Northern Gas Networks

Appendix A21 Cost Assessment and Benchmarking Approach

Contents

1 Introduction

This appendix provides additional justification for our expenditure plans for RIIO-GD3 as set out in Chapter 6 of our main Business Plan. Section 2 provides an overview at a Totex level; while Sections 4, 5 and 6 respectively provide additional information related to the three key expenditure areas of Repex, Opex and Capex. This appendix also sets out our views and evidence on Real Price Effects (RPEs) in Section 7 and Ongoing Efficiency (OE) in Section 8. In Section 10 we outline our views on issues which Ofgem will need to address when developing its cost benchmarking and catch-up efficiency approach. Table 1 provides a comprehensive list of where more detail on the cost components discussed throughout our Business Plan and the associated appendices can be found.

	Business Plan	A21 Cost Assessment and Benchmarking Approach	IDP A22
Totex	**Section 6.1**	**Section 2**	
Cost efficiency	**Section 6.2**	**Section 3**	
Repex	**Section 6.3**	**Section 4**	
Mandatory	Section 6.3.4	Section 4.6	A22.l
Non-mandatory	Section 6.3.5	Section 4.7	A22.m
>2" Steel	Section 6.3.6	Section 4.8	A22.m
Zero-scoring mains & other mains	Section 6.3.7	Section 4.9	A22.m
Stubs	Section 6.3.8	Section 4.10	A22.l
Diversions	Section 6.3.9	Section 4.11	A22.m
Other services	Section 6.3.10	Section 4.12	A22.l
Risers	Section 6.3.11	Section 4.13	A22.p
Capex	**Section 6.4**	**Section 5**	
Local transmission system (LTS)	Section 6.4.4	Section 5.4.1	A22.i (LTS) and A22.n (River Allen)
Offtakes & PRS	Section 6.4.4	Section 5.4.2	A22.a
- Filters			A22.b
- Pressure Control			A22.c
- Preheating			A22.d
- Odorant & Metering			A22.e
- Civils			A22.f
- Electrical & Instrumentation			A22.g
Governors	Section 6.4.5	Section 5.5	A22.h
Reinforcement	Section 6.4.6	Section 5.6	A22.i
Connections	Section 6.4.7	Section 5.7	N/A
Other network capex	Section 6.4.8	Section 5.8	A22.k (overcrossings) and A22.o (pressure management)
Other non-network capex	Section 6.4.8	Section 5.9	N/A
Opex	**Section 6.5**	**Section 6**	
Work management	Section 6.5.4	Section 6.4	N/A
Work execution	Section 6.5.5	Section 6.5	N/A
Indirect activities	Section 6.5.6	Section 6.6	N/A
Non-controllable Opex	Section 6.5.7	Section 6.7	N/A
Managing Uncertainty	**Section 6.7**	**Section 9**	
Real price effects	**Section 6.6.1**	**Section 7**	
Ongoing efficiency	**Section 6.6.2**	**Section 8**	

Table 1 Reference documents

2 Total Expenditure – overview and key drivers

Consistent with Section 6.1 of the Main Business Plan, Table 2 sets out our total expenditure for RIIO-GD3. Costs reported throughout this chapter are in 23/24 prices and with Real Price Effects (RPEs) excluded. We will need to invest, on average, £367.43m in each year of RIIO-GD3 to maintain compliance with our statutory obligations, manage network risk and deliver the service standards identified via our extensive stakeholder engagement. This annual spend is based on previously delivered costs over RIIO-GD1 and RIIO-GD2, periods during which NGN has set and maintained the efficiency benchmark across gas distribution networks. The total expenditure in RIIO-GD3 is £1.837bn.

2023/24 Prices	RIIO-GD2 Average	RIIO-GD3 Spend per Year (£m)					RIIO-GD3 Total	RIIO-GD3 Average
		2026/27	2027/28	2028/29	2029/30	2030/31		
Controllable Opex	115.66	133.45	132.60	130.07	130.97	129.28	656.37	131.27
Capex	62.18	76.81	60.12	65.63	61.71	66.50	330.77	66.15
Repex	126.15	145.76	157.13	170.27	182.21	194.66	850.03	170.01
Totex	**303.98**	**356.02**	**349.85**	**365.97**	**374.88**	**390.44**	**1,837.16**	**367.43**

Table 2 Totex in RIIO-GD3

We will spend £1.837bn on our controllable Totex in RIIO-GD3 to ensure the continued operation of an efficient, safe, and reliable network. In total, our expenditure is set to increase by 21% relative to RIIO-GD2. The most notable cost increase is observed in Repex as we enter the final years of the mandated iron mains replacement programme (discussed further below). Our Capex and Opex expenditure will also increase in RIIO-GD3, driven largely by mandatory compliance requirements with the Medium Combustion Plant Directive[1] and additional Opex cost impacts driven by HSE fatigue requirements and Streetworks legislation.

Controllable Opex

We will allocate £656.37m to operating and maintaining the network, a 14% increase from RIIO-GD2. This rise is largely driven by higher costs for asset maintenance, street works, and additional resources needed to comply with the Health and Safety Executive's (HSE) fatigue management policy. We are also actively seeking to keep Opex in check through innovation and efficiency measures such as exploring the use of new technologies such as remote monitoring and automated data processing, ensuring operational costs remain sustainable as Repex drives down gas leakage and improves environmental performance. NGN will make further strides in optimising operational costs through improved maintenance practices, risk-based asset replacement and upgrades, and leveraging digital solutions to reduce inefficiencies in network operations.

Capex

Investment in RIIO-GD3 will total £330.77m, a 6% increase from RIIO-GD2. This increase is predominantly due to regulatory and compliance requirements such as those from the HSE driving a need for infrastructure upgrades, particularly around pressure management and asset safety. The Capex programme is risk-based, prioritising the refurbishment or replacement of the worst-condition assets to maintain service levels and overall network risk at acceptable levels. In RIIO-GD3, our strategy focuses on both targeted asset replacement where appropriate and refurbishment where we can safely and efficiently extend the life of an asset. Notably, we now need to move from a refurbishment led programme of works to a more replacement focussed programme in RIIO-GD3 as asset deterioration continues and assets approach end of life. Our RIIO-GD3 plan tackles concern around obsolescence of existing equipment and increasing compliance risks (such as the need to meet low NOx requirements as required by the Medium Combustion Plant Directive (MCPD) as detailed in the A22.d NGN RIIO-GD3 Investment Decision Pack - Offtakes & PRS – Preheating.

[1] https://www.gov.uk/guidance/medium-combustion-plant-when-you-need-a-permit

Some changes in Capex costs are attributable to factors outside our control, such as specific reinforcements or connections required to accommodate new customers or industrial demand, or legislative drivers mentioned above.

Repex

£850.03 million is dedicated to our replacement program, which will upgrade 2,819.07km of outdated metallic mains with modern plastic pipes. The main driver of this expenditure is the HSE-mandated Iron Mains Risk Reduction Programme (IMRRP), which requires that we replace all small diameter iron mains within 30 meters of customer properties by 2032 (see Section 4.1). Based on in-depth modelling work which has been put through external independent scrutiny, Repex costs will increase by 35% relative to RIIO-GD2. This increase is driven by changes in the mix and complexity of Repex workload we must now undertake; and by premiums required on contractor resources as we reach the end of the IMRRP. Our plan, informed by thorough risk assessment and stakeholder input, will enhance both the safety and reliability of our network while delivering significant environmental benefits by reducing natural gas leakage. Beyond RIIO-GD3, the Repex programme will end, and the lower pressure network will predominantly consist of plastic pipes, which are safer and require fewer repairs. Securing the necessary funding to complete this critical programme will allow us to finish it on schedule to a high standard. NGN have successfully managed delivery of the Repex programme at the lowest cost since 2005 and our Direct Service Provision (DSP) model puts us in an enviable position to manage the impact of these cost pressures as we close out the programme. However, NGN is not immune to the cost pressures associated with the nature and increased complexity of the remaining work and the wider pressures in the market for contract labour.

3 Robust and efficient costs

3.1. Cost expenditure process

As set out in Section 6.2 of the Main Business Plan, at NGN robust and efficient costs are defined as those which address the network, customer service and environmental risk in an effective and enduring way, to avoid future additional costs or service interruptions. NGN follows an efficient and robust process to determine expenditure, involving historical and forward-looking analysis of expenditure and risks.

The key features of this process are set out in Section 6.2.1 of the Main Business Plan.

We have dedicated time and resource to ensuring that we have processes that are engrained and well understood by our colleagues. Thanks to this, we now have in-depth knowledge of:

- Detailed historic costs.
- Historic performance relating to our assets.
- Data driven cost models.
- Aggressive industry leading commercial models.
- Our comprehensive forward plan work plan for mandatory and non-mandatory workload with a well justified cost benefit analysis (CBA).

Our historical performance proves that both Ofgem and our stakeholders can be confident that we will deliver what we say we will. We discuss this further in Sections 3.3.1, 3.3.2 and 3.3.3.

3.2. Maintaining cost efficiency

To ensure we maintain an efficient view on cost, we have strenuously challenged ourselves throughout the business planning process, and we will remain at the frontier because of this. In addition to this rigorous challenge process, we propose an ongoing efficiency target of 0.5% to be applied year on year (see Section 8).

The regulatory framework plays a critical role in ensuring that the competitive forces of the market operate effectively and drive the ambition for ongoing efficiency. Without a level playing field for all parties when operating in a regulated sector, there is a significant risk of unintended outcomes that have a detrimental impact on value for customers. For

example, our colleagues and DSP partners are highly desirable to our competitors thanks to our continued investment in them and the valuable experience that they gain from operating consistently at the efficiency frontier. Regulatory allowances that permit companies in the sector to "outbid" the frontier company for resources creates a perverse environment whereby costs spiral upwards, ultimately at the expense of productivity and long-term customer value.

3.3. Customer Led Priorities

And as noted in Section 6.2.3 of our Business Plan, active and continuous engagement with our customers and stakeholders have set our objectives as we have planned our investment for RIIO-GD3.

Our industry-leading efficiency position is built on a culture of continuously striving for excellence – ensuring we build and maintain the trust of our customers and other stakeholders, including Ofgem. Three elements of this are particularly important when evaluating our RIIO-GD3 plan:

1. ***Track record of delivery*** **-** we do what we say we will do. We have met our commitments and delivered the volumes of work we planned for. We haven't chosen to simply do the easiest work first – we have delivered a sensible mix of both complex and simpler work, as we had planned.
2. ***Track record of cost efficiency*** **-** Ofgem has consistently assessed us to be the most efficient gas distribution company, having maintained our frontier status across both RIIO-GD1 and RIIO-GD2.
3. ***Track record of service quality*** **-** we never compromise on service quality. We consistently lead the way across various key delivery metrics. For example, across the sector we lead the way on the proportion of controlled and uncontrolled gas escapes which we respond to within statutory timelines – our performance is well above industry upper-quartile on these key measures that reflect the priority customers place on safe provision of services. We similarly lead the way on customer satisfaction metrics and reducing the length of interruptions; and we are an above-average performer on our efforts to minimise our environmental impact by reducing shrinkage. In more recent years, our efforts to reduce our backlog of repairs outstanding for greater than 28 days also leave us placed as an industry leader on this measure.

Our RIIO-GD3 plan is grounded in these foundations. Our track record is why our customers and stakeholders can trust that our plan delivers efficiency and value for money. We expand briefly on each of these points below.

3.3.1. Track record of delivery

Across all our outputs and workloads, NGN consistently delivers its customer commitments. This is relevant across our business, but particularly important when it comes to the Iron Mains Risk Reduction Programme (IMRRP), which is the main component of Repex expenditure (see Section 4.1).

Throughout RIIO-GD1 and RIIO-GD2, we have proactively engaged with Ofgem as the programme has evolved. We have consistently gone beyond the minimum requirements - incorporating and delivering Non-Mandatory Tiers into our annual programme, aiming to further de-risk assets, justified by cost-benefit analysis (CBA). This has resulted in multiple benefits to the customer and the environment, which align with key outcomes Ofgem is seeking to drive delivery of at RIIO-GD3, including;

- **High Quality of Service from Regulated Firms:** Fewer interruptions to supply.
- **Infrastructure fit for a low-cost transition to net zero:** Reduced leakage costs and retention of higher diameter skills for efficient delivery.
- **Secure and resilient supplies:** Long term reliability and safety.

For mandatory Repex we have delivered a broad mix of work, simple through to complex, to deliver a balanced portfolio of investment over the RIIO-GD1 and RIIO-GD2 period. NGN has distinguished itself with notable difference in the delivery of the **Tier 1 iron workload** relative to our peers, as presented in Table 3 (see also additional data in Section 4.4 below). Table 3 shows that 72% of our portfolio of Tier 1 work delivered since 2013 has been on pipes larger than 75mm in

diameter (i.e. the larger and more complex (i.e. higher unit cost) - jobs). The industry average excluding NGN is 54%. Equivalently, other networks have done a much higher proportion of workload on smaller diameter (≤75mm) iron pipes, which are cheaper.

Diameter	Tier 1 Iron Workload Proportions APR 2013 - MAR 2024, actuals from RRP / BPDTs			
	NGN	WWU	SGN	Cadent
≤75mm	28%	52%	47%	44%
>75mm to 125mm	60%	37%	40%	48%
>125mm to 180mm	12%	10%	11%	7%
>180mm to 250mm	1%	1%	1%	0%
>250mm to 355mm	0%	0%	0%	0%
>355mm to 500mm	0%	0%	0%	0%
>500mm to 630mm	0%	0%	0%	0%
>630mm	0%	0%	0%	0%
Total	**100%**	**100%**	**100%**	**100%**

Table 3 Tier 1 Iron Workload Proportions Apr 2013 - Mar 2024 (Actuals from RRP/BPDTs)

In other words, we have ensured higher-risk assets are addressed first and avoided simply prioritising the cheapest assets first. What this means for the customer is that, as we reach the end of the IMRRP, NGN is now in a position where inevitable increases in average unit costs for Repex work are mitigated. Put another way, had we followed the same strategy as the other GDNs, we would have been left with a mix of work to deliver in RIIO-GD3 which would have been much more skewed toward the higher-cost assets (therefore leaving customers facing higher bill increases). Our more balanced approach means that our customers' bill increases are less than they would have otherwise been.

Our track record shows a resolute focus to deliver our commitments and where possible, exceeding that pledge. Based on this we can be trusted to continue to deliver in RIIO-GD3, to maintain high standards of service and delivery for our customers.

3.3.2. Track record of cost efficiency

At each price review, Ofgem compares the GDNs cost efficiency through detailed benchmarking analysis. Throughout RIIO-GD1 and RIIO-GD2 NGN has been consistently ranked as the most efficient operator by Ofgem.

In RIIO-GD2, Ofgem used a 'Totex' benchmarking model to compare efficiency across the sector – meaning Ofgem compared our aggregate costs. Each company receives an efficiency score – lower scores reflect more efficient companies; higher scores reflect inefficient companies. Figure 1 shows the results of benchmarking analysis using Ofgem's RIIO-GD2 model.

In the RIIO-GD2 Final Determination (FD), Ofgem gave us an efficiency score of [90%] (note: lower efficiency score reflects better performance). As shown in the chart, this was substantially more efficient than our nearest competitor, and indeed the rest of the sector.

We have updated this analysis using the latest outturn data (up to Regulatory Reporting Pack (RRP) 2023/24), as shown in Figure 1 below. So far in RIIO-GD2, our performance has been 11.7% more efficient than our nearest comparator – increasing our leading position as assessed by Ofgem in the FD. If we then factor in the latest forecasts for the remainder of RIIO-GD2, performance varies widely across the sector, but that NGN remains industry-leading and well ahead of our peers.

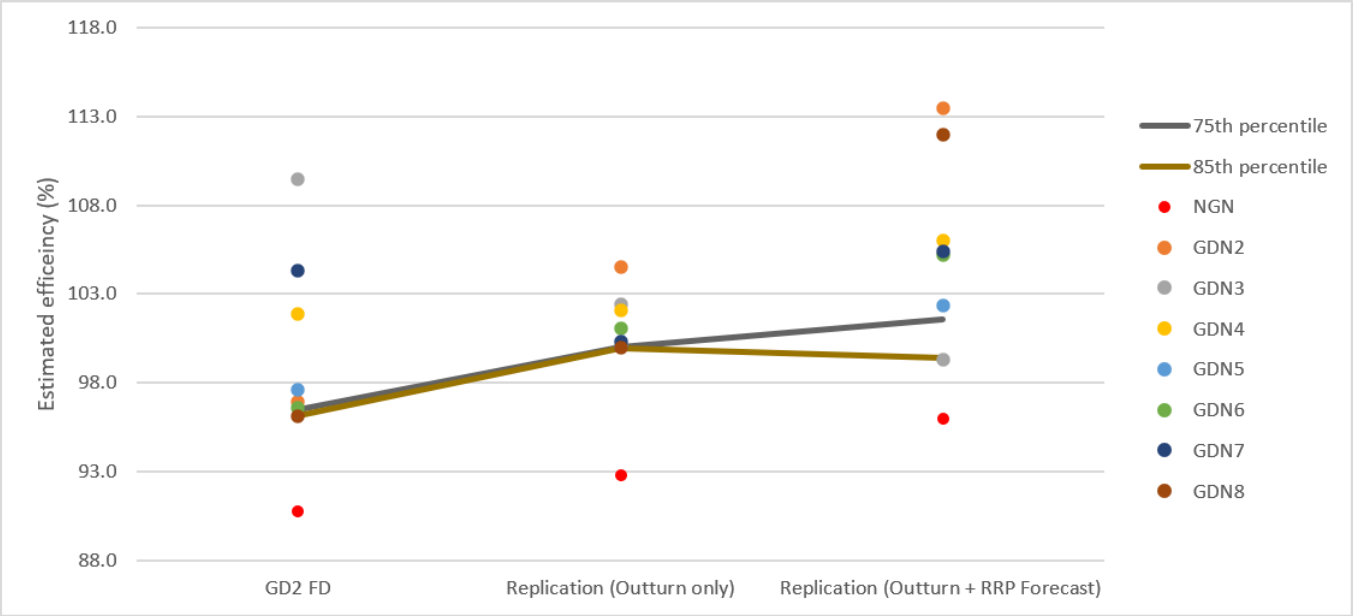

Figure 1 NGN Efficiency benchmarked against peers (Note: A lower efficiency score indicates that the GDN is more efficient. Several GDN's relative performance change materially between three different data sources but have been anonymised due to data confidentiality)

This higher level of efficiency is a dramatic gap that was a result of material effort we invested to improve efficiency in RIIO-GD1 and which we are sustaining through RIIO-GD2. We estimate that NGN's stretching efficiency performance enabled Ofgem to set tougher targets for GDNs across the country in RIIO-GD2.

Our ambitious RIIO-GD2 proposals meant national cost allowance for GDNs were £211 million lower than they would have been without NGN stretching the efficiency frontier. In other words, our efficiency leads to lower consumer bills across the country.

We have achieved this position by being innovative in our thinking and directly and aggressively challenging industry norms and practices by bringing forward market-led, commercially focussed business solutions across almost every area of our business. We made key strategic decisions at the start of RIIO-GD1 which have continued to drive efficiency in RIIO-GD2 and RIIO-GD3. This is described in more detail in Chapter 1 of our Main Business Plan.

At RIIO-GD3 we will continue to use our embedded efficiencies to mitigate the impact of the unique cost challenges. We are committed to maintaining our frontier status in efficiency and delivery among the gas distribution networks.

To ensure we maintain an efficient view on cost we have strenuously challenged ourselves throughout the business planning process and we expect to remain at the frontier because of this. In addition to this rigorous challenge process, we propose an ongoing efficiency target of 0.5% be applied year on year. We discuss this further in Section 8.

Our approach to labour procurement has also given us an advantage in maintaining continuity and efficiency in deployment. Having work done by local DSPs avoids the cost increases that can occur with frequent changes in service providers. Our DSPs have retention contracts that provide them with an incentive to stay until project completion, and this is a key component of **A7 Workforce Resilience Strategy Appendix.**

3.3.3. Track record of service quality

Being the frontier company is not only about driving operational efficiency but also about quality of service, innovation and thought leadership. While we push the boundaries of operational efficiency it also means not compromising on quality standards in service delivery. This dual focus, balancing efficiency with service quality, drives sector leading standards of customer satisfaction, safety, reliability, and environmental performance. These measures should not be looked at in isolation but as a suite of measures that have interdependencies and together highlight the quality of service, we provide to our customer.

We have established and developed an operational model that enables us to allocate resource effectively during peak emergency incidents or events. Our commitment to ongoing training ensures that that our teams are well prepared to support critical activities as they arise. By promptly restoring gas and completing repairs, we minimise risk, optimise resource, and reduce the carbon emissions. This proactive approach allows us to meet the customers and stakeholder's expectations. We pride ourselves on being at the frontier of service delivery, the goal is to elevate the other GDNs alongside us.

In the RIIO framework outputs were introduced to show value, benchmark, and measure performance. Below we discuss how quality is not compromised.

1-hour and 2-hour emergency response standards

Our regulator requires us to respond to 97% of controlled 'Public Reported Escapes' (PREs) within 2 hours; and 97% of uncontrolled PREs within 1 hour as a minimum requirement. Meeting and exceeding these standards are critical indicator of our approach to safety. Figure 2 and Figure 3 below show that we are the top performer in our sector on both 1-hour and 2-hour emergency response standards – exceeding Ofgem's targets and performing well above the industry upper quartile. Our performance has been close to 100% over a sustained period. Taking our performance into consideration we can provide the confidence to the regulator that we will deliver the quality required by them and to the customer at the most efficient cost.

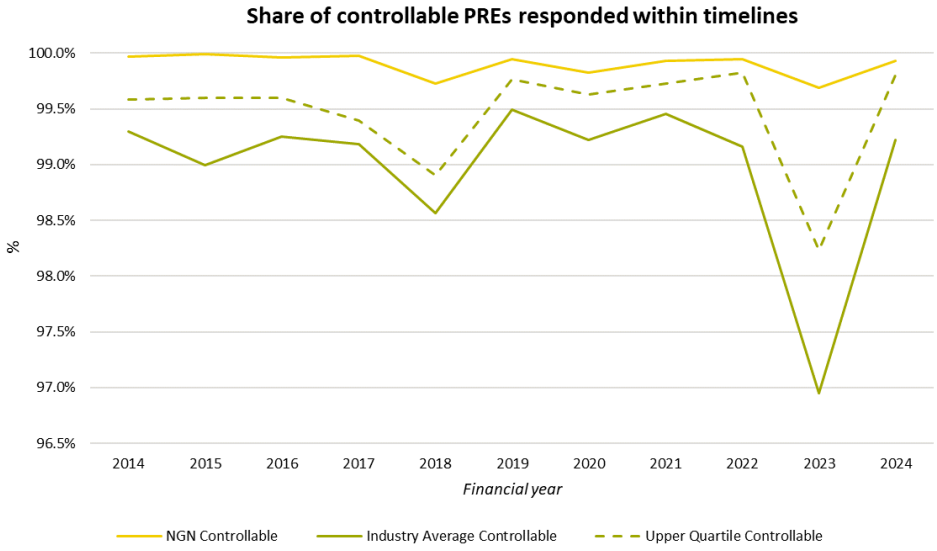

Figure 2 Share of controllable PREs responded to within timelines

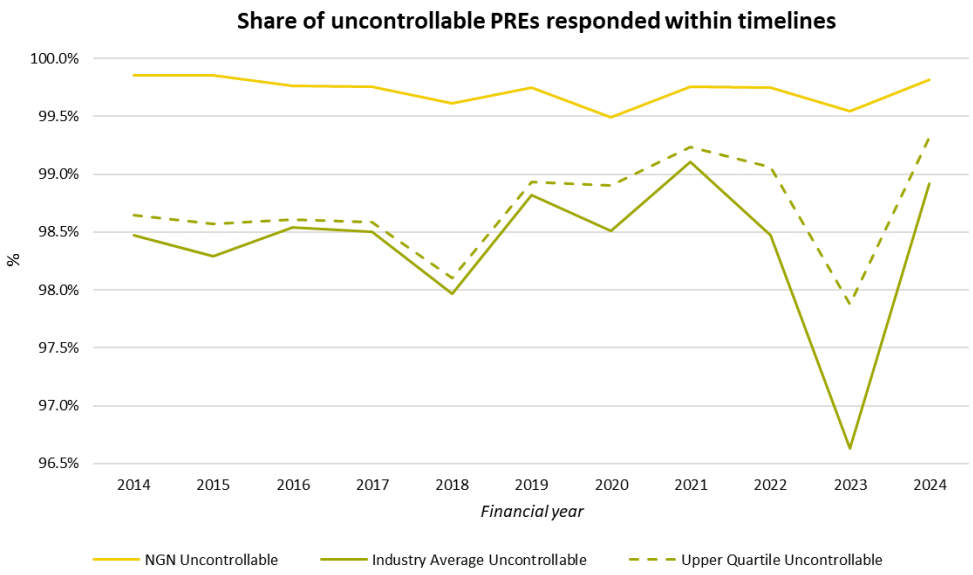

Figure 3 Share of uncontrollable PREs responded to within timelines

Customer Satisfaction

Ofgem undertakes annual consumer surveys which measure both customer satisfaction and customer complaints. Both measures attract a score out of ten for each GDN – for customer satisfaction, higher scores reflect better performance, while for complaints, lower scores reflect better performance. The chart below compares our performance to the industry over time. We are consistently an upper-quartile performer on customer satisfaction, and broadly in line with our peers on complaints.

Achieving a high average score of nine on customer satisfaction reflects our commitment to placing customers at the heart of our operations. The quality of our interaction with customers and stakeholders is integral to this success. We collaborate across networks to share best practice and listen to our stakeholders. Their feedback indicate that we are performing at a high level and advise that additional spending to enhanced performance may not be the most effective use of customer funds. In cases where we receive a small number of complaints, we address each one individually aiming for a resolution.

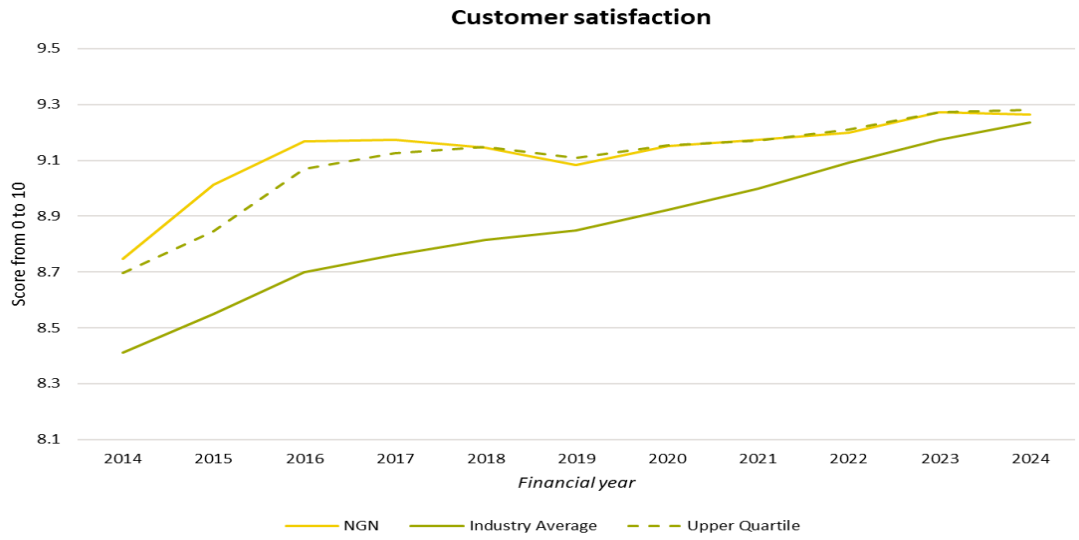

Figure 4 Customer satisfaction scores

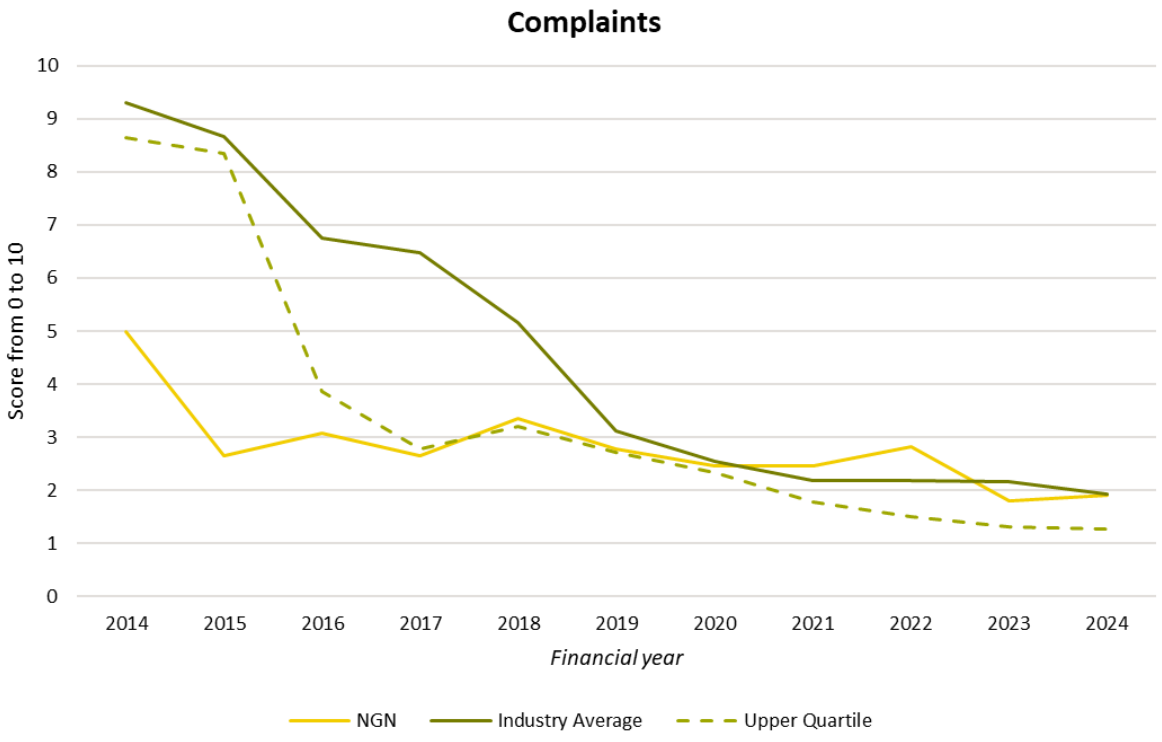

Figure 5 Customer complaint scores

Service Interruptions

NGN achieved an average of 5.3 hours unplanned service interruptions against a minimum performance level target of 10 hours. Over the past 3 years NGN has achieved 5 hours (2021/22), 5.58 hours (2022/23) and 5.31 hours (2023/24) during the last three years. This is demonstrated in Figure 6.

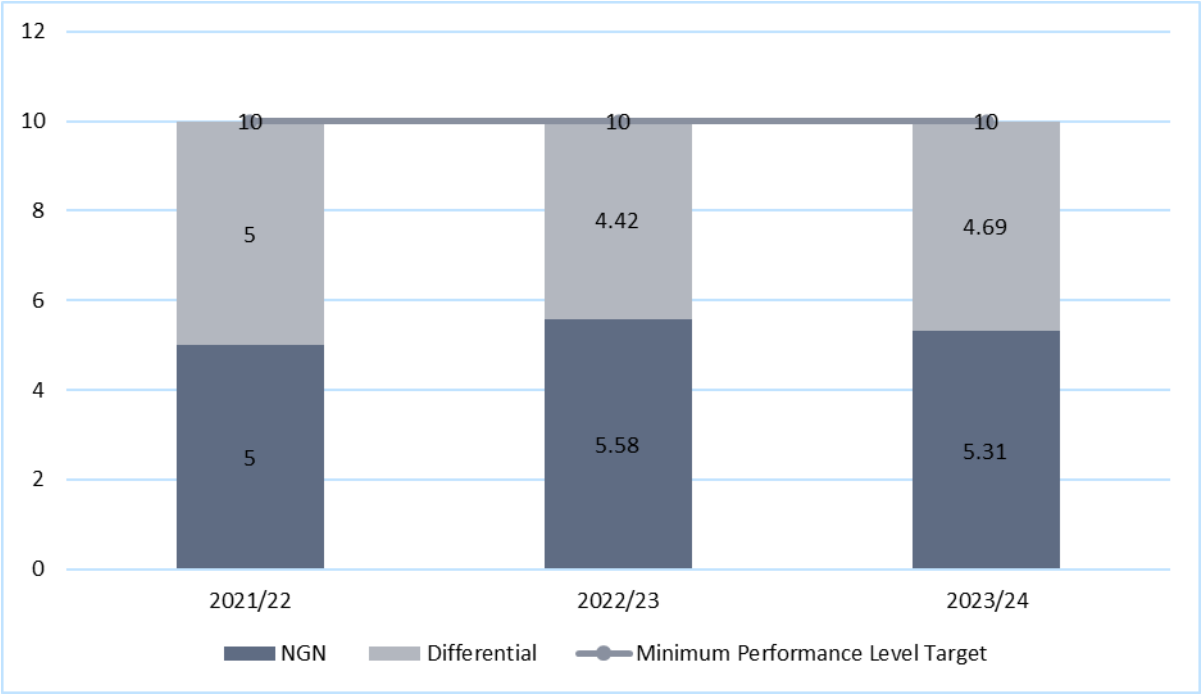

Figure 6 Unplanned service interruptions

Figure 7 below shows data on the average minutes off-supply (fewer minutes off supply reflects better performance). It shows we are industry leading on this measure, consistently performing better than the industry upper quartile. Ofgem set minimum levels of performance (MPL) for all GDNs based on their RIIO- GD1 performance. We have the most stringent MPL set in RIIO-GD2, due to our excellent performance in RIIO-GD1. In RIIO-GD3 Ofgem have asked for a common level to be set for all GDNs, and we support this approach. We have put forward the 10 hours minimum performance level for all GDNs. This will drive performance across the GDNs and stop a post code lottery for customers across the country.

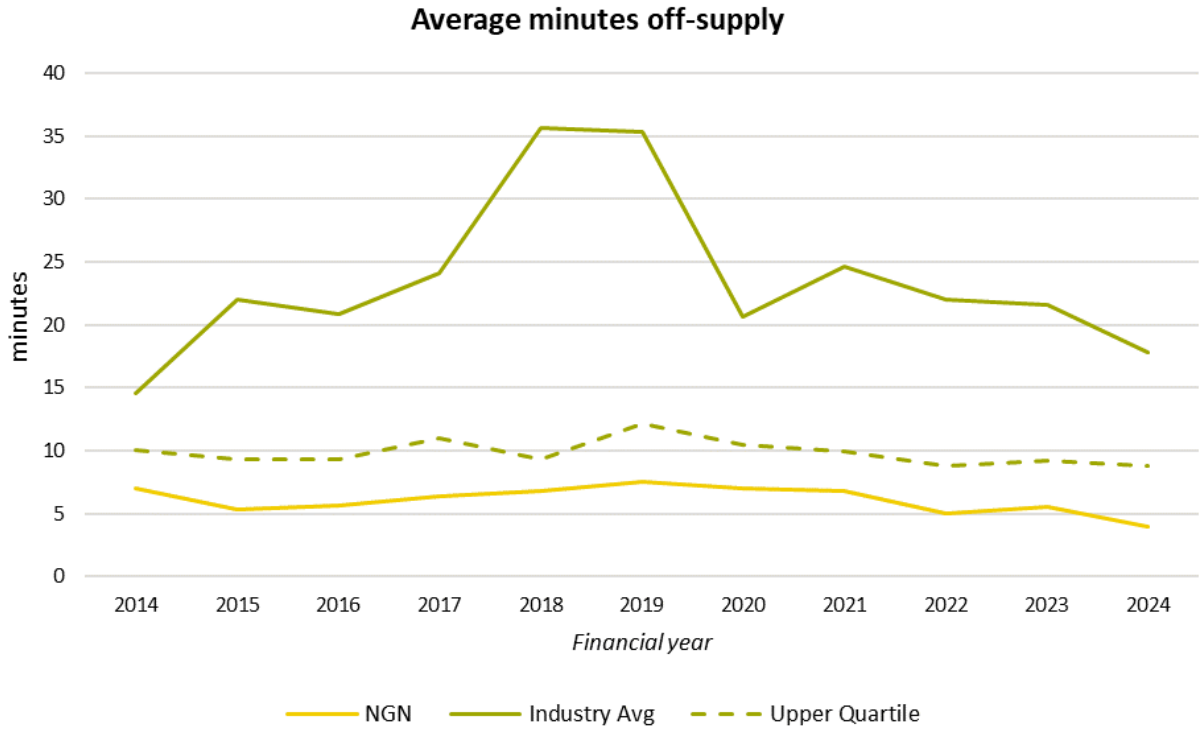

Figure 7 Average minutes off supply

Part of the reason our interruptions performance is strong is because of our commitment to minimising the log of outstanding repair work. Ofgem requires the GDNs to report data on the number of outstanding repair jobs they have logged which have remained outstanding for greater than 28 days. The chart below reports this, normalised by network length. It shows that in recent years we have delivered significant improvements on this metric – driving down the time it takes for us to complete repair jobs. We are now industry-leading on this measure, significantly outperforming the industry upper quartile. We also believe that this should be a measure that we are held to account for in RIIO-GD3. This can be found in Chapter 3 of the business plan.

A secondary benefit of these measures is the effective management of resources to mitigate risks and reduced carbon emissions, which customers are placing higher priority upon (we discuss this further in Section 0). The necessary resources and focus for these improvements have emerged from a productivity project implemented in RIIO-GD1 which was successfully transitioned into RIIO-GD2, all without incurring an additional cost for our customer.

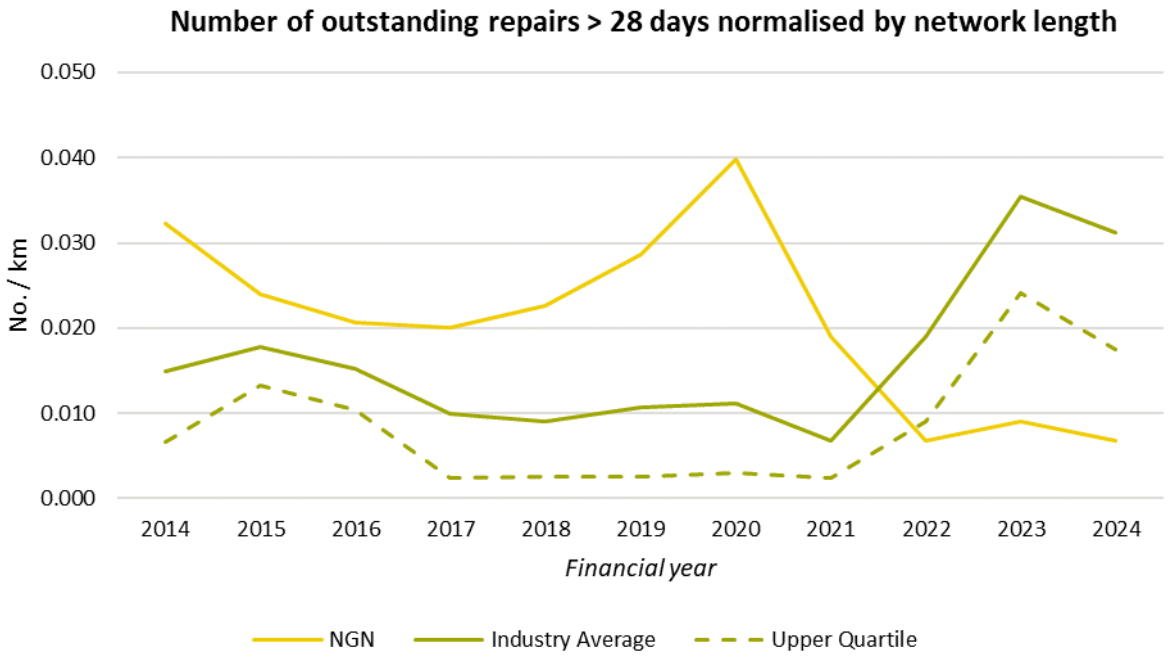

Figure 8 Number of outstanding repairs > 28 days normalised by network length

Delivering service levels that customers value

Our customers place significant value on across-the-board high level of performance we achieve. Chapter 2 of our Business Plan and **Appendix A3 – Stakeholder Engagement Decision Log** provide a comprehensive overview of the engagement that has taken place with our stakeholders to inform our RIIO-GD3 business plan.

Figure 9 below shows the results of recent customer engagement which allowed us to track the importance customers' place on different metrics against their value perception (measured in £). The specific services tested are listed beneath. The chart shows that our customers placed the most value on service measures such as meeting the 1-hour standard, reducing repair time, and minimising the length and number of supply interruptions. It can be seen from the performance metrics shown above that we are meeting the deliverables our customers value the most.

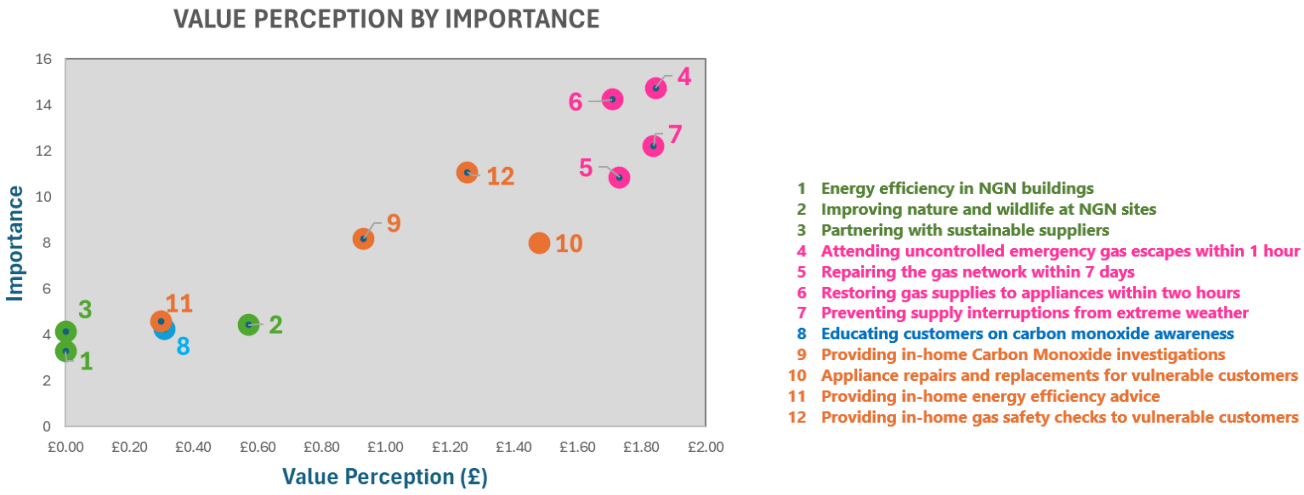

Figure 9 Value perception customer insights

From our stakeholder research (for example, see Insight 1, 9 and 10 from **Appendix A3** outlined in Table 4), we know that network reliability and cost remain our customers key priorities. Customers also value the importance of improving resilience against extreme weather, such as storms. We also know that our customers expect value for money and that we make the right investment decisions for both our existing and future customers.

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

Table 4 Customer insights

In addition to engaging with our customers directly, we have also been rigorously challenged by our Independent Stakeholder Group (ISG) during several challenge and deep dive sessions throughout the year. We have tested the acceptability of our plan with customers and clearly articulated the bill impact associated with the increase in our Totex programme. As a result of customer feedback and stakeholder engagement we have developed our investment plan for RIIO-GD3 that keeps bill low without compromising on the level of service and safety we need to provide.

Feedback from our engagement programme showed that informed customers understood both the cost-of-service implications and the potential impact of Ofgem's policy proposals on bills. Our business plan acceptability testing with informed customers and stakeholders revealed an average acceptance rate of 79% for our RIIO-GD3 business plan, which among other things reflects the ambition of our commitments. After being informed about the services provided, performance levels, and the portion of the gas bill allocated to NGN, 80% of informed customers considered NGN's proposed bill profile to offer good value for money. More details about our Engagement programme are provided in Chapter 2 of our RIIO-GD3 business plan and **Appendix A3: Stakeholder Engagement and Decision log**.

4 Replacement expenditure summary (Repex)

Replacement expenditure (Repex) involves replacing metallic pipes that are prone to failure, which can lead to gas leaks, posing safety risks and disrupting gas supply to end customers. The Health and Safety Executive (HSE) has overseen a legally mandated programme of Repex work over the last 20 years, which will continue until at least 2032. Our assets targeted for replacement include:

- Distribution mains pipeline systems carrying gas across roads, waterways, and railways.
- Service lines delivering gas to properties.
- Riser and lateral pipelines which deliver gas to consumers within Multiple Occupancy Buildings (MOBs).

Investment in these assets may be mandatory based on risk assessments, or non-mandatory, where investment is justified by cost-benefit analysis (CBA). This not only includes the replacement of iron mains, but also the replacement of steel mains, steel services, non-standard material pipes, and above-ground riser pipes – all of which require ongoing management.

Table 5 outlines the distinct categories of Repex investment, specifying whether each is mandatory, or non-mandatory.

Definitions		
Mains	A below ground pipe that supplies, or has the capability to supply, more than 2 primary meter installations operating below 7 bar gauge pressure	
Tier 1	Iron pipes ≤ 8” in diameter	**Mandatory**
Tier 2a	Iron pipes 8” < diameter < 18” and MRPS score ≥ RAT (risk action threshold)	**Mandatory**
Tier 2b	Iron pipes 8” < diameter < 18” and MRPS score < RAT (risk action threshold)	**Non-mandatory**
Tier 3	Iron pipe diameter ≥ 18”	**Non-mandatory**
≤2” Steel	Steel pipes ≤ 2” in diameter	**Non-mandatory / policy**
>2” Steel	Steel pipes > 2” in diameter	**Non-mandatory**
Zero scoring	Mains of any Tier with MRPS score of zero	**Non-mandatory**
Other Mains	Mains of non-standard material (e.g. asbestos)	**Mandatory**
Services	A pipe from a main up to the outlet of the emergency control valve (ECV) to an individual meter installation	**Non-mandatory / policy**
Riser	A vertical pipe that carries gas between floors within a multi-occupancy building (largely steel or PE)	**Non-mandatory**
Lateral	A horizontal pipe connected to a riser that conveys gas along one floor level within a multi-occupancy building (largely steel or PE)	**Non-mandatory**
Diversions	Diversions of mains requested by third parties. These can be rechargeable or non-rechargeable.	**Mix of Mandatory / Non-mandatory**

Table 5 Repex categories of investment

4.1.1. The iron mains risk reduction programme (IMRRP)

The Iron Mains Replacement Programme (IMRP) was introduced by the HSE in 2002 to address concern about the failure of iron mains. The IMRP required the distribution companies to replace all ‘at risk’ iron mains (i.e. those within 30 meters of a property) within 30 years of 2002 and became known as the ‘30/30 programme’. Following a ten-year review of the IMRP commissioned by the HSE, IMRP was revised in 2013 to become the current Iron Mains Risk Reduction Programme (IMRRP), also known as the ‘Three-Tier Approach’.

Work is divided into three tiers based on the size and the risk of the pipes. Table 5 provides an overview of the work covered by the IMRRP (under 'Tier 1', 'Tier 2a', 'Tier 2b' and 'Tier 3').

The key advancements in this 'Three-Tier Approach' methodology include:

- **Increased flexibility in prioritisation:** The programme now allows for a broader range of customer and stakeholder benefits to influence replacement priorities, including reductions in gas losses, operating costs, and improvements in safety.
- **Alternative remediation techniques**: There is now greater flexibility to consider and apply other accepted remediation methods to extend the life or continued use of larger diameter mains.
- **Cost-benefit assessment**: All replacements driven by condition or risk are required to undergo a CBA.
- **Tier 1 (Iron pipes ≤ 8" diameter)**: The original requirement remains unchanged - pipes within 30 meters of properties must be decommissioned by March 31, 2032.
- **Tier 2 (Iron pipes > 8" and < 18" diameter)**: A Risk Action Threshold (RAT) was established, requiring all pipes exceeding this threshold to be decommissioned.
- **Tier 2 pipes below the RAT and Tier 3 pipes (Iron pipes ≥ 18" diameter):** These are now subject to condition monitoring and management regimes. Decommissioning may occur if the pipes have deteriorated beyond safe or effective repair, or where justified by a cost-benefit analysis (CBA).

This more flexible approach enables a better balance between removing the highest-risk pipes and delivering an efficient, effective, and safe programme of work, ultimately ensuring value for money for customers.

4.2. Our RIIO-GD3 expenditure

Table 6 summarises our RIIO-GD3 Repex investments and compares the average planned expenditure to the 5-year average we have seen in RIIO-GD2 to date. Figure 10 shows the key movements that drive the increase. Overall, expenditure will increase from £126.15m on average to £170.01m per annum.

2023/24 Prices	RIIO-GD2 Average	RIIO-GD3 Investment (£m)					RIIO-GD3 Total	RIIO-GD3 Average
		2026/27	2027/28	2028/29	2029/30	2030/31		
Tier 1 Mains and services < 2" steel	85.92	99.36	107.87	117.55	127.35	136.15	588.27	117.65
Tier 2a Mains and services	1.25	2.08	2.16	2.26	2.35	2.44	11.30	2.26
Tier 2b Mains and services	10.03	10.53	11.37	12.32	13.30	14.15	61.67	12.33
Tier 3 Mains and services	6.91	9.63	10.15	10.75	11.37	11.90	53.80	10.76
> 2" Steel mains and services	5.62	7.76	8.24	8.78	9.34	9.83	43.96	8.79
Zero Scoring mains & other mains	3.60	4.27	4.45	4.65	4.85	5.05	23.27	4.65
Iron Stubs	2.26	1.64	1.64	1.64	-	-	4.91	0.98
Diversions mains and services	3.40	1.90	2.36	3.05	3.99	5.16	16.47	3.29
Other services	6.87	7.11	7.41	7.79	8.17	8.50	38.98	7.80
Risers	0.29	1.48	1.48	1.48	1.48	1.48	7.40	1.48
Total	**126.15**	**145.76**	**157.13**	**170.27**	**182.21**	**194.66**	**850.03**	**170.01**

Table 6 Repex RIIO-GD3 Investment

2023/24 Prices	RIIO-GD2 Average	RIIO-GD3 Workload Decommissioned (km)					RIIO-GD3 Total	RIIO-GD3 Average
		2026/27	2027/28	2028/29	2029/30	2030/31		
Tier 1 Mains and services < 2" steel	477.83	482.00	482.00	482.00	482.00	482.00	2,410.00	482.00
Tier 2a Mains and services	1.64	2.02	2.02	2.02	2.02	2.02	10.10	2.02
Tier 2b Mains and services	20.40	21.80	21.80	21.80	21.80	21.80	109.00	21.80
Tier 3 Mains and services	5.62	5.82	5.82	5.82	5.82	5.82	29.10	5.82

Table 7 Repex RIIO-GD3 workload decommissioned (km)

2023/24 Prices	RIIO-GD2 Average	RIIO-GD3 Unit Cost (£/mtr)					RIIO-GD3 Average
		2026/27	2027/28	2028/29	2029/30	2030/31	
Tier 1 Mains and services < 2" steel	179.82	206.13	223.80	243.87	264.22	282.46	244.10
Tier 2a Mains and services	759.43	1,029.86	1,070.73	1,117.86	1,165.81	1,207.89	1,118.43
Tier 2b Mains and services	491.77	483.18	521.35	565.25	609.87	649.19	565.77
Tier 3 Mains and services	1,229.68	1,654.14	1,743.97	1,847.50	1,952.83	2,045.22	1,848.73

Table 8 Repex Unit Costs (£/mtr)

In RIIO-GD3, we will upgrade 2,819.07 km of outdated metallic pipes with modern plastic pipes, as presented in Table 9 . On average, the volume of pipes that will be decommissioned will remain stable relative to the previous RIIO-GD2 and average 563.81 km per year.

	RIIO-GD2 Average	Decommissioned Main (km)					RIIO-GD3 Total	RIIO-GD3 Average
		2026/27	2027/28	2028/29	2029/30	2030/31		
Tier 1	437.57	437.97	437.97	437.97	437.30	437.30	2188.51	437.70
Tier 2a	1.64	2.02	2.02	2.02	2.02	2.02	10.10	2.02
Tier 2b	20.40	21.80	21.80	21.80	21.80	21.80	109.00	21.80
Tier 3	5.62	5.82	5.82	5.82	5.82	5.82	29.10	5.82
Iron Mains	**465.23**	**467.61**	**467.61**	**467.61**	**466.94**	**466.94**	**2,336.71**	**467.34**
<2" steel	40.48	44.70	44.70	44.70	44.70	44.70	223.50	44.70
>2" steel	30.17	27.88	27.88	27.88	27.88	27.88	139.40	27.88
Steel Mains	**70.65**	**72.58**	**72.58**	**72.58**	**72.58**	**72.58**	**362.90**	**72.58**
Other (Zero Scoring, MPDI)	8.53	10.87	10.87	10.87	10.20	10.20	53.01	10.60
Diversions	12.06	13.29	13.29	13.29	13.29	13.29	66.45	13.29
Total	**556.47**	**564.35**	**564.35**	**564.35**	**563.01**	**563.01**	**2,819.07**	**563.81**

Table 9 Mains workload decommissioned RIIO-GD3

4.3. Repex cost drivers

While replacement volumes will remain broadly stable, we are seeing an increase in Repex costs influenced by the factors shown in Figure 10.

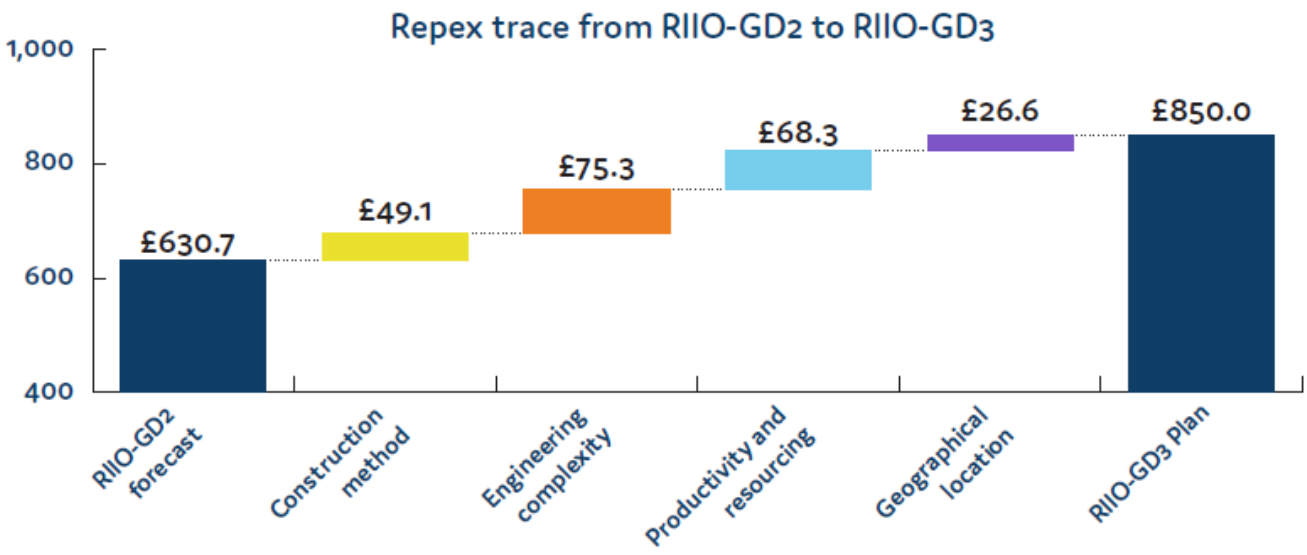

Figure 10 Repex trace from RIIO-GD2 to RIIO-GD3

4.3.1. Construction Method

Increase in Percentage of Open Cut

The percentage of open cut work is increasing as we finalise the Repex program. Open-cut techniques are more expensive as they involve excavating the entire length of the pipeline, as opposed to pipe insertion methods, which involve smaller, more targeted excavations. The proportion of insertion compared to open-cut work on Tier 1 pipes will drop from an average of 89% in RIIO-GD2 to 83% in RIIO-GD3, leading to an increase in overall project costs. Three critical factors determine the need to open cut and replace mains.

1. Meeting network capacity (i.e. 1 in 20 demand). Pipe insertion can mean that the capacity of the network is reduced leading to reinforcement works.
2. To maintain a holistic approach to average system pressure and associated leakage which is also related to the reduction in pipe diameter associated with insertion techniques; and
3. Unforeseen constraints and construction issues encountered on site.

Figure 11 and Figure 12 show the proportions of insertion vs. open cut for both Tier 1 and the full Repex Mains programme from the start RIIO-GD2 and the trend into RIIO-GD3.

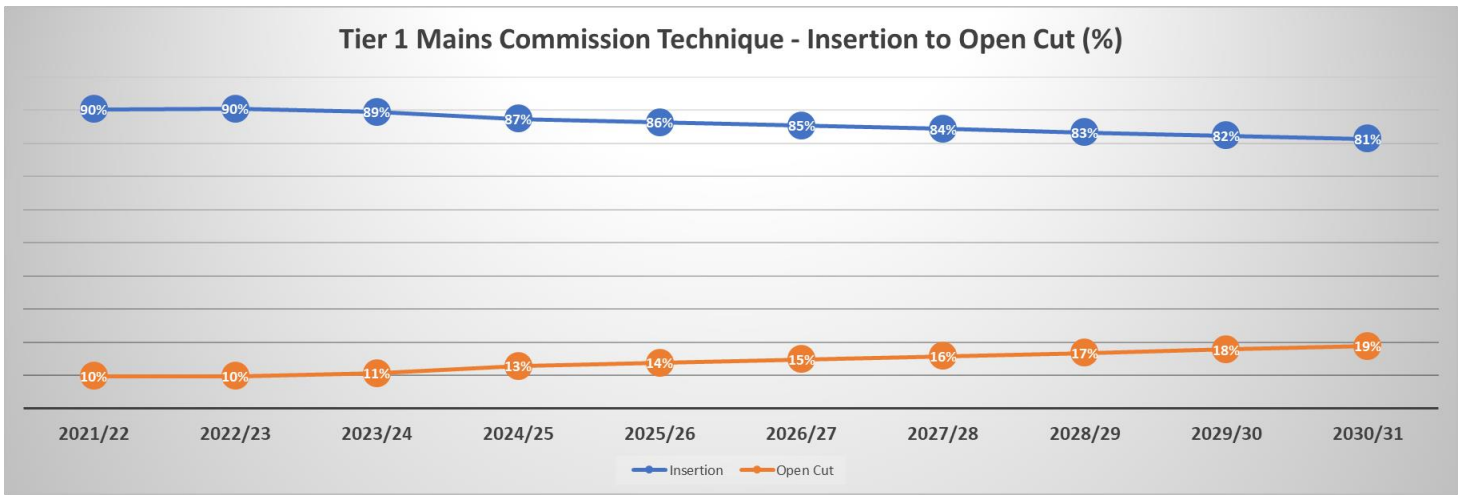

Figure 11 Tier 1 Mains Remaining proportions of insertion vs. open-cut (change over RIIO-GD3 from the start of RIIO-GD2)

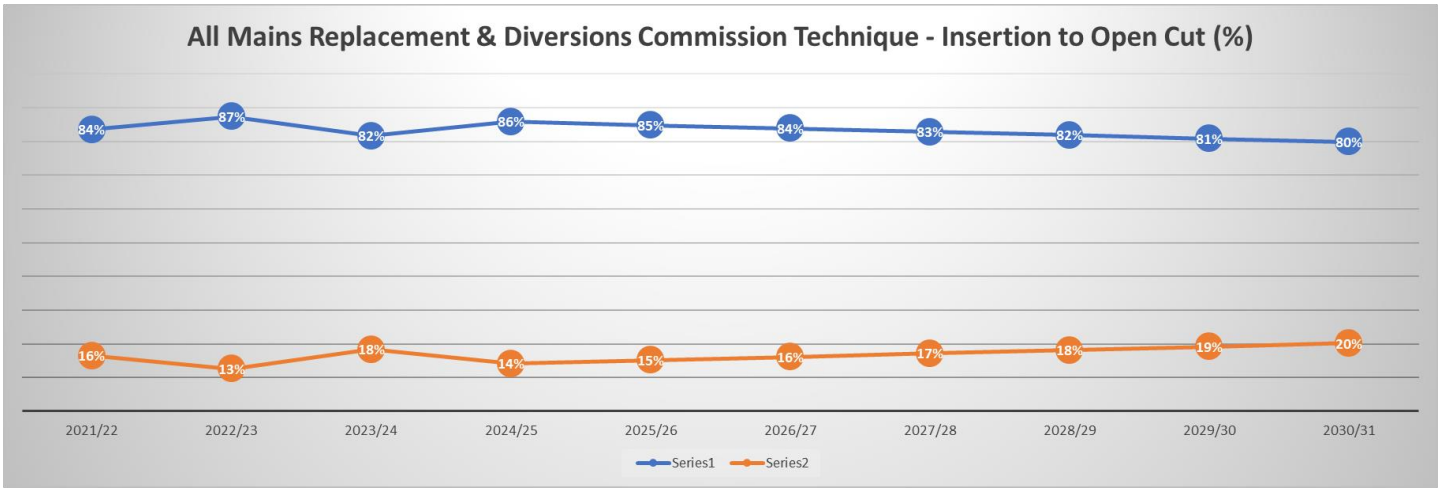

Figure 12 All Mains & Diversions Remaining proportions of insertion vs. open-cut (change over RIIO-GD3 from the start of RIIO-GD2)

4.3.2. Engineering Complexity

Table 10 summarises examples of factors contributing to engineering complexity. Further detail on each of these factors is set out in the following section.

Physical engineering complexity

Back garden mains and limited access
Gas main located in private land with other services at the rear of the property, restricted access, and associated costs with removal of fences. There are also occasions where the location and depth of the gas main prevents the use of standard construction techniques.

Fragmented works
Stranded metallic mandated pipes, typically of shorter length, resulting in a greater amount of remobilisation and demobilisation on shorter projects impacting overall efficiency.

Part complete works
These are works which are left part complete due to Local Authority request to leave site prior to completion.

Narrow/limited access
Narrow backstreets/roads/tracks. Difficult to operate traditional machinery and often leads to significant manual element to project completion.

Long-sided services
Where one gas main feeds both sides of a street. Typically, there is one gas main either side of a street feeding properties.

Terraced properties
A high concentration of services which restricts the ability to replace the main via the insertion construction method.

Arterial routes
Gas mains located within this road type present various complexities including larger volumes of traffic, council restrictions, increased reinstatement costs.

Flats
This property type requires above-ground pipework for service renewal and additional ancillary works.

Diameter mix	
	The mix of diameter being commissioned in the Network is increasing on higher diameter bands i.e. increase from 32% to 60% of work in 125mm to 180mm pipe which represents an **84% increase** in work volume in this diameter and attracts increased materials and delivery costs. Higher diameter work is typically more fragmented due to the majority of the Network being 4" Mains. This results in significant mobilisation and demobilisation to deliver the quantity of work required, resulting in inefficiency and increased costs.
Increased ductile iron	
	Ductile Iron volumes in RIIO-3 are increasing by **11%** in RIIO-3 with 36% of Tier 1 works being Ductile Iron. This work is typically more expensive to complete due to more complex and time-consuming techniques required to replace the pipe which leads to increased cost of delivery and reduced productivity across the wider programme of works. The Repex programme and associated guidance historically risk scored Ductile Iron lower than other materials which resulted in a higher volume of non-Ductile Iron pipe being decommissioned until GD2 when the risk coefficient was updated to normalise most materials as far as risk.

Table 10 Summary of examples of Engineering Complexity

Back garden mains and limited access

This refers to projects with Gas Mains running through back gardens of properties and associated services at the rear of properties. This results in projects requiring a longer duration as certain equipment and machinery is unable to be used and often there is a requirement to remove fences or other structures bringing extra cost/rectification issues.

Due to potential for built over mains, it is preferable to use open cut construction method and hand digging excavations and using wheelbarrows to remove spoil due to the issues around equipment access. Some projects will also require open cutting at the front of the property and either mole services to the back of the property or run internal pipework from the front to boiler position. This means that projects often require extra time and adds additional risk and cost.

Figure 13 Example of Project with Back Garden Mains – Project R1/017194 Poole Crescent Leeds – Central Area

Fragmented works

Stranded metallic mandated pipes which require replacement result in lower productivity due to their short lengths, as these require mobilisation and demobilisation costs equivalent to those with longer lengths. The time to complete the schemes is also often the same for similar works of 2-3 times the length with increased concentration of connections – all of which increases key cost drivers and reduces productivity.

Figure 14 Example of fragmented work – Project R1/001043 Hull, St Hilda Street

Part Complete works

This refers to works which have been part complete and require remobilisation to complete. Factors which can lead to these projects are:

- Local Authority request to leave site prior to completion.
- Works overrunning due to changes on site and the Local Authority not granting an extension at that time leading to demobilisation from site. Prior to leaving the site, any associated reinstatement of works are completed, but will then require re-excavation upon returning to complete works.
- The original project cost and associated delivery length are not achieved, and unit rate impacts are experienced.
- Remobilisation to site is then required later to complete remaining works, often minimal in length and scope.

Narrow Access works

This refers to projects which have working area restrictions due to narrow passage between buildings. This work is typically low productivity, requiring hand digging of excavations due to the inability to mobilise equipment. There are often occasions where work is not constructible due to gas main location and depth.

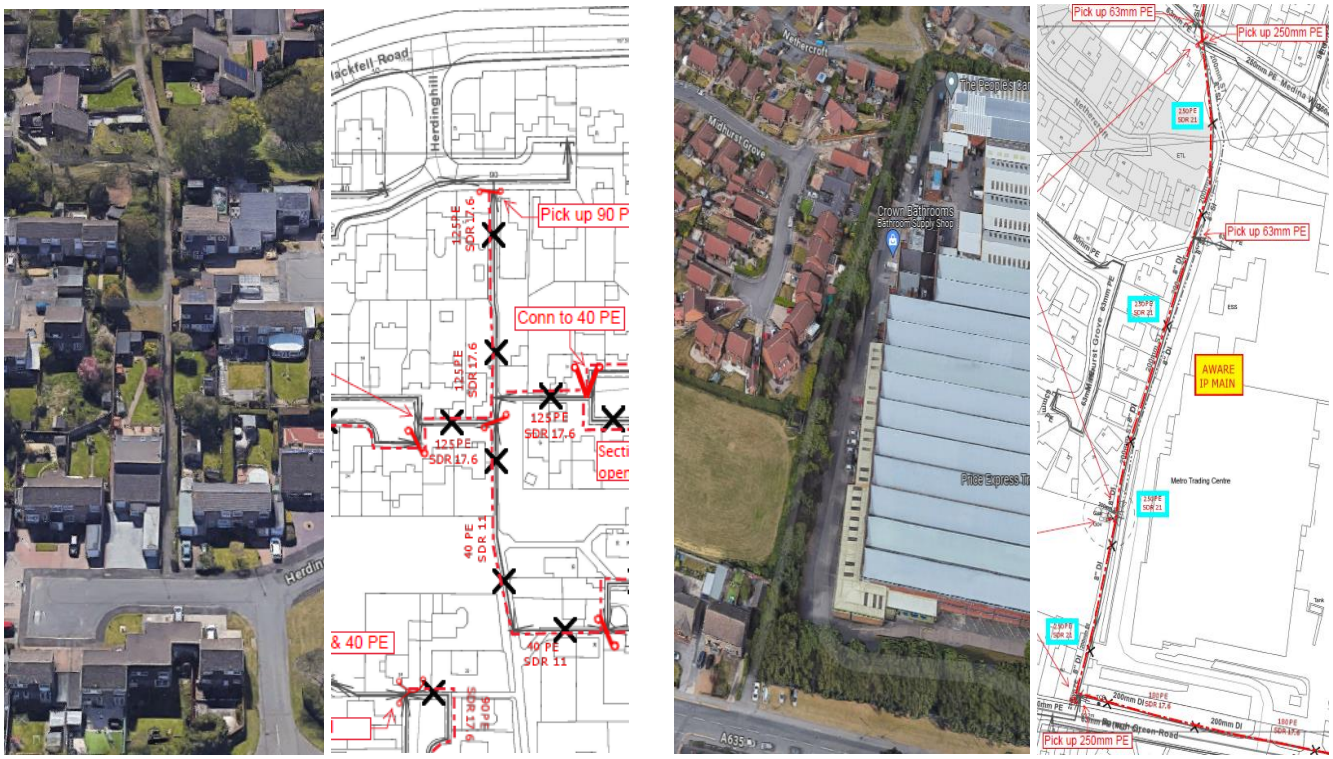

Figure 15 Examples of Narrow Access works – Project R1/700165 Westernmoor Washington – Tees Area and Project R1/700905 Barugh Green Road Thurnscoe – Central Area

Arterial Routes

This refers to routes with a larger volume of traffic and associated traffic management requirements, depending on road type and location. This can increase costs as:

- This often results in restrictions being put in place by local council on pull lengths, which reduces productivity.
- This can require traffic management with a full time operative to control lights, and the request of a 'spotter' is also becoming more prevalent by local authorities.
- There may be Variable Message Signs (VMS) required on major routes giving advanced notice on works as opposed to handwritten signage which has previously been used, creating additional cost compared to typical signs used on majority of works.
- There are reinstatement cost differences which are dependent on road type i.e. Type 1/2 road typically HRA/SMA vs Type 3/4 road being DBM - backfill and specialist reinstatement costs significantly higher and more difficult/time consuming to excavate.
- Councils may request for restricted working hours, night works and weekend working which are not typically part of the Repex works programme and will bring with it contractual changes and additional costs from delivery partners.

Flats (MOBs)

These works potentially require above ground pipework if renewing services and the need for Gas Engineers to complete works in advance (DLO / P&R contractor) – this can cause issues if not planned efficiently or works not completed prior to DSP arriving to complete project(s).

Works are typically time consuming for replacement teams as it is less productive and requires additional equipment. Ancillary works are typical within customers property to maintain customer experience (flooring, kitchen cupboards, boxing pipe etc) which drives a higher unit rate.

Dual service properties (i.e. Maisonettes) are not easily identified on plans and changes on site will be required around engineering and scope to deliver project(s) leading to delays and reduced productivity/increased delivery cost.

Figure 16 Example of Flat (MOBs) works – St Matthias Grove Leeds – Central Area

Long Sided Services & Terrace House works

Typically, these services are found on projects where there is only one gas main feeding properties on either side of the road. Most projects have a main either side of the road, so these projects are more complex and less efficient.

Where there is only one main feeding properties on both sides, this results in highly service-dense works. That is, it results in more services per metre which negatively impacts productivity and cost. Customer issues (e.g. around parking) are also more prevalent with road closures, impeding works and often creating additional requirements for traffic management. As such there are higher delivery costs resulting from the reduced productivity and increased excavations/connections on site.

Figure 17 Example of Long Sided Services and Terrace House works – Project R1/017199 Cardigan Lane Leeds – Central Area

Diameter Mix

The diameter mix that we are faced with replacing in RIIO-GD3 contributes £16.3m to the cost increase. The mix of diameter being commissioned in the Network is increasing on higher diameter bands i.e. increase from 32% to 60% of work in 125mm to 180mm pipe which represent an 84% increase in work volume in this diameter and attracts increased materials and delivery costs.

Higher diameter work is typically more fragmented due to the majority of the Network being 4" Mains. This results in significant mobilisation and demobilisation to deliver the quantity of work required, resulting in more fixed overheads being applied to smaller length projects and therefore increased costs. Table 11 demonstrates how in RIIO-GD3 we are carrying out significantly higher diameter works than in the RIIO-GD1 and RIIO-GD2 periods.

Tier 1	Commissioned (Km)			Commissioned (%)		
	RIIO-GD1 Total	RIIO-GD2 Total	RIIO-GD3 Total	RIIO-GD1 Total	RIIO-GD2 Total	RIIO-GD3 Total
less than or equal to 75mm	1,200	630	297	31%	27%	12%
greater than 75mm to 125mm	2,197	1,186	1,114	57%	50%	46%
greater than 125mm to 180mm	409	502	925	11%	21%	38%
greater than 180mm to 250mm	33	40	75	1%	2%	3%
greater than 250mm to 355mm	3	0	0	0%	0%	0%
greater than 355mm to 500mm	0	0	0	0%	0%	0%
greater than 500mm to 630mm	0	0	0	0%	0%	0%
greater than 630mm	0	0	0	0%	0%	0%
Total	**3,843**	**2,358**	**2,410**	**100%**	**100%**	**100%**

Table 11 Diameter mix of commissioned work between RIIO-GD1 and RIIO-GD3

Increase in replacement of more challenging materials (Ductile Iron)

Ductile Iron volumes in RIIO-GD3 are increasing by 11% in RIIO-GD3 with 36% of Tier 1 works being Ductile Iron (DI). A key reason for this is due to the Repex programme and associated guidance historically risk scoring DI lower than other materials. This resulted in a higher volume of non-DI pipe being decommissioned up until RIIO-GD2, when the risk coefficient was updated to normalise most materials as far as risk. As a result, we are now required to decommission proportionally more DI pipes, and they are becoming a larger portion of NGN's replacement workload. The proportion of DI workload will increase from 33% to 36% between RIIO-GD2 and RIIO-GD3.

DI pipes are more challenging to replace as they require specialised cutting tools. This work is typically more expensive to complete due to more complex and time-consuming techniques required to replace the pipe which leads to increased cost of delivery and reduced productivity across the wider programme of works. DI work is therefore more difficult and more costly compared to cast iron work due to increased project duration.

Tier 1 - Material Type	Decommissioned (km)			Decommissioned (%)		
	RIIO-GD1 Total	RIIO-GD2 Total	RIIO-GD3 Total	RIIO-GD1 Total	RIIO-GD2 Total	RIIO-GD3 Total
Cast Iron & Spun Iron	2,871	1,405	1,319	73%	59%	55%
Ductile Iron	722	781	868	18%	33%	36%
Steel	326	202	224	8%	8%	9%
Total	**3,919**	**2,389**	**2,410**	**100%**	**100%**	**100%**

Table 12 Decommissioned works by material type – Summary

		Decommissioned Main (%)										RIIO-GD2	RIIO-GD3
		2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31		
Tier 1 and < 2"steel	Cast Iron and Spun Iron	64%	59%	61%	55%	54%	55%	55%	55%	55%	55%	59%	55%
Tier 1 and < 2"steel	Ductile Iron	26%	34%	32%	36%	36%	36%	36%	36%	36%	36%	33%	36%
Tier 1 and < 2"steel	Steel	9%	7%	7%	9%	10%	9%	9%	9%	9%	9%	8%	9%

Table 13 Remaining work on Tier 1 & 2" Steel Programme

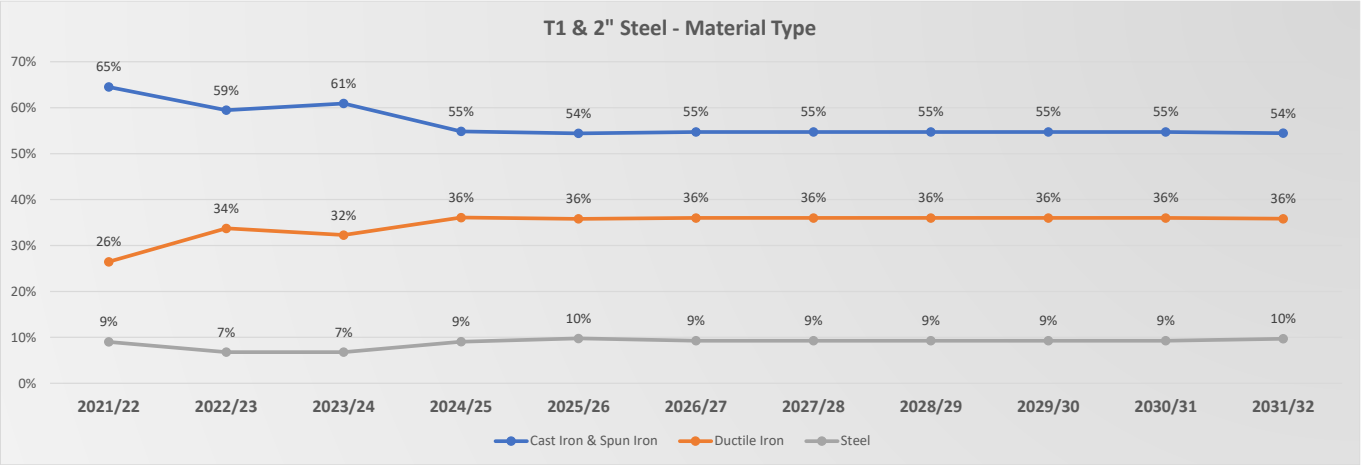

Figure 18 Workload mix Tier 1 and 2" steel

4.3.3. Productivity and resourcing

As set out in Section 6.3.3, NGN have remained at the frontier of Repex efficiency in RIIO-GD2 due to an efficient DSP model and accompanying end-to-end design and delivery process. However, Engineering Complexity, DSP reinstatement support and additional work on risers means that the duration of jobs will increase in RIIO-GD3, and additional resource will be required.

Time on Site and Resource is a key cost driver in delivering projects to time and scope as the Repex programme is finalised. Productivity will also naturally reduce as the Repex programme completes, as length of work remaining in the mandated programme will reduce. Therefore, NGN will not be able to deliver the length to historic unit rates.

More resource is required to deliver these to scope and time, which means that work in the Repex mandated programme will be more complex and less efficient than the Repex works completed to end of RIIO-GD2. This reduction in productivity (i.e. project duration and associated meterage delivery outputs) will result in a requirement to increase resourcing (**DSP Teams**) to complete work.

Engineering complexity and increased open-cut techniques will lead to increased reinstatement across the Network and therefore additional **DSP Reinstatement Support** to maintain reinstatement at the D+3 standard in-line with quality and customer commitments. Additional **Deep Excavation Resource** and associated equipment will also be required because of the increase open cut on remaining works.

Productivity will also be impacted by **Risers** where both volumes and cost will increase due to the volume of buildings with an excess of 10 floors requiring works. There are 28 buildings, which equates to approximately 57 risers, to replace in RIIO-GD3. 75% of those risers are located on buildings with greater than 10 floors. This again adds time and therefore cost to the replacement programme.

Productivity will also decrease as the length of the remaining mandated programme reduces flexibility for local authorities to deny access to areas for works to be carried out. Previously the programme has been flexible in parts to work

collaboratively with local authorities around regional locations they have not wanted works to be completed i.e. city centres, high traffic areas. Mandating work in these areas is expected to result in requests from local authorities to work outside of times to reduce disruption i.e. evenings and weekends. This will bring a level of complexity to the programme not previously experienced and not typical in our contractual terms with delivery partners. The ability for the existing delivery model to deliver works in this scenario will require amendments likely leading to additional delivery premiums, additional resourcing, and ultimately less productive and more costly delivery.

4.3.4. Geographic location of the remaining work

The geographical location of the remainder of the mandated Repex programme will present a range of challenges which will lead to increased costs in RIIO-GD3.

We have several isolated areas of work still to complete, specifically in the extremities of the Network (i.e. Berwick Upon Tweed and Settle) and more city centre work than rural. These remaining works and their location have a direct impact on resource costs, as the locations require teams to travel further and/or potentially stay away as well as requiring increased support in the Network due to the extremities/distance the remaining works cover. The remoteness of some areas also brings with it a lack of suppliers (Tarmac plants, Material/Waste recycling plants and plant/traffic management suppliers) resulting in significant increased travel, time and cost.

Figure 19 shows the geographic location remaining of the programme that has been developed by NGN Insight Team utilising our modern IT infrastructure (PowerBI application) and data capture to identify all remaining T1 and 2INST works by postcode. The map is a live on-line view of the remaining programme which enables visualisation of programme concentration across the Network. This shows that we have several isolated areas of work still to complete, specifically in the extremities of the Network (i.e. Berwick Upon Tweed and Settle) and more city centre work than rural. These remaining works and their location have a direct impact on resource costs as the locations require teams to travel further and/or potentially stay away as well as requiring increased support in the Network due to the extremities/distance the remaining works cover. The remoteness of some areas also brings with it a lack of suppliers (Tarmac plants, Material/Waste recycling plants and plant/traffic management suppliers) resulting in significant increased travel, time and cost.

Other peripheral areas will require open cutting due to the need maintain system pressures because of demand/population i.e. Wakefield, Pontefract, and Doncaster. Figure 19 shows an extract of our modelling of the geographical location of the remaining Tier 1 and <2” steel Repex programme, with red areas having more concentrated volume of work in the remaining Repex programme.

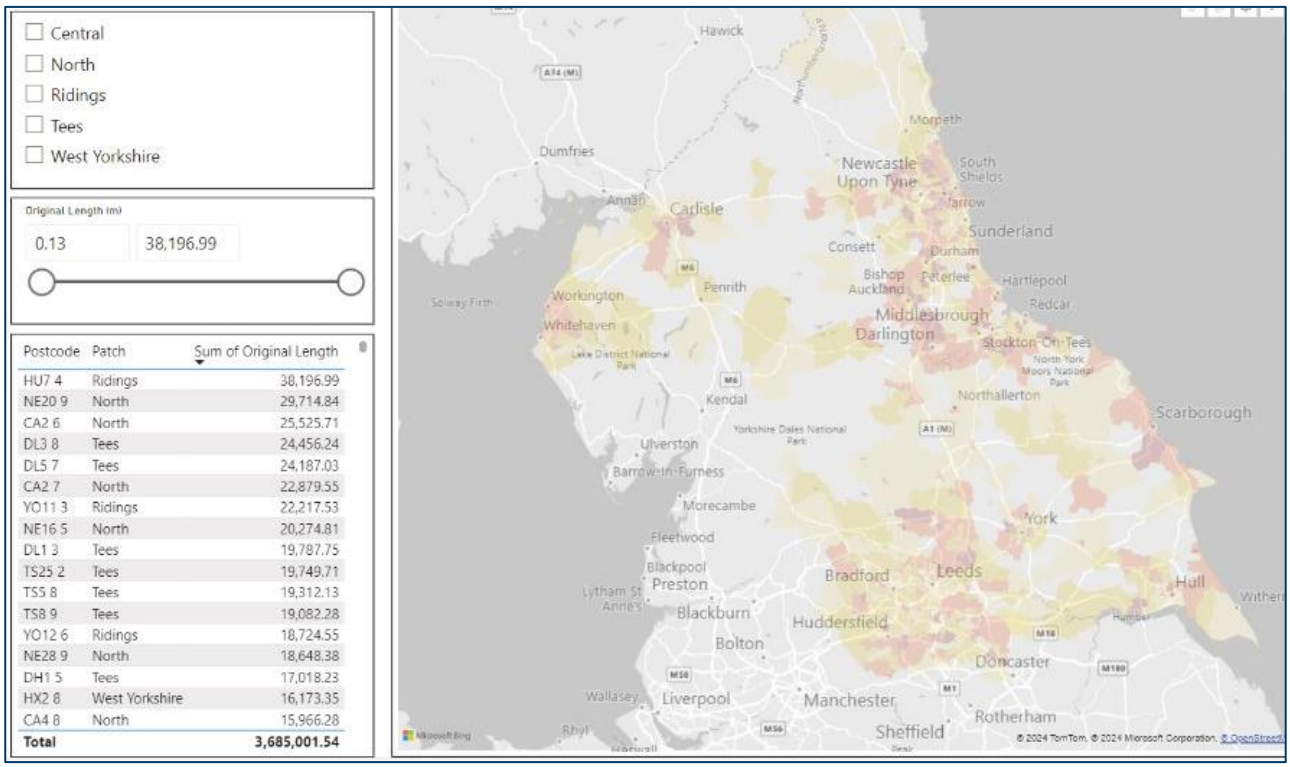

Figure 19 Geographical location of the remaining Tier 1 and <2" steel for NGN RIIO-GD2 and RIIO-GD3 Repex programme

4.3.5. Other direct delivery cost pressures

NGN is facing direct delivery cost pressures that are additional to the inflationary pressures compensated for through RPEs (see further discussion on RPEs in Section 7.1 of this appendix).

We are facing **DSP cost** pressures. Demand for labour is going to increase because, throughout the UK, there is significant infrastructure work still to be done across sectors to meet decarbonisation targets. The National Grid's 2020 report, *Building the Net Zero Energy Workforce*, identified a need in the UK's energy sector to fill 117,000 roles in the Net Zero Energy Workforce between 2020 and 2030.

The DSP model underpins NGNs frontier performance on Repex, and its retention is imperative for continued efficient delivery in RIIO-GD3 to provide best value for customers. NGN has a strong relationship with delivery partners which has been developed over many years and have embedded cost to ensure resilience via a retention programme for DSP partners.

Retention of the DSP model will become more challenging in RIIO-GD3 as the end of the mandated Repex programme nears. This is due to renewed competition across GDNs to source skilled workforce to deliver RIIO-GD3 mandated commitments, as well as competition from other sectors as outlined above. This is evidenced in RIIO-GD2 when GDNs with significantly higher allowances in Repex than NGN were able to attract workforce to their respective network through higher cost/payment. This resulted in NGN's frontier position being a disadvantage and less efficient networks having greater financial capacity with allowances to pay higher rates.

To embed resilience NGN completed a tender process in advance of RIIO-GD3 to retain resource to complete the mandated works in RIIO-GD2 and the majority of RIIO-GD3 programme. NGN have also introduced a retention mechanism for all Repex delivery partners to reduce the risk of other GDNs/utility companies attracting skilled resource from NGN and putting mandated delivery targets at risk.

Traffic management and **street works** are generating an increase in costs as a greater volume of permits and associated traffic management are required for more complex works. In addition, Local authorities are implementing stricter

requirements, such as lane rental charges, and more stringent permit conditions, which add significant costs to pipeline replacement projects. For example, the expansion of the number of areas designated as 'traffic-sensitive' will increase costs related to road closures and temporary traffic management.

Section 58 works[2] will become more prevalent in RIIO-GD3. This prevents statutory undertakers from excavating the road for between three to five years after the road has been resurfaced or reconstructed unless the work is an emergency or needed to provide a new customer service. These works will become more prominent in RIIO-GD3 as delaying works for future periods is not an option.

The type of work will require more **Specialist Operations** support due to the volume of increased Medium Pressure activity as this work is more skilled and requires additional machinery/equipment to complete.

4.4. Our replacement strategy

Our strategy has leveraged the flexibility of the "Three-Tier Approach" to maximise customer benefits. We will continue refining and applying this approach in RIIO-GD3. However, as the programme draws to a close, our ability to flexibly prioritise work will naturally reduce – increasingly we will simply need to complete the remaining workloads. Accordingly, this means our ability to mitigate cost increases by optimising across the work portfolio reduces. The core features of our replacement strategy are set out in Section 6.3.2 of the Business Plan.

The key advancements in this 'Three-Tier Approach' methodology include:

- **Balancing risk and Totex efficiency:** replace high-risk mandatory pipes early while developing cost-efficient projects.
- **Cost-benefit methodology:** use CBA to prioritise mains replacement for optimal investment.
- **Economies of scale:** plan projects to capitalise on economies of scale and mitigate cost pressures.
- **Risk threshold for Tier 2 pipes:** continue to implement the risk threshold for Tier 2 iron pipes approved by the HSE.
- **Targeted replacement for Tier 2 and Tier 3 pipes:** replaces below-threshold pipes that provide overall net benefits after a CBA.
- **Monitoring and maintenance for large-diameter Iron mains:** monitor, maintain and remediate large-diameter iron mains where accepted by the HSE.
- **Balanced workload volumes:** Maintain a workload volume of 30 km p.a. for Tiers 2 and 3 since RIIO-GD1 to keep risk levels acceptable, and gradually replace aging assets with safe PE mains.
- **Risk quantification**: Use the Network Asset Risk Metric (NARM) to demonstrate the removal of network risk and ensure a safe, reliable service for customers.
- **HSE IMRRP Review:** We have developed our business plan consistently with the proposed changes being made by the HSE IMRRP review. Where we have confidence in our costs and certainty over investment need, we have included costs in our baseline Repex allowances, however, to manage uncertainty we have deferred any further material changes to the HSE Reopener so that a further robust challenge on costs and certainty can be undertaken. We have outlined this is section 6.7, table 6.23. We will continue to work with the HSE, Ofgem, GDN's and other relevant stakeholders as this review unfolds.

We will continue with our proven strategy for managing non-mandatory volumes, which entails reviewing options to increase Tier 3 investment and reducing that in >2" steel slightly to target relatively riskier and escape-prone Tier 3 pipes based on network data. To maintain our risk-balanced programme on non-mandatory Repex, we require more funding than in RIIO-GD2 due to the cost pressures affecting all Repex. Despite this, and thanks to our efficient delivery

[2] https://www.legislation.gov.uk/ukpga/1980/66/section/58

model, our entire £198.92m non-mandatory programme has a Net Present Value (NPV) of £165.71m by 2050 and pays back within 10 years, demonstrating value for money.

4.5. Our efficiency and delivery record

As set out in Section 6.3.3 of our Business Plan, NGN has consistently delivered a balanced and proactive Repex programme throughout RIIO-GD1 and RIIO-GD2.

In RIIO-GD1 and RIIO-GD2, we consistently delivered a balanced and proactive Repex programme. We have been successful in striking a balance between maximising the outputs derived from this investment and keeping costs low within each period, whilst ensuring that this is not at the expense of imposing increased costs in future periods. We have ensured that we have not avoided any of the challenging and difficult work and are confident that there has been an appropriate and justified balance across all the key drivers of mains replacement workloads. This has included a balance across, for example, pipe diameter bands, geographies and engineering complexity.

Throughout RIIO-GD1 and RIIO-GD2, we have proactively communicated our approach to the remaining programme and articulated the premiums associated with full completion. NGN offered a front-end-loaded programme in 2010/11 as part of RIIO-GD1 planning in a bid to reduce the cost impact at the end of the programme, but this was not supported at that time. As a result of this, there is a higher economic burden in the remaining stages of the Repex programme. We delivered more Repex up front, at an efficient cost.

We have ensured that higher-risk assets have been addressed first, while also aiming to mitigate against a situation where works on less expensive diameter bands were completed upfront, leaving the costlier ones to a later date. For example, 73% of NGN's work from the start of RIIO-GD1 to year 2 of RIIO-GD2 was on pipes larger than 75 mm, a higher proportion compared to the industry average (excluding NGN) of 53%.

This innovative approach to delivering a large proportion of more expensive projects in earlier periods has allowed us to mitigate a significant element of the inevitable cost increases associated with the completion of the full replacement programme in 2032.

Our approach to labour procurement has also given us an advantage in maintaining continuity and efficiency in deployment. Having work done by local DSPs avoids the cost increases that can occur with frequent changes in service providers. Our DSPs have retention contracts that provide them with an incentive to stay until project completion, and this is a key component of our **A7 Workforce Resilience Strategy Appendix**. For the trace of Repex cost changes between RIIO-GD2 and RIIO-GD3 please see Figure 10.

Maintaining frontier cost efficiency

We have carefully analysed key cost drivers, including labour, materials, and inflationary pressures, to ensure our estimates are realistic and defensible.

Our Repex cost model takes account of predicted workload volumes and unit costs derived from historical data, adjusted for unique project characteristics and external cost drivers such as compliance, contractor and material costs. We incorporate lessons learned and efficiency gains from previous regulatory periods into our future estimates.

NGN's historical efficiency in delivering Repex programs, as well as its consistent ranking at the efficiency frontier, confirms that the standardised estimating templates and cost models used in previous periods were accurate and effective. Detailed historical data provides a solid benchmark for current and future cost assessments. Benchmarking has also been carried out against other GDNs to demonstrate that our unit costs remain competitive and reflect best practices.

When our proposed RIIO-GD3 unit rates were compared with three years of actual cost data from other gas distribution networks (using RIIO-GD2 RRP costs inflated to 2023/24 prices using Ofgem's index) NGN was demonstrably efficient, with our overall weighted average Repex unit rates sitting 2% below the industry average. See Figure 20.

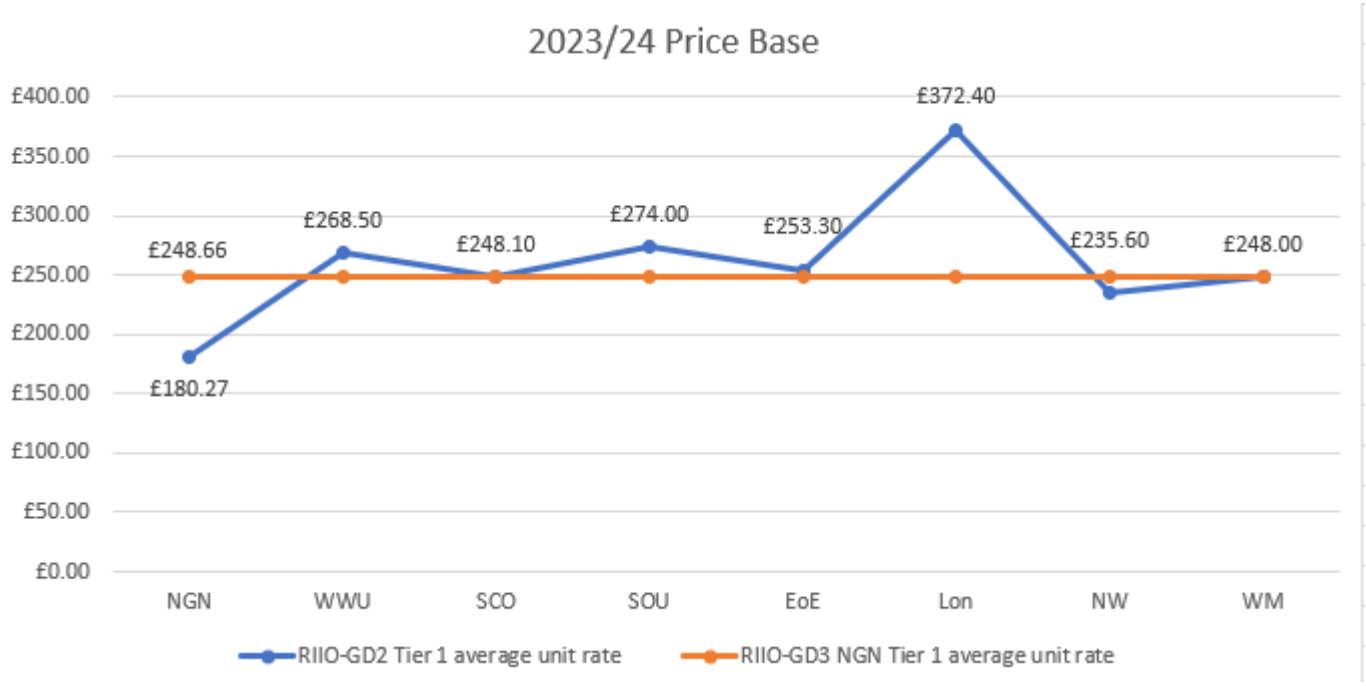

Figure 20 RIIO-GD2 Tier 1 average unit rate comparison to NGN RIIO-GD3 Tier 1 average Tier 1 unit rate

As all GDN's are facing cost challenges in completing the Repex programme therefore our unit rates will be significantly below other GDN forecasts. All investments are tested through our decision-making framework and are subject to CBA. This includes risk management strategies to accommodate unforeseen challenges and maintain budget discipline.

Our track record on delivery

Diameter	Tier 1 Iron Workload Proportions APR 2013 - MAR 2024, actuals from RRP / BPDTs			
	NGN	WWU	SGN	Cadent
≤75mm	28%	52%	47%	44%
>75mm to 125mm	60%	37%	40%	48%
>125mm to 180mm	12%	10%	11%	7%
>180mm to 250mm	1%	1%	1%	0%
>250mm to 355mm	0%	0%	0%	0%
>355mm to 500mm	0%	0%	0%	0%
>500mm to 630mm	0%	0%	0%	0%
>630mm	0%	0%	0%	0%
Total	**100%**	**100%**	**100%**	**100%**

Table 14 Tier 1 workload proportions

Looking at actual tier 1 iron workloads from the start of RIIO-GD1 to year 3 of RIIO-GD2, NGN is a clear outlier in the balance of work taken to date. The smallest diameters are generally easier work to do and have the lowest unit rates. NGN has undertaken 72% of its work on >75mm diameters over the period, compared to an industry average excluding NGN of 54%. Proportionally, other networks have done nearly double the work on the smallest diameter iron (≤75mm) to date.

Diameter	Iron <30m Remaining Populations by Diameter Band, as of RRP 2023/24			
	NGN	WWU	SGN	Cadent
Diameter Band: A	2%	1%	2%	2%
Diameter Band: B	37%	35%	35%	31%
Diameter Band: C	21%	25%	23%	22%
Diameter Band: D	11%	14%	11%	13%
Diameter Band: E	1%	2%	2%	2%
Diameter Band: F	19%	17%	17%	19%
Diameter Band: G	3%	3%	3%	4%
Diameter Band: H	4%	4%	6%	6%
Diameter Band: I	0%	0%	1%	1%
Total	**100%**	**100%**	**100%**	**100%**

Table 15 Iron <30m remaining populations by diameter band

Looking at remaining iron <30m populations as shown in Table 15, NGN has 39% of remaining work in diameter bands A & B (~<4" or ~<100mm). This compares to an industry average excluding NGN of 34%. Up the diameter levels, NGN generally has less work to do than other networks by several percentage points.

For example, NGN has 28% of work left in Diameters E-I (~>8" or ~>200mm) vs. an industry average excluding NGN of 31%. Cumulatively, NGN's more balanced programme to date and efficient Direct Service Provider model will allow us to materially mitigate the cost rises facing the entire industry from macro factors and as we reach the end of the IMRRP.

Tier 1 Material	Tier 1 Material Workload Proportions APR 2013 - MAR 2024, actuals from RRP / BPDTs			
	NGN	WWU	SGN	Cadent*
Cast Iron & Spun Iron	71%	74%	90%	76%
Ductile Iron	21%	15%	5%	21%
Steel ≤2"	8%	11%	5%	3%
Total	**100%**	**100%**	**100%**	**100%**

Table 16 Tier 1 Material workload proportions

Cast and Spun Iron replacement work generally has lower unit rates than ductile and Steel ≤2", all else equal, due to the latter being more difficult to work with (e.g. more open cut).

NGN has done the greatest proportion of ductile and Steel ≤2"from the start of RIIO-GD1 to year 3 of RIIO-GD2, at 29%, compared to an industry average excluding NGN of 20%. This shows that on a material basis, NGN has undertaken the most balanced programme to date, which supplements our diameter balanced programme.

Cadent did not provide a CI / SI to DI split for RIIO-GD1 in the BPDTs and so the figures above are from the years 1-3 of RIIO-GD2 only for them.

4.6. Tier 1 and associated <2" steel and Tier 2a

As set out in Section 6.3.4 of our Business Plan, unit cost for Tier 1 & <2" Steel mains and services will increase by 36% and unit cost for Tier 2a mains and services by 47% relative to RIIO-GD2. By the end of RIIO-GD2, we will have decommissioned all known Tier 2a pipes. However, as pipe risk scores are dynamic, additional Tier 2a pipes will be identified in RIIO-GD3 as pipes exceed the Tier 2a Threshold. The HSE requires that these newly identified pipes be replaced within a reasonable timeframe following their discovery.

With the end of the IMRRP in sight, we will optimise our mandatory programme, considering factors such as delivery efficiency, the impact of pipe failures (e.g. forecasted leaks) and stakeholder impact. For more information on the IMRRP see Section 4.1.1. We also account for the overall feasibility of completing the programme by 2032, including other physical constraints that limit our maximum annual workload in any given area (as described in Section 6.3.1 of the Business Plan).

Taking these factors into account, the unit cost for Tier 1 and <2" steel mains and services will increase by 37% and the unit cost for Tier 2a mains and services by 81% relative to RIIO-GD2. Despite this, and thanks to our industry-leading efficiency starting point, our overall mandatory programme has a NPV of £221.58m at 2050 and pays back within 18 years, demonstrating that it is still value for money for customers. Our CBA is based on average risk removed, and our in-year delivery benefits will be greater due to targeting the riskiest and most escape-prone pipes, and available and efficient bundling of projects where possible from the remaining work.

2023/24 Prices	RIIO-GD2 Average	RIIO-GD3 Spend per Year (£m)					RIIO-GD3 Total	RIIO-GD3 Average
		2026/27	2027/28	2028/29	2029/30	2030/31		
Tier 1 mains and services and < 2"steel cost (£m)	85.92	99.36	107.87	117.55	127.35	136.15	588.27	117.65
Tier 2a mains and services cost (£m)	1.25	2.08	2.16	2.26	2.35	2.44	11.30	2.26
Tier 1 mains and services and < 2"steel workload (km)	477.83	482.00	482.00	482.00	482.00	482.00	2410.00	482.00
Tier 2a mains and services workload (km)	1.64	2.02	2.02	2.02	2.02	2.02	10.10	2.02

Table 17 mandatory mains investment

We have a comprehensive programme of investment to reduce risk on Tier 2a pipes programmed to the end of RIIO-GD2. As pipe risk scores are dynamic, additional Tier 2a pipes will be identified in RIIO-GD3 as pipes exceed the Tier 2a threshold. The HSE policy[2] requires these newly identified pipes be replaced within a defined timeframe following their discovery. It is important to note that these volumes do not account for any changes to the Tier 2a risk threshold associated with the ongoing review by the HSE to the IMRRP policy. Please refer to A22.l NGN RIIO-GD3 Investment Decision Pack -Mandatory Repex.

Option	Desciption	RIIO-GD3 Intervention		Total NPV compared to Baseline at 2070 (£m)						Payback (years)	Total Risk Change from 2026
		Mains (km)	Services (no)	2035	2040	2045	2050	2060	2070		
-	Baseline	-	-	-£705.12	-£1,073.54	-£1,429.36	-£1,775.24	-£2,448.47	-£3,131.33	-	12.8%
1	Preferred	2,422	26,140	-£112.03	-£72.98	£47.64	£221.58	£615.85	£1,028.32	18	-45.3%
2	Accelerate IMRRP	2,878	243,386	-£122.33	-£67.77	£83.00	£296.88	£781.37	£1,291.71	17	-57.7%

Table 18 details the headline business case metrics to allow a high-level comparison of the options. Available options were determined to be:

- Manage the existing mandatory replacement assets by only intervening following failure (i.e. "reactive" / "do nothing")
- Continue with the run rates delivered in RIIO-GD2 and carry out the proposed RIIO-GD3 Mandatory Replacement programme by the deadline set by HSE (described as a 'balanced programme'
- Increase Tier 1, Small Diameter Steel and associated services to accelerate the programme and to complete Tier 1 mandatory replacement before 2032.

Option	Desciption	RIIO-GD3 Intervention		Total NPV compared to Baseline at 2070 (£m)						Payback (years)	Total Risk Change from 2026
		Mains (km)	Services (no)	2035	2040	2045	2050	2060	2070		
-	Baseline	-	-	-£705.12	-£1,073.54	-£1,429.36	-£1,775.24	-£2,448.47	-£3,131.33	-	12.8%
1	Preferred	2,422	26,140	-£112.03	-£72.98	£47.64	£221.58	£615.85	£1,028.32	18	-45.3%
2	Accelerate IMRRP	2,878	243,386	-£122.33	-£67.77	£83.00	£296.88	£781.37	£1,291.71	17	-57.7%

Table 18 Mandatory Repex CBA Summary

The accelerated programme is clearly supported by the Cost and Benefit Analysis as a good long-term investment. It produces a positive Net Present Value (NPV) by 2043, just outside of the 16-year recommendation from Ofgem and has the highest NPV in 2070. That said, our preferred option produces very similar results – positive NPV in 18 years and a comparable NPV by 2070. This had led us to a conclusion that our balanced programme is the preferred option, based on the closely matched outputs within the analysis, however at 17% less upfront cost. Cost has emerged as one of the top concerns for our customers through our stakeholder engagement, thus it had a significant influence on our preferred strategy choice.

4.7. Tier 2b and Tier 3

The details of our planned investment for non-mandatory Tier 2b and Tier 3 mains in RIIO-GD3 are set out in Section 6.3.5 of our Business Plan and A22.m NGN RIIO-GD3 Investment Decision Pack - Non-Mandatory Repex.

Table 19 compares our investment for non-mandatory Tier 2b and Tier 3 mains in RIIO-GD3 against our forecast and actual costs for RIIO-GD2.

2023/24 Prices	RIIO-GD2 Average	RIIO-GD3 Spend per Year (£m)					RIIO-GD3 Total	RIIO-GD3 Average
		2026/27	2027/28	2028/29	2029/30	2030/31		
Tier 2b mains and services cost (£m)	10.03	10.53	11.37	12.32	13.30	14.15	61.67	12.33
Tier 3 mains and services cost (£m)	6.91	9.63	10.15	10.75	11.37	11.90	53.80	10.76
Tier 2b mains and services workload (km)	20.40	21.80	21.80	21.80	21.80	21.80	109.00	21.80
Tier 3 mains and services workload (km)	5.62	5.82	5.82	5.82	5.82	5.82	29.10	5.82

Table 19 Tier 2b and Tier 3 investment

The main drivers of the Tier 2b and Tier 3 workload are safety and reliability, as per the mandatory programme, and some work on these aging assets is still necessary to keep overall network risk and service levels at acceptable levels. Failure of these pipes can lead to significant loss of supply events, gas in buildings and explosions, as well as significant leakage emissions due to their higher diameter and their position as trunk mains on our network. We ensure value for money for our customers through CBA and a proportion of Tier 2b and Tier 3 work will be integrated into Tier 1 projects to enhance overall efficiency.

We've carried out a CBA to ensure we deliver the most effective programme with a payback of three years (2050 NPV £93.58m) and 12 years (2050 NPV £37.85m) for Tier 2b and Tier 3 respectively. Due to our efficient delivery model and accounting for the cost pressures we will face in RIIO-GD3, the high NPV associated with non-mandated Repex means that we could justify even more work than we have in our plan. However, as Figure 21 demonstrates, our balanced programme broadly maintains risk at acceptable levels, with a slight increase for Tier 2b and Tier 3 vs RIIO-GD2 to reverse the upward trend in leaks we are observing on these mains. Our track record demonstrates we can efficiently deliver this alongside our mandated programme.

During RIIO-GD2, we have abandoned an average of 20.40 km of Tier 2b mains and 5.62 km of Tier 3 mains per year. The workload for both tiers has been driven by the forecasted failure rates of these assets and their impact on our customers. For RIIO-GD3:

- We will slightly increase Tier 2b replacement at 21.80 km per year compared with RIIO-GD2 to counter the increasing leak trend observed in Figure 21. The unit cost will increase by 15% on average in RIIO-GD3 due to engineering complexities of the remaining programme.
- We will slightly increase the Tier 3 replacement workload to 5.82 km per year in RIIO-GD3. This is because failure rates for Tier 3 pipes have risen during RIIO-GD2 as well.

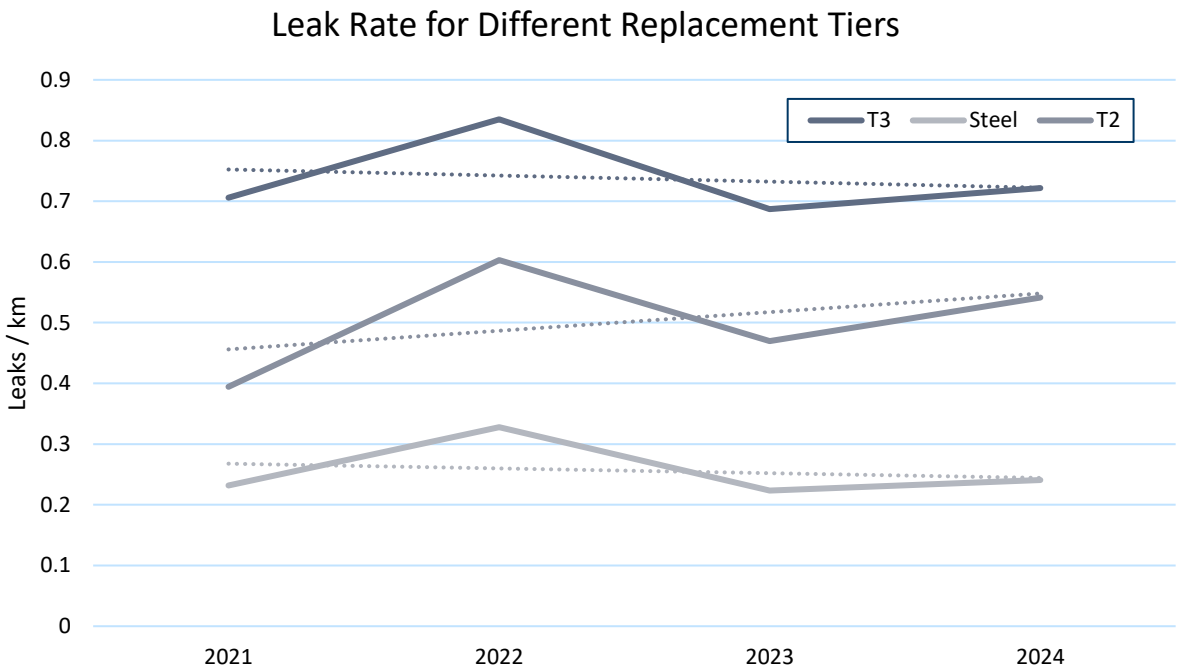

Figure 21 Tier 2b and Tier 3 leakage rates over time

Figure 21 shows leakage rates for Tier 3 and >2" steel over the RIIO-GD2 period to date and that the investment ensures we maintain leakage rates across these non-mandatory pressure tiers. This in turn should reduce the average leaks on the network each year as the length of mains reduces. Please refer to A22.m NGN RIIO-GD3 Investment Decision Pack - Non-Mandatory Repex which includes full options analysis with engineering justification paper (EJP), CBA and NPV.

4.8. >2" steel

The details of our planned investments to replace steel mains greater than 2 inches in diameter in RIIO-GD3 are set out in Section 6.3.6 of our Business Plan.

2023/24 Prices	RIIO-GD2 Average	RIIO-GD3 Spend per Year (£m)					RIIO-GD3 Total	RIIO-GD3 Average
		2026/27	2027/28	2028/29	2029/30	2030/31		
>2" steel mains and services cost (£m)	5.62	7.76	8.24	8.78	9.34	9.83	43.96	8.79
>2" steel mains and services workload (km)	30.17	27.88	27.88	27.88	27.88	27.88	139.40	27.88

Table 20 >2" steel investment

The main driver of replacement is to provide value for money for our customers, which we assess through a CBA.

In 2018, NGN and other gas networks engaged AESL Consulting and Newcastle University to evaluate the performance of steel mains across the UK. This assessment revealed that steel mains are deteriorating at an accelerating rate. This finding was further confirmed by a DNV analysis commissioned by gas distribution networks, which concluded in April 2024.

> *"For steel mains, total Gas in Buildings (GiBs) are predicted to increase by 108% from current levels (10-year average) by 2055...The analysis demonstrates that stopping all proactive replacement is not a viable option as the level of GiBs in distribution mains would gradually return to and surpass the level seen at the start of the IMRRP."*

We've carried out CBA to ensure we deliver the most effective programme with a payback of eight years (2050 NPV £42.31m) for >2" steel. Due to our efficient delivery model and accounting for the cost pressures we will face in RIIO-

GD3, the high NPV associated with non-mandated Repex means that we could justify even more work. However, as Figure 21 demonstrates, our current balanced programme broadly maintains risk at acceptable levels. Our track record shows we can efficiently deliver this alongside our mandated programme.

In response, and based on our CBA, we will maintain the abandonment of steel mains greater than 2 inches. We will decommission an average of 30.17 km/yr of >2" steel mains in RIIO-GD2, and we will decommission 27.88 km/yr in RIIO-GD3. This will lead to a decrease in >2" steel replacement in RIIO-GD3 of 11.45 km as we are focusing efforts on Tier 2b and Tier 3 where leaks per km are higher and trending upwards. We still need this base level of steel replacement to keep risks at acceptable levels and to gradually replace the remaining aging >2" steel population over time.

4.9. Zero-scoring mains and other mains

The details of our planned investment for Zero-Scoring Mains and other mains in RIIO-GD3 are set out in Section 6.3.7 of our Business Plan.

We will replace a small number of iron mains that have a zero score on the Mains Risk Prioritisation System (MRPS). There will be no associated services workload for these zero-scoring mains. The replacement of these pipes is driven by two main factors:

- **Security of supply issues:** approximately 60% of the replacement work is motivated by concerns over supply security. We have identified several aging, single-leg, medium-pressure mains with security of supply issues. We will replace a proportion of these pipes during RIIO-GD3 based on their risk profile.
- **Efficiency and value for money:** the remaining 40% of the replacement work is driven by efficiency considerations and delivering the best value to our customers. This includes integrating zero-scoring mains into mandatory replacement projects to improve overall efficiency, anticipating that these pipes may score higher in the future. Additionally, some replacements are determined through CBA considering the poor condition of the pipes and their impact on customers.

The "other mains" category includes pipes made from materials such as asbestos and polyethylene (PE). We are required by the HSE to remove any asbestos mains due to health risks associated with this material. PE mains are decommissioned if they present an increased risk of failure or if it is advantageous to include them in a comprehensive replacement scheme.

Table 21 compares our investment in zero-scoring mains and other mains in RIIO-GD3 against our forecast and actual costs for RIIO-GD2. During RIIO-GD2, the workload for replacing these mains, averages 8.31 km per year. This workload will increase slightly to 10.20 km per year in RIIO-GD3.

2023/24 Prices	RIIO-GD2 Average	RIIO-GD3 Spend per Year (£m)					RIIO-GD3 Total	RIIO-GD3 Average
		2026/27	2027/28	2028/29	2029/30	2030/31		
Mains and services cost (£m)	3.60	4.27	4.45	4.65	4.85	5.05	23.27	4.65
Mains and services workload (km)	8.31	10.20	10.20	10.20	10.20	10.20	51.00	10.20

Table 21 Zero-scoring mains investment

We've carried out a CBA to ensure we deliver the most effective programme with a payback of two years (2050 NPV £33.40m) for zero-scoring mains. Due to our efficient delivery model and accounting for the cost pressures we will face in RIIO-GD3, the high NPV associated with non-mandated Repex means that we could justify even more work. However, as Figure 21 demonstrates, our current balanced programme broadly maintains risk at acceptable levels. Our track record shows we can efficiently deliver this alongside our mandated programme. We have not undertaken CBAs for asbestos and PE mains due to their low materiality and as PE for PE replacement has a negligible risk benefit.

The CBA summary below highlights how our preferred programme of works is set to pay back within 10 years and reduce risk by 4.4% from the 2026 position.

Option	Desciption	RIIO-GD3 Intervention Volume		Total NPV compared to Baseline at 2070 (£m)	Objectives		
		Mains (km)	Services (no)		Total Risk Change from 2026	RIIO-3 Total Repex Cost (£m)	Payback (years)
-	Baseline	-	-	-£4,531.71	13.7%	£0.0	-
1	Preferred	395	14,178	£481.54	-4.4%	£198.9	10
2	Do More	426	15,403	£534.04	-6.3%	£216.3	10
3	Do Less	364	12,953	£407.34	-2.6%	£204.7	13
4	Do More T3	395	13,725	£511.66	-4.3%	£214.3	11
5	Defer	0	0	£382.37	13.7%	£16.5	19

Table 22 Non-Mandatory Repex CBA Summary

Please refer to A22.m NGN RIIO-GD3 Investment Decision Pack - Non-Mandatory Repex which includes full options analysis with EJP, CBA and NPV.

4.10. Stubs

The details of our planned investment for replacing legacy stubs in RIIO-GD3 are set out in Section 6.3.8 of our Business Plan.

The increase in costs is driven by changes in direction following the 10-year review of the Replacement programme. Until 2013, all iron mains within 30 meters of properties were mandatorily scheduled for replacement by 2032. In some cases, we left short 'stubs' of smaller diameter iron mains connected to larger pipes, opting to replace these stubs when the larger pipes were replaced later in the programme for economic efficiency.

However, many of these larger parent pipes are no longer automatically replaced, as they now fall under Tier 2 and Tier 3 workloads, which are only replaced based on cost-benefit analysis (CBA). This change has led to the unintended consequence of stranded short stubs. We identified this issue during RIIO-GD1 and revised our policies and procedures to prevent the creation of additional Tier 1 stubs in RIIO-GD1 and RIIO-GD2.

To help mitigate the costs associated with the replacement of stranded short stubs at RIIO-GD2 we have collaborated with Steve Vick International to develop an innovate remote foam bagging system (commercially known as E-SEAL) to mitigate the cost increase of replacing these short stubs. This system allows for the remote and permanent isolation of Tier 1 stubs without needing to remove the parent main, thereby reducing excavation size, minimising disruption, and lowering costs.

Table 22.a compares our investment in stub replacement in RIIO-GD3 with our forecast and actual costs for RIIO-GD2. The annual expenditure for RIIO-GD3 will decrease to £1.64m from £2.26m in RIIO-GD2. We'll replace these stubs at a structured rate to complete the programme by mid RIIO-GD3, balancing cost and risk.

Operationally, we have already resourced to deliver this stubs programme at a relatively constant rate to ensure that it is sustainable and deliverable. Significant acceleration of the programme would leave us constrained in several geographical locations due to the large impact this work has on the local population in terms of road and lane closures. Additional skilled resource would also be required to deliver this work. Conversely, significant deceleration of the programme would reduce efficiencies gained and potentially hamper resourcing as we attempt to find contractors willing to take on a relatively low workload over a longer period.

2023/24 Prices	RIIO-GD2 Average	RIIO-GD3 Spend per Year (£m)					RIIO-GD3 Total	RIIO-GD3 Average
		2026/27	2027/28	2028/29	2029/30	2030/31		
Iron Stubs mains cost (£m)	2.26	1.64	1.64	1.64	0.00	0.00	4.91	0.98
Iron Stubs mains workload (km)	0.22	0.67	0.67	0.67	0.00	0.00	2.01	0.40

Table 22.a Stubs investment

We have found throughout RIIO-GD2 that the actual number of stubs that need action to be replaced or made compliant is not as high as originally estimated. Many stub investigations (trial holes) have resulted in no further action being taken as a stub was not located.

For RIIO-GD2, we used a DNV risk assessment accepted by HSE, allowing us to avoid replacing stubs if they met certain length and diameter criteria. We also worked with Steve Vick International to develop the E-SEAL system, which remotely and permanently isolates Tier 1 stubs without removing the parent main. This innovation reduces excavation size, minimises disruption and lowers costs.

4.11. Diversions

The details of our planned investment for diversions in RIIO-GD3 are set out in Section 6.3.9 of our Business Plan.

Table 23 compares our investment in diversions in RIIO-GD3 against our forecast and actual costs for RIIO-GD2. During RIIO-GD2, we will abandon approximately 12.06 km of mains annually due to diversions. This figure is projected to increase slightly in RIIO-GD3 to 13.29 km per year. Despite this increase in abandoned mains, diversion costs will remain stable at around £3.29m per year. Diversions are typically prompted by third-party requests to relocate our mains or by external factors such as landslips or riverbank erosion. The costs associated with diversions due to land slip are more expensive than those associated with third-party requests. For additional information relating to the climate resilience of our assets. please refer to **Appendix A8 Climate Resilience Strategy**.

2023/24 Prices	RIIO-GD2 Average	RIIO-GD3 Spend per Year (£m)					RIIO-GD3 Total	RIIO-GD3 Average
		2026/27	2027/28	2028/29	2029/30	2030/31		
Diversions mains and services cost (£m)	3.40	1.90	2.36	3.05	3.99	5.16	16.47	3.29
Diversions mains and services workload (km)	12.06	13.29	13.29	13.29	13.29	13.29	66.45	13.29

Table 23 Diversions investment

4.12. Other services

The details of our planned investment for other services in RIIO-GD3 are set out in Section 6.3.10 of our Business Plan.

Table 24 compares our investment in other services in RIIO-GD3 against our forecast and actual costs for RIIO-GD2.

2023/24 Prices	RIIO-GD2 Average	RIIO-GD3 Spend per Year (£m)					RIIO-GD3 Total	RIIO-GD3 Average
		2026/27	2027/28	2028/29	2029/30	2030/31		
Other services cost (£m)	6.87	7.11	7.41	7.79	8.17	8.50	38.98	7.80
Other services workload (number)	5,818	5,649	5,530	5,415	5,304	5,196	27,094	5,419

Table 24 Other services

Other services, whether metallic or non-metallic, are not replaced as part of the mains replacement programme. They are typically replaced following a reported escape, as part of a service alteration, or during other meter-related work.

The re-lay work conducted after an escape is closely tied to our repair activities. The workload will decrease in line with the reduction in escapes due to the mains replacement programme, but costs will increase due to the factors referenced around engineering complexity and labour pressures. Service alterations and other related work will continue at the same rates observed during RIIO-GD2.

Overall, the annual costs will increase from £6.87m average in RIIO-GD2 to £7.80m.

4.13. Risers

The details of our planned investment for risers in RIIO-GD3 are set out in Section 6.3.11 of our Business Plan.

Table 25 compares our investment in other services in RIIO-GD3 against our forecast and actual costs for RIIO-GD2. The workload for managing multi-occupancy buildings (MOBs) is forecast using a bespoke risk model and survey data. Unit costs are estimated based on historical expenditures from RIIO-GD2.

2023/24 Prices	RIIO-GD2 Average	RIIO-GD3 Spend per Year (£m)					RIIO-GD3 Total	RIIO-GD3 Average
		2026/27	2027/28	2028/29	2029/30	2030/31		
Risers services cost (£m)	0.29	1.48	1.48	1.48	1.48	1.48	7.40	1.48
Risers services workload (number)	23	12	11	12	11	11	57	11

Table 25 Risers investment

We will deliver a higher workload in RIIO-GD3, and our costs will increase from £0.29m per year in RIIO-GD2 to £1.48m per year in RIIO-GD3. NGN will look to replace 57 risers across 15 MOBs.

The primary driver for this investment is the need to address asset health, safety, and legislative concerns. We have also made provision within our "use it or lose it" (UIOLI) allowance to proactively investigate the removal of risers from MOBs Refer to table 6.23 and A22.p NGN RIIO-GD3 Investment Decision Pack – Risers, which we provide a summary of below.

A22.p NGN RIIO-GD3 Investment Decision Pack - Risers

Our Risers represent assets which are defined as an above ground arrangement of pipes (horizontal or vertical), which supply more than two supply meter installations in an individual premise or a building containing many premises, also referred to as Multiple Occupancy Buildings (MOBs). A pipe is considered a Riser from the base of the bend, which rises to each of the building floors. Risers within MOBs are subject to increased risk due to their location. During RIIO-GD1 and RIIO-GD2 we have undertaken a programme of works to intervene on those assets in the worst condition and we plan to continue this programme in RIIO-GD3.

The primary drivers for investment in Risers are the need to address asset health alongside safety and legislative concerns. This will enhance the security of our network, in line with Ofgem's guidelines.

The decision on the investment centres around three main drivers:

- Our Riser risk ranking model, which we implemented in 2012 and has been used to prioritise buildings to be surveyed based on the predicted Riser risk score.
- Risers with below-ground entries. If these failed, they would likely require immediate, full isolation of the Riser and significant interruption-time consequences.
- Buildings above 18m in height with external PE Risers. The building regulations were amended in 2018 to prevent combustible materials being externally installed on new buildings. This ensures that the entire population of Risers are considered regardless of their risk profile.

We considered 4 options: Do nothing, Do Minimum, Enhanced or Balanced, as summarised in Table 26.

Option	Description	Workload	Cost (£m)	NPV compared to Baseline (2070) £m	Risk Change over RIIO-GD3	Supply Interruption Change over RIIO-GD3	Change in Expected Failures over RIIO-GD3	Payback	Preferred
1	Baseline (Do Nothing)	0	0.00	-£ 72.91	28.1%	28.0%	28.0%	N/A	N
2	Carry out risk and below entry work (Do Minimum)	35	5.90	-£ 1.98	25.0%	26.6%	24.8%	N/A	N
3	Carry out additional sites 110 risers (Enhanced)	110	9.90	-£ 5.71	22.6%	24.9%	22.5%	N/A	N
4	Preferred (Balanced)	59	7.40	-£ 4.75	24.6%	26.0%	24.7%	N/A	Y

Table 26 Risers - Options Summary for Risk, SI impact and CBA

As shown, our preferred option for Risers involves 59 interventions at a cost of £7.40m.

This approach allows for replacement of PE Risers relating to the prevention of combustible materials being externally installed, including retrospective replacement should the HSE change policy and mandate this in RIIO-GD3. Building safety legislation has evolved rapidly since the Grenfell tragedy and we are concerned that removal of combustible materials may be retrospectively applied. The risk associated to safety legislation should factored into any regulatory decision. Whilst we are still facing an increase in risk and supply interruptions his is due to a mixture of asset health deterioration meaning we would need to intervene on a significant proportion of our asset base in RIIO-GD3 (which would not be viable from a resourcing perspective) and NARMs not considering compliance benefits. We discuss this in more detail within **Appendix A22.P – Risers EJP.**

5 Capital investment summary (Capex)

5.1. Our RIIO-GD3 expenditure

The detail of our planned capital expenditure for RIIO-GD3 are set out in Section 6.4.1 of our Business Plan. Table 27 summarises our RIIO-GD3 Capex investments and compares the average planned expenditure to the 5-year average we have seen in RIIO-GD2 to date.

2023/24 Prices	RIIO-GD2 Average	RIIO-GD3 Spend per Year (£m)					RIIO-GD3 Total	RIIO-GD3 Average	Variance %
		2026/27	2027/28	2028/29	2029/30	2030/31			
Local Transmission Systems (LTS) storage and entry	17.99	40.51	21.96	28.04	25.91	24.73	141.15	28.23	56.88%
Governors	4.69	4.39	4.21	4.39	4.21	4.39	21.59	4.32	-7.91%
Reinforcement	5.54	5.48	5.38	5.38	5.38	5.38	26.98	5.40	-2.64%
Connections	7.39	0.99	0.99	0.99	0.99	0.99	4.93	0.99	-86.65%
Other Capex	26.56	25.45	27.58	26.84	25.22	31.01	136.11	27.22	2.48%
Total Capex	**62.18**	**76.81**	**60.12**	**65.63**	**61.71**	**66.50**	**330.77**	**66.15**	**6.39%**

Table 27 Capex in RIIO-GD3

Note that Capex can fluctuate significantly year to year, depending on the types of assets we invest in and the specific interventions required.

Section 6.4.1 of our Business Plan and Figure 22 illustrates the key cost drivers for Capex in changes between RIIO-GD2 and RIIO-GD3. Our investment strategy is designed to address these drivers effectively, ensuring that we maintain high standards of service while managing costs prudently. We aim to minimise asset stranding risk by prioritising refurbishments and life extensions where feasible. For example, during RIIO-GD2 we have implemented a more robust maintenance and refurbishment strategy to extend asset life and ensure our gas transportation service continues to function safely and reliably whilst representing value for our customers. This strategy will continue throughout RIIO-GD3, however, there are also various compliance and supplier requirements which will require the replacement of mechanical assets across offtake and PRS sites (such as water bath heaters, odorant, pressure control assets and metering systems). These compliance requirements have resulted in an increased average Capex spend in the LTS, Storage and Entry category for example. Our investment approach aligns with our risk-based Network Asset Management strategy.

Overall expenditure will increase from £62.18m on average to £66.15m per annum. This is a 6% increase from RIIO-GD2, with the most significant increase due to mandatory upgrades on LTS storage and entry (Offtakes preheating and civils).

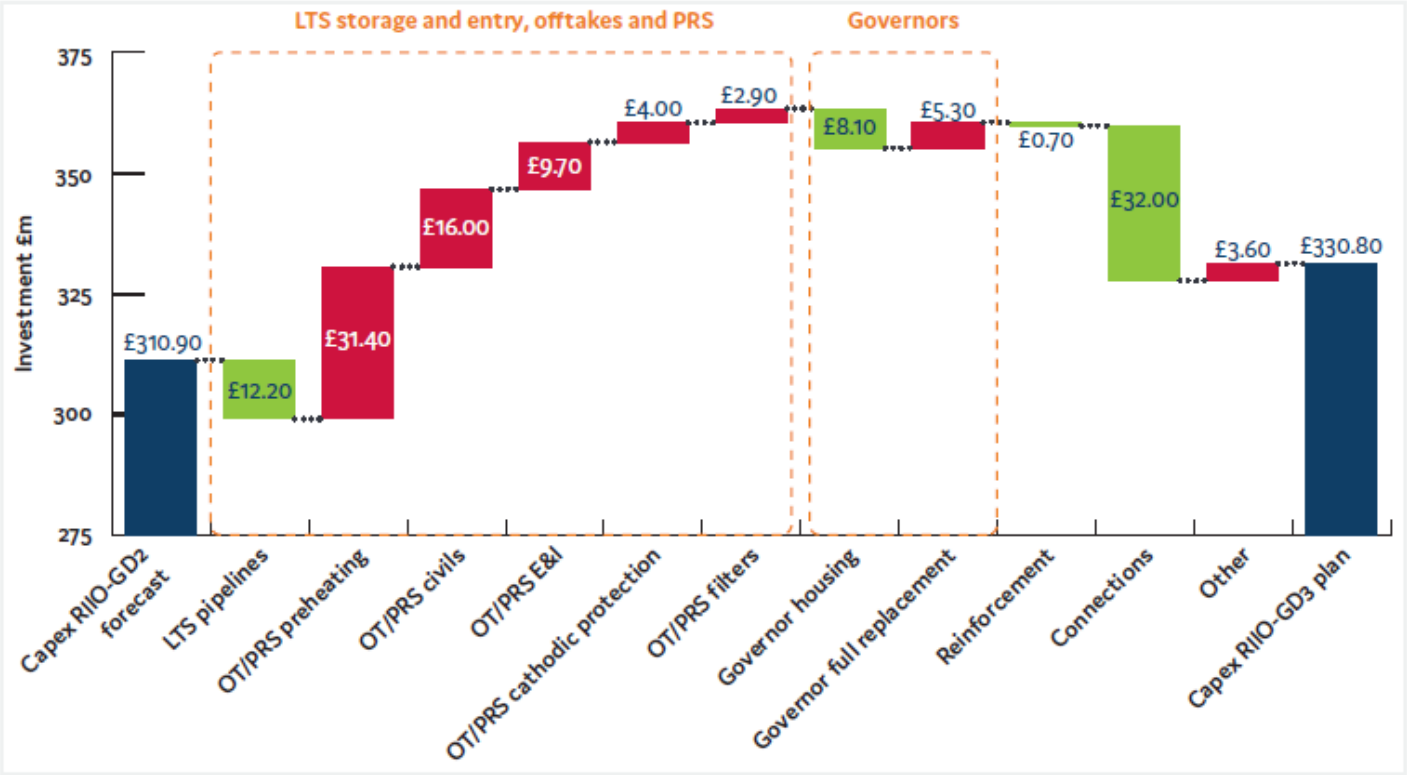

Figure 22 Capex trace from RIIO-GD2 to RIIO-GD3

5.2. Our capital investment strategy

An overview of our capital investment strategy is provided in Section 6.4.2 of our Business Plan.

To ensure that our interventions adequately balance the needs of the business, whilst delivering efficiency for our customers, we developed 5 objectives that each of our Offtake and PRS, LTS and Governor asset classes should meet. Our objectives also align with our customer insights, as discussed earlier in Section 3.3). We utilised a combination of our Decision Support Tool (to provide a NARM based approach) and our colleague's expert insight to develop an investment strategy that balances risk against our need for cost efficiency, whilst also ensuring legislative compliance. The 5 objectives were to:

- maintain total risk for each individual asset class to the same level as the starting position of RIIO-3 (plus or minus 10%)

- minimise spend in RIIO-GD3 over and above RIIO-GD2 levels.
- maintain supply interruptions to the same level as the starting position of RIIO-GD3 (plus or minus 10%)
- ensure our investments pay back within 16 years.
- ensure we are compliant with Health and Safety legislation relevant to each asset class.

We discuss each of these objectives in more detail in Section 5.4.2 and our expected performance against them in Sections 5.4.1, 5.4.2 and 5.5. As well as delivering on these 5 objectives, our Capex investment programme has been designed with a focus on:

- **Network reliability:** Our RIIO-GD3 Business Plan utilises NGN's Value Framework which we use to assess the value of intervention options consistently across asset classes for CBA and business planning purposes, by monitoring changing risk over time. We use Ofgem's NARM methodology as the basis of our Value Framework and are consistent with the Consequence Measures. However, we have recategorized them into five risk groups, not four, so that there is clear distinction between costs and the costs and benefits to NGN and those to society. This is further explained in our Network Asset Management Strategy. Our RIIO-GD3 interventions have been designed to offset this deterioration across the following risk categories: Customer Risk, Health & Safety Risk, Environmental Risk, Compliance Risk and Financial Risk.
- **Cybersecurity and technology:** The investments aimed at safeguarding our network from escalating threats posed by cyber and technology-driven attacks will ensure we can continue to deliver a safe and reliable service.
- **Physical security:** Several of our proposals are designed to maintain or enhance physical security at our sites. For example, by replacing or refurbishing security fencing (as outlined in A22.f NGN RIIO-GD3 Investment Decision Pack Offtakes and PRS Civils EJP) and enhancing security features such as flood lighting and intruder detection systems (discussed further in A22.g NGN RIIO-GD3 Investment Decision Pack Offtakes and PRS E&I EJP) we can prevent unwanted access to our sites.
- **Pressure control and leakage:** we are expanding our investment in pressure control equipment to enhance system pressure and improve leakage performance. This is further explained within A22.o NGN RIIO-GD3 Investment Decision Pack Pressure Management EJP and Section 5.8.

During RIIO-GD1 and RIIO-GD2 our proactive maintenance and refurbishment strategy has proven successful in helping our assets reach the end of their useful life (or beyond). However, a mixture of the upcoming legislative compliance requirements, combined with a number of our assets now reaching end of life means our strategy needs to encompass more replacements than was previously the case. For these reasons our RIIO-GD3 spend has increased across almost all Offtake and PRS asset classes, though this is necessary to ensure the continued safe and reliable functioning of our network. We discuss the specifics within **Investment Decision Packs A22.a to A22.g**.

5.3. Our efficiency and delivery record

An overview of our efficiency and delivery record is provided in Section 6.4.3 of our Business Plan.

We employ best practice asset management in delivering our Capex programme, striving to effectively mitigate asset risk consistent with NARM objectives. We maintain an agile approach to our delivery programme to effectively manage network risk. For further detail please refer to A21 Cost Assessment and Benchmarking Approach.

We also effectively manage our supply chain by optimising procurement processes and have benefited from long-term contracts with suppliers and contractors which allow work to progress with known cost profiles that are more resilient to external shocks. Consistency of costs has also enabled the implementation of new design and delivery frameworks through RIIO-GD2. These have helped us to manage delays to long lead items and a shortage of experienced contractor resource. For further detail please refer to A7 Workforce and Supply Chain Resilience Strategy.

5.4. Local Transmission System (LTS) Storage and Entry, Offtakes and PRS

An overview of our planned investment in LTS, Offtakes and PRS is provided in Section 6.4.4. of our Business Plan.

2023/24 Prices	RIIO-GD2 Average	LTS , Storage & Entry					RIIO-GD3 Total	RIIO-GD3 Average
		RIIO-GD3 Spend per Year (£m)						
		2026/27	2027/28	2028/29	2029/30	2030/31		
New / Reinforcement	0.01	-	-	-	-	-	-	-
PRS	0.39	-	-	1.46	-	-	1.46	0.29
NTS Offtake	0.50	1.46	-	-	-	1.86	3.31	0.66
Total Load	**0.90**	**1.46**	**-**	**1.46**	**-**	**1.86**	**4.77**	**0.95**
Diversions	5.08	8.52	-	0.82	-	0.85	10.20	2.04
Other Pipelines	0.52	1.22	1.33	0.99	1.10	0.99	5.63	1.13
PRS	7.03	17.39	14.85	16.77	19.32	14.66	83.00	16.60
NTS Offtake	4.46	11.92	5.78	8.00	5.48	6.38	37.55	7.51
Total Non-Load	**17.10**	**39.05**	**21.96**	**26.59**	**25.91**	**22.88**	**136.39**	**27.28**
Total - LTS, Storage and Entry	**17.99**	**40.51**	**21.96**	**28.04**	**25.91**	**24.73**	**141.15**	**28.23**

Table 28 LTS storage and entry investment Note: Figures match BPDT CV5.01 may not sum in table due to rounding

5.4.1. Local transmission system (LTS)

Our RIIO-GD3 plan includes several measures designed to improve efficiency and reduce costs, as outlined below.

A22.j NGN RIIO-GD3 Investment Decision Pack - Local Transmission System

The primary focus for LTS is to address the growing risks associated with the aging assets within our LTS infrastructure, which consists of high-pressure steel pipelines constructed between 1960 and 1980 and sub-assets such as Cathodic Protection, valves and PIG traps (above ground installations used to facilitate in-line inspections (OLI1 pipelines only). Equipment consists of launch and receiver pressure vessels, bridle/bypass pipework and isolation valves that can alter the flow of gas to propel the inspection tool through the pipeline). The key issues for LTS include asset health deterioration due to aging pipelines and equipment, high replacement costs associated with LTS pipelines, and the need to maintain compliance with industry legislation and standards.

Our proposed solution has been costed at £5.63m. It reduces risk by 13% from 2026 levels and has a payback of 4 years. It emphasises continued robust inspection, targeted repairs, and continued extensive investment in Cathodic Protection (CP) systems rather than large-scale pipeline replacement. We will continue a rigorous inspection regime to monitor asset health, conduct targeted repairs and upgrades based on inspection outcomes, invest in CP systems where needed to ensure they remain effective and appropriately sited, and maintain and upgrade LTS valves and the chambers they are housed in to ensure accessibility and functionality.

- **Optimised monitoring and mitigation**: by closely monitoring the condition of our LTS pipelines and proactively addressing environmental risks, we avoid the need for costly large-scale replacements.
- **Targeted interventions**: rather than broad asset replacements, we focus on smaller, localised diversions where necessary to minimise disruption and reduce costs.

Option	Desciption	RIIO-GD3 Intervention Volume	Total NPV compared to Baseline at 2070 (£m)						Payback (years)	Total Risk Change from 2026
			2035	2040	2045	2050	2060	2070		
-	Baseline/Reactive		-£50.8	-£72.9	-£93.4	-£112.4	-£146.7	-£177.5		10.4%
1	Limit investment	22	£0.9	£2.2	£3.5	£4.8	£7.2	£9.3	6	2.8%
2	Expand investment	143	-£9.7	-£5.0	£0.3	£6.0	£16.7	£26.4	19	-24.2%
3	Balanced Approach **(preferred)**	91	£3.8	£8.1	£12.3	£16.3	£23.7	£30.4	4	-13.4%

Table 29 LTS - Options Summary for Risk and CBA

A22.n NGN RIIO-GD3 Investment Decision Pack - River Allen

Catton to Cummersdale, an 18" steel pipeline operating at 19 bar, is exposed in the riverbed of a powerful watercourse – River Allen. The river's east bank is visibly eroding, which is putting the pipeline at further risk of being exposed and damaged, as the pipeline is currently only approximately four meters away from the bank's edge. Damage to this pipeline could lead to a catastrophic failure and the prolonged loss of supply to more than 100,000 customers, as well as causing significant environmental damage.

We have identified available options as either Do Nothing, Remediation, Diversion or Overcrossing, as shown below in Table 30.

Option	Total installed cost	Cost estimate accuracy	Project operating lifespan	Project NPV (2035)	Project NPV (2070)
Do nothing	n/a	n/a	n/a	n/a	n/a
Remediation	£300k	20%[i]	1-5 years from 2028	£9.68m	(£51.66m)
Diversion (preferred option)	£7.7m	60%*	50+ years from 2028	£30.19m	£160.33m
Overcrossing	£7.8m-£8.6m[o]	50%	15 years[o] from 2028	(£9.57m) – (£9.97m)	(£191.40m) – (£191.86m)

Table 30 River Allen Options Summary

Our analysis has determined the most efficient and appropriate intervention is to divert the pipeline to mitigate the risk as shown in Figure 23. For the £7.7m investment, NPV is £30.19 by 2035. Figure 23 provides a graphical representation of a pipeline diversion plan.

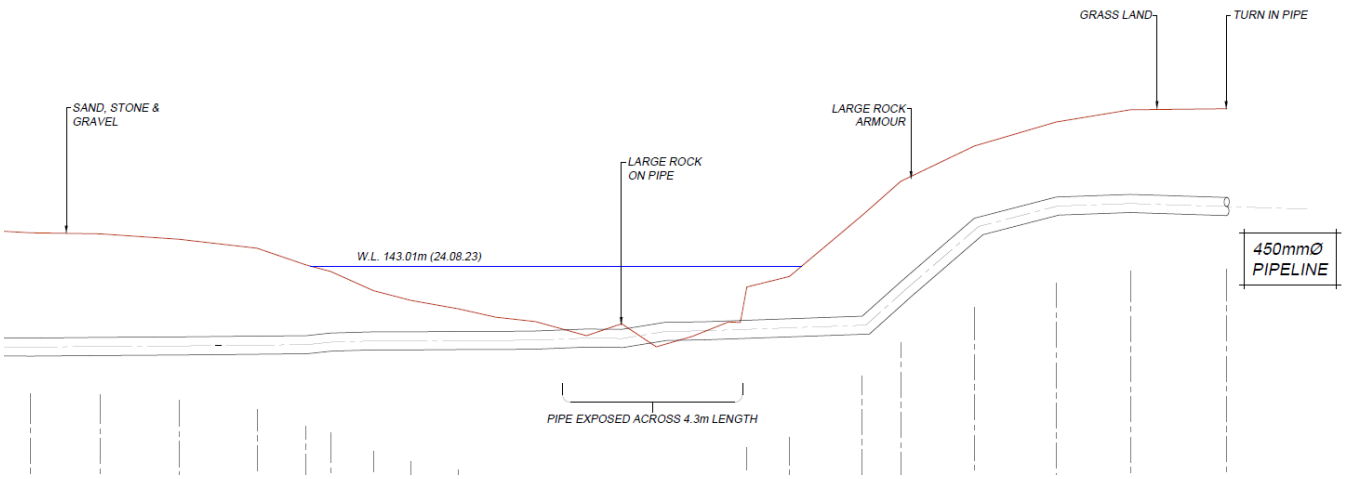

Figure 23 Example of a pipeline diversion plan

5.4.2. Offtakes and pressure reduction stations (PRS)

Our RIIO-GD3 plan incorporates several efficiency measures and innovations to improve outcomes and reduce costs:

- **Optimised Asset Management**: Using the Decision Support Tool (DST) and our NGN Value Framework, we have optimised asset investments to prioritise those offering the greatest value and risk mitigation wherever possible.
- **Targeted Refurbishment**: Rather than introduce a widespread, generic asset replacement programme, we have undertaken various challenge and review sessions across the business to identify specific sites where interventions will be required for compliance purposes. By focusing on site-specific interventions in this way, we have been able to identify efficiency savings to identify where we can maximise our existing assets and refurbish rather than replace with a brand-new asset. However, we have had to move towards replacement where refurbishment is proving to be no longer economical, due to increasing deterioration in the asset health of our assets over RIIO-GD3 – for further details see Investment Decision Packs A22.a to A22.g. We have also looked to reduce site mobilisation and mobilisation to identify where single sites require multiple interventions, thereby benefitting from economies of scale. By planning in this way, we have been able to identify the best cost-benefit ratio, for example with regards to things such as selective preheating and metering upgrades.
- **Innovation in Preheating Technology**: Shifting away from older preheating technologies, such as water bath heaters, and focussing on more efficient systems will deliver long-term cost savings.
- **Risk-Driven Investments**: By focusing on reducing total network risk, we've ensured that the investments, including those for physical security and odorant systems, offer high returns in terms of reliability and safety.

We have built confidence in our RIIO-GD3 plan for Offtake and Pressure Reductions Stations through:

- **Data-Driven Decision making**: We've used tools like the DST and comprehensive risk assessments undertaken by our subject matter experts and project managers who have the in-depth expertise relating to our sites and assets. This has helped us to prioritise projects that deliver the highest value.
- **Stakeholder Feedback**: Our investment strategy aligns with stakeholder feedback on safety and reliability as outlined in **Appendix A2** and summarised in Section 3.3.
- **Historical Performance**: our robust maintenance and refurbishment strategy has been successful in allowing our existing assets to reach (or in some cases exceed) their expected life. This strategy will continue into RIIO-GD3 given the benefits it has delivered to our customers to date by driving cost efficiencies. However, we are mindful of the need to replace rather than refurbish in cases where either it is not economically viable to continue to refurbish (due to asset age or condition), or where compliance with shift follows successful asset replacements in previous periods, enabling us to focus more on extending the lifespan of existing assets.
- **Robust Cost Assessment**: For each asset class, we have conducted thorough cost-benefit analyses, ensuring that our planned investments deliver strong returns, as evidenced by payback periods and reductions in system risk.

We set 5 objectives for our Offtake and PRS assets, as per the below:

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

We know that our customers value safety and reliability as their number one priority and without intervention, we demonstrated that total risk will increase by 19% for Offtakes and PRS overall within the RIIO-GD3 period. In addition, we want to manage increasing risks to provide a safe working environment for our operatives and avoid loss of supply events. We will *aim* to maintain risk throughout RIIO-GD3 to plus or minus 10% from the RIIO-GD3 starting position, however we understand the need to balance this ambition with service and cost constraints. We are on track to meet our NARM target in RIIO-GD2. As the regulatory landscape is likely to broadly remain the same in RIIO-GD3, we have seen no need to take a step change approach to risk and have therefore adopted a risk objective that is consistent with that adopted in RIIO-GD2.

Efficiency Objective: to minimise spend in RIIO-GD3 over and above RIIO-GD2 levels

We know that our customers expect us to invest their money wisely and efficiently to enable a reduction in their bills. To do this we need to make sure we maximise value from our existing assets before we replace them, however, we must understand the whole life cost of the decisions we make to ensure we are doing the right thing both now and in the future. As risk is rising sharply in RIIO-GD3 we will need to intervene on more assets than we have during RIIO-GD2 to meet our objectives around managing total risk. To avoid escalating costs we therefore need to think of pioneering solutions to ensure we are delivering value for money for our customers. Whilst our RIIO-GD3 spend exceeds our RIIO-GD2 spend at a total level, a significant proportion of this is compliance led driving the need for asset replacement (for example to ensure ongoing compliance with Health and Safety legislation such as the Medium Combustion Plant Directive and the Pressure Systems Safety Regulations). Our objective in RIIO-GD2 was to maintain cost. However, the objectives we are setting out are becoming increasingly conflicted with one another as we move into RIIO-GD3. We are continually committed to providing a balanced programme of work and delivering value for customers. We have therefore updated our efficiency objective in RIIO-GD3 to be to minimise cost in RIIO-GD3 over and above RIIO-GD2 levels.

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

The key service measure for our PRS assets is the Total Expected number of Supply Interruptions. Table 1.06 of the 2023/24 Regulatory Reporting Pack (RRP) submission highlights that our current customer satisfaction scores for unplanned interruptions are exceeding the targets set by Ofgem (9.37 target against our actual performance of between 9.543 and 9.650 between 2022 and 2024). Supply interruptions are increasing by 10% for Offtakes and PRS overall within the RIIO-GD3 period without intervention. Our RIIO-GD3 investments aim to target this service measure and reduce it back down to a more acceptable level.

Certainty Objective: to ensure our investments pay back within 16 years

To ensure the investments we make in RIIO-GD3 are right for both our existing and future customers, and to avoid the risk of asset stranding we must ensure that our investments offer a payback before either the asset life or a point in time where future uncertainty could reduce the forecasted benefits, whichever is the smallest time period. The RIIO-GD3 Business Plan Guidance states that a 16-year payback period is appropriate for the GD sector (page 45)[3], meaning that any new, refurbished or replaced equipment that pays back within this time frame will be deemed suitable for investment.

Compliance Objective: to ensure we are compliant with legislation relevant to each asset class

During RIIO-GD3 we are required to undertake a number of interventions for compliance reasons. For preheating assets, we need to ensure compliance with the Medium Combustion Plant Directive (MCPD) and Pressure Systems Safety Regulations (PSSR).

A summary of our strategy for each sub asset class is given below. More detail is provided in detailed in **our Offtake and PRS Investment Decision Packs A22.a to A22.g. Appendix A22.a** is a summary of all Offtake and PRS interventions and has not been summarised here. Instead, we have summarised the individual asset classes below:

A22.b NGN RIIO-GD3 Investment Decision Pack - Offtakes & PRS - Filters

In RIIO-GD3 we are planning to undertake 15 filter system replacements and 2 skid unit replacements. The key driver for these interventions is the Pressure Systems Safety Regulations (PSSR)[4] which is mandated by the Health and Safety

[3] https://www.ofgem.gov.uk/publications/riio-3-business-plan-guidance
[4] https://www.hse.gov.uk/pressure-systems/pssr.htm

Executive (HSE). The aim of these Regulations is to prevent serious injury from the hazard of stored energy as a result of the failure of a pressure system, or one of its component parts.

In devising our preferred strategy, we also considered a 'Do More' option where we would intervene on an additional 3 filters in RIIO-GD3 to account for the fact our filters are older in RIIO-GD3 and therefore may need relatively more interventions than was the case in RIIO-GD2. We also considered we could 'Do Less' and not replace filters straight away upon failure, instead utilising some redundancy that is in place at those sites (accepting this would impact our resilience and increase risk). A summary is shown below in Table 31.

Option	Desciption	RIIO-3 Primary		Total NPV compared to Baseline at 2070 (£m)	Objectives			
		Replace	Refurb		Total Risk Change from 2026	RIIO-3 Total Capex Cost (£m)	Supply Interruption change from 2026	Payback (years)
-	Baseline	0	0	-£ 2,034.2	12.9%	£ -	8.5%	-
1	Preferred	17	0	£ 154.1	5.7%	£ 3.8	-2.9%	6
2	Do More	20	0	£ 187.6	4.2%	£ 4.3	-3.9%	6
3	Do Less	9	0	£ 81.1	9.1%	£ 2.0	5.9%	6

Table 31 Offtakes and PRS Filters - Options Summary for Risk, SI impact and CBA

The preferred option was developed by constraining the RIIO-GD3 workload to be proportional to the workload in RIIO-GD2 applied to the number of PSSR inspections surveys. Our decision support tool has then optimised based on achieving the optimal risk output. This approach assumes that replacement work will follow the year after a PSSR inspection. We have not selected the top risk reduction sites coming out of the optimiser, as we cannot be sure that it is these sites which will definitely come forward for intervention requirements following a PSSR inspection. We have therefore, selected site interventions based on a median level of risk reduction, based on expected workload. Our preferred option does result in a slight risk increase from 2026 but is still within our objective of maintaining risk within a 10% boundary. Despite this slight risk increase, supply interruptions will reduce by 2.9% and our investment should pay back within 6 years, meaning it has been deemed suitable for investment.

Capex relating to filters for the RIIO-GD3 EJP (£3.83m) has increased on projected RIIO-GD2 spend (£0.89m). This increasing expenditure is driven by continuing deterioration of asset health combined with the ongoing need to maintain compliance with PSSR Regulations. Whilst unit volumes are broadly in line with RIIO-GD2, total costs for RIIO-GD3 are higher due to the differences in workload type; for example, we completed 10 single filter replacements in RIIO-GD2, whereas our filter replacements in RIIO-GD3 all relate to systems (which contain either 2 or 3 installed filters per site).

A22.c NGN RIIO-GD3 Investment Decision Pack - Offtakes & PRS - Pressure Control

We are continuing to see increasing deterioration in asset health with some pressure control assets approaching end of life, resulting in a shift from a predominately refurbishment focus in RIIO-GD2 to replacement focus in RIIO-GD3. The preferred option for pressure control assets was developed using a combination of bottom-up approach to system replacement based on condition and optimisation using our DST to maximise investment value. We demonstrate below in Table 32 that a significant proportion of our investment proposal (£6.20m) are to overcome obsolescence concerns with our existing Lineguard cabinets. £4.77m is required for capacity upgrades to preserve the capacity of the network. The remainder of the interventions are mainly asset health driven.

	RIIO-3 EJP Preferred Option		
Intervention	**Workload units**	**Capex (£m) 23/24 prices**	**Driver**
Non volumetric - Full system replacement	5	5.24	Asset Health
Non-volumetric partial system replacement - per system (equal to 4 units)	10	2.02	Asset Health
Regulator overhauls (don't fall under NARM)	15	1.05	Asset Health
Lineguard Cabinets	100	6.20	Obsolescence/ Compliance
Volumetric - Replacement	2	4.00	Asset Health
Capacity Upgrades - Regulator	3	3.17	Capacity
Capacity Upgrades - Inlet/Outlet Pipework	4	1.60	Capcaity
Total	**139**	**23.28**	

Table 32 Pressure control investment key drivers

Our RIIO-GD3 spend £23.28m is broadly in line with our RIIO-GD2 spend of £22.97m in 2023/24 prices.

Table 33 demonstrates that whilst our preferred investment pays back within 15 years and reduces supply interruptions by 3.4%, we are not quite delivering on our risk objective. However, this is primarily due to the rising cost of carbon. We considered a 'Do More' strategy whereby we could introduce a more proactive refurbishment and replacement strategy, undertaking 20% more interventions during RIIO-GD3 and as shown below, for the additional £2.9m investment, only a modest risk reduction is achieved. We therefore considered that our preferred strategy should be maintained as it ensures compliance with the Pressure Systems Safety Regulations (PSSR) and overcomes concerns around increasing obsolescence of the Lineguard cabinets.

Option	Desciption	RIIO-3 Primary Interventions		RIIO-3 Secondary Interventions	Total NPV compared to Baseline at 2070 (£m)	Objectives			
		Replace	Refurb	Pipework Upgrade		Total Risk Change from 2026	RIIO-3 Total Capex Cost (£m)	Supply Interruption change from 2026	Payback (years)
-	Baseline	0	0	0	-£ 3,534.7	20.4%	£ -	0.6%	-
1	Preferred	10	125	4	£ 180.6	14.6%	£ 23.3	-3.4%	15
2	Do More	11	150	5	£ 208.4	13.9%	£ 26.2	-3.6%	14
3	Do Less	9	100	3	£ 144.4	16.4%	£ 20.0	-2.3%	19

Table 33 Offtakes and PRS Pressure Control - Options Summary for Risk, SI impact and CBA

A22.d NGN RIIO-GD3 Investment Decision Pack - Offtakes & PRS - Preheating

Interventions in this area are a mixture of asset health and compliance driven, as it is imperative that our preheating assets remain in good condition to ensure gas continues to flow through our network in a safe and reliable manner. Around half of our water bath heaters require intervention to ensure safe nitrous oxide levels to comply with the Medium Combustion Plant Directive (MCPD). Our preferred strategy is made up of 107 interventions at a cost of £45.82m over RIIO-GD3.

The preferred option was developed using a bottom-up approach to site selection, focussing on:

- compliance with the MCPD,
- replacing NIC preheating with more efficient alternatives (NIC was an innovation trial which aimed to identify alternative technologies and to improve efficiency of older systems),
- assessing the condition of water bath heaters and boilers to maintain asset health, and
- installation of 3 new preheating assets.

We considered the implications of a 'Do More' option, under which we would pro-actively replace rather than refurbish planned boiler houses and water bath heaters, against a 'Do Less' option where we allowed our planned boiler assets to

reach 20 years of age rather than 15 before we replace them, accepting a likely increase in faults resulting from aging assets. A summary of these options is provided below in Table 34.

Option	Desciption	RIIO-3 Primary Interventions			Secondary Intervention	Total NPV compared to Baseline at 2070 (£m)	Objectives			
		Replace	Refurb	New Asset	Adams Retrofit		Total Risk Change from 2026	RIIO-3 Total Capex Cost (£m)	Supply Interruption change from 2026	Payback (years)
-	Baseline	0	0	0	0	-£ 1,126.7	17.4%	0	7.3%	-
1	Preferred	47	32	3	25	£ 274.3	-12.9%	45.8	-24.8%	14
2	Do More	79	0	3	25	£ 360.6	-23.3%	75.3	-38.2%	22
3	Do Less	44	27	3	25	£ 177.8	-1.0%	40.5	-15%	17

Table 34 Offtakes and PRS Preheating - Options Summary for Risk, SI impact and CBA

We recognise that our preferred strategy (£45.82m) is a significant increase on our RIIO-GD2 spend of £14.40m, however we demonstrate within the EJP A22.d that just over half of our spend for RIIO-GD3 is either purely compliance driven, or is compliance driven with resulting asset health benefits. The remaining 48% is asset health driven and given our assets are older now that in RIIO-GD2, we will need to invest more to maintain asset health given the positive correlation between asset age and faults experienced. We demonstrate the drivers in Figure 24.

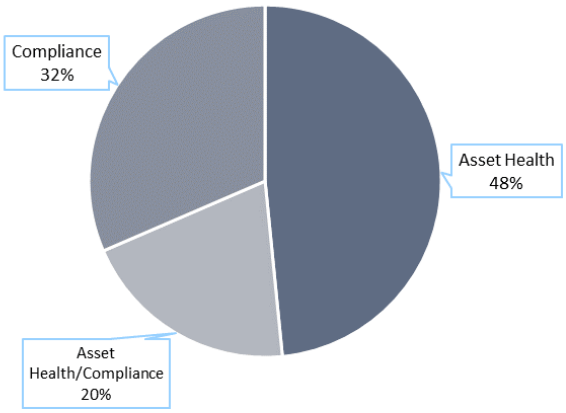

Figure 24 Preheating investment drivers for RIIO-GD3

As shown, our preferred option leads to a 12.9% reduction in modelled Total Risk from 2026 and a 24.8% reduction in supply interruption risk over the period, whilst paying back within 14 years.

A22.e NGN RIIO-GD3 Investment Decision Pack - Offtakes & PRS - Odorant & Metering

During RIIO-GD2 we have been undertaking a programme to upgrade our current meters with ultrasonic meters. Our investment plan for RIIO-GD3 is to continue with this programme of works and complete the final 4-meter replacements. The majority of our planned interventions are to overcome increasing concerns around obsolescence of our existing odorant and metering assets as shown in Table 35 (note that elements of the metering system are expected to have an

asset life of 20 years due to the IT infrastructure used). The compliance led interventions are to ensure our sampling points comply with ISO10715.

	RIIO-3 EJP Preferred Option		
Intervention	**Workload units**	**Capex (£m) 23/24 prices**	**Driver**
Fiscal Meter Upgrade - Meter	4	3.07	Obsolescence
Fiscal Meter Upgrade - E&I	4	1.12	Obsolescence
Fiscal Meter Upgrade - Building Replacement	3	0.68	Obsolescence
Fiscal Meter Upgrade - FWACV	11	1.82	Obsolescence
Odorant Injection System Upgrades (excl. tanks) - Replace	16	5.60	Obsolescence
Calorimeter Upgrades - Sampling Point upgrade	4	0.20	Compliance
Total	**42**	**12.49**	

Table 35 Odorant and metering investment key drivers

Upon completion of the interventions outlined above, we will benefit from improved metering accuracy, as well as ensuring that our strategy aligns with that agreed with gas shippers during RIIO-GD1.

We are planning to invest £12.49m during RIIO-GD3, compared with £10.29m in RIIO-GD2 in 2023/24 prices. Whilst this does constitute an increase of £2.20m, we are confident that the increase is both necessary and justified to overcome the increasing risk of obsolescence of our odorant and metering assets. Given their vital safety role, we do not consider it acceptable to delay or halt entirely the interventions planned in this area. Our RIIO-GD3 strategy pays back within 6 years and will reduce risk by 35.4% and reduce supply interruptions by 46.4% compared with our position at 2026.

Option	Desciption	RIIO-3 Primary Interventions		RIIO-3 Secondary Interventions		Total NPV compared to Baseline at 2070 (£m)	Objectives			
		Replace	Refurb	Calorimeter Upgrade	Building Replace		Total Risk Change from 2026	RIIO-3 Total Capex Cost (£m)	Supply Interruption change from 2026	Payback (years)
-	Baseline	0	0		0	-£ 1,627.7	28.0%	0	24.2%	-
1	Preferred	28	7	4	3	£ 859.8	-35.4%	12.5	-46.4%	6
2	Do More	35	8	5	3	£ 1,577.7	-93.9%	15.3	-95.4%	4
3	Do Less	10	0	4	0	£ 326.2	0.1%	3.7	-22.3%	11

Table 36 Offtakes and PRS Odorant and Metering - Options Summary for Risk, SI impact and CBA

A22.f NGN RIIO-GD3 Investment Decision Pack - Offtakes & PRS - Civils

Our civils infrastructure and buildings protect the various assets installed across our Offtakes and PRSs and therefore are vital to the safe and reliable functioning of our network. Maintaining our civils infrastructure and buildings is important to not only maintain the physical security of our sites, but also to protect our colleagues and the public by maintaining site safety. Our approach is to proactively invest to ensure compliance with legislation such as the Health and Safety at Work etc Act 1974 and avoid compliance related issues such as HSE Improvement Notices being placed upon us.

We have taken an evidence-based approach to develop our Civils intervention programme for RIIO-GD3. During 2024 we have tasked our maintenance team with undertaking surveys to gather evidence on the condition of our buildings and civils infrastructure. We now have a strong evidence base of the actual condition of half of our sites, which has allowed us to make informed decisions about our investment needs for RIIO-GD3. The results of our 2024 survey also align with the results of structural surveys that have been undertaken previously, which provides additional support for the validity of results.

We considered various options, including undertaking a more proactive approach to undertake around 100 more interventions under our 'Do More' option, or to 'Do Less' by pulling back and only intervene on sites we had surveyed with clear evidence of where intervention is required based on information available today. Accepting the risk that we

will not have the resource available to intervene on other issues that are likely to come to light during the RIIO-GD3 price control. The CBA results are provided in Table 37.

Option	Desciption	RIIO-GD3 Secondary Interventions					Total NPV compared to Baseline at 2070 (£m)	Objectives			
		Building Replace	Fence Replace	Building Refurb	Fence Refurb	General Civils		Total Risk Change from 2026	RIIO-GD3 Total Capex Cost (£m)	Supply Interruption change from 2026	Payback (years)
-	Baseline	0	0	0	0	0	-£ 2,486.8	20.0%	0	9.4%	-
1	Preferred	31	25	48	21	146	-£ 0.9	18.8%	£28.4	7.2%	46
2	Do More	40	72	64	32	174	£ 50.0	15.9%	£39.8	-4.2%	29
3	Do Less	20	36	32	16	114	-£ 4.4	19.5%	£21.9	8.7%	N/A

Table 37 Offtakes and PRS Civils - Options Summary for Risk, SI impact and CBA

Our preferred option for RIIO-GD3 increases risk by 18.8% compared to start of RIIO-GD3 levels but delivers a slight mitigation of 1.2% from the baseline scenario. The modest reduction in risk compared to the investment is to be expected due to the way that risk is modelled through NARMs for this asset class as civils interventions are a modifier to the probability of failure of the mechanical asset they are associated with. This is by virtue of the civils asset providing protection or security to the mechanical asset. The risk reduction is not measuring the risk reduction of the civils asset but on the associated mechanical asset. The risk and CBA analysis does not therefore take into account risks such as health and safety risks to personnel and equipment from for example collapsing civils infrastructure.

Costs for Civils for the RIIO-GD3 EJP are significantly increased (£28.37m) on the projected spend in RIIO-GD2 (£3.98m) on a comparable 23/24 price basis. The RIIO-GD2 programme of investment focussed on a refurbishment focussed approach to extend the life of our assets. In RIIO-GD3 we are continuing a refurbishment approach to extend life where appropriate, but there has been a significant transition to replacement of assets which have reached end of life following challenge and engagement sessions with our subject matter experts and an extensive surveying exercise. The significant step change in civils and building investment programme is required to proactively manage safe working conditions on Offtake and PRS sites and we are confident that our programme of works has been devised in a way which will deliver value for customers.

A22.g NGN RIIO-GD3 Investment Decision Pack - Offtakes & PRS - Electrical & Instrumentation

Interventions across our Electrical and Instrumentation (E&I) assets are vital from a safety point of view and we have introduced a comprehensive investment plan to ensure that we have the appropriate infrastructure in place to support our investments, ensuring we can utilise the full range of capabilities that are available from those assets. Our RIIO-GD3 plans cover 104 E&I and Telemetry interventions including a range of full and partial E&I upgrades, lighting column replacements, investments in generators and telemetry upgrades. These interventions have been carefully selected to:

- overcome concerns about age and condition (asset health) or obsolescence of the existing equipment,
- address health and safety concerns with existing lighting,
- provide additional resilience against future storm damage or
- enhance or improve existing functionality to support mechanical assets and/or physical security (through things such as flood lighting or intruder detection systems, for example).

We are planning to invest £16.98m in RIIO-GD3 compared to £9.43 in RIIO-GD2 in a comparable 2023/24 price basis. However, our RIIO-GD2 interventions were primarily asset health driven, rather than to enhance resilience and overcome obsolescence or health and safety concerns as outlined above.

We considered the impact of undertaking a more proactive approach to ‘Do More’ and undertake 20% more interventions during RIIO-GD3, or to scale back E&I interventions to accommodate work in other areas and reduce E&I works by 20% to ‘Do Less’. A summary is provided in Table 38.

Option	Desciption	RIIO-3 Secondary Interventions					Total NPV compared to Baseline at 2070 (£m)	Objectives			
		Full System E&I Upgrade	Partial E&I Upgrade	Lighting Columns	Telemtry Upgrade	Generator Replacement		Total Risk Change from 2026	RIIO-3 Total Capex Cost (£m)	Supply Interruption change from 2026	Payback (years)
-	Baseline	0	0	0	0	0	-£ 1,477	18.3%	0	11.1%	-
1	Preferred	41	11	12	15	25	£ 163	0.1%	£17.0	-43.8%	12
2	Do More	49	13	14	18	30	£ 170	-0.7%	£20.3	-44.0%	14
3	Do Less	33	9	10	12	20	£ 156	0.9%	£13.7	-43.2%	10

Table 38 Offtakes and PRS E&I - Options Summary for Risk, SI impact and CBA

Our preferred option meets our objectives as it delivers on our objective to maintain total risk, delivers a 43.8% reduction in supply interruptions, and pays back within 12 years.

5.5. Governors

An overview of our planned investment for governors is provided in Section 6.4.5 of our Business Plan and summarised in Table 39. Over 93% of this expenditure will be focused on District Governors, which are critical for reducing pressure and balancing supply across the network. These assets reduce pressures to supply the medium or low-pressure networks. They balance pressures to ensure enough capacity to meet a 1:20 demand, whilst keeping pressures as low as possible to reduce leakage. District Governors can supply anywhere between tens of customers to tens of thousands of customers. They represent a significant loss of supply risk within our network should they fail.

2023/24 Prices	RIIO-GD2 Average	Governors					RIIO-GD3 Total	RIIO-GD3 Average	Variance %
		RIIO-GD3 Spend per Year (£m)							
		2026/27	2027/28	2028/29	2029/30	2030/31			
Total - District Governors	4.45	4.12	3.94	4.12	3.94	4.12	20.23	4.05	-9.14%
Total - District Governor (Units)	159	104	103	104	103	104	518	104	-34.84%
Total - Service Governors	0.24	0.27	0.27	0.27	0.27	0.27	1.36	0.27	15.13%
Total - Service Governors (Units)	74	85	85	85	85	85	425	85	15.49%
Total - Governors	4.69	4.39	4.21	4.39	4.21	4.39	21.59	4.32	-7.91%
Total - Governors (Units)	233	189	188	189	188	189	943	189	-18.92%

Table 39 RIIO-GD3 Investment - Governors

A22.h NGN RIIO-GD3 Investment Decision Pack - Governors

Interventions in this area are asset health and compliance driven, as it is imperative that our governor assets remain in good condition to ensure gas continues to flow through our network in a safe and reliable manner. We have used a combination of our Value Framework and our asset data and expertise to determine the appropriate interventions during RIIO-GD3. The following efficiency improvements and cost reductions are built into our plan:

- **Targeted refurbishments:** focus on specific governor sites that pose the highest risk, reducing the overall cost by prioritising critical upgrades and refurbishments.
- **Regulatory compliance:** the upgrade program is designed to meet HSE recommendations in a cost-effective way, prioritising safety while controlling costs.
- **Risk management:** by targeting the sites most at risk of failure, we can prevent costly future disruptions and minimise the risks of supply loss, ensuring network resilience at a lower cost over time.

We built confidence in our plan through:

- **Data-Driven Risk Assessments:** we've used comprehensive asset health data to identify and prioritise high-risk assets, ensuring our investments are focused where they deliver the most value.
- **Stakeholder and Regulatory alignment**: Our approach aligns with HSE recommendations and stakeholder feedback, ensuring compliance and addressing key concerns.
- **Historical Performance**: The RIIO-GD2 program has informed our strategy, allowing us to replicate successful interventions while expanding the program to cover more sites in RIIO-GD3.

Our preferred strategy includes the following 943 investments at a cost of £21.59m over RIIO-GD3, as shown below (note that CBA covers only district governors due to the materiality thresholds set by Ofgem):

Option	Description	RIIO-3 Primary		Total NVP compared to Baseline at 2070 (£m)	Objectives				
		Replace	Refurb		Total Risk Change from 2026 %	RIIO-3 Total Capex Cost (£m)	Supply Interuption Change from 2026 %	Customer Risk Change from 2026 %	Payback (years)
	Baseline	0		-£1,434.6	15.23	-	18.64%	13.64	-
1	Preferred	468	25	£85.5	9.68	21.59	14.05%	7.68	2
2	Do More	1018	25	£81.5	9.62	35.3	14.05%	7.68	6
3	Do Less	440	25	£61.2	11.20	16.8	15.78%	9.29	2

Table 40 Governors - Options Summary for Risk, SI impact and CBA

Our preferred option aims to maintain risk to an acceptable level, compared with our position at the start of RIIO-GD3. It ensures compliance with our legal and industrial requirements and accounts for interventions required due to the deteriorating age and condition of our existing assets and their increasing obsolescence. As shown in Table 40, whilst risk is set to increase by 7.68% from 2026, though this is still within the 10% tolerance set out in our objectives. Whilst supply interruptions are exceeding our 10% limit (14.05%) this was expected due to the civils interventions not having any associated NARMs benefit. Overall, we are confident that our proposed plan delivers benefits for our customers in a cost-effective way, paying back in just 2 years.

5.6. Reinforcement

An overview of our planned investment for reinforcement is provided in Section 6.4.6, with a summary provided in Table 41.

2023/24 Prices	RIIO-GD2 Average	Reinforcement					RIIO-GD3 Total	RIIO-GD3 Average	Variance %
		RIIO-GD3 Spend per Year (£m)							
		2026/27	2027/28	2028/29	2029/30	2030/31			
Total - Reinforcement	5.54	5.48	5.38	5.38	5.38	5.38	26.98	5.40	-2.64%
Total - Reinforcement (km)	12.10	11.11	11.11	11.11	11.11	11.11	55.53	11.11	-8.24%
Total - Reinforcement (DG)	9	13	12	12	12	12	61	12	33.44%

Table 41 RIIO-GD3 Investment - Reinforcement

A22.i NGN RIIO-GD3 Investment Decision Pack - Reinforcements

Our Gas Transporter Licence conditions require us to provide a reliable service to customers. This means that we need to have enough network resilience to cope with extreme events, including a 1 in 20-year event (for a more detailed explanation on how we ensure resilience of our network, see Chapter 5 of our Business Plan).Where there is growth in demand, or where we are undertaking other changes on the network that impact capacity, we may need to reinforce the network to ensure that we can continue to meet this requirement. In summary, there are three main drivers we need to invest in reinforcement:

- Where there is growth in demand (either general growth in demand or a new point load at a specific location) that impacts the capacity of the network; or

- Where we are replacing mains via an insertion technique which reduces network capacity; or
- Where growth in the network or local network changes result in existing Governors been close or over capacity.

Our proposal for RIIO-GD3 is to carry out 55.53km of reinforcements and 61 individual interventions at a cost of £26.98m throughout RIIO-GD3 across our network. This includes 27.32km of general reinforcement, 28.21km of specific reinforcement, 31 new governors and 30 governor capacity upgrades.

Costs for reinforcements for the RIIO-GD3 EJP (£26.98m) are comparable to projected RIIO-GD2 spend (£27.71m) on a comparable 23/24 price basis. During RIIO-GD2, we effectively reduced the number of reinforcement projects by adopting advanced pressure management techniques and employing a Cost Benefit Analysis (CBA) evaluation process. This process assesses the trade-off between the impact of pressure increases on leakage and the capital costs of network reinforcement. In RIIO-GD3, we will build on these successes by continuing to use these techniques to identify the most cost-effective solutions, ensuring both value for money and reliable supply while minimizing our environmental impact.

5.7. Connections

An overview of our planned investment for connections is provided in Section 6.4.7 of our Business Plan. Table 42 compares our investment in RIIO-GD3 against our actual and forecast investment in RIIO-GD2.

The actual workload for domestic and non-domestic connections will be c.50% lower than our allowed workload in RIIO-GD2. The decline in connections, which began during the Covid-19 pandemic, has not returned to the pre-pandemic levels seen in the latter years of RIIO-GD1. Factors such as the cost-of-living crisis, high energy prices and current economic conditions have further contributed to this reduction. Government policy tabled to take effect in 2025/26 could halt new domestic connections by prohibiting the installation of new gas boilers in new properties. Despite these challenges, NGN will continue to add over 3,000 connections per year on average throughout RIIO-GD2. However, this number is projected to drop to approximately 1,500 connections per year in RIIO-GD3.

2023/24 Prices	RIIO-GD2 Average	Connections					RIIO-GD3 Total	RIIO-GD3 Average	Variance %
		RIIO-GD3 Spend per Year (£m)							
		2026/27	2027/28	2028/29	2029/30	2030/31			
Mains	1.41	0.20	0.20	0.20	0.20	0.20	0.99	0.20	-86.05%
Services	5.97	0.79	0.79	0.79	0.79	0.79	3.95	0.79	-86.78%
Total - Connections	**7.39**	**0.99**	**0.99**	**0.99**	**0.99**	**0.99**	**4.93**	**0.99**	**-86.65%**
Total - Connections (km)	16.54	4.26	4.26	4.26	4.26	4.26	21.30	4.26	-74.26%
Total - Connections (Services)	3,174	1,595	1,595	1,595	1,595	1,595	7,975	1,595	-49.75%
Domestic	6.00	0.63	0.63	0.63	0.63	0.63	3.17	0.63	-89.43%
Non-Domestic	1.39	0.35	0.35	0.35	0.35	0.35	1.76	0.35	-74.63%
Total - Connections	**7.39**	**0.99**	**0.99**	**0.99**	**0.99**	**0.99**	**4.93**	**0.99**	**-86.65%**

Table 42 Connections investment

The anticipated reduction in connection volumes, the removal of the Domestic Load Connection Allowance (DLCA), and the removal of the Domestic Connections Volume Driver (DCVD) has changed our pricing methodology for RIIO-GD3. Fixed overheads associated with our connections function, necessary for meeting our obligations, will not be significantly reduced by the lower volume of connections compared to RIIO-GD2, and we will still need to maintain a team to handle design and quotation activities, that may not progress to acceptance and delivery. A high proportion of the fixed overhead will now be borne by the customer, with £4.93m being retained by NGN.

5.8. Other network Capex

An overview of our planned investment for other network Capex is provided in Section 6.4.8 of our Business Plan.

Table 43 summarises the other network-related assets not previously addressed split into 3 categories, Security, Pipelines, and Electrical & Instrumentation.

2023/24 Prices	RIIO-GD2 Average	Other Capex					RIIO-GD3 Total	RIIO-GD3 Average	Variance %
		RIIO-GD3 Spend per Year (£m)							
		2026/27	2027/28	2028/29	2029/30	2030/31			
Security	0.79	0.94	1.27	1.04	1.27	0.94	5.46	1.09	37.44%
PSUP	0.11	-	-	-	-	-	-	-	-
Pipelines (Inc overcrossings, sleeves, CP, valves)	3.04	3.59	2.91	3.28	3.28	2.98	16.04	3.21	5.38%
Electrical and mechanical instrumentation	1.77	1.96	1.96	1.96	1.96	1.96	9.79	1.96	10.92%
Other Network	**5.71**	**6.48**	**6.14**	**6.28**	**6.51**	**5.88**	**31.29**	**6.26**	**9.54%**

Table 43 other network capex investment

Security

During RIIO-GD2 we focused on improving security and site access by installing electronic locks across all our sites whilst improving security fencing through replacement or refurbishment on several above ground installations. For RIIO-GD3 we have carried out an extensive site survey programme at 80 sites, this has identified a number of fence replacements and refurbishments to ensure our above ground installations remain secure, this is a key part of our proposals (for more information see **Appendix A22.f Investment Decision Pack – Offtakes and PRS - Civils EJP**). Our RIIO-GD3 cyber and physical security plans will add CCTV and other digital security measures where appropriate, these are discussed further in **Appendix A13 - IT & Telecoms strategy** (included in security RIIO-GD2).

Pipelines

A significant portion of our RIIO-GD3 proposals are allocated to overcrossings and corrosion management measures (Cathodic Protection), amounting to £11.11m. Cathodic protection is a corrosion management process used to control the corrosion of a metal surface, on 1 high pressure pipeline remedial in RIIO-GD2 there was significant corrosion along part of it following CP failures. The RIIO-GD3 investment looks to address the issue and minimise the impact of corrosion in the future. Compared to RIIO-GD2, our investment in overcrossings and pipeline remediation will increase.

The remaining £4.93m is to be spent on replacement/installation of IP/MP valves following extensive survey work in RIIO-GD2 and the FEED study for the potential downrating of pipeline in the centre of Leeds (South Village development)

A22.k NGN RIIO-GD3 Investment Decision Pack - Overcrossings

An overcrossing occurs where our below ground pipelines need to cross natural or man-made obstacles such as rivers, canals, roads and railways. We will target the highest-risk overcrossings (scores 4 and 5) including some with current score 3 which expect to deteriorate to score 4 or 5 in RIIO-GD3. We will also target mandatory Tier 1 overcrossings. We have identified 46 sites requiring intervention and will maintain the number of security upgrades (60) from RIIO-GD2. The primary drivers for this investment in overcrossings are the need to address asset health concerns, ensure the security of these exposed sections of pipeline and increase the resilience of these assets against climate change risks such as flooding.

If an overcrossing fails, it can lead to serious consequences including explosions, loss of gas supply, and methane leaks into the atmosphere. There is also a security focus regarding the risk posed to the public due to the exposed nature of above-ground pipework. There have been recorded cases in the UK where exposed pipework without appropriate security measures has been accessed by members of the public which led them to injure themselves due to a fall. To mitigate these risks, we prioritise overcrossing maintenance and upgrades based on risk assessments and findings from visual surveys conducted during routine inspections.

We considered a number of options in relation to overcrossings: to intervene only on category 5 overcrossings, to intervene according to asset age, or to undertake a balanced programme combining the two. We considered that the

optimal strategy would blend aspects from the thorough scope of the second option while moderating the frequency and intensity of interventions, ensuring both practicality and cost-efficiency. By choosing a more measured path, we can improve the safety and reliability of overcrossings without overstretching financial and logistical resources. Table 44 highlights the options summary and shows that NPV is positive after 12 years under our preferred option.

Option	Desciption	RIIO-GD3 Intervention Volume	Total NPV compared to Baseline at 2070 (£m)						Payback (years)	Total Risk Change from 2026
			2035	2040	2045	2050	2060	2070		
-	Baseline/Reactive	-	-£76.71	-£112.35	-£143.97	-£171.98	-£219.44	-£259.17	-	5.0%
1	HP Focus	3	-£0.09	-£0.07	-£0.04	£0.00	£0.08	£0.16	24	4.5%
2	Based on age	255	-£11.51	-£7.71	-£2.67	£3.02	£15.14	£27.80	22	-6.5%
3	Balanced **(Preferred)**	106	-£1.08	£1.78	£5.24	£9.00	£17.25	£26.37	12	-2.7%

Table 44 Overcrossings CBA Summary

Electrical & Instrumentation (A22.o NGN RIIO-GD3 Investment Decision Pack - Pressure Management)

We manage pressures within our network to ensure that we meet our 1 in 20 demand obligations whilst aiming to reduce leakage from our mains, reducing our business carbon footprint and preventing customers losing their gas supply. To enhance our network's efficiency, we will continue to leverage advanced pressure management techniques, including:

- **Fixed Pressure:** consistent pressure levels throughout the year for PE networks.
- **Seasonal Pressure Settings:** adjusting pressure for summer and winter months to accommodate various pipe materials.
- **Clock control:** managing pressure changes between peak and off-peak times during winter.
- **Remote pressure management:** using sophisticated technology for real-time pressure control and monitoring, which reduces the need for site visits and allows for proactive issue resolution.

Remote pressure management provides 24/7 visibility of the network as well as the ability to adjust system pressures to manage leakage and resulting carbon emissions without the expense of visiting site. We can avoid expensive reinforcement through managing pressures daily, remotely control the network during incident events, and identify issues early allowing proactive resolutions. In addition, we install Dataloggers at strategic points of our network downstream of our governors to provide an early indication of developing network issues which, if not acted upon, could result in poor pressures or a loss of supply. Loggers are also fitted to district governors as we require pressure data for our leakage calculations.

The clocks we have in the network are already well beyond their life expectancy and we are seeing them fail on a regular basis. We are therefore developing a new clock design to replace the existing aging units and are advancing our remote pressure management technology to ensure reliability. This investment will prevent equipment failures, avoid costly reinforcement projects, and support early issue detection. We have developed a mechanically proven protype and are now developing the software.

In RIIO-GD3 we are proposing that we replace any devices which haven't been renewed already in RIIO-GD2. Rather than like-for like, our ambition is to leverage the latest technology to capture real time data. We will have greater visibility of what our networks are doing now, rather than what they did yesterday. To get the best value, we will carry out a review of the current logger positions and carry out works to remove, renew install or relocate posts as required.

To make the best use of the real time data from these network points and governors, we will consult with a data science provider to produce a data driven system to alert us to any anomalies in the network when they happen, to minimise the effect on customers. This system will also make use of the real-time data we are already receiving from district governor sites.

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

Table 45 Validation logger preferred units and costs

Pressure control remains the most effective method of leakage reduction. NGN currently have 36 Networks with profiling fitted which is around 900 district governor sites. In RIIO-GD3 some of these systems will be reaching end of life, so after a site-by-site assessment of the continued benefit, we will replace some of the aging fleet with modern 'Smart' Controllers.

There will be occasion where it is not viable to replace a profiler which has reached end of life, for this we would need to replace the profiler with a datalogger.

Pressure control material costs	Units	Unit Cost	Total
Remove profiling and make logging only	100	£ 1,658.80	£ 165,880.00
Replacement of parts (refurb)	400	£ 1,740.00	£ 696,000.00
Full replacement	400	£ 8,120.00	£ 3,248,000.00

Table 46 Pressure control preferred units and costs

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

In addition to this, we hope to enrich our monitoring on some of our more strategic sites to include data such as access monitoring, slam-shut or relief sensing and possibly flow sensors as the technology becomes available.

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

Table 47 Governor logger preferred units and costs

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

To do this we plan to integrate our Low-pressure data with our existing SCADA data with all the advanced alarm and alert management that brings. Rolling in the models produced by the current SIF.

This, combined with real time monitoring and additional sensors will validate the distribution of gas throughout our system from offtake to distribution. The Futureproofed Network Monitoring solution. Project to cost £0.9m. We also anticipate that this investment, will further validate gas distribution from offtake to distribution, ensuring enhanced reliability and efficiency across our network.

For RIIO-GD3, we will build on these successes by adopting the latest technology and refining our monitoring systems. This includes:

- **Conducting site-by-site assessments** to replace or upgrade pressure management equipment.
- **Implementing a data-driven system** for real-time issue detection in collaboration with a data science service provider.
- **Integrating low-pressure data with SCADA systems** for advanced alarm and alert management.

Our approach is grounded in comprehensive risk assessment and historical data analysis. We have successfully used cost-benefit analysis and pressure management techniques in RIIO-GD2 to minimise reinforcement needs.

5.9. Other non-network Capex

An overview of our planned investment for other non-network Capex is provided in Section 6.4.8 of our Business Plan and in Table 48.

2023/24 Prices	RIIO-GD2 Average	Other Capex					RIIO-GD3 Total	RIIO-GD3 Average	Variance %
		RIIO-GD3 Spend per Year (£m)							
		2026/27	2027/28	2028/29	2029/30	2030/31			
IT and Telecoms	11.43	11.02	13.18	13.12	12.09	13.54	62.96	12.59	10.18%
Plant, tools & equipment	1.40	1.23	1.07	1.64	0.69	0.69	5.31	1.06	-24.17%
Vehicles	5.02	4.77	5.26	3.86	3.99	8.97	26.85	5.37	6.94%
Property and workspace	2.96	1.94	1.94	1.94	1.94	1.94	9.71	1.94	-34.43%
Other – incl. compensation	0.04	-	-	-	-	-	-	-	-
Other Non-Network	**20.85**	**18.97**	**21.45**	**20.55**	**18.71**	**25.14**	**104.82**	**20.96**	**0.54%**

Table 48 Other non-network Capex investment

Our planned investment incorporates the following efficiencies and cost reductions:

IT and Telecoms

In RIIO-GD2, we invested in IT and telecoms systems for a resilient, flexible, cloud-based environment supported by our in-house 3iG team. This ensures 99.85% system availability, cost-efficient operations and internal knowledge retention. Our RIIO-GD3 IT and Telecoms Strategy is detailed in **Appendix A13**. For RIIO-GD3, we plan an annual Capex investment of £12.59m, similar to RIIO-GD2 (+10%). This investment follows the principles in our IT and Telecoms Strategy and Digitalisation Strategy and Action Plan (**Appendix A12**) and includes these key initiatives:

Software (£16.8m): our operations use various software systems as highlighted in A12 Digitalisation Strategy & Action Plan, including S/4HANA (asset management, finance, HR, emergency processes, connections, maintenance), SCADA, analytics software, and MS Dynamic Customer Engagement. In RIIO-GD3, we aim to maintain these systems at supplier support levels, reduce operational costs, enhance security and introduce new features for improved safety, customer service and efficiency. This investment will include:

- Colleague services features to support performance management, occupational health and recruitment.
- Project planning and delivery to support greater operational efficiency.
- Asset management and asset data management to support greater operational efficiency.
- Investments in Geospatial, Enterprise Resource Planning (ERP) and data capture systems to be a foundation for the delivery of A12 Digitalisation Strategy & Action Plan, and to support greater operational efficiency.

Devices and hardware (£12.8m): we plan a three-year refresh cycle for mobile phones, laptops and field devices to maintain support, reduce costs and ensure high availability. We will invest in our cloud infrastructure to keep systems secure and supported, leveraging new technologies for IT resilience and cost reduction. By following our 2024 cloud strategy, which saved £0.5m compared to 2023, we aim to drive further efficiency during RIIO-GD3.

Network (£1.8m): our operations are supported by resilient and high-speed data links, mobile and wireless communications to our operational colleagues and a resilient call centre solution. In RIIO-GD2, we invested in this area by establishing a Software Defined Wide Area Network (SD WAN) and the use of roaming 4G SIMs for our field tablets, used by our engineers. In RIIO-GD3, we will invest further in SD WAN technology to improve our resilience, replace legacy and end-of-life technology and to ensure our operational support costs remain low.

Plant Tools and Equipment: Annual expenditure will decrease to £1.06m (-24%) during RIIO-GD3. RIIO-GD2 spending was higher due to team expansion, purchases of welfare cabins and wheeled plant instead of hiring, and replacing outdated equipment. In RIIO-GD3, we will invest in over 150 new items (including 27 excavators and 125 trailers) to maintain our operational efficiency.

Vehicles: Expenditure will increase from £5.02m per annum in RIIO-GD2 to £5.37m in RIIO-GD3 (+7%). We will replace 557 vehicles during RIIO-GD3 according to our fleet replacement policy, targeting six years of operation or 100,000 miles, to maximise efficiency and reduce costs. Due to the limited availability of zero-emission large vans, we will purchase 303 new diesel vans. For smaller vehicles, we aim to buy 100 electric vans out of 230 new purchases (43%) to reduce carbon emissions. We will buy 21 cars/4x4s (10 hybrids), one vacuum excavation vehicle, and trial two hydrogen fuel cell vans. Vehicle price increases above inflation and the cost of transitioning to zero-emission alternatives are significant factors between RIIO-GD2 and RIIO-GD3.

Property: During RIIO-GD2, we invested significantly in our property portfolio, including refurbishing, relocating and acquiring Thorpe Head Office in Leeds (2023). These investments result in a £1.02m annual saving (-34%) during RIIO-GD3. To meet RIIO-GD3 Environmental Action Plan (EAP) commitments to reduce our carbon footprint, we are enhancing building energy efficiency with low-energy lighting, low-carbon heating/hot water systems and efficient windows at our head office. We are also expanding our electric vehicle charging network with rapid chargers (50kW+) strategically placed across properties. Additionally, we are upgrading operational depots to provide modern work environments and replacing end-of-life assets.
Implementing technological advancements and optimising equipment purchasing strategies contribute to cost savings and operational efficiency.

- **Vehicles**: By replacing a portion of our fleet with EVs where feasible, and focusing on efficient Diesel vans for essential operations, we aim to manage costs while aligning with environmental goals.
- **Property**: Strategic investments in property and the acquisition of our head office have led to significant cost reductions and environmental benefits.

We built confidence in our plan in the following ways:

- **Plant Tools and Equipment**: Our plan is informed by HSE requirements and technological trends, ensuring that our equipment investments meet both safety and efficiency standards.
- **Vehicles**: We have assessed the market and operational requirements to justify our vehicle procurement strategy, balancing cost with functionality and environmental impact.

6 Operational expenditure summary (Opex)

As set out in Section 6.5 of our Business Plan, we use our controllable Opex to operate and manage our network and maintain assets to ensure that the gas network is safe and resilient (further detail on how we maintain a secure, resilient network is set out in Chapter 5 of the Business Plan). We also provide a 24-hour, 365-day-a-year emergency and repair service when an interruption or leak does occur. Our controllable Opex is categorised into direct and indirect costs:

- Our direct costs cover Work Management and Execution, including key areas such as Asset Management, Operations Management, Customer Management, System Control. This category also covers land and site remediation costs.
- Our indirect costs provide business support functions such as HR and Training, as well as IT and Finance, which equip our network operations with the necessary resources to maintain resilience and consistently deliver on our key objectives.

Separately, non-controllable Opex are costs that are beyond management control in the short term and are subject to pass-through mechanisms. These costs mostly relate to the purchase of gas to replace losses from our network, known as Shrinkage.

6.1. Our RIIO-GD3 expenditure

Table 49 below summarises our RIIO-GD3 Opex investments and compares the average planned expenditure to the 5-year average we have seen in RIIO-GD2 to date. Overall, expenditure will increase from £115.66m on average to £131.27m per annum which is a 14% increase.

2023/24 Prices	RIIO-GD2 Average	RIIO-GD3 Spend per Year (£m)					RIIO-GD3 Total	RIIO-GD3 Average	Variance %
		2026/27	2027/28	2028/29	2029/30	2030/31			
Asset management	6.14	3.11	3.12	3.12	3.12	3.12	15.60	3.12	-49%
Operations management	10.87	9.73	9.76	9.78	9.78	9.78	48.82	9.76	-10%
Customer management	1.62	2.41	2.52	2.52	2.52	2.52	12.50	2.50	55%
System control	0.73	0.96	0.96	0.96	0.96	0.96	4.79	0.96	32%
Work management	**19.35**	**16.21**	**16.36**	**16.38**	**16.38**	**16.38**	**81.71**	**16.34**	**-16%**
Environmental remediation	0.84	0.95	0.67	0.35	0.33	0.31	2.62	0.52	-37%
Total work management	**20.18**	**17.16**	**17.04**	**16.73**	**16.71**	**16.69**	**84.32**	**16.86**	**-16%**
Emergency	13.65	18.11	17.96	17.81	17.61	17.41	88.89	17.78	30%
Repair	21.39	25.10	24.71	24.57	24.36	24.15	122.90	24.58	15%
Maintenance	24.83	30.26	30.22	27.75	27.75	27.75	143.72	28.74	16%
Other direct activities	4.16	4.46	4.49	4.49	4.49	4.49	22.41	4.48	8%
Interruptions	0.12	-	-	-	-	-	-	-	-100%
Work execution	**64.15**	**77.92**	**77.38**	**74.61**	**74.20**	**73.80**	**377.92**	**75.58**	**18%**
IT and telecoms	8.03	9.49	9.53	9.53	9.53	9.53	47.61	9.52	19%
Property management	2.88	3.13	3.14	3.14	3.14	3.14	15.70	3.14	9%
Human resources	1.64	1.83	1.83	1.82	1.82	1.82	9.12	1.82	11%
Audit finance and regulation	4.57	5.37	5.49	6.56	7.90	6.71	32.02	6.40	40%
Insurance	3.76	4.64	4.83	5.02	5.02	5.02	24.54	4.91	30%
Procurement and logistics	0.25	0.32	0.32	0.32	0.32	0.32	1.62	0.32	30%
CEO and group management	5.73	6.67	6.68	6.68	6.68	6.68	33.39	6.68	17%
Training and apprentices	4.46	6.93	6.36	5.64	5.63	5.56	30.12	6.02	35%
Indirect activities	**31.33**	**38.37**	**38.18**	**38.73**	**40.05**	**38.80**	**194.12**	**38.82**	**24%**
Total controllable Opex	**115.66**	**133.45**	**132.60**	**130.07**	**130.97**	**129.28**	**656.37**	**131.27**	**14%**

Table 49 Opex

Figure 25 highlights the impact that the individual cost drivers have had between RIIO-GD2 and RIIO-GD3 costs. We discuss each in more detail below.

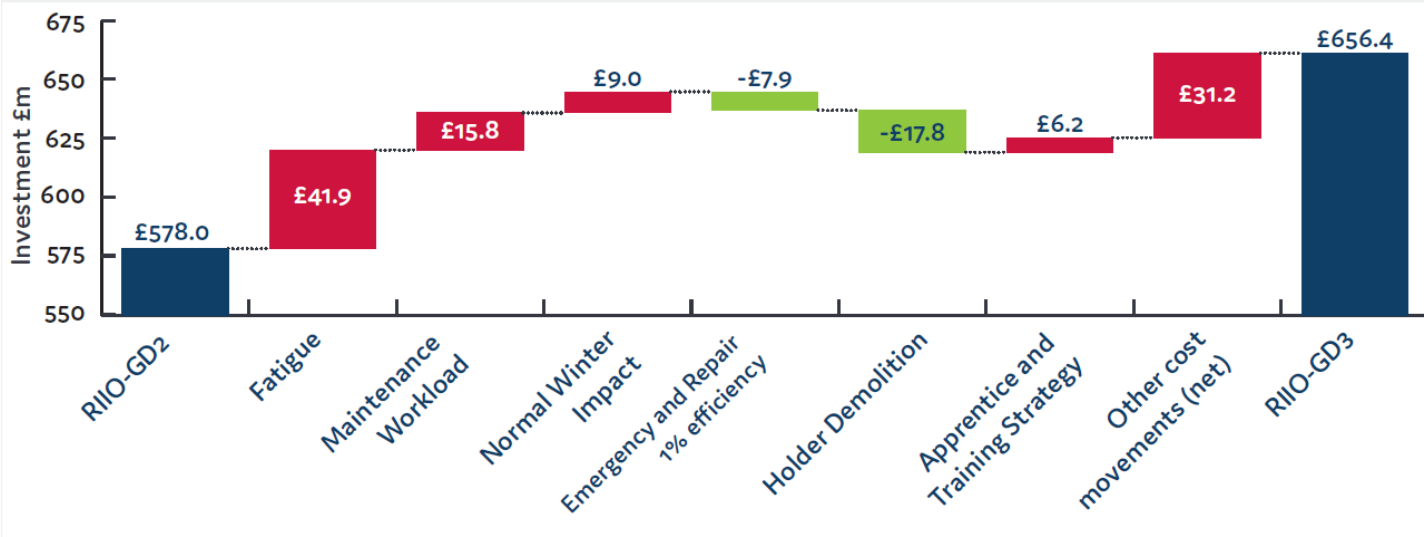

Figure 25 Opex trace from RIIO-GD2 to RIIO-GD3

Fatigue (+£41.9m)

An ongoing area of focus is a requirement which has been set out by the Health and Safety Executive (HSE), to minimise the risks associated with fatigue and working patterns, predominantly focused on length of shifts and dedicated rest periods. We are working proactively with the HSE and have presented our long-term plan to address and proactively manage this risk. The updated HSE fatigue management policies require 12- and 16-hour working standards. Despite reduced activity, emergency costs have risen due to hiring more engineers to enhance resilience and meet HSE requirements. This increase will continue into RIIO-GD3 and is reflected in our Business Plan, as well as having been considered as part of **Appendix A7 – Workforce and Supply Chain Resilience Strategy**.

Maintenance Workload (+£15.8m)

Maintenance costs have significantly increased as we align our strategy to address maintenance in several areas which include:

- More work on District Governors to extend their operational life and reduce Capex (see Section 5.5for further detail around our RIIO-GD3 strategy in relation to Governors).
- Carry out in-line inspections using new technology on our 4" high pressure pipelines.
- Install more Pressure Control systems which require increased maintenance.
- An increase in valve surveys, cathodic protection and DR4 workload.

Accelerating this workload post the Covid-19 pandemic has proved more difficult than expected with long lead times for some equipment and scarcity of resource. We have also included the impact of changing HSE legislation associated with Gas Safety Regulations (GSRs) with an expectation of addressing the backlog during RIIO-GD3 and factored in the impact of Advanced Leakage Detection.

Normal Winter Impact (+£9.0m)

Our forecast for Emergency and Repair remains in line with our Business Plan and is based on a more prudent 'normal' winter workload than we have seen in recent years. We would expect to outturn lower than this when weather is milder, but we cannot always assume this will be the case. This assumption has been continued in our RIIO-GD3 plan and includes a

1% year on year reduction (-£7.9m) in cost to reflect a positive impact of the Repex programme on workload.

Holder Demolition (-£17.8m)

The main cost reduction driver within Work Management is due to the holder demolition programme that is due to be completed during RIIO-GD2.

Apprentice and Training Strategy (+£6.2m)

As part of our commitment to upskill and multi-skill our workforce as we move into RIIO-GD3, we have committed to the following as part of our Workforce and Supply Chain Resilience Strategy (see **Appendix A7**):

- Create an NGN Green Academy which will support UK net-zero training for future engineers by developing whole systems energy transition training.
- Continue our successful operational apprenticeship programme and recruit 12 apprentices per year, which following successful completion are guaranteed permanent full-time employment.
- Develop our business admin apprenticeship programme further with an opportunity to move around the business and work across various support functions on a rotation basis.
- Build a Graduate recruitment programme aligned to our resilience needs and any skills shortages identified.

To achieve our challenging ambitions to improve Equality, Diversity, and Inclusion across the business, we need to build connections with the broader community to ensure that we have a diverse pipeline for the future. Through our apprenticeship schemes and targeted recruitment activity, we are now seeking to test how we attract a more diverse workforce – including advertising our jobs in women only spaces for example. This is only the start of this journey and broadening our attraction and recruitment will remain a key priority and focus. This will ultimately lead to a more widely represented workforce, with the aspiration that in time we will begin to change the course of our gender pay gap. The apprentice programme will cost an additional £0.8 million per year during RIIO-GD3 to train more apprentices. This investment is part of our strategy to replace the aging workforce and ensure we have skilled staff for future operational challenges.

Other cost movements

Three other key cost drivers of note include meter box isolation £8.00m, Joint Office Encoda system £5.55m and automated leakage detection £5.00m.

6.2. Our operational investment strategy

Detail on our RIIO-GD3 expenditure is set out in Section 6.5.1 of our Business Plan. Operational Expenditure is managed through a process that focuses on maintaining and operating our network efficiently, while ensuring compliance with our statutory obligations by adhering to the appropriate safety and regulatory standards. The Opex pathway emphasises long-term sustainability and operational efficiency. **Appendix A13 – IT & Telecoms Strategy** provides further information on how bringing our IT support services and project delivery teams in house helped to reduce operating costs and drove further efficiencies by retaining knowledge of systems and data within the business.

Our stakeholder engagement programme has reinforced that safety and reliability should remain amongst our top priorities. Stakeholders have emphasised the importance of environmental responsibility, urging us to reduce the environmental impact of our operations and network. The activities within our Operating Costs will directly support the following key areas, even in the face of rising costs and external pressures:

- **Safety and resilience**: we will maintain a safe and resilient network by closely monitoring our cyber resilience and providing a 24/7 emergency response to gas escapes, ensuring rapid intervention every day of the year.
- **Reliability**: our gas network is already highly reliable, and our targeted maintenance programme will preserve this standard while minimising the whole-life costs of our assets.
- **Environmental impact**: methane leaks from our network contribute to climate change as methane is a powerful greenhouse gas. We are committed to reducing this impact by identifying and repairing leaks faster than ever before. Our industry-leading in achieving 7- and 28-day repair targets demonstrates the effectiveness of our investments to date.

6.3. Our efficiency and delivery record

Detail on our efficiency and delivery record is set out in Section 6.5.3 of our Business Plan.

Our Opex pathway is designed with a clear focus on long-term sustainability and operational efficiency. We plan to leverage digital transformation to drive operational efficiency. Making use of existing IT infrastructure, such as the S4/HANA system, is enabling us to let good data improve our decision-making processes. Section 6.8 of our Main Business Plan outlines the benefits of digitalisation and open-data initiatives that will optimise resource allocation, predict maintenance needs, and deliver smarter, more targeted interventions.

NGN has consistently demonstrated exceptional efficiency in managing its operational expenditures (Opex). With a strong history of being recognised as one of the most efficient operators in the industry. Our approach has proven to be reliable during RIIO-GD1 and RIIO-GD2, demonstrating our ability to deliver cost-effective services supported by robust cost assessment and planning. We have continued to achieve our strong efficiency performance, even though our relatively small size means that our ability to achieve economies of scale is limited relative to other, larger networks.

Our approach remains transparent and in line with Ofgem's expectations. Our continual monitoring, review, and adjustment are part of our business-as-usual (BAU) processes. Our ongoing vigilance keeps our cost assessments responsive to changing conditions and reflective of operational reality. In keeping with our model of cultural change (see section 1.4.4.) and commitment to learning and sharing, lessons learned from past regulatory periods and ongoing performance data have been used to refine and improve our cost models.

NGN has enhanced efficiency during the RIIO controls, benefiting both NGN and UK consumers. Key initiatives have included updating labour terms, saving £9m annually, and implementing a Direct Service Provider (DSP) model, which reduced costs by £15m annually. Additionally, NGN has reinvested its savings into IT systems and productivity-enhancing projects such as SAP S/4HANA and the “Future Ways of Working” programme, aiming to improve customer experience and make NGN a more data-driven business.

NGN has managed its workforce strategically by optimising shift patterns and staffing levels while maintaining the capability to meet emergency response standards without significant cost increases. This process includes allocating time and resources based on productivity data to ensure no monthly shortfalls in work hours and flexibility in moving resources across Opex, Capex and Repex, depending on workload demands and spare capacity. For further information, please refer to **Appendix A7 Workforce and Supply Chain Resilience Strategy**

6.4. Work management

The details of our planned costs for work management in RIIO-GD3 are set out in Section 6.5.4.

Work Management includes two key areas with distinct cost drivers:

- **Asset Management and System Control,** which involve the strategic oversight and day-to-day management of our distribution network assets. These costs are primarily driven by the number and condition of assets.
- **Operations and Customer Management,** which cover the daily supervision of emergency, repair, and maintenance activities. These are influenced by workload demand and our commitments to achieving one and two-hour response time standards.

Table 50 compares our Work Management costs for RIIO-GD3 against our actual and forecast costs for the remainder of RIIO-GD2.

2023/24 Prices	RIIO-GD2 Average	RIIO-GD3 Spend per Year (£m)					RIIO-GD3 Total	RIIO-GD3 Average
		2026/27	2027/28	2028/29	2029/30	2030/31		
Asset management	6.14	3.11	3.12	3.12	3.12	3.12	15.60	3.12
Operations management	10.87	9.73	9.76	9.78	9.78	9.78	48.82	9.76
Customer management	1.62	2.41	2.52	2.52	2.52	2.52	12.50	2.50
System control	0.73	0.96	0.96	0.96	0.96	0.96	4.79	0.96
Work management	**19.35**	**16.21**	**16.36**	**16.38**	**16.38**	**16.38**	**81.71**	**16.34**
Environmental remediation	0.84	0.95	0.67	0.35	0.33	0.31	2.62	0.52
Total work management	**20.18**	**17.16**	**17.04**	**16.73**	**16.71**	**16.69**	**84.32**	**16.86**

Table 50 Work management costs

During RIIO-GD2, costs averaged £20.18m annually. This will decrease by £3.32m per year to £16.86m during RIIO-GD3, mainly due to a £4m reduction in Holder Demolition costs as this programme concludes. Additional savings come from operational efficiencies through new technology for remote supervision and control.

We are committed to addressing legacy land contamination and pollution from historical use. In RIIO-GD2, we reassessed all at-risk sites, shaping our RIIO-GD3 strategy that combines monitoring, control, and direct intervention, costing £2.62m over five years.

Our Asset Management functions have seen significant investment during RIIO-GD1 and RIIO-GD2 to enhance our Asset Risk and Total Network Management strategies. These remain a critical area and in RIIO-GD3, we plan to implement further innovations and techniques to stay at the forefront of strategic asset management.

We will achieve further efficiencies by the end of RIIO-GD3. The most notable reductions are in Asset Management, where costs have decreased by 49%, and in Operations Management, where costs have decreased by 10%, largely through advancements such as remote supervision and control of operations.

We will deliver additional benefits to both businesses and local communities, as we explore opportunities to repurpose holder sites for productive use, including potential sale for development.

6.5. Work execution

The details of our planned costs for work execution in RIIO-GD3 are set out in Section 6.5.5 and Table 51.

2023/24 Prices	RIIO-GD2 Average	RIIO-GD3 Spend per Year (£m)					RIIO-GD3 Total	RIIO-GD3 Average
		2026/27	2027/28	2028/29	2029/30	2030/31		
Emergency	13.65	18.11	17.96	17.81	17.61	17.41	88.89	17.78
Repair	21.39	25.10	24.71	24.57	24.36	24.15	122.90	24.58
Maintenance	24.83	30.26	30.22	27.75	27.75	27.75	143.72	28.74
Other direct activities	4.16	4.46	4.49	4.49	4.49	4.49	22.41	4.48
Interruptions	0.12	-	-	-	-	-	-	-
Total work execution	**64.15**	**77.92**	**77.38**	**74.61**	**74.20**	**73.80**	**377.92**	**75.58**

Table 51 Work execution costs

During RIIO-GD2, our Work Execution costs averaged £64.15m per annum. For RIIO-GD3, they will increase by £11.43m, bringing the average annual total to £75.58m.

Emergency and repair

Costs will increase from £13.65m to £17.78m per annum for Emergency services, and from £21.39m to £24.58m per annum for Repair activities in RIIO-GD2. Emergency teams are first responders to gas escapes or supply interruptions, ensuring safety and performing immediate repairs when possible. This service operates 24/7 with strict response times:

within one hour for uncontrolled escapes and two hours for controlled escapes. To meet these safety standards, we must maintain adequate resources. This is a standard that we will not compromise on. Our ambition is for 100% compliance, exceeding the minimum requirement of 97%.

Maintenance

Please see Section 6.1.

Other direct activities

Other direct activities include odorant costs, wayleaves and easements, some survey work, and general expenditure on materials, tools and equipment. The drivers behind these costs will not change in RIIO-GD3, so our forecast remains broadly flat.

6.6. Indirect activities

The details of our planned costs for indirect activities in RIIO-GD3 are set out in Section 6.5.6 of our Business Plan. Efficiency improvements, cost reductions and innovation built in our plan.

Indirect controllable Opex encompasses Business Support, and Training and Apprentices, with subcategories including IT and telecoms, property management, HR, audit, finance and regulation, insurance, procurement, CEO and Group management, and stores and logistics. Table 52 compares our Indirect Opex for RIIO-GD3 against our actual and forecast costs for the remainder of RIIO-GD2.

2023/24 Prices	RIIO-GD2 Average	RIIO-GD3 Spend per Year (£m)					RIIO-GD3 Total	RIIO-GD3 Average
		2026/27	2027/28	2028/29	2029/30	2030/31		
IT and telecoms	8.03	9.49	9.53	9.53	9.53	9.53	47.61	9.52
Property management	2.88	3.13	3.14	3.14	3.14	3.14	15.70	3.14
Human resources	1.64	1.83	1.83	1.82	1.82	1.82	9.12	1.82
Audit finance and regulation	4.57	5.37	5.49	6.56	7.90	6.71	32.02	6.40
Insurance	3.76	4.64	4.83	5.02	5.02	5.02	24.54	4.91
Procurement and logistics	0.25	0.32	0.32	0.32	0.32	0.32	1.62	0.32
CEO and group management	5.73	6.67	6.68	6.68	6.68	6.68	33.39	6.68
Training and apprentices	4.46	6.93	6.36	5.64	5.63	5.56	30.12	6.02
Indirect activities	**31.33**	**38.37**	**38.18**	**38.73**	**40.05**	**38.80**	**194.12**	**38.82**

Table 52 Indirect activities

During RIIO-GD2, our costs for Indirect Activities have averaged £31.33m per year. For RIIO-GD3, they will increase by £7.5m, bringing the total to £38.82m annually. We explain below in greater detail what is driving this increase.

IT and telecoms

Costs will increase by £1.49m per year in IT and telecoms. Key drivers of IT and telecoms expenditure include the number of users, service levels, applications, and IT infrastructure. We will increase spend on cyber-resilience to comply with legislation and as we move to a more automated network and new legislation. For further details, please refer to **Appendix A13 IT & Telecoms Strategy**.

Property management

Property management costs will remain stable but with a slight £0.26m uplift to the RIIO-GD2 average. During RIIO-GD2, we invested significantly in property, including office and depot refurbishments and relocations. In 2023, we acquired

our Thorpe head office in Leeds, enhancing it with solar panels and EV charging points to reduce long-term costs and benefit the environment. Our property management Opex is increasing whilst our property Capex is decreasing in the main due to increasing utility bills and provision of welfare cabins.

Insurance

In RIIO-GD2, insurance costs have risen due to the cost-of-living crisis. Cover levels and types vary by network, affecting Totex costs. Claims, especially related to ill health, fluctuate yearly. Despite a slight drop in claim volume, increased payouts for complex issues are driving an annual cost increase of £1.15m.

Training and apprentices

In RIIO-GD3, we will recruit more apprentices, increasing training and apprenticeship costs by £1.56m annually. This is a change from RIIO-GD2, where we focused on hiring adults to drive cultural change, transition the workforce quickly and compensate for retirements.

Other indirect activities

The remaining activities encompass various support and corporate functions, including human resources, audit, finance and regulation, procurement and logistics and CEO and group management remain broadly flat or with slight increases from RIIO-GD2 to RIIO-GD3

We anticipate a £0.07 million annual increase in procurement and logistics costs primarily due three additional sustainability roles supporting procurement.

6.7. Non-controllable Opex

The details of our planned costs for non-controllable Opex in RIIO-GD3 are set out in Section 6.5.7 of our Business Plan.

Non-controllable Opex covers the cost of gas to replace network losses (Shrinkage), including 95% leakage, 3% theft and 2% for our use. Table 53 compares our non-controllable Opex costs for RIIO-GD3 with our actual and forecast costs for the rest of RIIO-GD2. There will be a 19% reduction in costs compared to the previous period.

2023/24 Prices	RIIO-GD2 Average	RIIO-GD3 Spend per Year (£m)					RIIO-GD3 Total	RIIO-GD3 Average
		2026/27	2027/28	2028/29	2029/30	2030/31		
Shrinkage	10.32	6.35	5.64	5.53	5.53	5.53	28.57	5.71
Ofgem Licence	2.97	3.36	3.43	3.43	3.43	3.43	17.08	3.42
Network Rates	43.49	40.70	40.87	40.87	40.87	40.87	204.17	40.83
Established Pension Deficit Recovery Plan Payment	7.87	-	-	-	-	-	-	-
NTS Exit Costs	47.11	54.92	55.58	56.87	57.01	55.89	280.27	56.05
Innovation	3.23	4.19	4.03	3.57	2.64	1.09	15.50	3.10
Xoserve	3.48	6.69	6.66	6.60	6.60	6.60	33.15	6.63
Supplier of Last Resort	26.05	0.86	0.86	0.86	0.86	0.86	4.28	0.86
Non-Controllable Costs	**144.53**	**117.06**	**117.06**	**117.72**	**116.92**	**114.26**	**583.02**	**116.60**

Table 53 Non-controllable Opex

Shrinkage gas

We forecast shrinkage costs to reduce by approximately 45% over RIIO-GD3. This forecast is based on current average wholesale prices, although actual costs may fluctuate with future changes in wholesale prices.

National Transmission System (NTS) pensions and NTS exit costs

Our costs also include the latest projections for NTS Exit costs provided by National Gas, reflecting increases due to rebalancing of NTS Offtake charging methodology. We have also factored in that the licence cost will remain stable throughout the period.

All other costs such as licence costs will remain broadly similar relative to RIIO-GD2. We are committed to reduce costs whenever it is possible to do so, even within our non-controllable Opex. Particularly, several key measures will contribute to the 45% reduction in Shrinkage costs:

- **Mains replacement programme:** we are replacing the leakiest and high-risk iron and steel mains with modern materials. This proactive approach will significantly reduce leakage.
- **Pressure Management:** our continued investment in remote pressure management technology will lower average system pressures. In RIIO-GD2, we are expanding this technology to ten additional zones, building on the 26 zones addressed in RIIO-GD1. Our Pressure Management team use this equipment to manage the network pressures remotely from the Control Room in Moorside. Current average system pressure in the network is c. 32 mbar and we expect pressure to remain close to this level over RIIO-GD3.
- **Strategic Shift in gas treatment**: We will cease using MEG (monoethylene glycol), a "wet" gas used to saturate and swell metallic joints which otherwise may leak, at the end of RIIO-GD2.

Our approach ensures that we are prepared for potential cost variations while strategically reducing shrinkage and optimising network performance.

We have based on Shrinkage cost forecast on the 2023/24 average wholesale gas price, recognising that actual costs may vary with future price fluctuations. Given the recent volatility in gas prices due to geopolitical events, our forecast is designed to accommodate such uncertainties. Figure 26 shows wholesale gas prices from 2020/21 to 2024/25 (note that the graph flattens from the second week of December 2024 as these are forecasted gas prices).

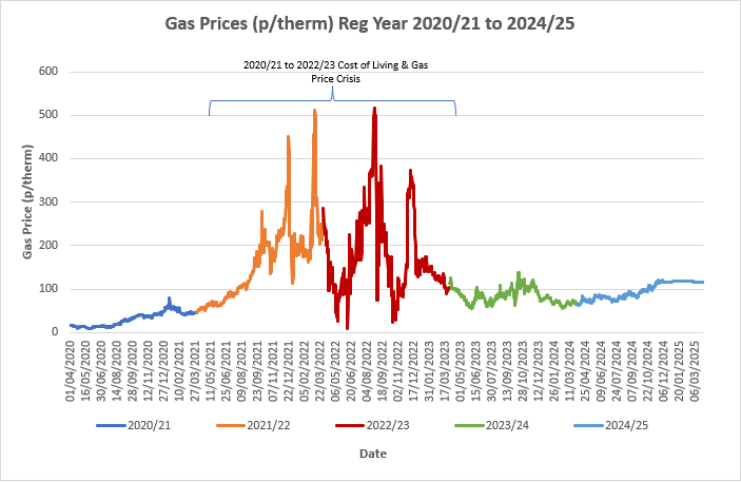

Figure 26 Wholesale gas prices 2020/21 to 2024/25

7 Frontier shift

Frontier shift refers to the productivity and efficiency improvements set by leading companies. NGN is a leader in gas distribution efficiency, consistently performing well and setting industry benchmarks. This has resulted in lower cost allowances across the sector, determined by Ofgem.

We challenge industry norms with commercially focused, market-led solutions to maintain our lead over other gas networks. We aim to extend this trend into RIIO-GD3, further increasing NGN's efficiency lead.

7.1. Real price effects (RPEs)

RPEs capture the difference between input price inflation and consumer price inflation. Network companies' costs are subject to input price inflation, but changes in these input prices may differ from the general inflation index used to index their revenues (the ONS Consumer Prices Index with Housing, or CPIH).

For example, specialist contractor labour and certain materials are specific to the sector and can face price changes vastly different from general inflation. This gives rise to a wedge, or RPE, in terms of the trajectory of prices. It should be noted that networks can, and have experienced in RIIO-GD2, negative RPE price adjustments where input prices increase, as measured by the indices which make up the RPE framework, are less than CPIH.

The purpose of including an RPE allowance in the regulatory framework is to ensure that risks from exogenous changes in input prices are appropriately allocated. Regulators in the UK have typically acknowledged input price risk and incorporated treatment of RPEs into the determination of allowances. Failure to incorporate RPEs risks efficient costs being unrecoverable, with a consequential impact on financeablity driven by factors outside of company control. Appropriately specified RPEs provide protection for both companies and customers.

Ofgem is proposing to broadly retain the same approach to RPEs as RIIO-GD2, where adjustments to allowances are made based on forecasts for input price indices, and allowances are “trued up” annually based on outturn differences between CPIH and input price indices. At SSMD, Ofgem considered that a high materiality for RPEs is appropriate but has invited companies to submit evidence on whether changes are required to the setting of the materiality threshold. The gas networks have also commissioned a report from KPMG (RPE Framework at RIIO-3 – KPMG, the “RPE / KPMG report”) to provide advice on how to develop the RPEs approach for RIIO-GD3, which we refer to where relevant below.

Table 54 shows where, in this section, we have addressed each element of Ofgem’s Business Plan Guidance requirements.

Ofgem Business Plan Guidance (paragraph 6.12)	Reference
The input costs for which our measure of general output price inflation (i.e. CPIH) is a poor proxy, along with justification for why.	Sections 7.2-7.5
The expenditure categories (e.g. direct Opex) to which these input costs relate, and to what extent. Network companies should consider the practical implications of their proposals, and in doing so to show that each RPE is material relative to both Totex and our measure of general output price inflation. This information should align with the data provided in the BPDT.	Sections 7.2-7.5
Evidence as to what extent our existing RIIO-GD2 approach is not appropriate for RIIO-GD3.	Sections 7.2-7.5
Evidence to support all proposed RPEs and their proposed weighting (or changes to existing RPE weighting), including clear evidence of a sustained and material deviation between input costs and our measure of general output price inflation.	Sections 7.2-7.5, A15 BPDTs & A16 BDPTs Commentary (S1.02 RPE & OE)
Proposed indices for any proposed RPEs, along with evidence to support their use in indexation and justification for their selection over alternatives. The plan should include proposed forecasts for any proposed indices, along with evidence of how these have been derived.	Sections 7.2-7.5, A15 BPDTs & A16 BDPTs Commentary (S1.02 RPE & OE)
An explanation of any RPE cost profiling effects proposed through the price control.	Section 7.5, A15 BPDTs & A16 BDPTs Commentary (S1.02 RPE & OE)

Table 54 addressing Ofgem's Business Plan Guidance

In the Sections that follow we cover the following:

- Overview of NGN’s view on RPEs (Section 7.2)
- Proposed methodology changes for RIIO-GD3 (Section 7.3)
- KPMG’s proposed indices for considerations (Section 7.4)
- RPEs presented in our BPDT (Section 7.5)

7.2. Overview of NGN's view on RPEs

NGN supports continued need for Real Price Effect (RPE) adjustments beyond CPIH as, in principle, the indexation of revenues to RPEs limits GDNs' exposure to exogenous input price fluctuations and mitigates the risk of windfall gains and losses. However, changes to the RIIO-GD2 methodology are required to provide protection for both companies and customers.

Our concerns with Ofgem's RPE analyses primarily relate to the choice of index for each input, and the 'notional structure' used to calculate a GD-specific RPE index. In particular, the price indices used to construct the RPEs have not accurately reflected the prices facing GDNs in recent years (e.g. the wage indices used to construct the labour RPE may not reflect the wage pressures facing GDNs).

During RIIO-GD2, all networks have seen relatively large swings in real term allowances year to year due to RPE and inflation volatility from the geopolitical energy shocks in 2022 and 2023. RIIO-GD3 presents an opportunity to refine the basket of reference indices to better capture GDNs actual input price movements and better mitigate this risk.

The gas networks therefore commissioned an independent report from KPMG (RPE Framework at RIIO-3 – KPMG) to look at the RPE methodology, with the work concluding in May 2024 ("the RPE report" going forward). The KPMG report reviews the performance of RPEs in RIIO-GD2 and identifies methodological changes that would improve the robustness of the approach and lead to better risk-sharing between GDNs and customers. This work supports NGN's view that while core elements of the RIIO-GD2 RPE methodology should be maintained into RIIO-GD3, some changes are needed to make incremental improvements.

The following sections outline the proposed approach for RIIO-GD3 RPEs based on the KPMG report. The full and detailed evidence base to support the proposed changes can be found in the KPMG report appended to this submission. Table 55 provides an overview of the observations on RIIO-GD2 RPE approach and recommendations on a RIIO-GD3 revised RPE approach, which are further explained in the remainder of the section.

Element of RPE framework	Performance of RIIO-GD2 approach	Recommendations on a revised approach in RIIO-GD3
Input category selection	• The use of materiality thresholds in RIIO-GD2 has been perceived to be arbitrary and subjective. ▪ Some input categories that did not meet the materiality threshold later exhibited a large RPE wedge, exposing networks to cashflow risk.	▪ Consider applying RPEs to any input categories where (a) a price index can be identified or (b) a large or volatile wedge is expected.
Index selection	▪ The longlist was narrow and may not have considered potentially relevant indices. ▪ While labour indices tracked companies' costs at the aggregate level, this accuracy varied across networks. ▪ Lagged material indices had greater explanatory power than same-year indices for some material costs. ▪ The RIIO-GD2 indices varied in their volatility and responsiveness to economic shocks.	▪ Consider a broad range of indices for inclusion in the longlist. ▪ Consider lagged indices as part of the index accuracy assessment to test whether they hold greater explanatory power. ▪ Consider whether volatility should play a role in the selection of price indices.
Weighting	▪ Approach to index triangulation and weighting may not have reflected indices' relative importance.	▪ Seek greater alignment between the RPE framework and other Ofgem frameworks and building blocks of the

	▪ This may imply that, where evidence is supportive, alternative weights should be adopted. ▪ The approach to weighting input categories is also inconsistent with the regional approach used for cost benchmarking.	price review. ▪ Reconsider the equal weighting of indices within input categories. ▪ Consider establishing input category weights by using (a) actual costs for all networks; or (b) region-specific notional costs for GDNs (NGN do not support this, see section 7.3.3).
Index forecast assumptions	▪ There has been an observed wedge between forecast and outturn RPEs. ▪ Ofgem's assumption that material prices would revert immediately to LTAG following an inflationary spike has been challenged in the outturn data. ▪ Macroeconomic modelling of wages suggests that OBR forecasts, used by Ofgem to forecast labour indices, may under-predict wage growth in RIIO-GD3.	▪ The RPE true-ups approach introduced in RIIO-GD2 and T2 should be continued. ▪ Consider embedding an assumption of stickiness following periods of high inflation when producing updated forecasts during the AIP. ▪ Consider using macroeconomic forecast scenarios for price indices to inform ex-ante forecasts and the production of region-specific index price forecasts (NGN do not support this, see section 7.3.3). ▪ Where available, consider further use of third-party forecasts (e.g. BCIS).

Table 55 Assessment of RIIO-GD2 RPE approach and recommendations for RIIO-GD3 (Source: KPMG)

7.3. Methodology changes for RIIO-GD3

In this section we cover the following proposals, detailed by KPMG:

- Input category selection: moving away from the materiality threshold approach (Section 7.3.1);
- Index selection: the use of time lags and volatility considerations (Section 7.3.2)
- Weighting: seeking greater consistency with other building blocks of the price review (Section 7.3.3)
- Index forecast assumptions: true-ups, inflation stickiness and macroeconomic and third-party forecasts (Section 7.3.4)

7.3.1. Input category selection: moving away from the materiality threshold approach

In the RIIO-GD2 framework, only costs that met a materiality threshold were assigned an RPE allowance. Materiality thresholds were introduced to ensure that the RPE framework only focused on the largest areas of spend to balance the effort required to develop the RPE framework and sufficient coverage of network costs to allow adequate recovery of efficient costs. The materiality threshold consisted of:

- the cost represented at least 10% of Totex; or
- the cost represented at least 5% of Totex and the expected real price movements in the category represented at least 0.5% of Totex.

Based on these criteria, Ofgem determined that the following cost categories should have RPE adjustments in RIIO-GD2:

- Labour (general and specialist) for all distribution and transmission companies.
- Materials for all distribution and transmission companies.
- Plant and equipment for Scottish Hydro Electric Transmission (SHET) only.

At RIIO-GD3, Ofgem should move away from a materiality threshold approach and instead apply RPEs to any input categories where (a) a price index can be identified or (b) a large or volatile wedge is expected. The reasons why Ofgem should reexamine its materiality thresholds for selecting input categories are explained below:

The use of materiality thresholds has been perceived to be arbitrary and potentially subjective in terms of cost categorisation and risk allocation.

Other sectors and jurisdictions in the UK have avoided using materiality thresholds for this reason. Ofwat moved away from the materiality threshold initially proposed for PR19 due to the concerns expressed by companies that the thresholds are arbitrary and open to subjectivity. The Utility Regulator (UR) in Northern Ireland has not employed any materiality criterion in any determination since GD14.

Some input categories that did not meet the materiality threshold at RIIO-GD2 later exhibited a large RPE wedge.

For example, transport and plant costs did not meet the materiality threshold in RIIO-GD2 and T2. However, Figure 27 shows that machinery and equipment price indices exhibited significant growth above CPIH over the initial years of RIIO-GD2, as did transport costs. Aggregate GDN transport costs grew by 19.9% per annum on average in the first two years of RIIO-GD2. This compares to an average CPIH growth of 5.2% per annum during this period.

Failing to account for RPEs for input categories which do not meet a materiality test risk adversely affecting company cashflows. If the allowance is not adequate to cover the efficient costs faced by the company, then the fact that the unfunded cost is small relative to Totex is arguably more one of categorisation than of principle. If the wedge between expected costs within the category is higher or lower than that of general price inflation, it may result in customers paying either more or less than efficient prices for the services they receive.

Applying RPEs to any input categories where (a) a price index can be identified or (b) a large or volatile wedge is expected, will mitigate the risk that input categories are not selected but later exhibit a large RPE wedge.

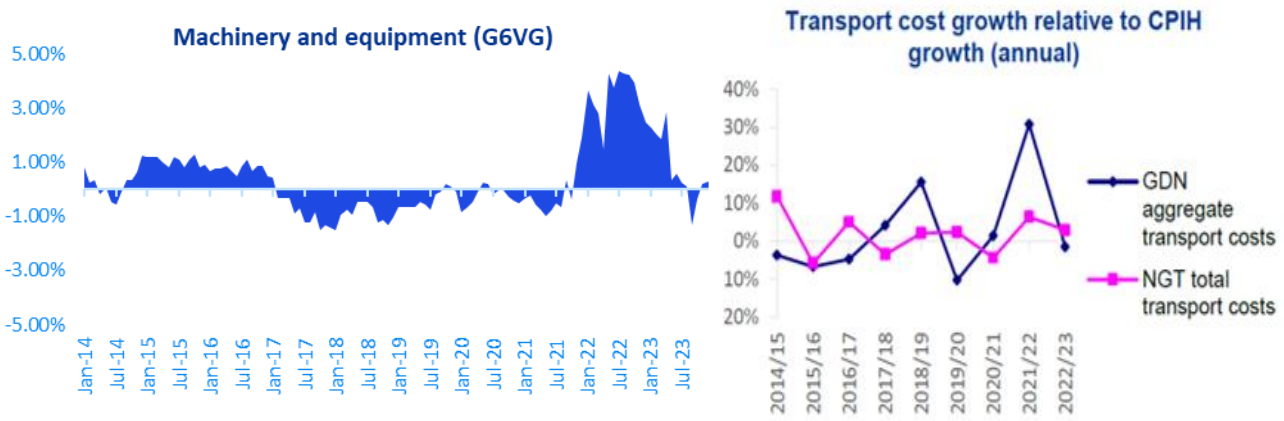

Figure 27 Input price wedges for transport and equipment (Source: KPMG analysis. Index G6VG taken from ONS (Jan 2014 – Dec 2023). Cost data provided by networks.)

7.3.2. Index selection: the use of time lags and volatility considerations

For each input category that receives an RPE allowance, the RIIO-GD2 framework assigns relevant input price indices to that category. The RPE allowance is then calculated based on the expected wedge between input price index inflation and consumer price inflation.

In RIIO-GD2, the index longlist drew initially on those considered in RIIO-GD1 and later included those that were proposed by networks during the Draft Determination (DD) consultation responses. A structured process was used to select indices from the longlist. This included an initial threshold assessment of candidate indices followed by a more detailed assessment of indices that met the threshold criteria.

However, a review of regulatory precedent considered across sectors in GB and Northern Ireland indicates that indices considered relevant by Ofwat, and the UR were omitted by Ofgem during the RIIO-GD2 Gas Distribution index compilation process (see section 3.2.1 of the KPMG report).

As such, for RIIO-GD3 we suggest considering a broad range of indices for inclusion in the longlist to improve the likelihood of selecting indices that track network-specific costs, including lagged indices which KPMG finds may hold greater explanatory power. We also suggest, in line with KPMG's recommendation, to include volatility considerations in the selection of price indices. KPMG's assessment of the approach of RIIO-GD2 indices and suggestions for RIIO-GD3 approach is explained below:

The RIIO-GD2 longlist was too narrow and may not have considered potentially relevant indices.
Assessing a broad range of indices from different sectors and jurisdictions in the longlist could increase the likelihood of selecting indices that best track network-specific costs. This should look beyond the RIIO-GD1 precedent and network suggestions and look at other sectors and jurisdictions in the UK. The KPMG report provides a longlist of indices from regulatory decision documents, business plans, and consultation reports relating to RIIO-GD1 and RIIO-GD2 for Ofgem, in addition to those used by Ofwat and the UR (see appendix A4 of the KPMG report).

Labour indices tracked companies' costs at the aggregate level, but this accuracy varied across networks.
At the aggregate level, the composite index has a higher degree of correlation with GDN and National Gas Transmission (NGT) costs than CPIH (R2 of 0.917 versus 0.896 for GDNs and 0.985 versus 0.952 for NGT) (see left-hand side of Figure 28). At the network level, for GDNs the composite index is inversely correlated with the costs for East of England (EoE) and London at Cadent.

Lagged material indices had greater explanatory power than same-year indices for some material costs.
Material Opex at the aggregate level is more strongly correlated with lagged RIIO-GD2 indices than equivalent-year indices for GDNs (R2 of 0.920 versus 0.550) (see right-hand side of Figure 28).

This covariance with lagged prices can be explained through the lag between when prices are set and when costs are ultimately later incurred. For example, internationally there has been an observed lag between the increase in input prices and the increase in construction output (the price charged by firms for completed projects), due to the lag in passing costs on.

The consideration of lagged indices for RPEs has precedent with the Australian Energy Regulatory (AER).

The RIIO-GD2 indices varied in their volatility and responsiveness to economic shocks.
The construction wage index showed high negative growth in 2020 (see left hand side of Figure 29). The other two labour indices have been relatively stable. Similarly, the structural steelworks index has shown significantly more volatility in the past few years compared to FOCOS materials and plastics indices.

Volatility has the potential to improve the allocation of risk, since volatility may imply the index is responsive to economic developments and will accurately track input cost development. However, index volatility may also undermine the credibility of estimates and introduce uncertainty.

The approach adopted by Ofwat in PR19 to include a high-level "quality of data" requirement in the index selection criteria could be used as a compromise between these two trade-offs. The "quality of data" requirement stipulated that any movements in the index should represent genuine movements in underlying wages and not just random variation due to a small sample.

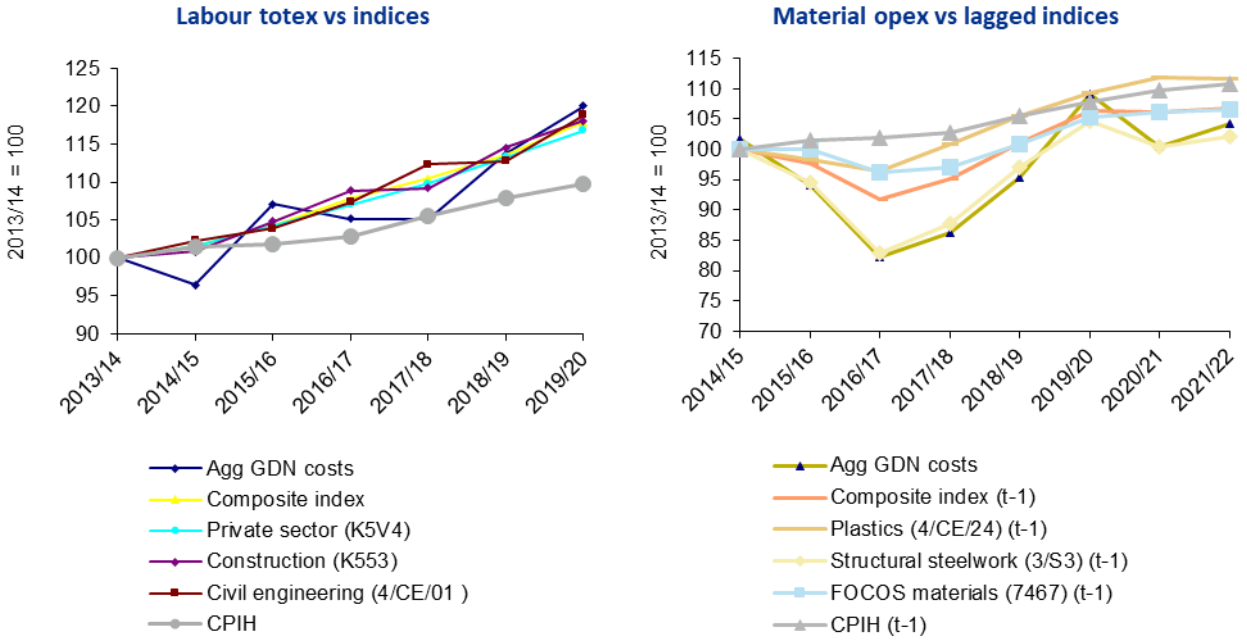

Figure 28 Network costs versus indices at GDNs in RIIO-GD1 and RIIO-GD2 (Source: KPMG analysis of ONS and BCIS indices and cost data provided by networks)

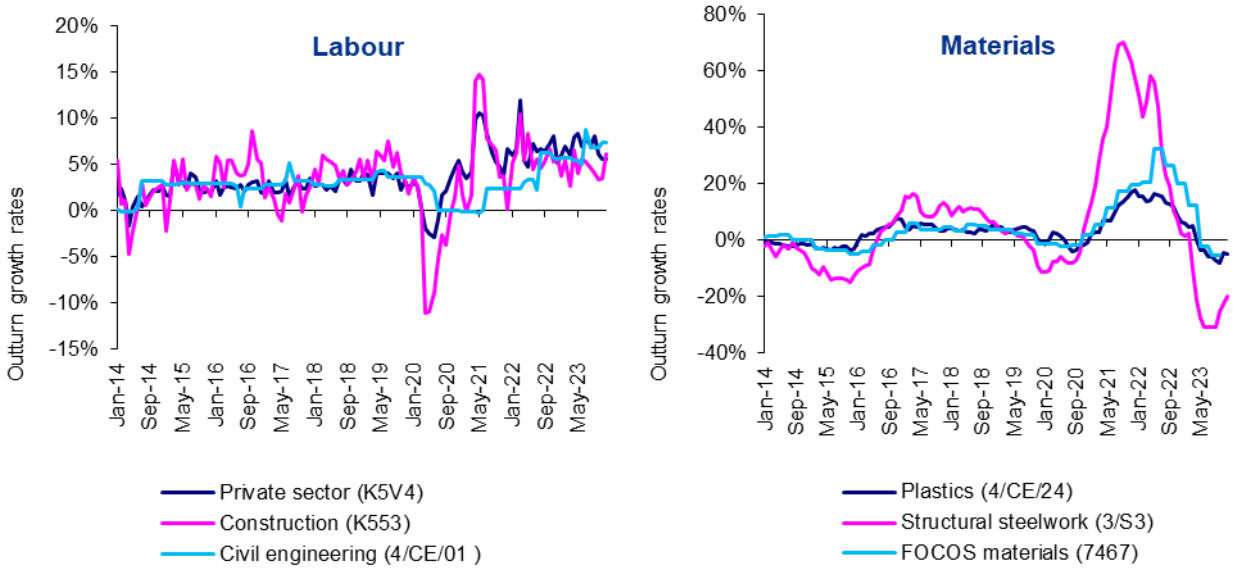

Figure 29 Annual growth in outturn input price indices per cost category (Source: KPMG analysis)

7.3.3. Weighting: seeking greater consistency with other building blocks of the price review

In RIIO-GD2, Ofgem weighted input categories based on a notional cost structure for GDNs and based on actual costs for NGT. Indices were weighted equally within each input category. For example, the labour costs RPE was an unweighted average of labour price indices. To calculate the Totex-level RPE, a weighted average of the cost-level RPEs was calculated based on the cost structure.

KPMG's assessment of RIIO-GD2 approach to index triangulation and weighting indicates that the equal weighting approach may not reflect indices' relative importance. The approach is also inconsistent with the regional approach used for cost benchmarking. As such, for RIIO-GD3 we suggest Ofgem should do the following.

Reconsider the equal weighting of indices within input categories.

The RIIO-GD2 approach may not reflect the relative importance of different indices. The approach adopted at RIIO-GD2 was designed to ensure that the overall index is not dependent on a single sub-index which could be affected by a shock.

However, this may not be representative of the relative importance of the activities being considered. For example, technically skilled labour may merit greater weight than non-skilled labour. As another example, the price of steel has been a large driver of the RPE for materials, whereas this is a relatively small component of material costs for many networks.

The weighting of indices within input categories could be based on the historical weight of the underlying activity in the input category or consideration of the importance of the underlying activity in RIIO-GD3.

Seek greater alignment between the RPE framework and other Ofgem frameworks and building blocks of the price review.

At RIIO-GD2, the input categories were weighted using an industry-wide notional cost structure for GDNs and using company-specific weights for NGT.

This approach contrasts with the regional differentiation adopted by Ofgem in cost benchmarking, in which Ofgem applies regional pre-modelling adjustments for wage differences in its econometric cost models. In practice, KPMG suggested that Ofgem should consider establishing input category weights by using either:

a. Actual costs for all networks. This approach aims to capture company-specific characteristics that are outside management control and affect networks' cost structures. There is variation in the cost structures across GDNs over RIIO-GD1 and RIIO-GD2, implying some GDNs have been more exposed to price risk than others. For Opex, there is particular variation in material costs across GDNs, which could reflect the different investment challenges facing each GDN. There is also variation in the labour share in the cost structure, which in part reflects regional variation in wages.

b. Region-specific notional costs for GDNs. This approach aims to capture regional differences which result in varying input price pressures for GDNs. Wages are affected by regional factors that create different price risks across GDNs based on their region. These factors include: (1) unequal demographics across regions; (2) difference in skills shortages across regions; and (3) difference in competition from other infrastructure sectors across regions. This implies that regions have their own wage indices and, consequently. Figure 32 shows that the scale of these differences as overall measured Ongoing Efficiency (OE).

NGN do not support option b. There are methodological difficulties, such as the availability, robustness and sensitivity of regional indices. It is also likely the approach would increase the volatility of RPE adjustments for networks. NGN consider that this would conflate and potentially double count the regional adjustments built into other parts of the cost benchmarking and allowance setting process. RPEs adjustments should be kept uniform across sectors at a national level to minimise volatility for customers and networks and ensure that the overall allowance setting process if fair and robust.

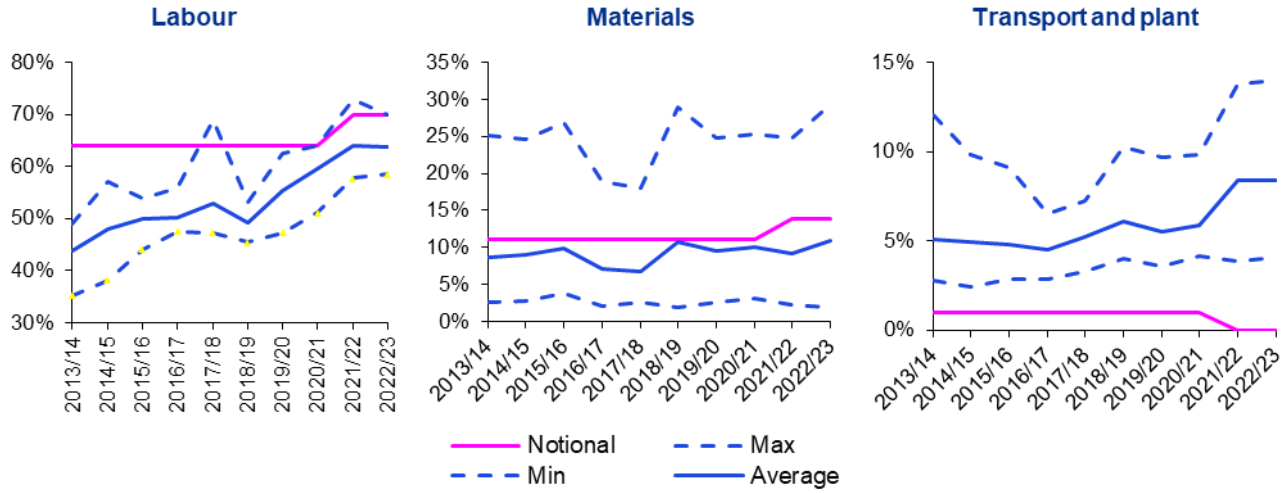

Figure 30 Regional variation in outturn share of input categories in outturn Opex vs notional Totex in GD1&2 (Source: KPMG analysis) (Note: Outturn values are the share of Opex. Notional values are the share of Totex)

7.3.4. Index forecast assumptions: true-ups, inflation stickiness and macroeconomic and third-party forecasts

In RIIO-GD2 ex-ante forecasts for labour indices were based on OBR forecasts, while for material indices they were based the extrapolation of historical long-term average growth (LTAG). Ofgem introduced true-ups that allow companies to revise RPE allowances during the Annual Iteration Process (AIP), in addition to an end-of-period true up. The AIP allows forecasts to be updated with outturn values and, in the case of labour indices, with revised OBR forecasts. Material price index growth was assumed to revert immediately to LTAG following inflationary spikes.

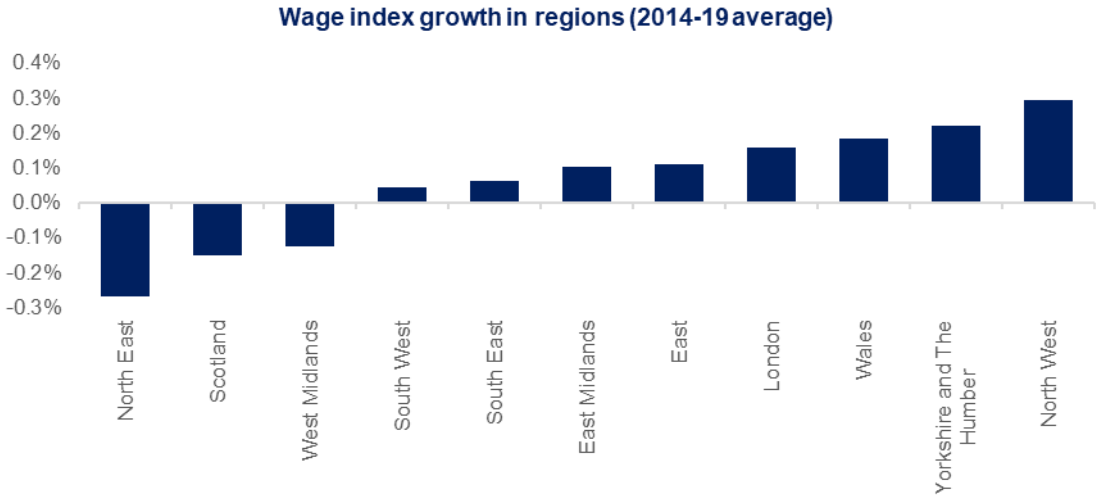

Figure 31 Regional variation in labour price growth (Source: KPMG analysis of ONS ASHE data on hourly pay (gross))

KPMG's assessment of the RIIO-GD2 approach to index forecast assumptions indicates that there has been an observed wedge between forecast and outturn RPEs. Outturn data also shows there is prolonged volatility in material price indices, which do not immediately revert to LTAG. And macroeconomic modelling of wages suggests that OBR forecasts may under-predict wage growth in RIIO-GD3. As such, for RIIO-GD3 KPMG suggest the following approach:

The RPE true-ups approach introduced in RIIO-GD2 should be continued.

There has been an observed wedge between forecast and outturn RPEs. This is especially significant for the price of materials. The true-ups mechanism has provided a means to address the difference between RPE ex-ante forecasts and

outturn values. This approach has allowed sharing inflation risk with customers, effectively de-risking the GDNs but also customers in terms of any mis-forecasting.

Consider embedding an assumption of stickiness following periods of high inflation when producing updated forecasts during the AIP.

Ofgem's assumption that material prices would revert immediately to LTAG following an inflationary spike has been challenged in the outturn data, where price growth rates for materials have deviated from LTAG for extended periods (see Figure 32).

Despite the fact that companies are protected from mis-forecasting through an end-of-period true-up, there is a risk of significant variation in cashflows as a result of the material price forecasts being based on historical LTAG. The index growth assumptions in RIIO-GD2 may therefore require revisiting to align with what was observed in the more recent dataset.

The exact mechanics of the stickiness would need to be based on analysis of the stickiness observed in the high-inflationary period observed in RIIO-GD2. This should be assessed once inflation has fully returned to its 2% target and there is sufficient data.

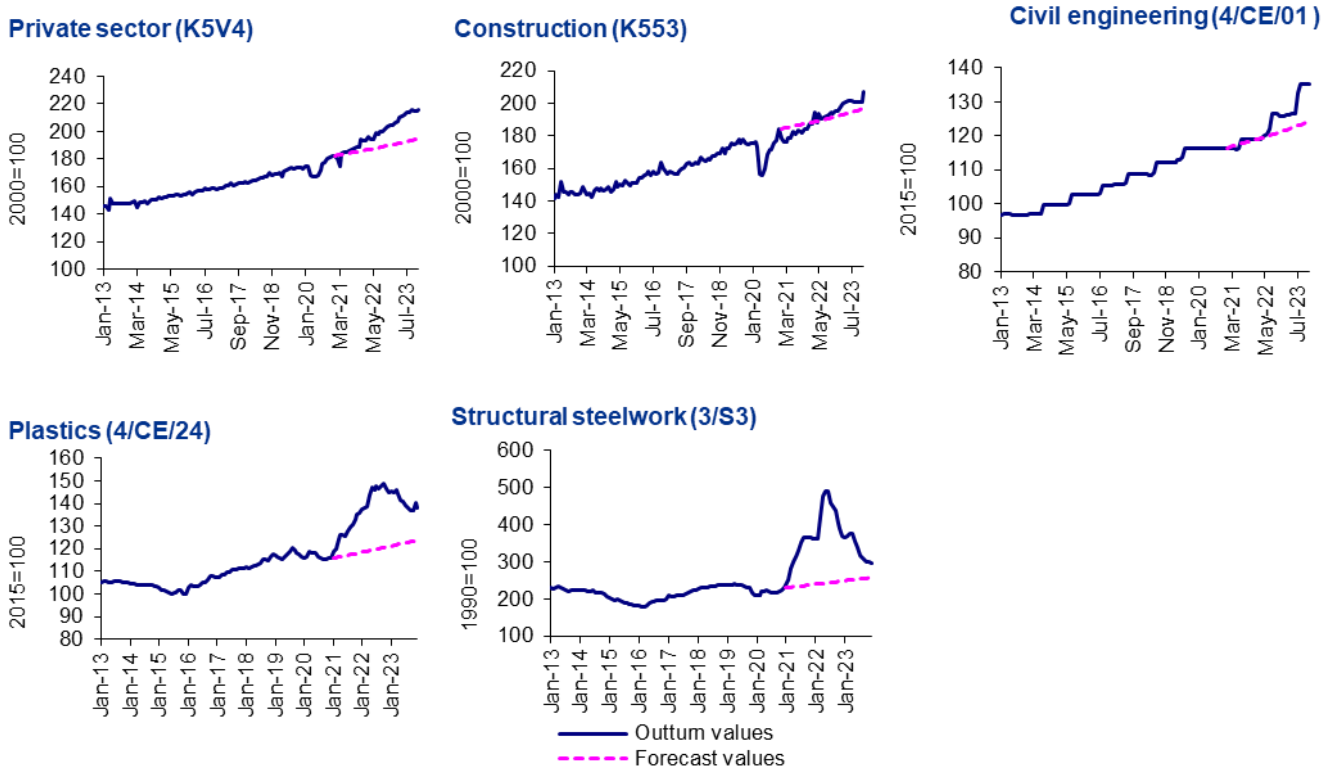

Figure 32 Forecast vs outturn labour & materials price indices in RIIO-GD1&2 (Source: KPMG analysis) (Note: The recent uptick in inflation has exceeded that observed in the 20-year period that was previously analysed, and the consequent volatility in index price growth rates for materials has not dropped out of the data set the following year)

Where available, consider further use of third-party forecasts.

For example, the index forecasts produced by Building Cost Information Service (BCIS) offers a potential route for third-party forecasts that is consistent with the methodology used for creating the indices.

However, third-party forecasts beyond this are limited in availability.

Consider the use of region-specific index price forecasts to address observed regional variation in price risk.

NGN do not support this. There are methodological difficulties, such as the availability, robustness and sensitivity of regional indices. It is also likely the approach would increase the volatility of RPE adjustments for networks. NGN consider

that this would conflate and potentially double count the regional adjustments built into other parts of the cost benchmarking and allowance setting process. RPEs adjustments should be kept uniform across sectors at a national level to minimise volatility for customers and networks and ensure that the overall allowance setting process if fair and robust.

7.4. KPMG's proposed indices for consideration at RIIO-GD3

For illustrative purposes, the RPE report selected an indicative set of input categories and associated indices in line with the recommendations for the RIIO-GD3 RPE framework outlined above. The identified set of indices is indicative and requires further consideration. This report has also not considered specific weighting. The included recommendations in this assessment are:

- **Identification of input categories**. The input categories are assessed based on the expected size of their price wedge. All three input categories (a) labour; (b) materials and (c) transport and plant are identified to require RPE allowances according to the specified criteria. To inform this assessment, the historical wedges for indices relevant to each input category are observed (see Annex A5 of the RPE report) as well as the correlation between input costs and CPIH (see Annex A7 of the RPE report). In addition, t-tests are used to confirm the significance of the size and volatility of the wedge across multiple time horizons (see Annex A7 of the RPE report).
- **Creation of an index longlist**. Index price longlists are created for three input categories. The index longlists are created through a detailed review of regulatory documentation, business plans and consultation reports associated with recent price controls conducted by Ofgem, Ofwat and the UR (see Annex A4 of the RPE report).
- **Creation of an index shortlist.** An indicative assessment of the longlist of price indices is performed using the threshold criteria of independence and accuracy (see Annex A9 of the RPE report). The accuracy assessment is undertaken based on an observation of the correlation of average historical company costs with index values CPIH (see Annex A7 of the RPE report). The independence assessment is based on whether the index has a low or no chance of being manipulated by actions of companies in the sector.
- This threshold assessment results in a shortlist indices that correlate well with GDN costs. This shortlist includes 6 labour indices, 10 material indices, and 4 indices related to transport and plant inputs (see Table 56). For the material indices, the accuracy assessment indicates that lagged indices track network costs better than various same-year indices. The listed indices represent indicative indices of interest in RIIO-GD3. In addition, Ofgem may in practice consider further indices. Forecasts of these indices are presented in Annex A8 of the RPE report.

Labour indices
ONS AWE: Private Sector Index: Seasonally Adjusted Total Pay Excluding Arrears (K5V4)
ONS AWE: Construction Index: Seasonally Adjusted Total Pay Excluding Arrears (K553)
BCIS PAFI civil engineering (4/CE/01)
ONS ASHE Median Hourly Earnings for All Employees (Median)
BCIS **Labour Cost Index (1161)**
ONS "Manufacturing" wage index
Materials indices
BCIS Plastic Products (including pipes) (4/CE/24)
BCIS FOCOS Resource Cost Index of Infrastructure: Materials (7467)
ONS's Producer input prices index
BCIS Resource Cost Index of Building Non-housing materials (NOCOS) (7405)
BCIS Metal Structures (4/CE/26)
BCIS Aluminium Products (4/CE/25)
BCIS Timber (90/12)
ONS Interim Construction Output Price Indices
BCIS PAFI Pipes and Accessories: Copper (3/58)

Transport and equipment indices
BCIS Plant and Road Vehicles: Providing and Maintaining **(1702 (70/2))**
ONS Machinery & Equipment n.e.c. for domestic market (G6V6)
BCIS PAFI plant and road vehicles (90/2)
BCIS Purchased Plant Including depreciation and maintenance (4/CE/04)

Table 56 List of potential indices for RIIO-GD3 RPE assessment

7.5. RPEs presented in the business plan data tables (BPDTs)

In our Business Plan we put forward a simplified version of the approach outlined in the sections above. In particular:

1. We considered the list of indices set out in Table 56. This list goes beyond the list of indices considered by Ofgem in RIIO-GD2 and does not apply a materiality threshold, in line with the recommendation set out in section 7.3.1.
2. We suggested provisional ex-ante forecasts based on the long-term average growth (LTAG) rates, in line with Ofgem´s approach for materials indices in RIIO-GD2. We considered using the OBR wage average earnings forecast to calculate the forecast of labour indices, however these were only available for the first two years of RIIO-GD3.[5]
3. We weighted equally all indices within each input category, in line with Ofgem´s RIIO-GD2 approach. However, we are of the view that further consideration should be given to weighting of indices, in line with the recommendation set out in section 7.3.3, to consider alternative weights that may better reflect the costs faced by GDNs.
4. We suggested input category weights based on NGNs input costs.

Table 57 below presents the RPEs we have proposed in the BPDTs.

		RIIO-GD3				
		2026/27	2027/28	2028/29	2029/30	2030/31
Direct Opex	RPE Growth Index	1.012	1.010	1.010	1.010	1.010
Indirect Opex	RPE Growth Index	1.015	1.013	1.013	1.013	1.013
Load Related Capex	RPE Growth Index	1.010	1.009	1.008	1.008	1.008
Non-Load Related Capex	RPE Growth Index	1.010	1.009	1.008	1.008	1.008
Repex Mains	RPE Growth Index	1.012	1.010	1.010	1.009	1.009
Repex Services	RPE Growth Index	1.013	1.011	1.010	1.010	1.010

Table 57 RPE indices

8 Ongoing efficiency

Ongoing Efficiency (OE) is the productivity improvement that even the most efficient company should be able to achieve. The OE challenge is a key building block under Ofgem's RIIO framework for setting cost allowances for gas network companies. A higher the OE challenge means companies are given a tougher target to deliver cost savings across the price control. The OE challenge determined by Ofgem should be grounded in evidence of what is likely to be achievable for all network companies, including the frontier performer. (We note that additional efficiency challenges are required for laggard companies via Ofgem's 'catch-up' efficiency challenge, established separately via Ofgem's benchmarking analysis).

Table 58 shows where, in this section, we have addressed each element of Ofgem's Business Plan Guidance requirements.

[5] OBR. Average Earnings Growth. May 2024.

Ofgem Business Plan Guidance (paragraph 6.14)	Reference
The ongoing efficiency assumptions submitted for each expenditure category, along with evidence of how these assumptions have been derived. This could include:	Sections 8.1-8.5 , A15 BPDTs & A16 BDPTs Commentary (S1.02 RPE & OE)
any proposed comparator industries for the purpose of cost assessment, along with a justification for those proposed;	As above
an explanation of how any historical data has been used to derive efficiency forecasts, including a justification for the time period selected and how forecasts capture enduring effects from efficiencies generated in previous price controls;	As above
a comparison of efficiency forecasts against efficiency gains realised in previous periods;	As above
interactions with innovation stimulus funding and deployed innovation projects (past and future);	As above
interactions with proposed Capex and any benefits to reducing Opex (e.g. through automation or standardisation); and	As above
interactions between ongoing efficiency forecasts and output quality.	As above

Table 58 addressing Ofgem's Business Plan Guidance

8.1. Ongoing efficiency target suggested by NGN

In the UK gas distribution sector, NGN has consistently been benchmarked as the most efficient frontier company throughout RIIO-GD1 and RIIO-GD2; and we expect that to continue in RIIO-GD3 based on available information and analysis of the latest GDN cost data. Therefore, NGN is uniquely positioned to provide insight into the achievable frontier shift for the sector. This section provides NGN's views on the ongoing efficiency that can be delivered by the sector in RIIO-GD3.

The gas grids have commissioned Economic Insight (EI) to provide an independent estimate of an appropriate OE challenge for RIIO-GD3 (Ongoing Efficiency for Gas Networks at RIIO-3 Report - Economic Insight, the "OE / EI report"). The EI supplementary report (Further evidence for Gas Networks on Ongoing Efficiency at RIIO-3 - Economic Insight) presents further and updated evidence on the relevance of the wider UK productivity slowdown to the setting of OE at RIIO-GD3.

EI have used established approaches applied to a wide range of available data from relevant benchmarks and comparators to inform their proposed OE range. EI have also undertaken a comprehensive survey of academic literature and available evidence from independent sources.

Based on this comprehensive review of the latest available evidence, the OE report concludes that the OE target at RIIO-GD3 for gas networks should lie in the range of 0.2% to 0.8%. The mid-point is 0.5%.

One of the critical issues which Ofgem needs to address for RIIO-GD3 is how to account for the sustained reduction in productivity growth in the UK over the 15 years since the 2008 Great Financial Crisis. Energy networks are not insulated from this and there is no evidence to suggest an imminent uptick in economy-wide productivity is likely over RIIO-GD3. In our view, evidence from EU KLEMS benchmarks pre-GFC is now largely outdated and should be weighted less prominently than Ofgem did in RIIO-GD2, in recognition that the balance of evidence indicates a structural shift has occurred. In addition, the historical investments which NGN has made to achieve our efficiency gains to-date are difficult to replicate.

Overall, we therefore consider that an OE Target of 0.5% year-on-year strikes the right balance. This target is derived directly from the balance of evidence and reflects a target that is ambitious and stretching for the frontier company but also achievable. This target should be applied to Totex allowances, with no differentiation for Capex and Opex being necessary.

In the remaining sections we provide more detail of the following:

- Key context for RIIO-GD3 (Section 8.2);
- Updated methodology proposed to calculate OE (Section 8.3)
- Underlying benchmark estimates (Section 8.4)
- Importance of the 'UK productivity puzzle' (Section 8.5).

8.2. Key context for RIIO-GD3

8.2.1. Low productivity growth in the UK

According to evidence from empirical assessments, outlined in the OE report, the UK's historical productivity rate since 2008 has been falling steadily (year-on-year) to near zero (see Figure 33). The productivity slowdown is widespread across industries. In setting the OE challenge at past price controls, regulators have not properly accounted for this significant slowdown, creating a divergence between their target OE rate and the productivity improvements that can be achieved in the real economy. Regulatory decisions are increasingly drifting away from the actual evidence.

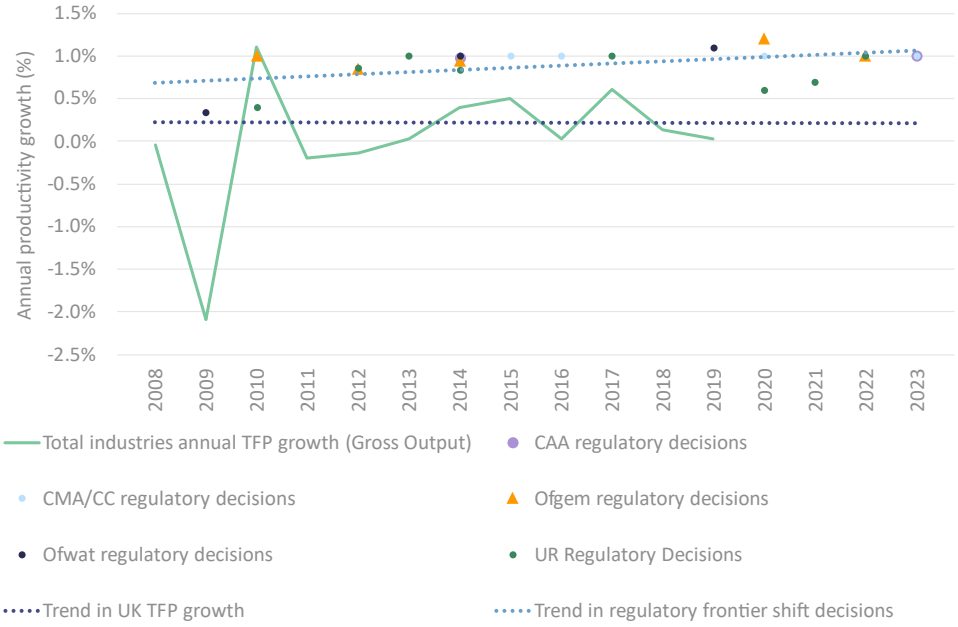

Figure 33 Stagnant UK productivity and increasing regulatory OE decisions, post-2008 (Source: Economic Insight analysis of EU KLEMS data and regulator decisions)

A survey of academic evidence[6] shows most experts expect UK productivity growth to be 0.5% pa or below over the next five years. Academics also do not expect the energy industry to outperform the UK, with regards to productivity growth.

Moreover, Economic Insight also find that simply updating CEPA's methodology from RIIO-GD2 – but using the most recent EU KLEMS data and time periods – implies starkly different OE estimates for RIIO-GD3. This exercise implies an OE target of between -1.1% and 0.5%; a dramatic change from CEPA's RIIO-GD2 recommended range of 0.2% to 1.0%.

Figure 34 shows that the TFP growth of gas networks has reflected the structural break in productivity growth exhibited by the wider UK economy. We also observe that the average TFP growth achieved by the gas networks has been significantly below the OE targets set at recent (post-crisis) price controls.

[6] 'The UK productivity puzzle: A survey of the literature and expert views.' Williams, S.; Glass, A.; Matos, M.; Elder, T.; and Arnett, D. (January 2024).

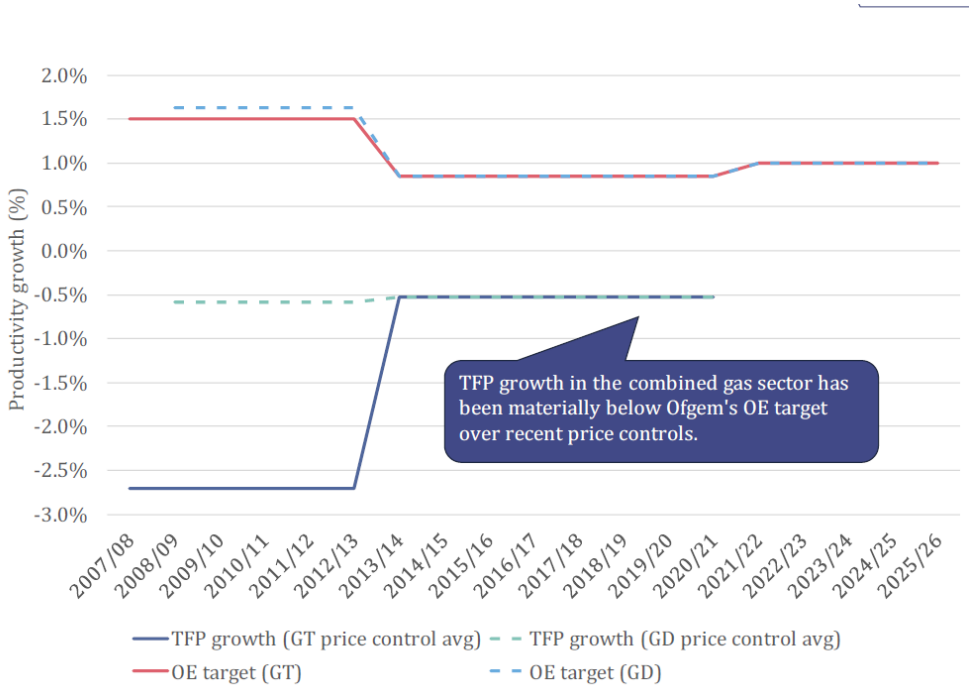

Figure 34 Gas sector TFP growth (%) is materially lower than recent OE targets (Source: Economic Insight analysis of Productivity Institute (2022) data)

Section 8.5 expands further on the productivity puzzle experienced in the UK and the reasons why it is applicable to regulated companies.

8.2.2. Historic investments to achieve efficiency

While historic investments have enabled NGN to extend and maintain its frontier position for both delivery and efficiency, they are not replicable in the future. The key drivers of our leading efficiency position are explained in [Chapter 1 of the Main Business Plan]; and evidence of our industry-leading efficiency to-date is set out in Section 2 above in this appendix. Savings from these stretching innovations are already baked into our RIIO-GD3 baselines – meaning our customers will continue to benefit on an enduring basis.

These savings also benefit customers across the country, driving improvements across the sector as other GDNs are targeted to 'catch-up' to NGN's leading performance via Ofgem's benchmarking model. The key point is, these savings were not easy to come by. NGN took the initiative to grapple with fundamental, structural challenges to deliver these benefits – at significant cost and risk to our shareholders. Now that these benefits have been achieved, they are not readily available to be replicated again. Future advances are of course possible but imply even greater cost/risk to NGN to achieve them and are likely to be less material than those achieved in RIIO-GD1 and RIIO-GD2.

The savings we have driven via these initiatives cannot be further replicated in future. As the frontier company, marginal gains are more difficult for NGN to achieve. Further frontier efficiency improvements are more difficult to make, require risky innovation, and tend to be less impactful as less 'low hanging fruit' is available. This should be considered by Ofgem when setting the OE challenge in the GD sector.

In our view, our sector-leading performance should be considered by Ofgem when setting the OE challenge in the GD sector. We think our performance represents strong grounds for a differential OE challenge to be considered for the frontier company, as part of the overall incentive package to recognise the value the frontier performance drives for all customers.

8.3. Updated methodology proposed to calculate OE

EI recommend the approach for estimating OE at RIIO-GD3 be guided by the following principles:

- The benchmarking approach should be transparent and robust.
- The relevance of UK productivity performance to gas networks should be considered.
- Post-estimation adjustments to the range derived from benchmarking should be avoided.
- Point estimates from any benchmarked range should generally be taken from values 'towards the middle' of that range. This reflects the inherent uncertainty as to the 'true' value of OE, where it cannot be observed.

Estimates of OE for regulated industries are typically derived from productivity growth data, using a benchmarking approach. At a high level, this involves making decisions regarding the (i) productivity measures, (ii) choice of comparators, and (iii) choice of time periods. The remainder of this section further expands on these considerations.

8.3.1. Productivity measures

Total factor productivity (TFP)

OE estimates should be based on TFP, rather than some combination of TFP and partial factor metrics, such as labour productivity for Opex. TFP uses all measurable factors of production that it is possible to include. It is therefore more reflective of the costs of gas networks and not just labour. A 'mixing and matching' of TFP and partial factor metrics ignores the fact that the comparator industries used in any benchmarking are themselves free to substitute between labour and capital and should, therefore, be using the optimal mix of these inputs to maximise their TFP.

However, it is important to note that TFP may include or exclude aspects of productivity other than OE. In particular, TFP captures efficiency savings arising from sources such as catch-up efficiency and economies of scale.

Gross Output (GO)

OE estimates should be based on the GO measure of productivity, because it more accurately measures changes in productivity over time and across industries than Value Added (VA). The differences between VA and GO occur due to the exclusion of intermediate inputs from the VA measure. Specifically:

- the academic literature establishes (and the OECD recommends) GO as a conceptually superior measure;
- GO accounts for intermediate inputs, which are a material proportion of costs for gas networks (c. 50% of controllable Opex); and
- at an individual industry level, GO is a better measure of productivity than VA (being less volatile, but also avoiding a potential upwards bias that arises for VA).

Figure 35 below illustrates the high volatility of VA relative to GO measure.

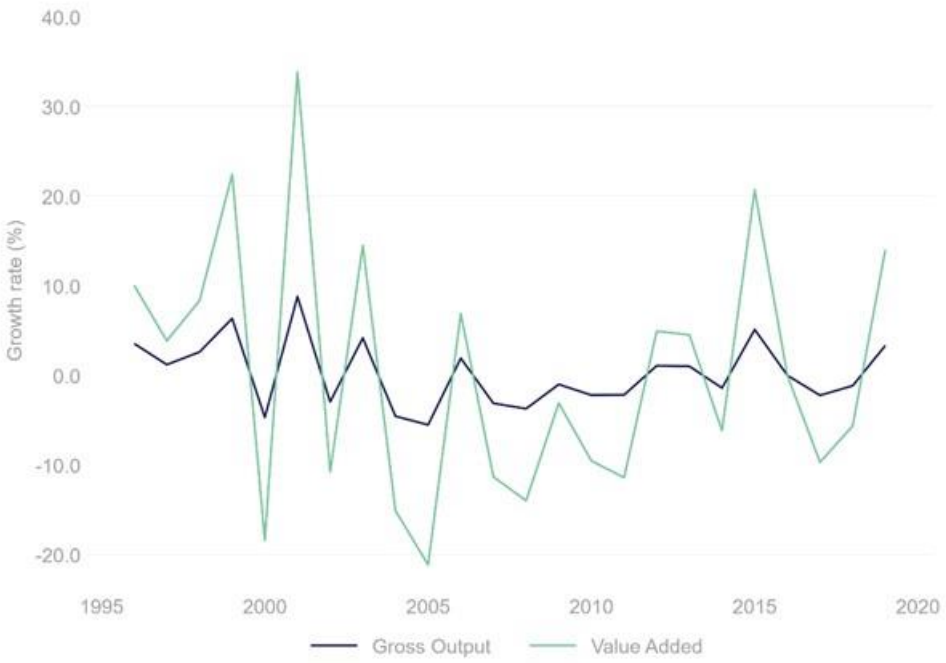

Figure 35 Volatility of VA relative to GO (Source: Economic Insight)

8.3.2. Choice of comparators

EI recommend that the selection of comparators should not be based solely on apparent similarity of activities. Rather, clear and transparent criteria should be used to identify comparator industries. EI have used the following criteria: (i) similarity of activities; (ii) extent of competition; (iii) similarity of scope to benefit from economies of scale. EI consider these to be non-contentious. We summarise the rationale each in turn below.

1. Similarity of activities.

When activities are similar between firms, one would expect productivity gains to be similar. This is because the comparators will likely use similar processes and technology to gas networks. Similar activities EI have considered include: (i) operation and maintenance of a complex network; and (ii) the construction of major infrastructure.

However, it is important not to place undue weight solely on the apparent similarity of activities because it may result in 'too few' comparators being included. This may make OE estimates inconsistent or arbitrary over time, due to the underlying data volatility.

2. Competitiveness of industry

If a firm, or firms, within an industry are not already operating at the efficiency frontier, TFP growth can be achieved via a firm 'catching-up' to the frontier. Catch-up efficiency will be present for all industries to some extent, as none are perfectly efficient. Using comparators that operate in competitive industries means that TFP growth is more likely to have been primarily driven by OE; and will be less driven by catch-up efficiency (which Ofgem implements elsewhere in the regulatory model). Applying this criteria therefore mitigates the risk of overstatement of OE or double-counting the 'catch-up' efficiency challenge.

3. Similarity of scope to benefit from economies of scale

TFP includes productivity gains achieved through economies of scale. It is therefore important that comparators have a similar scope for scale-related gains to the gas networks. Two criteria could be used to account for the extent of scale effects:

a. Fixed costs. We would expect there to be a high correlation between the extent of fixed costs in an industry and the extent of scale effects. Hence, having a similar proportion of fixed costs to the gas networks is an important consideration when selecting comparators.

b. Capital growth and output growth. Efficiencies arising from scale effects vary with growth rates. For example, for a given level of fixed cost, a faster-growing firm benefits more from economies of scale than a slower-growing firm. Hence, comparators that exhibit similar growth rates over time to the gas networks further allows us to ensure that scale-related gains are likely to be similar over the relevant time period.

Based on application of the above criteria (1 to 3), EI recommend a set of comparators from a longlist of industries previously used by Ofgem and CEPA at RIIO-GD2; and further industries that share similar characteristics to gas networks. The resulting short list, presented below, includes "Total industries" which captures productivity changes across the entire UK on average. This is included to broaden the pool and mitigate against risk of inherent subjectivity in comparator choices.

- Total industries (A-S);
- Manufacturing;
- Chemicals; basic pharmaceutical products;
- Manufacture of rubber and plastic products and other non-metallic mineral products;
- Computer, electronic, optical products; electrical equipment;
- Manufacture of machinery and equipment n.e.c.;
- Manufacture of motor vehicles, trailers, semi-trailers and other transport equipment;
- Manufacture of furniture; jewellery, musical instruments, toys; repair and installation of machinery and equipment;
- Construction;
- Wholesale and retail trade; repair of motor vehicles and motorcycles; and
- Transportation and storage.

8.3.3. Choice of time periods

Estimates of OE are sensitive to the time period over which they are assessed, and therefore the choice of time period needs careful consideration.

EI's view is that time period selection should be largely driven by internal consistency. EI also consider that it is preferable that the choice of time period allows for:

- Utilisation of as much data as possible, to reduce the chance that results arise out of a 'fluke' in the chosen years of data.
- Use of full business cycles, as productivity is generally higher in upswings in the business cycle.
- The structural break in UK productivity growth, which has flatlined since the financial crisis in 2008 and shows no sign of returning to pre-crisis levels in the near-term.

Based on the above considerations, EI suggest a range that contains two time periods:

- 2010-2019 (EU KLEMS NACE II). This provides what EI consider to be the plausible lower bound of productivity growth as they think it is unlikely that productivity growth will deteriorate further.
- Weighted average of: (i) 1995-2019 (EU KLEMS NACE II); and (ii) 1970-2007 (EU KLEMS NACE I). This provides a likely upper bound for OE as anything more than partial unwinding of the productivity puzzle over RIIO-GD3 is unlikely.

8.3.4. Post-benchmarking adjustments

EI notes that there are various reasons why one might consider making post-estimation adjustments to a benchmarked OE estimate (e.g. that TFP includes catch-up- and economies of scale-related gains; the question of to what degree embodied change is captured; etc). The OE report considers such issues in detail. However, EI find that 'at best' only the directional impact of each issue can be identified, and there is no reliable way to quantify their impact on OE. Therefore, one cannot determine whether the appropriate net impact of these factors would be that the benchmarked OE (derived from EU KLEMS estimates) is under-/overstated. Thus, one cannot reliably determine whether a net upwards or downwards adjustment is appropriate.

EI also note that the magnitude of such adjustments can be (and has been) so material as to call into question the validity of the benchmarking method in the first place. For example, at RIIO-GD2 Ofgem made two post-benchmarking uplifts to the OE estimate for transmission and gas distribution networks. This included a 0.2 percentage point adjustment for the innovation fund; and adjustments to add further stretch (for example, placing less weight on the wider productivity growth slowdown of recent years). Together, this accounted for approximately 50% of Ofgem's final OE estimate.

The OE report sets out a detailed consideration of possible ex-post adjustments and the interaction this has with the choice of benchmarks. Overall, we agree with EI's recommendation that post-benchmarking adjustments should be avoided. We further note that EI's effective and data-driven approach to comparator selection should mitigate the risk of discrepancies between OE and the benchmark TFP data.

Finally, EI are also clear that care should be taken to a avoid a double count of Ofgem's OE with other components of the price control. Whatever the determined number for OE, it is critical to note that productivity improvements can arise from *both* cost reductions *and* output (i.e. service quality) gains. As such, if Ofgem requires the GDNs to make substantial improvements in output performance for RIIO-GD3 (e.g. by setting highly stretching targets on ODIs or Los), the OE estimate derived from TFP benchmarks should accordingly be reduced – to reflect the fact that a productivity improvement is being driven elsewhere in the price control (i.e. via the ODI targets). Alternatively, Ofgem could recognise the risk of this double count when weighing up how it approaches selecting a point estimate within the evidence range for OE to be applied to Totex.

8.4. Underlying benchmark estimates

The resulting estimates derived from EU KLEMS data reflecting EI's preferred comparator set, and methodology are shown in Table 59. EI concludes that an OE range of 0.2 – 0.8% should be used for RIIO-GD3.

Comparator	2010-2019	Weighted average of: (i) 1970-2007; and (ii) 1995-2019
Final results (average)	0.2%	0.8%
Manufacturing	0.4%	0.9%
Chemicals; basic pharmaceutical products	1.2%	1.6%
Manufacture of rubber and plastic products and other non-metallic mineral products	1.0%	0.9%
Computer, electronic, optical products; electrical equipment	1.3%	2.2%
Manufacture of machinery and equipment n.e.c	-0.2%	0.9%
Manufacture of motor vehicles, trailers, semi-trailers and of other transport equipment	-0.1%	0.7%
Manufacture of furniture, jewellery, musical instruments, toys; repair and installation of machinery and equipment	-0.4%	1.0%
Construction	-0.1%	0.1%
Wholesale and retail trade; repair of motor vehicles and motorcycles	-0.1%	-0.1%
Transportation and storage	-0.6%	0.5%
Total industries (A-S)	0.2%	0.2%

Table 59 Gross Output TFP detailed results for the preferred set of comparators and final results (average) (Source: Economic Insight analysis of EU KLEMS data)

8.5. The UK productivity puzzle

UK productivity growth has been flat since the 2008 financial crisis, as illustrated in Figure 36. This decline in productivity growth can be widely observed across most Western countries although the persistence of low-to-stagnant productivity growth in the UK is particularly notable. The academic literature contains no clear consensus as to why this has occurred - and so it has become known as the UK's 'productivity puzzle'.

EI conclude that the productivity growth slowdown is unlikely to fully unwind over the RIIO-GD3 price control period. This is based on forecasts and views from credible institutions, further revised in the EI´s supplementary report, as well as views on future productivity performance potential as provided by surveyed independent academic experts.[7]

EI also note in the supplementary report that the UK's economic performance data remains mixed, which suggests that an improvement in UK productivity growth is unlikely to occur in the near future. The Bank of England raised its 2024 GDP growth forecast to 1.25% in August (a significant increase from the 0.25% it forecasted in the February 2024 release). However, the latest ONS GDP data, shows that GDP growth was zero in June and July 2024. This calls into question the plausibility of the more optimistic forecasts.

Most surveyed academic experts predict UK productivity growth will be less than 0.5% pa over the next five calendar years (see Figure 37). In relation to the Electricity, Gas, Steam and Air Conditioning Supply sector, 16 of the 18 experts interviewed expect to perform below or in line with the UK economy, with most expecting it to perform below the UK economy.

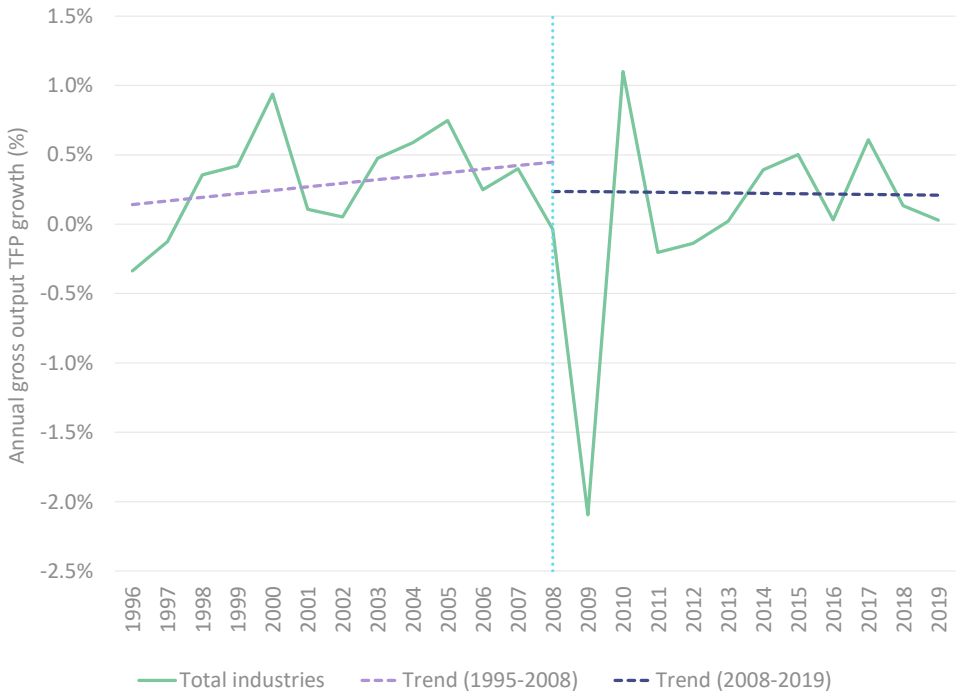

Figure 36 Average annual GO TFP growth rates with pre- and post-crisis trend lines (Source: Economic Insight analysis of EU KLEMS data)

[7] This survey was part of a wider academic research exercise, the results of which are contained in: 'The UK productivity puzzle: A survey of the literature and expert views.' Williams, S.; Glass, A.; Matos, M.; Elder, T.; and Arnett, D. (January 2024).

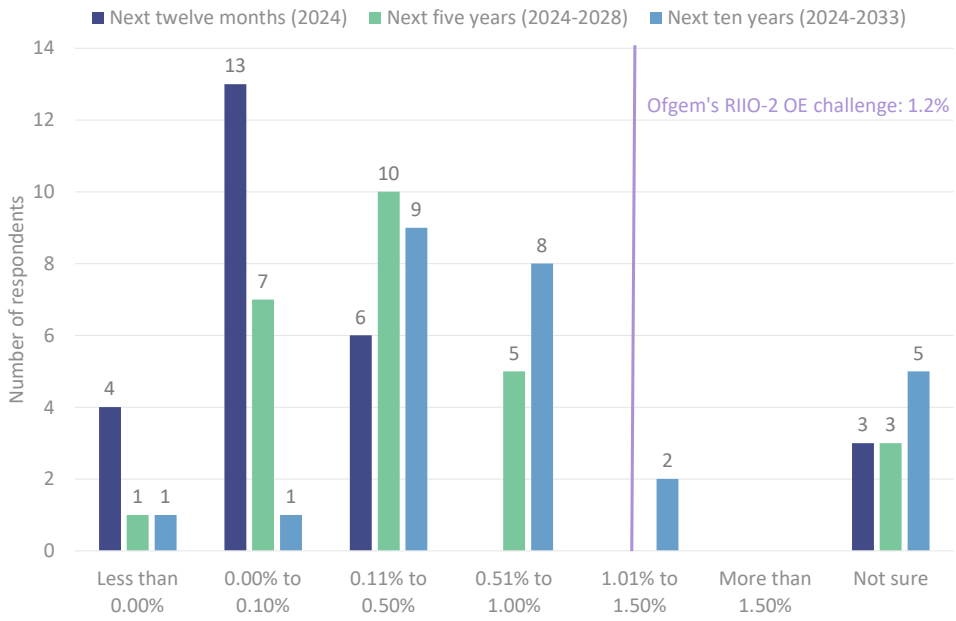

Figure 37 Expectation of range of UK productivity growth (as measured by average annual % MFP, multifactor productivity)

Ofgem in the past has taken the view that this sustained productivity slowdown can be dismissed on the grounds that regulation can materially mitigate the impact of the slowdown on gas networks. However, there is no evidence or logic to support this view.

As EI explain, the main factors causing the UK productivity slowdown include private investment, quality of infrastructure, public investment, quality of human capital stock, or quality of firm management. In principle regulation might mitigate the impact of the UK productivity slowdown on regulated companies' productivity given that (i) regulation makes investment more secure, hence regulated sectors may be less exposed to underinvestment; and (ii) regulators have introduced specific incentives to boost innovation. However, in practice the data does not suggest this is occurring (see Figure 38 below).

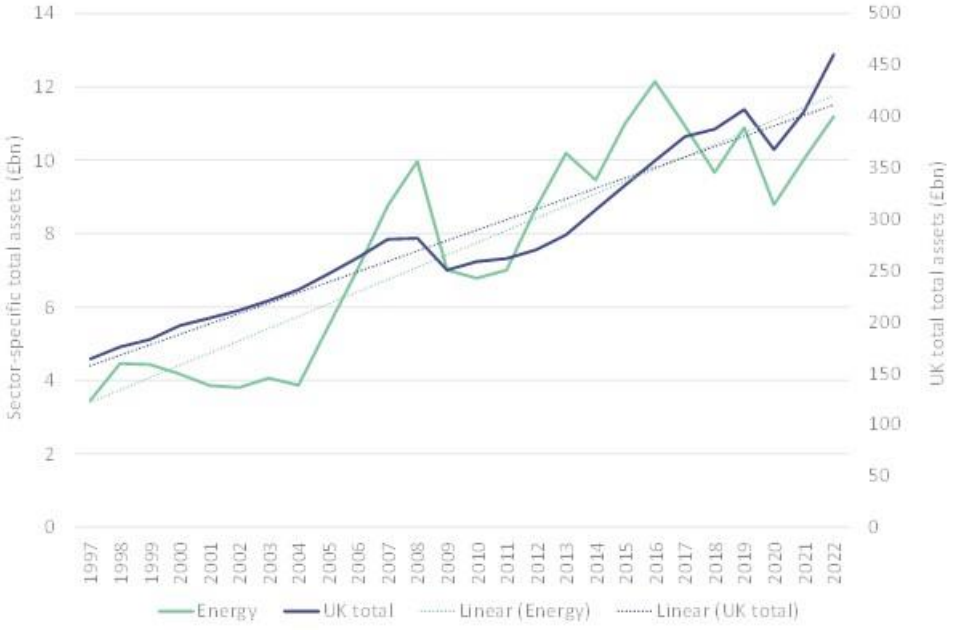

Figure 38 Annual gross fixed capital formation, total assets (£bn, current prices)

The analysis from the EI´s supplementary report confirms these findings. Similar to the wider UK economy, the UK's energy sector is underperforming in terms of investment relative to its counterparts in other comparable countries. Furthermore, investment trends in the energy sector suggest that it, like the rest of the UK, has experienced a substantial decline in investment growth since the financial crisis.

Furthermore, EI find no reasons to believe regulation can materially impact gas networks' productivity (i.e. it cannot address wider issues with the human capital stock, management quality, and so on), once the wider set of (main) causal factors of the productivity flatline are considered. In addition, the evidence does not support the notion that innovation incentives and funding can materially mitigate the productivity slowdown in regulated industries.

In short, we do not agree with Ofgem's prior rationale for dismissing the sustained and widespread post-GFC slowdown. In our view Ofgem needs to recognise for RIIO-GD3 that all relevant evidence and data indicates that the OE target for RIIO-GD3 should be lower than RIIO-GD2.

9 Consideration of uncertainty mechanisms in baseline expenditure

In RIIO-GD3 we will be flexible and adapt to changing circumstances but also ensure customers do not fund projects before clear certainty of need and robust costs are evidenced. Even where we have a clear view of the type of work required, we are cognisant that volumes may vary over time, or we may need to respond to changing policy and legislation.

Ofgem has recognised the need for uncertainty mechanisms and has included several of them for RIIO-GD3. In developing our plan, we have carefully reviewed our forecasts and considered the following types of uncertainty mechanism to apply.

- **Re-openers** – where the needs case, timing or scope of a project is unclear.
- **Volume drivers** – where there is uncertainty about the future level of demand.
- **Price control deliverable** – where the volume and mix of work to be delivered is specified.

We do not consider it appropriate to include anticipatory investment within baseline expenditure, where there is not clearly defined policy. Similarly, we do not consider it appropriate to allocate expenditure into an uncertainty mechanism where we have a clearly defined need. As such, our baseline and best view of Totex are very closely aligned.

We have a track record of delivering our outputs within allowances and at an efficient cost. Our RIIO-GD3 plan is based on known workloads and our baseline expenditure represents our "best view" of expenditure for RIIO-GD3, with very minor exceptions. We consider that any variance to allowances in RIIO-GD3 will result from policy decisions outside of our control and for which there will be specific reopeners to manage these decisions. At the time of writing and to the best of our knowledge we cannot reasonably forecast when or what policy decisions will be made and so for the purposes of business planning we have not included policy related uncertainty costs in our baseline expenditure or "best view" of Totex. We have only included forecast costs where there is a clear audit trail of historic expenditure and a need for future expenditure. If certainty becomes apparent regarding the future levels or timings of the expenditure required, a reopener will provide an opportunity to recover or prevent any further costs on a justified basis, subject to any reopener threshold. We will manage any variances below this threshold within our baseline allowances.

Table 60 outline schemes which we consider should be included within our best view of Totex.

Scheme	Mechanism	RIIO-GD3 spend (2023/24 £m)	Difference from RIIO-GD2
Baseline Network Risk Output (NARM)	Price Control Deliverable	241.88	-15.68
Tier 1 Mains decommissioned Price Control Deliverable	Price Control Deliverable	450.64	135.69
Tier 1 Services Repex Price Control Deliverable	Price Control Deliverable	93.05	37.28
National Insurance Increase Additional Cost	Totex	13.89	13.89

Table 60 Schemes included in best view of Totex

Outlined below we discuss key areas with a summary of the decision-making process.

Included in "best view" of Totex / Other Revenue Allowances

Baseline Network Risk Output (NARM) – this is the subset of Capex and Repex associated with asset health NARM targets. This was part of baseline funding in RIIO-GD2, but subject to a Price Control Deliverable (NARM delivery) and potential funding adjustment at closeout. We have retained this approach for RIIO-GD3.

Tier 1 Mains and Services PCD – this effectively acts as a Volume Driver and adjusts allowances in period with delivery. This has been retained by Ofgem as per SSMD and we have therefore included it in our baseline and best view of Totex.

National Insurance - Chancellor of the Exchequer Rachel Reeves announced in her autumn Budget on 30 October 2024 that National Insurance employer contributions would increase, and that the lower threshold limit would reduce. Resulting in an increase, on average, to NGNs National Insurance costs by £2.78m per annum across RIIO-GD3.

We have accounted for this increase in the BPDT 8.14 BUS (rows 30 to 56) (as agreed with Ofgem date CAWG 13 September GDPWG8) and consistent with the approach adopted by other GDNs. Once included this brings our Totex for RIIO-GD3 to £1851.05m, this is the total figure included Totex in our Business Plan Financial Model BPFM.

DPLA - We have included funding within our core business plan (baseline) for the intial role out of DPLA and leakage detection equipment. We note the uncertainty around the timing of this roll out as the SIF project had been delayed beyond the RIIO-GD3 submission. We have highlighted potential additional costs in BPDT M8.14 BUS that we have not included in our baseline and best view of Totex for potential additional costs that the roll out of this activity may.

River Diversions – we are increasingly cognisant of the risk that Climate Changes poses to our network and the operation of our assets and this is most apparent for network assets that cross or are in the vicinity of rivers. We have risk assessed our assets and included one essential diversion in baseline allowance (River Allen) as we have sufficient confidence and the costs and needs for this. We have included allowance for investigations on other assets and will use uncertainty mechanism if appropriate in RIIO-GD3.

Net Zero Research Village – we are excited about the role that Gas will play in the future energy mix and our focus in RIIO-GD3 is on supporting the customer journey through developed and delivered solutions at the Net Zero Research Village in Gateshead. We have high-cost confidence in the scope and timing of delivering this project and have proposed this as a PCD. We are mindful of the innovative nature of this project and did not consider it appropriate to include through core Totex allowances but see real benefit in progressing for the benefit of all consumers in transitioning to a lower carbon future. We welcome engagement with Ofgem on appropriate funding mechanism and cost recovery for this important keystone project.

Highlighted uncertainties excluded from "best view" of Totex / Other Revenue Allowances[8]

Streetworks (Opex, Capex, Repex) – Highways authorities in different parts of the country have introduced permit and lane rental schemes at different times and with different approaches. These schemes can impact our costs in three ways. We pay the permit and lane rental fees themselves because we manage the application and processing of the schemes, and the permits themselves impose conditions on how we operate in the street, which impacts our productivity. We have reasonable confidence in the costs we will incur if thee permits are applied, however the timing is uncertain. As such these

[8] Full list can be found in M8.14 Bespoke, Uncertain and Separate Activities BPDT

costs have been removed from our baseline and best view costs and would be included in a reopener to claim for any efficiently incurred cost increases that result directly from a change in the application of the schemes.

Streetworks excavation disposal (Opex) – Streetworks legislation covers the safe disposal of hazardous waste encountered when the road is dug up. Regulatory Position Statement 211 gave utilities exemptions from this legislation until January 2019 – and a subsequent temporary extension is in force. This extension has been put in place to give the utility industry time to formulate some alternative approaches to that outlined in the legislation that could satisfy the requirements with lower operational and cost impacts. Trials have been carried out through Streetworks UK to understand the materiality of the issue however, the exact timing and impact is uncertain at time of submitting this plan. Accordingly, we have not included costs within baseline and best view expenditure and will assess impact and justify costs via a reopener to allow recovery of efficiently incurred costs because of any legislative change.

Leeds City One Diversion (Capex) The progression of the Leeds City One project could require diversion of two medium pressure pipelines to allow the development to proceed. NGN has been working with the relevant planning authorities to understand the implications this has on our network and the timing of any diversion work. We considered inclusion of these costs within our plan but as the decision is entirely dependent on a third party, we have included this as an uncertainty mechanism as the timing and scale of costs being incurred is uncertain.

Hydrogen Blending – We identified the potential at our LTS, Offtakes and PRS sites to undertake additional augmentation through routine upgrades and replacement to prepare the network for Blending volumes of 5%-20% Hydrogen. Ofgem directed via their SSMD that this investment could be considered under uncertainty mechanisms and UIOLI and decisions are depending on policy decisions on Hydrogen blending. We have moved this expenditure outside of baseline and best view allowances to comply with Ofgem's guidance and will undertake further investigations via a proposed UIOLI to gather further evidence to trigger a reopener in RIIO-GD3 if applicable.

9.1.1. Use it or lose it allowances

We have seen great benefit in RIIO-GD2 with the use and the deployment of the Net Zero and Reopener Development (NZARD) "Use It Or Lose It" allowance (UIOLI). This allowance has provided the flexibility to rapidly respond to policy change and gather additional evidence for key net zero projects before applying for additional funding via Licence reopeners. We agree with Ofgem's position from its SSMD to retain the NZARD and only fund net zero projects where there is clear supportive evidence.

When preparing our RIIO-GD3 plan our ambition was to execute a range of strategic low regrets investment in RIIO-GD3 to commence the step change that is required for net zero. This included wide scale hydrogen blending (up to 20%), sectorisation of our network to prepare for repurposing or decommissioning and the establishment of a broader skill set to support the RESP. All these initiatives carry uncertainty both in timing but also in cost and deliverability in RIIO-GD3. Following our initial investigations and data gathering, we concluded that we did not have sufficient confidence in our cost estimates or programme to include a credible case in our RIIO-GD3 plans and that further investigations are required to build the evidence case for implementation.

We propose to use the NZARD to flexibly deliver these projects in RIIO-GD3. Our proposed areas of investigation are outlined in Table 61. Our approach means that we can be agile in RIIO-GD3 to meet the challenges Net Zero brings at lowest cost to consumers, whilst meeting the needs of future consumers.

In RIIO-GD2, our NZARD UIOLI was £4.5m (18/19 prices), based on a 0.25% total revenue calculation. This represented the lowest funding award for the highest performing company and limited our ability to deliver a range of projects compared to companies with higher allowances. To address this imbalance, we will increase this in RIIO-GD3 to 0.35% or £12.5m (23/24 prices). This increase will enable NGN to provide the necessary evidence to support the industry's net zero journey. We are confident that our track record of delivery and cost efficiency justifies parity of allowances in this critical area, ensuring gas networks can undertake appropriate work and evidence efforts to keep bills low for current

and future consumers. Table 6.24 provides an overview of the key themes and example projects for the UIOLI allowance.

Theme	Example projects identified
Cross-vector collaboration for net zero	1. RESP coordination and engagement
Network capabilities for net zero	2. Network sectorisation 3. Understanding disconnection and decommissioning
Whole system decarbonisation	4. Industrial and commercial hydrogen use 5. Hydrogen blending
Shrinkage reduction	6. Snart leakage identification and repair
Customer safety	7. Proactive removal of gas from MOBs

Table 61 Summary of UIOLI themes and example projects

10 Cost benchmarking and catch-up efficiency

This section sets out our views on Ofgem's approach to cost assessment and setting the catch-up efficiency challenge for RIIO-GD2.

10.1. Economies of scale

NGN is a single-licensee and cannot benefit from the same group-level economies of scale as licensees with multiple networks, yet group-level economies of scale are not accounted for in Ofgem's cost assessment.

Indirect Opex costs related to business support have a significant fixed element that should be able to be shared across multiple-licensee networks. Indirect expenditure items such as Business Support Costs (BCSs, e.g. finance and regulation costs) are unlikely to vary materially across GDN groups of different sizes — that is, a large GDN group might not require a substantially larger corporate finance and regulation team than a small GDN group. As such, the same indirect expenditure can be spread across a larger volume of output for GDNs in large GDN groups, leading to lower average costs.

NGN is structurally different as a singleton licensee and cannot benefit from such scale economies. Therefore, we are arbitrarily penalised by the current benchmarking approach. Economies of scale impacts and adjustments should be considered by Ofgem when looking at cost benchmarking normalisations in the round to ensure fair allocation of funding.

10.2. Upper quartile vs 85th percentile

Frontier companies have traditionally been rewarded by the regulator through setting an efficient cost benchmark at the upper quartile (or lower), which is then re-based at every five-year price control period. However, at RIIO-GD2 Ofgem departed from this well-established approach, setting the efficiency benchmark at the 85th percentile rather than upper quartile.

One of the GDNs (SGN) appealed this decision to the CMA. While the CMA did not overturn Ofgem's decision, the CMA emphasised that a key reason for its conclusion was that the difference between the 85th percentile benchmark and the upper quartile benchmark was relatively small. In our view, if the RIIO-GD3 models show a more material difference between Upper Quartile and 85th percentile, then the choice of benchmark is a matter that Ofgem must consider carefully, considering the CMA's guidance on other matters such as the small sample size.

10.3. Regional factors

The regional factors applied at RIIO-GD2 were material for some GDNs and were dominated by labour costs for London and the Southeast. It is important that the adjustments for regional factors are appropriately validated through a

combination of top-down and bottom-up evidence, to ensure that they are not conflated with managerial inefficiency or noise. The pre-modelling adjustments should not benefit companies disproportionately and modelling outcomes need to be fair and reflective of regional differences and not be conflated with inefficiency.

Ahead of RIIO-ED2, Oxera explored the impact of alternatives to the pre-modelling adjustments applied at RIIO-ED1 as part of a broader investigation on cost modelling for the ENA. This analysis provided some high-level evidence that the pre-modelling adjustments applied at RIIO-ED1 may have overstated the impact of regional factors on efficient costs and possibly conflated with managerial inefficiency. NGN consider that a similar analysis applied to the GD sector could be used to move away from unvalidated pre-modelling adjustments. We also note Ofgem's view that the most recent updates of ONS ASHE data appear to show a narrowing of regional wage gap.

It is possible that there are regional cost pressures, such as urbanity and sparsity, that are inadequately captured in Ofgem's cost assessment models such that some form of adjustment may be necessary. However, the regional adjustments as applied at RIIO-GD2 were highly material for some GDNs, and dominated by the regional wage adjustment for London and the South East of England. NGN consider that Ofgem did not address the following issues adequately as part of its company specific adjustments at RIIO-GD2:

- whether such cost pressures were implicitly captured in Ofgem's cost models through the modelled relationship;
- the correlation between the regional factors considered;
- validation of the magnitude of the adjustments;
- assessing whether the adjustments were conflated with managerial inefficiency.

NGN note that any of the above issues could result in an over-compensation for regional differences. Moreover, the construction of some of the regional factors and the magnitude of the adjustment applied at RIIO-GD2 were somewhat arbitrary. Indeed, the performances of some GDNs were highly sensitive to the inclusion of the pre-modelling adjustments. Such material impacts raise concerns over the value of such adjustments and whether they may be conflating genuine differences in operating characteristics with inefficiency.

NGN consider that Ofgem should develop a robust methodology for establishing the need, quantification and validation of pre-modelling adjustments for regional wages (and, indeed, other regional factors). This methodology would contain a combination of top-down and bottom-up evidence to ensure that the pre-modelling adjustments are robust and appropriate. This could include the following:

- Exploring how the regional factors perform 'within modelling' i.e., including the regional factor as an additional cost driver.
- Undertaking suitable robustness checks on indices used to construct the pre-modelling adjustments to ensure that they are not sensitive to the choices made.

In RIIO-GD2 Ofgem applied the sparsity index (which assumes higher costs associated with local authorities more sparsely populated than the GB average) to Emergency and Repair costs. NGN consider that Ofgem should re-assess the appropriate threshold to apply the sparsity adjustment, and which cost activities are subject to an adjustment for sparsity.

At RIIO-GD2, Ofgem made a pre-modelling adjustment in relation to urban productivity, arguing that GDNs may face additional costs associated with operating in urban areas. NGN considers that Ofgem may also need to re-assess which cost activities are subject to the urban productivity adjustment. There is a risk of double counting the impact of urbanity given the strong correlation between Ofgem's urban productivity adjustment and its adjustment for regional wages.

We refer to our response to Ofgem's SSMC for further discussion of regional factors.

10.4. Cost drivers

Ofgem would need to ensure that cost-pressures in RIIO-GD3 are (to the extent possible) captured in the selection of cost drivers. This should be developed collaboratively with stakeholders through the working group process and tested iteratively to ensure that changes from the status quo are genuine statistical improvements.

It is important to consider the outputs, workload delivery and quality of service in model specifications. NGN is investigating additional quality and output measures such as customer service, 1- and 2-hour standards, shrinkage and outstanding repairs for use in the CSV calibration to better capture what networks deliver for their expenditure. NGN consider that these important deliverables aren't explicitly or fully accounted for in the cost assessment framework. In theory, two networks could have similar costs in certain areas but materially different performance in these outputs. Conversely, networks could have significantly different costs for the same levels of service. This should be accounted for in the benchmarking process to ensure the frontier networks are rewarded for the value they deliver and so that laggard companies catch-up in efficiency and standards.

10.5. Modelling approach

10.5.1. Multiple Totex regression models

As we set out in our SSMC response we think that, in principle, there are advantages to using multiple Totex models at RIIO-GD3, assuming that alternative models perform well from economic, operational and statistical perspectives. These alternatives could differ with respect to the selection of cost drivers, the construction of Composite Scale Variable (CSV), the estimation approach, the use and magnitude of pre-modelling adjustments, the time period of analysis and other relevant factors.

However, any methodological changes from the RIIO-GD2 approach should have demonstrable benefits and improve the statistical performance of the econometric models as a minimum. The addition of models increases the resource burden of all parties and the potential for error and unintended consequences. Ofgem's objectives of simplification and streamlining should be considered as part of the evaluation of their inclusion.

In general, the cost assessment approach for RIIO-GD2 worked well and the models performed strongly with statistical tests. The value add from the additional models need to be sufficient to justify their inclusion and the current RIIO-GD2 approach for GD should be the default. As there are only eight networks across four Licensees, the modelling is sensitive to changes and increased granularity may not necessarily improve predictive performance.

NGN support Ofgem's cost assessment framework and Toolkit approach to benchmarking, as it provides a practical and robust approach to assessing relative efficiency between gas networks. At RIIO-GD2, a top-down regression model was used after a review of various models with different levels of aggregation and over different time periods, with different CSV make ups. Ultimately the outcome was similar across all models; hence the Totex model was used, rather than a mixture of top down /bottom-up models in RIIO-GD1. This should be re-examined for RIIO-GD3, but it is NGN's view that the current approach should be retained unless there are material improvements from deviating from it.

10.5.2. Middle-up modelling

Middle-up models may have some advantages over Totex models if they can capture activity specific cost drivers. Moreover, middle-up models may suffer less from cost allocation inconsistencies than disaggregated models. In principle, middle up models could form part of the evidence base at RIIO-GD3, providing that the models perform well in comparison to the Totex and (if pursued) disaggregated models.

Ofgem would need to work with stakeholders to explore which activities could be grouped together in a middle up model, and which are the most operationally relevant cost drivers for each activity.

10.5.3.Disaggregated modelling

Disaggregated models may form part of the evidence base at RIIO-GD3 if key concerns relating to cost allocation can be rectified. When undertaking disaggregated modelling, it will be important to ensure that trade-offs are appropriately captured, such that the overall Totex allowance is achievable. The correspondence in GDNs' performance across the different suite of models considered should be carefully examined prior to triangulation. We note that disaggregating models also has the potential to distort incentives.

Any methodological changes from the RIIO-GD2 approach should have demonstrable benefits and improve the statistical performance of the econometric models. The cost assessment approach for RIIO-GD2 worked well and the model performed strongly with statistical tests. Multiple models add the potential for additional complexity, unforeseen consequences, and increased potential for error. The value add from the additional models need to be sufficient to justify their inclusion and the current RIIO-GD2 approach for RIIO-GD2 should be the default.