure compliance. We have never had a programme like this, which would see us carrying out essential work to existing installations, where a full or part replacement has been deemed not necessary in the near future. Not only is this the right thing to do from an Asset Management perspective to ensure that our legacy systems are as safe as they can be, but we have also seen an increased awareness and contact from building owners/duty holders, following the introduction of The Building Safety Act 2022[13] and the subsequent requirement for high-risk buildings to have a safety case in place.

188 There is uncertainty around exactly what workloads would be covered as part of this maintenance programme, as well as the extent of the volumes might be across GD3, but there is certainty that this work will be required. We expect this programme to be formed of workloads such as (but not limited to); remediation or installation of appropriate pipeline supports/fixtures/fittings, sleeving of pipework, installation of mandatory signage and installation of vehicle impact protection.

[11] IGEM/G/5 section 9.4.2.2.2
[12] https://www.grenfelltowerinquiry.org.uk/phase-2-report
[13] https://www.legislation.gov.uk/ukpga/2022/30/contents

189 Although under The Building Safety Act 2022, high-risk buildings are currently determined by the height, 18m (or at least seven storeys), The Grenfell Tower Inquiry: Phase 2 report[14] recommended this definition is urgently reviewed. The inference is that the nature of use of the building and its occupancy, particularly the presence of vulnerable people, is more relevant than just the height of the building. This change would likely encompass a vast proportion of the MOBs supplied by gas across both Scotland and England.

190 For this reason, while we have put a core workload into the business plan we have also suggested that a reopener should be made available to enable an appropriate response to changing guidance and understanding as the Grenfell Inquiry findings a fully considered and acted upon through the HSE and Building Safety Regulator (BSR).

Complex Distribution Systems

191 In GD2, we introduced a new asset class to our portfolio, which have been initially termed as CDS. These are equivalent to risers, but supply commercial premises such as schools, hospitals, shopping centres, railway stations, sports stadiums, and are therefore on a much larger scale than domestic risers. We have started to survey these buildings, although are at quite an early stage in our programme and therefore the workload proposals associated with them are uncertain.

192 Initial findings from the CDS survey programme (and that of other GDN's) indicate that the installations that are true CDS, will be of a relatively low proportion to the overall building volume. However, they are of a significantly more complex nature and therefore we anticipate that the majority will be a significantly higher cost to refurbish or replace when the correct intervention is identified. Currently there is low confidence in being able to establish either an accurate assessment of cost or workload.

193 We expect to have a much higher volume of less complex supplies to these buildings, which will be either large single commercial supplies, or meter bank manifolds supplying multiple meters. While there is still uncertainty around the exact volumes that will require intervention during GD3, we have more confidence in the cost estimates of these, although some will still be complex by nature and will also require access measures for working at height.

194 For all the above scenarios of replacement and refurbishment in the MOBs programme, we will investigate whether there is any potential for permanent disconnection of the supplies, supporting decarbonisation and net zero with an innovation programme proposed in our innovation strategy SGN-GD3-SD-05, section G to identify alternative approaches to decarbonising multi-occupancy buildings. We currently operate a 'buy out' process, where we compensate the customer and on occasion the freeholder and leaseholders in order to permanently disconnect the supplies and help them to purchase new appliances. This is typically only successful when there is a low number of gas users in the building, and typically where the gas is used for cooking only. Some building owners are now more open to the idea of transitioning to an alternative energy supply. However, when this has been investigated on a larger scale such as very high-rise buildings with individual gas boilers in every flat, all other options have been far more expensive than the option to replace the gas risers, even with any government funding that can currently be made available.

C.4 Summary of workload and costs

195 The table below sets out a comparison of the workload and investment requirement for GD2 and for GD3. This shows that the replacement of steel risers is increasing investment requirements. We have then identified new areas of workload.

196 Due to the uncertainty around the expectations of the HSE, associated costs and workload for risers and CDS we have set out in Chapter 8 of the business plan the need to include a reopener in GD3 to cover these uncertainties.

197 For CDSs, manifold replacement and large commercial services (*) we have identified seed funding requirements only.

[14] https://www.grenfelltowerinquiry.org.uk/phase-2-report

Table 12: Workloads and costs for Southern Network

	Workload volume (No.)		Costs (£m)	
Programme/Project Detail	GD2	GD3	GD2	GD3
Steel riser replacement/refurbishment	3625	5280	71.85	180.08
PE riser replacement	-	86	-	4.68
Valve remediation	-	5000	-	5.2
Maintenance for compliance (Opex)	-	Re-opener	-	2
CDS replacement/refurbishment	-	2*	-	2.34*
Commercial manifold replacement	-	20*	-	0.42*
Large commercial services	-	200*	-	1.82*

Source: SGN

Table 133: Workloads and costs for Scotland network

	Workload volume (No.)		Costs (£m)	
Programme/Project Detail	GD2	GD3	GD2	GD3
Steel riser replacement/refurbishment	1088	1056	15.07	41.97
PE riser replacement	-	39	-	3.82
Valve remediation	-	3000	-	4.02
Maintenance for compliance (Opex)	-	Re-opener	-	0.5
CDS replacement/refurbishment	-	1*	-	1.51*
Commercial manifold replacement	-	12*	-	0.32*
Large commercial services	-	120*	-	1.41*

Source: SGN

Table 144: List of IDP's associated with this investment area

Network	Name / Project	Value (£m)	NPV at 16 years (£m)	EJP Reference	CBA Reference
SGN	MOBs	£250.1	£30.88	SGN-GD3-EJP-DST-004	SGN-GD3-CBA-(SOU/SCO)-DST-004

Source: SGN

Section D Distribution integrity for assets operating below 7 bar

198 This section covers our distribution integrity strategy for assets operating below 7 bar. We will set out the background and workload drivers for each asset and explain the level of funding required to deliver the requested workloads. For some areas, where the context is useful for comparison, we will also cover the main points of investment that we undertook in GD2, what we have learnt from that process, and how these have informed the investment that we are proposing to undertake in GD3.

Factors influencing our strategy

199 Our Distribution Asset Management strategy is underpinned by compliance with legislative and regulatory requirements:

- Under the Gas Act 1986 and the associated Gas Transporter Licence conditions, we are required to operate a safe and economic network. To comply with this legislation, we need to maintain satisfactory pressures under the 1:20 demand conditions, ensuring security of supply for existing and future customers.
- Under the Gas Safety (Management) Regulations (GS(M)R) we are required to set out arrangements for minimising the risk of gas supply emergency. We must always monitor performance and develop appropriate plans for the safe and economic development of our existing networks.
- Under Section 3(1) of The Health and Safety at Work etc. Act 1974 (HSWA), we are required to ensure that, as far as reasonably practicable, that persons not in our employment are not exposed to risks to our health and safety.
- Under the Pipelines Safety Regulations 1996 (PSR), Regulation 13, we are required to ensure that a pipeline is maintained in an efficient state, in efficient working order and in good repair. This duty is absolute, with a limited defence only if a breach is caused by a third party.
- As a result of the recent change in building standards regulations (The Building (Scotland) Amendment Regulations 2023), we factored in reduction in general reinforcement associated with new connections.
- Under the Climate Change Act 2008 (2050 Target Amendment), Order 2019, there is a target for at least a 100% reduction of greenhouse gas emissions (compared to 1990 level) in the UK by 2050. It is imperative that GDN's actively seek methods with which to control and limit network leakage. This target has a direct impact on Pressure Management requirements.
- Under Section 17 of SGN's Safety Case there is a requirement for the Validation of Network Analysis models which is also a key element of SGN's Licence to Operate.

200 Using these principles, we have reviewed and updated our work packages covering distribution (<7bar) assets. The following sections will cover investment that has been grouped into two main categories:

- Distribution asset strategy where investment must change from GD2, such as reinforcement, overbuilds, valve, pressure management and cathodic protection:
- Areas of distribution asset strategy that are constant from GD2, such as condition surveys, environmental surveys and maintenance activities.

D.1 Distribution asset strategy where investment must change from GD2

201 In this section, we will outline the GD2 position, and our strategy for GD3 covering each of the asset types in turn. We are proposing to change workload volumes and intervention plans when compared to GD2. Workloads that remain near constant are covered in brief within Section D.3. All workloads will then be detailed in Section D.4.

Reinforcement

202 Reinforcement is an essential workload to maintain supplies to our network at 1 in 20 peak conditions. Without reinforcement on our continually evolving network, we risk not meeting our licence condition to maintain supplies.

203 Our GD2 business plan recognised there was a level of uncertainty in new connections but anticipated a continued demand. Expenditure to date is below the available allowances, partially due to slowdown during the Covid-19 pandemic but also due to our 'just in time' approach to reinforcement implementation. We continuously monitor factors influencing reinforcement requirement, and projects are carefully scheduled and only delivered if and when needed. This approach ensures the security of supply while avoiding unnecessary expenditure.

204 Although some of the forecasted drivers of the reinforcement (demand growth) have not yet materialised, we continue to see new connections requests to our network. Our stakeholder engagement shows that there is still appetite from our Industrial & Commercial (I&C) customers for connections.

205 There is also a change in type of customers that request connection to our network, in the recent years we have received enquiries from data centres, energy centres or district heating schemes. All the above types of customers are likely to have disproportionate impact on our networks and trigger reinforcements. We have also seen a new trend in load increase requests from our existing I&C customers. These customer types range from distilleries to football clubs and their load increases could also require network reinforcements.

[redacted]

206 Our distribution gas system is built and operated to ensure security of supply under 1:20 design criteria and maintain a set of minimum pressures for our 6 million customers. Our networks are designed to sustain a peak six-minute demand that could be on average exceeded only once in 20 years. Various activities that we undertake on our network, including but not exclusive to mains replacement, governor replacement, new connections, load increases contribute to pressures falling below acceptable levels and realise need for network reinforcement.

207 In our GD3 plan we have included two categories of reinforcement: General and Strategic. Descriptions have been summarised in Table 15 below. We detail the workloads and associated costs of General Reinforcement below. Further details of the Strategic Reinforcement workloads can be found in the Tier 1 EJP with reference SGN-GD3-EJP-RPX -005.

Table 15: GD3 Reinforcement Categories with associated lengths

Reinforcement driver	Description	Length and no of regulators Southern	Length and no of regulators Scotland
General reinforcement	Reinforcements associated with network change such as reported poor pressures in the network, governor replacement option (reinforcement to facilitate decommissioning only of the governor), new connections that are requesting gas through either SGN Connections or third-party UIP / iGTs.	27.99km 20 DGs	17.07km 12 DGs
Strategic reinforcement	Reinforcements specifically intended to introduce additional capacity into an area where mains replacement is programmed. This is proven to be an optimal design option providing value to the end user i.e. it increases overall insertion of replacement mains and decreases overall open cut, while demonstrating clear economic benefits.	32.00km	16.13km
Total		**59.99km 20 DGs**	**32.20km 12 DGs**

Source: Forecast of workloads required for the GD3 period by drive. Economic benefits of Strategic reinforcement are included within the Tier 1 EJP and CBA.

208 As outlined in the General Reinforcement EJP (SGN-GD3-EJP-DST-005) our GD3 reinforcement strategy is based on historical reinforcement trends and future projections. Reinforcement works associated with new connections have been decreasing in recent years, and we predict this trend to continue. However, new connection requests have not entirely stopped, and

we continue to receive requests from customers wanting to connect to our network. Therefore, we predict that reinforcement associated with new demand will remain essential in GD3.

209 The remaining reinforcement is driven by factors unrelated to new connections such as mains replacement, poor pressure remediation or regulator abandonment. As these reinforcements are not sensitive to connections trends, we do not anticipate any significant reductions in this workload during GD3 and beyond.

210 To continue to ensure security of supply in our networks, we are looking for approval for £27.73m in funding for the <7bar General Reinforcement Programme to deliver 27.9km of mains and 20 district governors in Southern and 17.0 km of mains and 12 district governors in Scotland during GD3. We also request a Volume Driver that would cover any costs beyond our anticipated workloads.

Overbuilds

211 Historically management of overbuilds has been fully reactive, and interventions were only triggered when potential overbuilds were reported. If not remediated, overbuilds carry significant risk including increased probability of gas entry into the buildings, leading to risk to occupier safety and pipework loading beyond the design specification of the pipe.

212 With the increase in the sophistication of GIS datasets, we are now taking a proactive approach by identifying all pipes and services that appear to cross the building line. Those identified potential overbuilds are then geospatially reviewed and undergo a series of desktop checks. Any assets that fail the checks are then passed to our operational teams for site surveys. When an overbuild is confirmed, appropriate interventions are initiated, these could be cutting off the supply, diversions or building amendments.

213 In GD2 we have already surveyed a small group of assets, 12% of the cases required additional site surveys and as a result 18% of surveys were confirmed as overbuilds and required interventions. This forms the basis of our anticipated work programme in GD3 where we propose to investigate half of our 81,000 sites identified as being a possible overbuild.

214 Building on the work already undertaken in GD2, we plan to continue our proactive overbuild strategy aimed at the identification, investigation and remediation of overbuilds in GD3. Using the GIS system, we have an initial dataset of 81,000 potential overbuilds have been identified and plan on progressing, on a risk basis, 50% of those cases within GD3. The reminder will be investigated in GD4

215 As outlined in Overbuilds EJP, we developed a risk matrix to prioritise assets for investigation. The initial dataset was categorised by pipe type (mains or services), pressure tier, pipe material, intrusion length, and the number of associated repairs. Our analysis so far focused on high-priority assets, specifically Intermediate Pressure (IP) metallic mains with intrusion lengths exceeding 100m. We also prioritised assets with high-risk scores and a history of gas escapes.

216 While the initial checks and surveys have informed our workload projections for GD3, it is essential to acknowledge the limitations of this small dataset and the potential for underestimating future requirements. As such, we are proposing upfront seed funding to allow us to appropriately scale this programme and come back with the requirements in full through a re-opener submission. Please see Chapter 8 of our main business plan for more information.

Pressure Management

217 Gas profiling and logger systems have been successfully used within our network for many years. This equipment allows us to efficiently operate our network and keep leakage from our pipes low. Through our well-maintained equipment and efficient pressure management throughout GD1 and GD2 we will continue to produce industry-leading average operating pressures and limit our environmental emissions.

218 Leakage from our distribution network forms approximately 95% of total shrinkage, which accounts for 98% of our business carbon footprint. To comply with Climate Change Act 2008, we must actively seek to control and limit network leakage. One of the factors contributing to leakage reduction is effective control of average system pressures of above-ground assets through efficient pressure management systems.

219 In GD2 we have seen two major changes that have led to increased workloads in pressure management and system controls. The rollout of the Electronic Actuator system on 270 district governors in Southern drives the requirement to maintain and replace both the power supplies and data logging systems on this new equipment.

220 Meanwhile, the removal of Wholesale Line Rental will see the abolition of traditional Public Switched Telephone Network (PSTN) copper phoneline communications, on which the vast majority of our profiling systems operate and rely. In GD2 we 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.

221 Pressure management systems are a key component of the distribution network and utilise communication systems 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 limits periods of unnecessary increased pressures, and reduces gas leaks, shrinkage costs and environmental and societal impact.

222 Our internal 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. These emissions are equivalent to emissions generated by 36,966 cars on the road per annum [15/ 16]. This analysis is based on predicted increases in leakage volumes per annum if pressure management systems fail or were to be removed from all district governors across SGNs three LDZ. These increases assume that each governor would operate at seasonal Maximum Operating Pressures (MOP) with no additional pressure control.

223 To continue to operate the network in a safe, reliable, and efficient manner, we propose a continuation of the current programme of proactive pressure management maintenance and replacement workloads in our Scotland and Southern network and seek to secure an investment of £11.2m to replace 21,897 components across GD3.

Network Valves

224 Network valves are an integral component within our LP, MP, and IP distribution networks, and provide a controlled means of system management within the network. Network valves are critical to the operation of our network and have a significant influence on sections of the supply system.

225 We identified a programme of works in our GD2 business plan to ensure access to our valves are maintained. In line with this proposal, we have refined our approach to target more specifically valves according to their condition and set about an efficient valve survey and remediation programme.

226 Due to the success of this programme over GD2, we have reduced the proposed workloads for the GD3 submission. This reduced workload will still allow us to maintain a compliant network which can respond to the requirements as outlined above. The GD3 programme consists of surveys and, where necessary, remediation for M1 and M3 valves. The value of this programme is £1.6m.

Cathodic Protection

227 Cathodic Protection (CP) is a means of preventing buried steel mains from corroding by either:

- Use of a more reactive metal such as magnesium which corrodes in preference to the steel (a sacrificial system) or,
- Through the use of an external power source which induces a current onto the steel main (an impressed current system).

228 These systems work in combination with an effective underground wrap that provides primary protection against corrosion, CP is used in addition to help prevent defects in the coating from severely damaging the pipe wall. CP systems are operating in accordance with IGEM/TD/3 and our internal management procedure SGN/PM/ECP/2.

229 During GD2 we have undertaken a review of the CP schemes on the distribution system. This review has highlighted that many of SGN's CP systems are at the end of their design life and need repair or replacement. The review identified that previous investment into CP has been insufficient to keep up with deterioration and maintain all systems and requires additional investment in GD3. We now feel that major investment is required for SGN to have adequate CP systems and that we need to invest £16.18m in both of our networks. Our plans have the support of the HSE, which has also undertaken a review.

230 The change in approach to one of a greater level of intervention puts considerable strain on the resourcing and supply chain. We have undertaken a review of the required resources and have concluded the following:

- The materials required to undertake this programme of CP work are relatively easy to obtain. For less common items, such as transformer rectifiers and anodes, we have a mature relationship with suppliers, and we do not foresee any issues with getting an adequate supply of all materials required;
- The labour required to undertake this work requires skilled and specialised technicians. As this larger programme requires a significant increase in workload, we must acknowledge that it will need a substantial increase the number of qualified technicians and contractors that did not exist as we concluded our review.

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[15] European Environment Agency - Average car CO2 emissions = 108.1g CO2 = 0.1081kg
[16]https://www.racfoundation.org/motoringfaqs/mobility#:~:text=A32)%20The%20estimated%20average%20annual,to%206%2C600%20miles%20in%20 2022.

231 Since our review, we have sought to increase this resource in preparedness for the workload required. The nature of the work and the competence level required mean that there is a long lead time to having competent resources in place. We therefore feel that is more appropriate to spread this workload over two price controls to enable us to effectively manage resources in a more efficient manner. In programming our workload over GD3 and GD4, we have prioritised our work to ensure that the systems are not left to fail and have scheduled work on a needs basis accordingly.

D.2 Areas of distribution asset strategy that are constant from GD2

232 This section outlines work that needs to be continued in GD3 largely as a continuation of the work that was completed in GD2. We cover each of the asset types in turn:

Winter Pressure Surveys

233 We utilise network analysis 'models' to simulate the operation of the gas supply system under a range of conditions. A 'model' is a mathematical simulation tool, with a graphical front end, for a designated section of the supply system. The models calculate gas flow and pressures expected to be experienced on any network, under user-defined conditions.

234 Of the 960+ networks that SGN has, 134 of the larger LP models are regularly included in the Winter Pressure Survey. The Network Validation Winter Pressure Survey is a continual programme which ensures that recordings of actual network pressures are available for the Network Validation process. This ensures that we meet the requirements of the Gas Act, wherein we must develop and maintain a reasonable, efficient, and economical system for the transportation of gas under 1-in-20 demand condition

235 Winter Pressure Surveys workload includes fixed pressure survey posts to allow for monitoring of pressure at our district governors, and via catheters installed within customer's meter boxes. Once the survey is complete, the portable equipment, which are installed for the validation period, may be removed. The loggers are then sent to one of our maintenance service centres where they undergo recalibration.

236 Our workplan for GD3 is consistent with GD2 workloads and we require £1.88m to conduct 2,500 pressure surveys across the next regulatory period.

Above Ground Pipe Crossings and APMs

237 These assets are pipelines that cross waterways, railways, roads, open ground, tracks etc. Being above ground, they are exposed to moisture that can cause corrosion to the pipeline and supporting structures. These assets need to be maintained to prevent the loss of containment of gas or movement in the structure that can cause a danger to people, or property close by. APMs are also maintained to ensure the pipe crossings are not accessible to members of the public to prevent incidents that can cause injury or death as a result of people trying to climb onto the asset. The asset management work included both inspections and remediations when the assets have deteriorated.

IP Mains Marker Posts

238 Marker posts are a common feature on all buried utilities, the intention being to highlight the presence of the buried pipeline in accordance with IGEM/TD/3 Edition 5. Marker posts would have been installed along the route of the pipeline at critical points which heightens awareness of the pipelines location and reduces the risk of third-party damages. On occasions, we need to replace these marker posts when we find that these posts have been damaged, removed by third parties, or have degraded due to age.

Vehicle Protection Measures (VPMs)

239 VPMs are designed to protect Pressure Regulating Installations (PRIs) from vehicle damage and there are a number of designs used to accomplish this depending on the environment of the asset. The objective is to safeguard life, and property and prevent disruption of supply. VPMs installed will reduce the number and severity of accidents, injuries and fatalities that could be caused by vehicles colliding with our assets and causing an uncontrolled release of gas that has the potential to ignite.

240 The asset requires inspection and remediation if thought no longer fit for purpose. Through assessment, any legacy assets that now require VPM due to the environment changing around it, will need designed VPMs installed.

Condition Assessment Surveys on Pressure Regulation Stations (PRIs)

241 Condition assessment surveys are carried out in accordance with SGN/PM/CM4 Part 2 on mechanical and civil assets on our sites. They are used to obtain data on damage and defects identified, keep a historical record of site condition, and provide a platform that will inform the prioritisation of intervention plans to carry out repairs, refurbishment, and replacement of those defects. This does not include, pig traps, metering streams, E&I equipment, filters that are separate

from the regulator streams and pressure vessels, (not including gas conditioning units). This data informs our governor intervention program to help identify and prioritise those assets needing intervention.

Environmental Surveys and Remedials for PRIs

242 These inspections are carried out on all below 7bar PRIs. It is used to ensure the site is secured and in good condition. These surveys provide us with site data on, but not limited to, site security, asset housing, civil structures, site husbandry, signage, and ventilation. These surveys aim to identify any hazard related to the environment where our assets are located and programme remedial work to resolve the issues through a risk-based approach. These hazards (if possible) are resolved at the time of the survey while the operative is on site. Once completed these surveys are reviewed and further remedial work (if required) is agreed and prioritised based on risk to remove or control remaining hazards on site. A survey is completed on each site as part of a routine check and all district governor sites require at least one survey every two years in accordance with SGN policy.

PRI Security

243 The security of a PRI would normally consist of fencing, gates or walls. These structures are used to prevent unauthorised access to our sites. If members of the public were able to gain entry, then there would be risks to injury, security of supply and vandalism. Where defective security is identified then will we plan an intervention to restore the security of a PRI to ensure the safety and security of supplies maintained.

A note on non-routine integrity issues

244 A workload where issues will be identified through a combination of inspections, failures, incidents and site visits. These works are likely varied, and difficult to predict but once identified need to be addressed to prevent a significant risk to safety and security of supply. Examples include severe corrosion on a steel IP pipeline that requires remediation, or IP M2 valves that need remediation as they are leaking or are no longer accessible. These examples are not covered by existing programmes of work and are typically require a significant investment to remedy.

D.3 Summary of Workload and Costs

245 A comparison of the GD3 and cost to the GD2 and costs are shown in the figures below. The total value of the proposed distributed asset integrity investment is £115.7m which is comparable to the £103.6m investment in GD2. Please note that the GD2 value does exclude a number of programmes that are no longer comparable following the completion of works, changing asset management practices and the identification of alternative works.

246 Additionally, this area of spend was difficult to disaggregate allowances in the GD2 models, as such the comparator, £103.6m should be considered an under representation of the true spend.

Table 165: Workloads and associated costs for the Southern network

Programme/Project Detail	Volume (No.)		Cost (£m)	
	GD2	GD3	GD2	GD3
Aboveground Crossing Inspections		800		0.35
Aboveground Crossing Remediations		80		2.68
VPM Remediations		125		1.56
IP Main Marker Posts	1,400	1,890	1.02	0.71
CM4 Part 2 Surveys		4,857		0.81
Environmental Surveys		15,695		0.92
Fabric/Environmental/Security		520		1.95
Non-Routine Integrity		150		3.30
Cathodic Protection	836	33,821	3.41	7.98
Mains Reinforcement	69.9	59.99	51.49	37.33
Reinforcement Governors	37	20	4.03	2.84
Network Valves		153		1.10
Overbuilds Surveys	-	43,721	-	0.66
Overbuilds Interventions	-	462	-	4.18
Winter Pressure Surveys		1,875		1.52
Pressure Management Maintenance		16,112		7.44
Total			59.95	75.33

Source: SGN business plan

Table 176: Workloads and associated costs for Scotland network

Programme/Project Detail	Volume (No.)		Cost (£m)	
	GD2	GD3	GD2	GD3
Aboveground Crossing Inspections		400		0.18
Aboveground Crossing Remediations		50		1.66
VPM Remediations		75		0.96
IP Main Marker Posts	500	1065	0.36	0.41
CM4 Part 2 Surveys	-	1658		0.28
Environmental Surveys		4187		0.75
Fabric/Environmental/Security		500		3.31
Non-Routine Integrity		73		1.69
Ancillary Integrity (Clyde Crossing)		2		0.85
Cathodic Protection	1251	26632	1.74	8.20
Mains Reinforcement	73.4	33.2	39.11	11.22
Reinforcement Governors	23	12	2.48	1.71
Network Valves		67		0.49
Overbuilds Surveys	-	2961	-	0.40
Overbuilds Interventions	-	410	-	4.16
Winter Pressure Surveys		625		0.36
Pressure Management Maintenance		5785		3.76
Total			43.69	40.40

Source: SGN Business plan

Table 18: 7List of IDP's associated with this investment area

Network	Name / Project	Value (£m)	NPV at 16 years (£m)	EJP Reference	CBA Reference
SGN	General Reinforcement*	27.73	-	SGN-GD3-EJP-DST-005	-
SGN	Overbuilds*	9.0	-	SGN-GD3-EJP-DST-003	-
SGN	Network Integrity*	22.38	-	SGN-GD3-EJP-GANDI-003	-
SGN	Pressure Management	11.2	-	SGN-GD3-EJP-DST-010	-
Southern	Remote Pressure Management	11	3.62	SGN-GD3-EJP-DST-009	SGN-GD3-CBA-DST-SOU-009

*Source: SGN business plan *Proposals above are not covered by CBA as it is a compliance driven programme*

Section E Distribution governors

E.1 Introduction

247 Our distribution governor strategy for GD3 has a specific focus on a well-proven engineering developed over many decades, using our and other GDN's best practice techniques. The continuation of this well-established program of works in GD3 is well documented to Ofgem within our various EJPs. This continuation of a "Gas Industry" well-established programme which dates to the early 1990's in all the UK GDN's.

248 Governor investment in GD3 is a must. It is essential to keep our customers both safe and warm. The investment is to justify the essential replacement of ageing and non-compliant distribution governors, some now 50 years old that supply gas into our networks at various strategic locations. All the governors that require investment are fast approaching the end of their design life or have exceeded their engineering design life by up to 10 years or more. The original industry design life of a governor is 40 years.

249 Across both our networks, we own and operate over 7,000 district governors and more than 26,000 service governors in rural, suburban and city centre areas. They reduce gas pressure within the network systems to allow efficient and safe gas transportation. The governors service mostly domestic customers and the smaller industrial and commercial customers. Governors on our network operate at three pressure tiers:

- Low pressure (up to 75mbar);
- Medium pressure (75mbar to 2bar); and
- Intermediate pressure (2 to 7 bar).

250 Governors must be available as they are a crucial component of the supply system, interventions during GD1 and GD2 were identified using a combination of a health and criticality risk-based approach, as well as assessing obsolescence and compliance and using engineering judgement.

E.2 Our current position

251 Primary government legislation requires that all our owned and operated governors must be replaced before they are allowed to mechanically fail. The failure of any governor could potentially endanger the lives and properties of our customers. This safety risk would not be acceptable to us or society in general and would not be in line with our Safety Case, which demonstrates safety compliance to our safety regulator, the HSE.

252 Our newly constructed governors are designed to an industry standard IGEM/TD/13-E3 - Pressure Regulating Installations for Natural Gas, Liquefied Petroleum Gas and Liquefied Petroleum Gas/Air (2023). In many cases our legacy governors that were constructed pre-1974 were not built to any industry standard, but instead were built to local engineering designs and do not always comply with safety standards.

253 The health of our governors is being exacerbated by a changing climate. Climate change and extreme weather events such as flooding are becoming more frequent. Flooding is a severe risk to loss of gas supply to customers in now both summer and winter. New governors are designed to run in flood conditions ensuring our customers keep safe and warm at all times.

E.3 Our distribution governor strategy in GD3

254 We use a health and criticality matrix to inform our condition monitoring programme and our approach to governor replacement. This risk-based approach ranks all our governors in relation to their engineering condition, their criticality of supply to the gas networks they feed into and obsolescence, the availability of spare parts that allow us to keep the governor operating safely.

255 All our governors are inspected in line with SGN/PM/CM/4 Part 2 engineering condition assessment procedure. Each governor is resurveyed on its own original overall assessment health ranking score. The governor is then resurveyed on a sliding scale from one year for end of engineering life expectancy out to 12 years as a new build governor.

256 Once we have identified that an intervention is required, we follow our 4Rs strategy, as covered in Section A.3 above. Applying this to governors we would seek to:

- Refurbish, when a system is compliant and in good working order but is suffering from minor condition issues, such as corrosion. A full re-paint is good example of a refurbishment intervention;
- Replacement, typically of a single component within the governor site. This intervention is undertaken when a site is generally compliant, but issues exist with specific components; and

- Rebuild, when all other options have been discounted and a wide array of issues exist. Common issues when a rebuild is required are non-compliant or non-functioning valves, underground auxiliary valves, and unprotected steel entering concrete. Rebuild in these situations is the most economic intervention.

257 To operate a safe and secure network and ensure security of supply to our customers, we must continue our proactive approach to our governor asset management strategies. We must continue the replacement of ageing and noncompliant governors before they fail in service. This ensures we meet our Licence and safety obligations as well as our Legislative requirements and comply with UK Government primary legislation such as PSR, Pressure System Safety Regulations (PSSR), Dangerous Substances and Explosive Atmosphere Regulations (DSEAR).

E.4 Summary of Workload and Costs

258 A comparison of the GD3 and cost to the GD2 and costs are shown in the figures below. The total value of the proposed governors investment is £65.2m that is comparable to the £66.3m investment in GD2.

Table 19: Southern Distribution Governor Workload and Cost Trace GD2 to GD3 £m (2023/24)

Programme/Project Detail	Workload volume (No.)		Costs (£m)	
	GD2	GD3	GD2 Cost	GD3 Cost
High Capacity	-	3	-	3.90
DG IP Replacement of Entire Installation	18	22	8.39	10.88
DG MP Replacement of Entire Installation	167	150	26.92	21.14
DG IP Inlet Decommission	-	2	-	0.39
DG MP Inlet Decommission	5	5	0.29	0.15
Domestic SG Replacement	2595	2500	2.34	4.32
Non-domestic SG Replacement	5	5	0.38	0.01
District IP Inlet Housing Replacement	114	25	7.66	1.48
District MP Inlet Housing Replacement	95	200	1.25	6.69
District IP Inlet Component Replacement/Refurbishment	-	12	-	0.31
District MP Inlet Component Replacement/Refurbishment	2682	50	1.94	1.14
Total			**49.16**	**50.41**

Source: SGN Business plan

Table 20: Scotland Distribution Governor Workload and Cost Trace GD2 to GD3 £m (2023/24)

Programme/Project Detail	Workload volume (No.)		Costs (£m)	
	GD2	GD3	GD2 Cost	GD3 Cost
High-Capacity Governors	-	10	-	4.78
DG IP Replacement of Entire Installation	15	0	7.44	-
DG MP Replacement of Entire Installation	45	43	6.65	5.72
DG IP Inlet Decommission	-	-	-	-
DG MP Inlet Decommission	2	5	0.14	0.34
Domestic SG Replacement	355	500	0.61	1.13
Non-domestic SG Replacement	5	5	0.52	0.30
District IP Inlet Housing Replacement	-	50	-	0.83
District MP Inlet Housing Replacement	90	50	1.41	0.83
District IP Inlet Component Replacement/Refurbishment	-	-	-	-
District MP Inlet Component Replacement/Refurbishment	429	25	0.35	0.83
Total			**17.12**	**14.76**

Source: SGN Business plan

Table 21: List of IDP's associated with this investment area

Network	Name / Project	Value (£m)	NPV at 16 years (£m)	EJP Reference	CBA Reference
Scotland	R6 Governors Other – SC	2.5	0.28	SGN-GD3-EJP-G&I-002	SGN-GD3-CBA-G&I-SCO-002
Southern	R6 Governors Other – SO	9.61	6.47	SGN-GD3-EJP-G&I-002	SGN-GD3-CBA-G&I-SOU-002
Scotland	High-Capacity Governors – SC	4.78	0.40	SGN-GD3-EJP-G&I-004	SGN-GD3-CBA-G&I-SCO-004
Southern	High-Capacity Governors – SO	3.9	-0.53	SGN-GD3-EJP-G&I-004	SGN-GD3-CBA-G&I-SOU-004
Scotland	R6 Governors – SC	7.5	13.83	SGN-GD3-EJP-G&I-005	SGN-GD3-CBA-G&I-SCO-005
Southern	R6 Governors – SO	36.89	159.53	SGN-GD3-EJP-G&I-005	SGN-GD3-CBA-G&I-SOU-005

Source: SGN business plan

Section F Local Transmission System (LTS)

259 The LTS is the backbone of our network, taking gas from the National Transmission System (NTS), controlling the flow and, or pressure into our LDZs, as well as providing metering, filtration, heating and odorisation.

260 The LTS is critical to the continued supply of gas to around 6 million customers (4 million in Southern and 2 million in Scotland). It serves whole communities, businesses, and significant industrial customers (e.g. refinery and power stations) often from single pipelines, PRS, and Offtakes. We need a continued investment programme to ensure that the assets are fit for purpose and maintained in a safe operational condition such that continuity of supply is ensured.

261 Most of our transmission assets are between 40 and 60 years old and, as such, exhibit increased deterioration in condition and performance, necessitating appropriate intervention to keep them operating in a safe and reliable manner. Without this continued investment, the probability of a major incident will increase and the consequences of a loss of supply from the assets covered in this section could result in loss of supply to over 1 million customers.

262 Our customers and stakeholders have told us that maintaining current levels of safety and resilience is very important to them and that maintaining a safe and reliable network should be our priority for GD3. This customer expectation is supported by a strong legislative and regulatory framework that provides a clear focus on when we should act; this framework is supported by a comprehensive suite of industry recommendations and guidance and internal procedures.

LTS Ambition, Objectives and Limitations

263 Through effective and efficient asset management the ambition of our LTS is to maximise the reliability, safety, and efficiency of our LTS networks, ensuring the secure and sustainable transportation of natural gas. We leverage technologies, data-driven insights, and best-in-class practices to deliver the right interventions in maintaining the long-term viability of the assets within the LTS system while minimising environmental impact. By fostering a culture of continuous improvement and collaboration, we aim to deliver high standards in asset management, delivering value to our customers and contributing to a resilient energy future.

264 The objective of the LTS GD3 investment plan is to invest where necessary to improve the health of assets within the LTS. To this end we follow the 4Rs strategy as outlined in Section A.3 and utilise data collected as outlined in A.4. We always ensure that we are only acting on assets that need intervention from the extensive data we collect, we intervene on assets in the most cost-effective way considering lower levels of intervention when appropriate.

265 On occasions, it may be appropriate to go beyond the bare minimum level of intervention, notably when wider issues on the site are of concern. When this is the case, we have applied a CBA to understand the economic benefits using the monetised risk model to understand the value that is being gleaned from our interventions. We believe that applying this level of scrutiny to our investments is required to ensure that we are not going further than necessary and that our overall investment strategy is being applied appropriately across all assets. As outlined in Section A.6, we have an overarching objective to ensure that our network is not deteriorating in its performance.

266 There is a limited pool of skilled workforce available within the UK to undertake construction projects on the LTS. Over-stretching on our ambition can affect the cost, delivery timelines, and ultimately, the overall project deliverability within the time constraints of a short regulatory period. To that end we have approached our GD3 programme to limit our intervention volumes by appropriately applying our 4Rs strategy and to work with our delivery partners to increase capacity, where its valid and necessary to do so, to ensure that skilled resources are available and that costs are maintainable at a competitive price point. For context, we have already been increasing the number of skilled resources in both our maintenance and major projects teams throughout GD2 to meet our delivery target.

F.1 Our current position

267 There are 30 national offtakes (12 in Southern and 18 in Scotland) that accept gas into LDZs from the NTS. The primary role of the offtake is to control and meter the volume and the energy of the gas as part of the custody transfer from the NTS into SGN and to odourise the gas. An offtake typically includes filtration, full energy metering, pre-heating, volumetric control, pressure reduction and odorisation systems. Offtakes vary greatly in size supplying as little as 0.034 million standard cubic metres per day and up to 24 million standard cubic metres per day.

268 The LTS is composed of approximately 3,122km of transmission pipelines (1,747km in Southern and 1,374km in Scotland) with diameters between 100mm and 1,200mm and operating pressures between 14barg and 85barg. The LTS transports gas around our LDZs from the offtakes to the Pressure Regulating Stations (PRS). LTS pipelines include pig traps, exposed and buried crossings including any support structures, valves, marker posts, sleeves, CP, and other ancillary systems.

269 We have 290 PRS (160 in Southern and 130 in Scotland) that reduce the pressure from the LTS into the intermediate (2barg to 7barg), medium (75mbarg to 2barg) and low (up to 75mbarg) pressure distribution systems. These typically include filtration, pre-heating, and pressure reduction.

270 We have a mature maintenance process to ensure that assets in our care are given the appropriate amount of attention through proactive functional checks and scheduled inspections. This ensures that the assets remain in good working order and any issues that may need further intervention are understood in good time so that they do not affect the continued supply of gas to our customers.

271 In GD2 we have three primary areas of delivery, two of which are measured through outputs in the RIIO price control.

- A programme of capital projects to deliver seven of the nine programmes contained. The seven programmes are within LTS system including three offtake rebuilds, two pipeline projects, and two PRS rebuilds. All of these projects are due to be completed with full customer benefits realised before the end of the GD2.
- A programme of integrity-related investment that is measured through the NARM output. We were unique within the GDNs to fully outline our plans at the outset of GD2. We have a defined list of refurbishments, replacements and rebuilds that are measured under our NARM output and all are projected to be fully delivered by the end of GD2. In addition, we have identified that there are several emerging projects that will take our delivery beyond that targeted at the outset and are in response to our CM/4 programme of inspections or as a result of emerging failures that have materialised in the GD2 period. These too are forecasted to be delivered by the end of the GD2 period.
- A programme of inspection, remediation and revalidation. This workload is predominantly driven by regulatory compliance activity such as PSSR (2000) and PSR (1996). This includes revalidation of pressure vessels such as heat exchangers and filters, and online inspection of Major Accident Hazard Pipelines using magnetic flux leakage tools. Our >7bar condition monitoring programme CM/4 Part 1 is a key part of this workload that ensures every PRS, offtake, pig trap and block valve is inspected every 12 years, with remediation of all our defects. Regulatory-driven work has strict deadlines, and we are on target to complete all of our compliance work, including CM4 within the GD2 period.

F.2 Our LTS strategy in GD3

272 The LTS Asset Management Strategy outlines our approach to managing mechanical assets to ensure their safety, reliability, efficiency, and longevity. The strategy is aligned with our objectives of a safe and reliable network, while adhering to regulatory requirements, optimising asset performance, and minimising environmental impact.

273 As outlined above, we implement this by leveraging asset data acquired through routine and non-routine maintenance activities, condition monitoring surveys, fault reports and qualitative knowledge. This information is gathered for all mechanical assets. Our maintenance strategy is key to delivering our asset management strategy and this maintenance plan combines preventive, predictive, and reactive maintenance strategies to optimise asset performance and extend asset life.

274 In addition to the maintenance plan, we implement risk management strategies to identify potential hazards and vulnerabilities associated with our LTS, this includes for example, aerial surveillance of our pipelines to identify encroachments or natural threats to our assets.

275 In parallel with the safety management and risk mitigation elements of our strategy, we also incorporate sustainability into our asset management strategy by aiming to reduce energy consumption, minimise emissions, and explore alternative technologies where possible.

276 Our LTS strategy is subject to frequent review and continuous improvement. The strategy is regularly reviewed to assess its effectiveness and allow the opportunity to make necessary adjustments. This is enabled by using internal and industry-wide learnings, audit recommendations and technological advancements.

277 This strategy aims to ensure that our LTS assets are managed effectively throughout their lifecycle, balancing safety, reliability, cost efficiency, and sustainability. By implementing this strategy, SGN will enhance its ability to provide a safe, reliable, and environmentally responsible gas supply to our customers.

Compliance workload

278 Compliance workload is driven by relevant regulations such as Pressure Systems Safety Regulations 2000 (PSSR) and PSR (1996), as well as industry guidance such as EEMUA 231[17].

[17] EEMUA (Engineering Equipment and Materials Users Association) Publication 231 - The mechanical integrity of plant containing hazardous substances: a guide to periodic examination and testing

279 To comply with the above regulation workload is scheduled on a calendar basis, some examinations being annual, others for example being 12 or six-yearly, this work cannot be postponed without strong safety justification, and then only one postponement is allowed.

280 In the GD3 period, the workload is increasing due to the scheduling of workload, and there is an associated increase in costs, particularly in our Southern network due to the workload mix. In-line Inspection of Major Accident Hazard Pipelines can cost more than £100,000, with subsequent remediation of defects in the tens of thousands, in contrast to the revalidation of a filter which may cost less than £10,000.

281 Building on the extensive CM4 survey programme undertaken in GD2 we are expanding this survey work to the remedial stage to ensure our assets are fit for purpose to serve our customers. Additionally, we are continuing the rollout of the initial 12-year CM4 survey cycle while beginning to resurvey some of our sites (those due their second survey). This workload increase is more significant in our Southern network and brings it in line with our Scotland network. This is explained further in our GD3 compliance EJP.

282 Following an extensive review of the management of CP systems endorsed by the HSE, our pipeline compliance investment is increasing in GD3. This investment enables compliance with PSR 1996 and IGEM/TD/1. The workload includes activities such as ensuring pipelines are appropriately marked and CP systems are compliant.

283 Our compliance workload also includes diversion and downrating of pipelines to ensure the management of our major accident hazard pipelines in line with regulation, industry best practice, and the principles of managing risk to be as low as reasonably practicable (ALARP). This includes:

- Diversion of a section of pipeline P005 Braishfield to Austins Copse. This pipeline has microbiological corrosion and poor coating, which prevents adequate levels of cathodic protection from being achieved;
- Downrating of pipeline from Hooley to Port Greenwich to 6.9barg. This pipeline runs in close proximity to properties and operates as a Major Accident Hazard Pipeline for in-line inspection operations. This work will facilitate compliance with PSR - Regulation 6; and
- Isolation of the pipelines Jail Lane to Biggin Hill HP storage to Sheepbarn Lane and Anchor farm to SCA Aylesford. These three sections of MAHP are redundant and the isolation from the network removes the exposure of societal risk. This work will facilitate compliance with PSR – Regulation 14.

Targeted interventions and component replacement

284 An example of targeted intervention is the replacement of Lineguard slam-shut control systems which is forming a package of works. This will see the most aged, obsolete, and problematic assets removed from the site and replaced while leaving the fit-for-purpose sections of the site untouched. Lineguard is referred to in IGEM/TD/13 as “unnecessarily complex and unreliable in operation”.

285 Part of our GD3 programme looks at a targeted investment to remediate the unreliable and problematic Lineguard system, taking the minimum intervention to mitigate the risks and supply interruptions that may be, and have been, experienced due to the failures of Lineguard systems.

286 Similarly, there are targeted interventions on other problematic assets such as flow control valves or pressure regulators that are at end of life, unserviceable and are known to induce problematic vibrations into downstream pipework and pose a threat to our safe and reliable supply.

287 Where possible we are making targeted and tactical interventions to enable the minimum investment possible to ensure a safe and reliable supply to our 6 million customers.

Full site and system rebuilds

288 There are situations whereby it is more economically preferential to fully rebuild a PRS site rather than make a targeted component replacement. This may be due to an inherent problem with the site’s location, e.g. flooding or subsidence issues, or where a targeted intervention is not possible due to the cumulative impact of asset risk across the site.

Continued programmes of rebuilding PRS

289 We are proposing a capital investment of £47.59m for the Full Site and System Rebuilds programme across GD3, which represents our preferred option for addressing defects and risk on critical infrastructure. This investment covers a total of 13 sites across the Scotland and Southern networks and represents less than 5% of our total PRS count.

290 The full site and system rebuild programme is addressing compliance issues with respect to PSSR, IGEM/TD/13, environmental hazards and obsolescence. Each site or system scheduled for this work has a cumulation of issues necessitating a system or site rebuild.

291 Not undertaking these interventions risks the safe and reliable operation of these sites and could compromise supply to our customers. Continued operation of these assets increases the risk of system failures, which could result in loss of supply. Additionally, these failures pose a safety and legal risk, as asset deterioration could result in the presence of unsafe situations leading to increased hazards, potential legal and or financial penalties being imposed or potentially site isolations, compromising supply to our customers. This would inevitably result in incurring additional reactive investment to remediate failures. Without this investment, the likelihood of leaks, over-pressurisation, ruptures, or supply failures increases, posing safety hazards and economic losses.

Large site rebuilds

292 We have identified three sites that have significantly atypical customer benefits and result in a significant reduction in risk. These projects have demonstrable customer benefits, and we believe that they are worth separating from the programme to highlight the amount of spend and risk in delivery.

- **Glenmavis**. One of our key strategic, targeted intervention plans in GD3 is to rebuild, replace and rationalise defective, ageing, and redundant assets at our Glenmavis Offtake, a site that is capable of supplying up to 1 million customers across Scotland's Central Belt. The driver for this investment is the critical need to address known corrosion and condition defects across the pressure reduction systems and the site bypass facility, obsolete and unreliable regulators, non-compliant pressure control configurations and failing preheat systems. Continuing to rely on these assets throughout GD3 presents an unacceptable risk to network safety, resilience, and security of supply. The investment proposal includes a review of valid options available for addressing condition, compliance, and operability issues at Glenmavis. The preferred intervention option involves rebuilding the 39barg and 19barg pressure reduction systems, replacement of failing boilers and site rationalisation through the removal of the bypass and redundant apparatus associated with historical LNG production and storage operations at Glenmavis. This approach provides comprehensive risk mitigation and site operational improvement through the removal of ageing, defective and obsolete assets, and also ensures long-term compliance with regulatory and legislative requirements, maximising passthrough customer benefit This project is valued at £5.71m to realise the proposed intervention.
- **Isle of Grain.** This PRS serves approximately 37,100 customers. The project aims to address compliance with IGEM/TD/13 and IGEM/SR/16 and integrity issues present at Isle of Grain PRS. The installation at Isle of Grain PRS currently falls short of industry standards IGEM/TD/13 and IGEM/SR/16 and faces significant integrity issues. The transmission pressure reduction system lacks stream discrimination, an essential feature for protecting downstream supply in the event of a failure. The preheat system, which relies on steam to heat the gas, is supplied by an outdated single immersion heater managed by a third party. Without a backup system, any supply failure could lead to prolonged reduced supply capacity or even a complete outage, particularly during winter when demand is high. The existing odorant tank and associated equipment, installed in 1981 to support the introduction of natural gas from European suppliers, is located on third-party land and no longer meets current industry standards for protective measures necessary for safe operation. This project will install a new, compliant tank within SGN-owned land, complete with updated control equipment to ensure safety and regulatory compliance. There are many complexities with this project as our PRS is located within a third-party upper-tier COMAH site. A full site rebuild is proposed with a value of £9.33m capital investment.
- **Welling.** Welling is a PRS that is located under the street level in southeast London. The primary objective of this project is to eliminate the risk to public safety associated with operating a transmission pressure reduction station (PRS) within an urban environment. The routine operation of a typical installation of this type creates hazardous area locations where large concentrations of flammable gases are or could be present. To mitigate this risk, it is standard practice to confine the hazardous area within the operational site boundary and to eliminate potential sources of ignition from the defined location. Where possible, these hazardous areas are minimised; however, they cannot be eliminated. The geographic location of the Welling PRS within a public area prevents SGN from effectively implementing these control measures. This increases the potential exposure of the public to the risks associated with these hazardous areas. The potential consequences of not addressing these risks include the possibility of preventable property damage, major injury, or even fatalities. Addressing this risk is critical to ensuring the safety and well-being of the surrounding community. We are proposing an investment of £8.86m for a Full Site Rebuild at Welling PRS at a new location to continue to safely and reliably supply 62,500 customers.

Diversions Reopener – Pipelines GM4 and P054

293 In the Southern network there have been two pipeline incidents that have occurred in the latter part of GD2. There are contributory factors from third-party interactions that have impacted both these incidents. In the GD2 period we are implementing temporary and interim measures to ensure both the integrity and resilience of our local transmission system. However permanent remediation will be required for both pipelines in the GD3 period.

294 At present the design, implementation, and therefore costs of these permanent remediations are still unknown. Therefore, we are unable to submit robust cost estimates into our GD3 submission. As designs and cost estimates mature, we will look to update Ofgem. This may be during the GD2 closeout period, or more likely during the GD3 period where we would look to submit an application as part of the diversions re-opener.

F.3 Summary of Workload and Costs

295 A comparison of the GD3 and cost to the GD2 and costs are shown in the figures below. The total value of the proposed LTS investment is £198.9m which is comparable to the £225.7m investment in GD2, when translated into the same baseline of 2023/24 prices. This is driven by an increase in the investment in Southern network and a decrease in investment in Scotland network.

Table 22: Workloads and costs for Southern network

	Workload volume (No.)		Costs (£m)	
Programme/Project Detail	**GD2**	**GD3**	**GD2**	**GD3**
Full Site Rebuild	4	6	18.14	28.28
Full System Rebuild	2	3	5.88	16.56
Preheat Replacement	8	3	13.24	4.24
Preheat Replacement - Offtakes	3	-	25.51	-
Boiler Replacement	-	4	-	5.57
Filter and Boiler Replacement	2	-	3.53	-
Filter and Preheat Replacement	1	-	1.38	-
Compliance	-	-	26.97	42.27
Other LTS Capex	-	-	12.36	21.88
Total	**-**	**-**	**107.01**	**118.80**

Source: SGN business plan

Table 23: Workloads and costs for Scotland network

	Workload No.		Costs £m	
Programme/Project Detail	**GD2**	**GD3**	**GD2**	**GD3**
Full Site/ System Rebuilds	10	6	44.14	20.94
Preheating Replacement Programme	3	11	2.60	12.26
MAHP Installations and Decommissioning	2	-	37.63	-
Compliance	-	-	24.41	25.39
Glenmavis System Rebuild and Rationalisation	-	1	-	5.71
Pressure Control Asset Health	-	20	-	8.47
Other LTS Capex	-	-	9.86	7.31
Total	**-**	**-**	**118.65**	**80.08**

Source: SGN business plan

Table 248: List of IDP's associated with this investment area

Network	Name / Project	Value (£m)	NPV at 16 years (£m)	EJP Reference	CBA Reference
Southern	Full Site and System Rebuilds	26.65	16.30	SGN-GD3-EJP-LTS-002	SGN-GD3-CBA-LTS-002
Southern	Isle of Grain PRS - Full System Rebuild	9.33	17.13	SGN-GD3-EJP-LTS-004	SGN-GD3-CBA-LTS-004
Southern	LTS Compliance Programme	51.63	-	SGN-GD3-EJP-LTS-001	-
Southern	LTS Pipelines Programme	10.7	-	SGN-GD3-EJP-LTS-006	-
Southern	Preheat Replacement	9.8	48.92	SGN-GD3-EJP-LTS-007	SGN-GD3-CBA-LTS-007
Southern	Welling PRS - Full Site Rebuild	8.86	13.10	SGN-GD3-EJP-LTS-009	SGN-GD3-CBA-LTS-009
Scotland	Glenmavis System Rebuild & Rationalisation	5.71	26.13	SGN-GD3-EJP-LTS-003	SGN-GD3-CBA-LTS-SCO-003
Scotland	Pressure Control Asset Health	8.47	48.41	SGN-GD3-EJP-LTS-008	SGN-GD3-CBA-LTS-SCO-008
Scotland	Preheat Replacement	12.26	16.81	SGN-GD3-EJP-LTS-007	SGN-GD3-CBA-LTS-SCO-007
Scotland	Compliance	29.15	-	SGN-GD3-EJP-LTS-001	N/A
Scotland	Full Site and System Rebuilds	20.94	101.59	SGN-GD3-EJP-LTS-002	SGN-GD3-CBA-LTS-SCO-002

Source: SGN Business plan, note some EJP may not have CBAs associated with them due to being driven by compliance

Section G Electrical and Instrumentation (E&I)

296 This section sets out the investment required for the E&I assets (only) that support the safe and reliable operation of the LTS systems referenced in Section F. The asset management strategy, ambition, objectives, delivery risks and uncertainty broadly align with the LTS and the overall Network Asset Management paper. This section will detail those areas which are specific to E&I assets.

297 The E&I submission also has interdependence with the biomethane strategy, the Statutory Independent Undertakings' (SIU) strategy and IT (Cyber) strategy. It therefore must be read in conjunction with the SGN Future of Gas, Environmental Action Plan and SIU submissions.

298 The workload drivers and justification for E&I workloads are compliance and integrity-driven to ensure a safe, reliable and resilient gas network.

G.1 Introduction

299 E&I assets on operational gas sites provide a monitoring and support function for the preheating and flow of natural gas through National Offtake sites, PRS, and other more specialised site types, such as Scottish Independent Undertaking's (SIU's), Biomethane Network Entry Facilities (BNEF's) and Cathodic Protection Transformer Rectifier (CPTR) locations. Below is a brief summary of the various asset groups and their functions to support the LTS gas transmission network:

- **Instrumentation**. Temperature and pressure sensors are used to measure the gas temperatures and pressures on site, this data is fed into a telemetry system and sent remotely to the Gas Control Centre (GCC) where site status is monitored and controlled.
- **Telemetry.** Information such as gas pressure, temperature, flows and gas quality are fed back to GCC via remote telemetry units. On some sites within SGN, temperature control is managed within the remote telemetry units as opposed to an independent temperature controller. Pressure and Volumetric Flow control is also managed within the telemetry units at some sites.
- **Pre-heating.** Gas pre-heating systems rely on gas temperature data provided by site instrumentation. Sites within SGN which are pre-heated with boiler systems are supported by standby diesel or gas electrical generators as an added level of redundancy. SGN also has water bath heaters as an alternative method of gas-preheating.
- **Metering**. SGN meter gas flow at national offtakes for fiscal purposes and compliance reasons. These flows are fed back to GCC via the remote telemetry unit. SGN have also been moving away from Orifice Plate metering to ultra-sonic metering providing more accurate readings with fewer errors and improved uncertainty of measurement. Metering is also crucial for correct odorant injection into the gas network. SGN also provides metering for inter-LDZ sites.
- **Gas Quality**. Gas quality is measured at national offtake and gas entry sites for regulatory/compliance purposes. This is done using an instrument called a gas chromatograph.
- **Local Gas Treatment.** At national offtakes, SGN odorise natural gas, this is a health and safety, and compliance requirement. The odorising equipment consists of an electronic controller as well as level gauges, pumps and motors. The volume of odorisation which is injected into the gas is determined by the gas flow rate, this is calculated within the controller using the data from the site flow metering.
- **Electrical Distribution**. All the above-mentioned assets require an electrical supply, as well as other site assets such as site alarms, interior lighting, flood lighting, security fence systems and space heating.
- **Physical and Cyber Security and Operational Technology Assets.** The Security of Network and Information Systems Regulations (NIS Regulations) provide legal measures to boost the level of security (both cyber and physical resilience) of the gas network and information systems for the provision of essential services. As such physical security systems and operational technology (OT) fall within the scope of this submission. For OT cyber security, this paper must be read in conjunction with the SGN IT submission as the cyber risk and mitigation measures and interventions are detailed within that submission.

G.2 Our current position and strategy in GD3

300 Network E&I plan to continue implementing its 4Rs strategy, with an emphasis on low-risk investment options prioritising component replacement and refurbishment over wholesale replacement and upgrades.

301 There is a low steady state of Capex investment requirement to operate and maintain our E&I assets in a safe and compliant manner.

302 The E&I investment plan however has seen an increase in Capex requirement, and this is due to the introduction of new compliance requirements and assets being onboarded, examples of which are highlighted below:

- Physical security systems which were installed in GD1/2 are now nearing the end of their life and require component replacement. Typically, these communication systems and equipment only have a short lifecycle, and certain components require continual firmware updates which older equipment can no longer support.
- Biomethane Network Entry Facilities; E&I, gas quality and metering assets which were adopted by SGN as part of the full and minimum adoption models require replacement due to integrity issues. Some assets have now been in operation for 14 years.
- Cyber Security requirements: with the introduction of NIS in 2018 and the Cyber Assessment Framework (CAF), E&I have included programmes of work to introduce password management, local access control, configuration management and OT asset management.

Factors influencing the strategy

303 For E&I activities, the key legislation drivers for compliance of the design, installation, operation and maintenance of the LTS operating at pressures above 7barg and up to 85barg pressure are detailed below.

- **Electricity at Work Regulations 1989**. The Regulations apply to all electrical systems and equipment whenever manufactured, purchased, installed or taken into use even if its manufacture or installation pre-dates the Regulations. Where electrical equipment pre-dates the Regulations this does not of itself mean that the continued use of the equipment would be in contravention of the Regulations. It is relevant to all work activities and premises and of relevance to **duty** holders, it will also be of interest and practical help primarily to engineers (including those involved in design, construction, operation or maintenance of electrical systems and equipment), technicians and their managers.
- **BS7671:2018 – IET Wiring Regulations.** The Regulations apply to the design, erection and verification of electrical installations, also additions and **alterations** to existing installations. Installations which conform to the standards laid down are regarded by the HSE as likely to achieve conformity with the relevant parts of the Electricity at Work Regulations 1989.
- **Dangerous Substances and Explosive Atmosphere Regulations (DSEAR) 2002**. are concerned with protection against risks from fire, explosion and similar events arising from dangerous substances used or present in the workplace and require employers to control the risks to the safety of employees and others from these hazards. They set the minimum requirements for the protection of workers and are supported by an Approved Code of Practice.
- **Gas Safety Management Regulations 1996 (GSMR)**. Apply to the conveyance of natural gas (methane) through pipes to domestic and other customers and cover four main areas: (i) the safe management of gas flow through a network, particularly those parts supplying domestic customers, and a duty to minimise the risk of a gas supply emergency; (ii) arrangements for dealing with supply emergencies; (iii) arrangements for dealing with reported gas escapes and gas incidents and (iv) gas composition.
- **Gas Calculation of Thermal Energy Regulations**. These Regulations provide for the number of therms or kilowatt hours, conveyed by public gas transporters to premises, or to pipe-line systems operated by other public gas transporters, to be calculated based on calorific values of the gas (with adjustments of volumes for temperature and pressure) either determined by, or declared by, the transporter in accordance with the Regulations. They provide for the places or premises and the times at which and the manner in which determinations of calorific values are to be made to be such as the Director General of Gas Supply ("the Director") may direct. They also provide for declarations of calorific values to be made at such times and in such manner as the Director may direct, for securing uniformity of calorific value and for the carrying out of tests of gas by public gas transporters, and also by persons ("gas examiners") appointed by the Director under Section 13 of the Gas Act 1986 at such places or premises as the Director may direct and for such premises, apparatus and equipment to be provided and maintained for carrying out those tests as the Director may direct.
- **BS EN 61511 – Safety Instrumented Systems for the Process sector.** Safety Instrumented Systems (SIS) are engineered controls that protect critical process systems. The specific control functions performed by a SIS are called Safety

Instrumented Functions (SIFs). This standard provides guidance on the specification, design, installation, operation and maintenance of SIF's and related SIS as defined in BSEN61511-1. It is recognised as good engineering practice in most countries and is a regulatory requirement in an increasing number. Its use will help assure reliable and effective implementation of SIS to achieve risk reduction objectives, thereby improving process safety. End users in the **process** industry should use this standard to develop their internal procedures, work processes, and management systems. Implementing a SIS lifecycle management system provides a framework for managing people, processes, and systems to improve overall safety and operational performance.

- **The Security of Network and Information Systems Regulations (NIS Regulations).** Provide legal measures to boost the level of security (both cyber and physical resilience) of network and information systems for the provision of essential services and digital services. These Regulations are of particular importance to Network E&I as some of our assets are classed as Operational Technology (OT) assets on Critical National Infrastructure (CNI) sites. The National Cyber Security Centre (NCSC) has set out a Cyber Assessment Framework (CAF) and an enhanced profile of CAF which our cyber regulator Ofgem use as its benchmark for compliance with NIS and therefore the benchmark SGN striving to achieve within the permitted timescales.

304 The E&I Asset Management Strategy is aligned to the wider LTS Strategy detailed previously in this paper. It outlines our approach for managing assets to ensure their safety, reliability, efficiency, and longevity. The strategy is aligned with our objectives of a safe and reliable network, while adhering to regulatory requirements, optimising asset performance, and minimising environmental impact.

G.3 Summary of Workload and Costs

305 The Network E&I submission is like the GD2 submission in terms of workload drivers, justification and programmes of work. However, in terms of volume it is reduced in scale as a lot of the largest sites and asset base have been replaced in GD1 and GD2 where we have undertaken offtake rebuilds and metering replacements. Where there is an increase in workload and costs this has been attributed to new assets recently being brought online and now needing replacement such as biomethane sites and physical security assets as well as new compliance drivers such as cyber security.

306 The E&I submission also has interdependence with the biomethane strategy, and the SIU and IT (Cyber) therefore must be read in conjunction with the Innovation appendix SGN-GD3-SD-05, Environmental Action Plan SGN-GD3-SD-01 and SIU appendix SGN-GD3-SD-11.

307 The below tables highlight the workload volumes and associated costs for the E&I asset base both in GD2 and GD3. As SGN is still in the delivery phase of GD2, the volumes are subject to minor change. The costs associated with GD2 costs at 2023/24 prices and the GD3 costs. There are two tables, Table 25 is for Southern and Table 26 for Scotland.

Table 25: Workloads and costs for Southern Network

	Workload volume (No.)		Costs (£m)	
Programme/Project Detail	**GD2**	**GD3**	**GD2**	**GD3**
Remote Telemetry Unit Replacements	84	-	3.77	-
UHF Radio Replacement	115	-	0.39	-
Cyber PIN Project	-	108	-	0.67
Non-telemetered Pre-heating sites	14	-	1.38	-
E&I Upgrade Programme	25	2	5.11	2.18
E&I Minor Works	25	-	3.63	-
CM4 Surveys	-	238	-	0.38
CM4 Remedial Works	-	238	-	8.98
Pneumatic Controllers	41	-	0.37	-
Functional Safety - Documentation	19	-	0.21	-
Functional Safety - Intervention	-	18	-	8.60
Metering Uncertainty Programme	1	2	0.23	2.62
LGT refurbishments	12		0.31	
LGT System Overhaul	-	6	-	6.46
Gas Chromatograph Replacements	2	1	0.34	0.21
Inter LDZ Upgrades	3	-	0.36	-
Flow Computer Replacements	-	6	-	0.44
SR25 Remediation	-	25	-	0.28
Critical Spares	-	1	-	0.22
Design and Feasibility	-	1	-	1.13

	Workload volume (No.)		Costs (£m)	
Programme/Project Detail	**GD2**	**GD3**	**GD2**	**GD3**
Hilltop Upgrades	1	-	0.04	-
Hilltop Battery Replacements	8	-	0.18	-
Biomethane Improved Access Rollout	7	1	7.53	0.73
Biomethane Remediation Works	-	4	-	0.86
Security System Component Replacement	-	18	-	5.52
Cathodic Protection T/R Upgrades	40	-	0.60	-
ICMDL	2184	-	4.00	-
Totals			**28.43**	**39.28**

Source: SGN business plan

Table 26: Workloads and costs for Scotland network

	Workload No.		Costs £m	
Programme/Project Detail	**GD2**	**GD3**	**GD2**	**GD3**
Remote Telemetry Unit Replacements	81	-	4.08	-
UHF Radio Replacement	73	-	0.27	-
Cyber PIN Project	-	86	-	0.30
E&I Upgrade Programme	9	1	2.11	0.91
E&I Minor Works	15	-	0.49	-
CM4 Surveys	-	120	-	0.30
CM4 Remedial Works	-	120	-	3.46
Pneumatic Controllers	26	-	0.26	-
Metering Uncertainty Programme	6	3	4.08	6.21
LGT refurbishments	18	-	0.41	-
LGT System Overhaul	-	9	-	8.92
Glenmavis HV Rationalisation	1	-	0.31	-
Gas Chromatograph Replacements	2	-	0.30	-
Lamberton Toll Inter LDZ	1	-	0.13	-
Flow computers	-	6	-	0.88
SR25 Remediation	-	25	-	0.23
Critical Spares	-	1	-	0.20
Design and Feasibility	-	1	-	1.19
Hilltop Upgrades	1	-	0.05	-
Biomethane Improved Access Rollout	3	7	4.42	5.31
Security System Component Replacement	-	8	-	2.99
Cathodic Protection T/R Upgrades	15	-	0.24	-
ICMDL	1120	-	3.03	-
OT Systems – Protocol and Integration Review	-	1	-	0.60
Totals			**20.19**	**31.50**

Source: SGN business plan

Table 27: List of IDP's associated with this investment area

Network	**Name / Project**	**Value (£m)**	**NPV at 16 years (£m)**	**EJP Reference**	**CBA Reference**
SIU	Wick and Thurso SIU Compressed biomethane	15.8	26.64	SGN-GD3-EJP-SIU-001	SGN-GD3-CBA-SIU-001
Southern	Functional Safety	8.6	2.43	SGN-GD3-EJP-E&I-002	SGN-GD3-CBA-SOU-002
SGN	LGT Overhaul	15.4	35.34 (Sou) 14.61 (Sco)	SGN-GD3-EJP-E&I-003	SGN-GD3-CBA-SOU-003 SGN-GD3-CBA-SCO-003
SGN	Metering Upgrades	8.4	8.4 (Sou) 6.15 (Sco)	SGN-GD3-EJP-E&I-004	SGN-GD3-CBA-SOU-004 SGN-GD3-CBA-SCO-004

Source: SGN business plan