Northern Gas Networks

A22.p - Risers

Engineering Justification Paper

Contents

1. Summary table

Name of Project	*Risers – RIIO-GD3*		
Scheme Reference	*A22.p.NGN*		
Primary Investment Driver	*Asset Health / Health and Safety / Compliance*		
Project Initiation Year	*2026/27*		
Project Close Out Year	*2030/31*		
Total Installed Cost Estimate (£)	*£7.40m*		
Cost Estimate Accuracy (%)	*+/- 5%*		
Project Spend to date (£)	£0m		
Current Project Stage Gate	*Asset data evaluation*		
Reporting Table Ref	6.02		
Outputs included in RIIO-GT3 and RIIO-GD3 Business Plan	*Yes – see section 10.2*		
Spend apportionment	**RIIO-GD2**	**RIIO-GD3**	**RIIO-GD4**
	£1.47m	*£7.40m*	£7-9m*

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

2. Executive summary

This Engineering Justification Paper outlines our strategic proposal for investment in Risers during the RIIO-GD3 period. The primary drivers for this investment 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.

As a network, we have not completed a full replacement project on a tower block where every riser has been replaced. We therefore requested guidance from the other GDNs via the Multi-Occupancy Building Working Group regarding indicative costs for a full replacement, alongside the work we have carried out in RIIO-GD2 the costs proposed are in line with the other networks.

Option	Workload	Cost (£m) 23/24 prices
Do Minimun	35	5.00
Do More (Enhanced)	110	9.90
Balanced (Preferred)	57	7.40

Table 1 Options Summary

	RIIO-GD2		RIIO-GD3	
	Workload	Cost £m 23/24 prices	Workload	Cost £m 23/24 prices
Risers	23	1.50	57	7.40

Table 2 RIIO-GD3 and RIIO-GD2 Comparison

NGN's preferred proposal aims to replace 57 Risers across 15 multiple Occupancy Buildings (MOBs). The scope for Riser replacement has evolved since RIIO-GD2. Previously, the focus was primarily on non-compliant buildings. However, in RIIO-GD3, our strategy has shifted to address higher-risk areas and include below-ground entries as well as PE Risers. This shift has resulted in an increased cost for RIIO-GD3 compared to RIIO-GD2, due to the deterioration of asset health and our emphasis on removing non-compliant PE pipes (see Section 8.2), which has led to a higher workload. The costs have been calculated based on previous RIIO-GD2 work carried out based on unit costs and full Riser replacement in specified buildings.

Under our preferred option we see an increase in Risk, SI and failure levels over RIIO-GD3 of 24.6%, 26.0% and 24.7% respectively primarily due to deterioration of non-PE assets (with baseline increases of 28% being seen at individual asset level). Payback is not achieved within 50 years. These elements are discussed in detail in Section 8.2. We have assessed that this option meets all objectives outlined in Section 5 and represents the best balance between managing service levels and keeping bills as low as possible, in line with customer expectations. This balanced programme of work will enable us to continue providing a safe, resilient, and compliant network for our customers while ensuring value for money. Investments are primarily driven by health and safety or compliance considerations.

3. Introduction

This Engineering Justification Paper details our proposals for investment on our Risers during RIIO-GD3. It includes narrative for security and condition-based upgrades for safety and legislative reasons. These are the primary drivers for investment. This paper explicitly follows Ofgem's guidance.

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.

This engineering paper outlines the justification for our proposed RIIO-GD3 Riser investment, detailing our asset management decision-making process during which we analyse risk, value and trade-offs between different intervention options. It explains the drivers for investment, the inputs and assumptions used in our Cost Benefit Analysis and how our proposed investment benefits our customers and stakeholders.

4. Equipment summary

Building Type	2023/24	Intervention
3-5 floors	752	
6-9 floors	362	15
10+ floors	181	42
Total	1295	57

Table 3 Equipment summary (detail from surveyed buildings)

NGN operates 1295 Risers within the region (data from surveyed buildings), and we are proposing the replacement of 57 Risers in the building types described in Table 3. To comply with current legislation NGN must satisfy the requirements of Regulation 13 of the Pipeline Safety Regulations 1996, and ensure pipelines are 'maintained in an efficient state, in efficient working order and in good repair'.

NGN must satisfy the requirements for inspection, maintenance, and monitoring of supplies to high rise buildings.

Irrespective of the level of risk associated with the mains network surrounding each site, NGN's management procedure must be applied to all 6 storey and above high-rise buildings containing a gas supply.

5. Problem / opportunity statement

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

We proactively manage the risk on our MOBs by specifically targeting areas of higher probability of failure and areas of criticality. We use an ongoing programme of surveys to regularly reassess risk and then carry out remedial work on a planned and reactive basis as required.

The primary driver for our proposed RIIO-GD3 investment plan for Risers is to maintain the high levels of integrity, safety, and reliability of these assets – as demonstrated by our low levels of MOB

interruptions. This will be delivered by continuing with our planned inspection regime and making the appropriate investment decisions. These include:

- No further action required.
- Replace the asset, either due to the Riser being of a non-preferred material (ductile iron, cast iron, spun iron or copper) or following inspection or a reported escape where local repair or more extensive refurbishment is not possible or suitable.
- Carry out minor localised repair (usually patch-paint – Opex cost).
- Carry out isolation of the Riser, following a request from the building owner.

Through RIIO-GD3, we expect to make Riser interventions (replacements) on 57 Risers.

This paper does not account for customer driven (and sometimes customer funded) decommissions. Therefore, these have not been modelled or accounted for as they are out of our control.

In RIIO-GD3 we are looking to undertake a further piece of work to understand the journey for high rise customers as part of the transition to net zero. We continue to collaborate with Local Authorities who are keen to remove gas from MOBs to support their local area plans and reduce the risk further.

The buildings identified for replacement have been identified as sites where customers still require a gas connection with the support of their building owners.

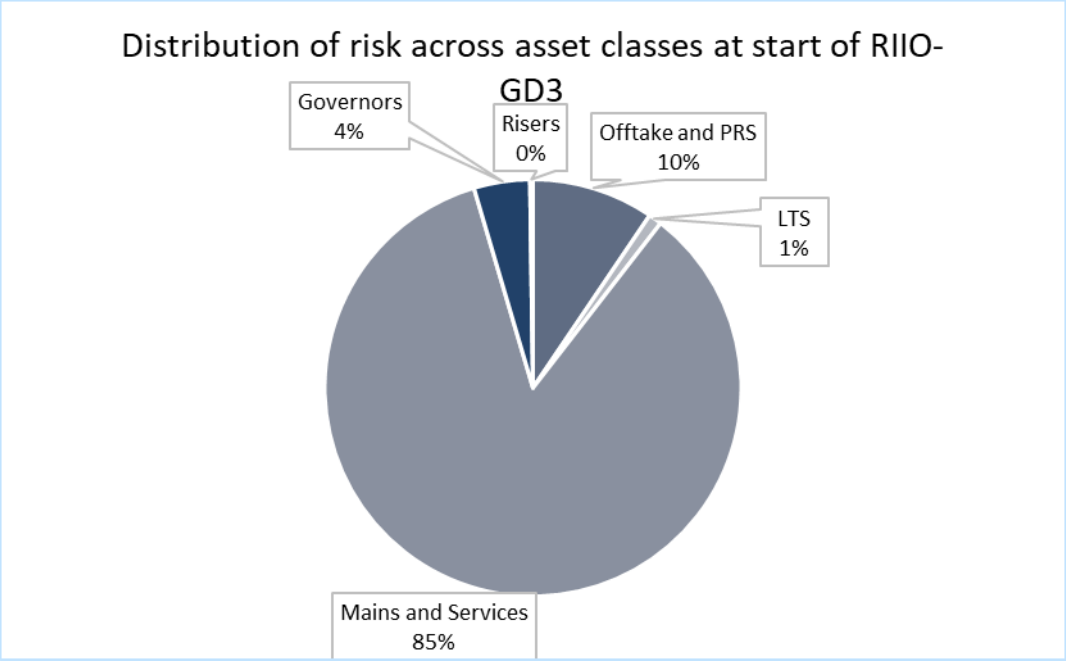

Figure 1 total value framework risk at start of RIIO-GD3

Risers account for 0.2% of risk we hold within our network in terms of our total value framework risk at the start of RIIO-GD3. However, there is a clear asset health and health and safety driver for investment in these network assets.

The asset health movement of riser assets over RIIO-GD3 with and without investment (preferred option) is included below.

Consideration of Riser Asset Health

We have utilised the NARM Value Framework to assess the health of our assets. We are however using the latest NGN asset data rather than the NARM data which is held in time as at the start of RIIO-GD2 for regulatory reporting purposes. This data includes Risers for buildings which have not been surveyed. Where any data field for the NARM modelling are unknown, predefined default assumptions or average values are applied at the base data processing stage.

Riser assets are assigned a Health Banding 1-10 based entirely on the total failure rate (i.e. the sum of all failure rate components). There are ranges of failure rates which assign an asset to bands 1-10. For pressure control, if the asset has less than 0.001 total failure rate (expected number of failures per year), is it in band 1, but greater than 0.009 then it is in band 10.

Consideration of Riser health trends is useful in the calculation of asset risk. Table 4 highlights the health of our assets using the NARM value measures. This shows that 19.9% of our Riser assets have a score of 6 or more (10.7% in HI 10) at the start of RIIO-GD3. Without intervention, this rises to 29.9% and 14.1% respectively by the end of RIIO-GD3. If our Preferred Option of investment is followed in RIIO-GD3, this falls back down to 29.9% and 13.7% respectively at the end of RIIO-GD3 with investment.

Health Index	1	2	3	4	5	6	7	8	9	10	Total
Baseline start of RIIO-GD3	1063	210	203	300	126	120	17	45	37	253	2374
	45%	9%	9%	13%	5%	5%	1%	2%	2%	11%	100%
End of RIIO-GD3 w/o intervention	947	212	140	177	187	139	116	107	14	335	2374
	40%	9%	6%	7%	8%	6%	5%	5%	1%	14%	100%
End of RIIO-GD3 with interventions	924	211	141	180	207	144	115	110	17	325	2374
	39%	9%	6%	8%	9%	6%	5%	5%	1%	14%	100%

Table 4 Asset health of Riser assets across RIIO-GD3 with and without intervention

Table 4 shows the asset health of our Riser assets over RIIO-GD3 with and without intervention (under out preferred investment option, see Section 10.1).

What is the outcome that we want to achieve?

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

We want to ensure compliance with all relevant Health and Safety, or technical Regulations.

This is a key objective for risers. For 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.

There is a possibility of a policy change during RIIO-GD3 from the HSE whereby retrospective PE Riser replacement may be required. Therefore, we have measured our options against whether they allow or don't allow for prospective compliance in respect of this retrospective PE replacement.

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

We want to manage total risk

We know that our customers value safety and reliability as their number one priority. Without intervention total risk will increase by 28.1% (NARM Risk) for Risers within the RIIO-GD3 period due to deteriorating asset health. In

addition, we want to manage increasing risks to provide a safe working environment for our operatives and avoid loss of supply events.

Table 14 in Section 9.2 shows that the above 28% rise in risk is due to a 28% rise in risk on 84% of our Riser and Lateral population which is non-PE. This is due to asset health deterioration of these assets (deterioration is assumed at 5% per year in our modelling). Table 14 also indicates that we see this 28% rise in risk for each individual non-PE Riser and Lateral. It is not possible to intervene on 84% of our asset base in RIIO-GD3, so we will continue to assess and target Riser replacement based on our Riser risk model scoring (which feeds into NARM assessment) and based on compliance requirements.

The remaining population (16%) is PE, and these assets deteriorate at a rate of 1% over RIIO-GD3 due to a lower asset health deterioration factor. The NARM model does not currently account for the risks associated with regulatory requirements around prevention of combustible materials being externally installed on new buildings (or the retrospective application of this). Some of our options consider compliance with retrospective replacement of PE Risers and this is measured against our compliance objective, but the real risk benefit of this has not been able to be modelled or captured within CBAs due to omission from the NARM model.

Further discussion on risk levels can be found in Sections 8.1-8.5 and Section 9.

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

We want to continue to provide exceptional service

Key service measures for our Riser assets are the Total Expected number of Supply Interruptions and Expected number of Failures.

Supply interruptions are increasing by 28.0% overall for Riser assets within the RIIO-GD3 period to a point where we would be expecting a supply interruption approximately every 7-8 months (probabilistically across the asset base) at the end of RIIO-GD3 without intervention. Expected number of Failures are similarly expected to rise by 28%.

As for Risk, Table 14 in Section 9.2 shows that the above 28% rise in SI and failure levels is due to a 28% rise in risk on 84% of our Riser and Lateral population which is non-PE. This is due to asset health deterioration of these assets. This is discussed in full in the Risk objective section above, including the reason why we will not be able to maintain risk in RIIO-GD3. This discussion extends to the reason why we will not be able to maintain supply interruption or expected number of failures (at a population level).

The remaining population (16%) is PE, please refer to discussion in the Risk objective section above.

Further discussion on SI and failure levels can be found in Sections 8.1-8.5 and Section 9.

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

We want to ensure efficient costs – we know that our customers expect us to invest their money wisely and efficiently to enable a reduction in their bills. As risk is rising sharply in RIIO-GD3 it is expected that we will need to intervene on more assets than we have during RIIO-GD2 to meet our objectives around managing total risk, health and safety and compliance.

Our aim at outset is to maintain spend relating to asset health in RIIO-GD3 broadly in line with RIIO-GD2 levels, where this is possible. We discuss this in more detail in **Section 10.2**.

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

Our unit costs are discussed in Section 8.6.

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

Protecting customers from future uncertainty

In other asset classes we are looking to ensure the investments we make in RIIO-GD3 are right for both our existing and future customers, and to avoid the risk of asset stranding we must ensure that our investments offer a payback before either the asset life or a point in time where future uncertainty could reduce the forecasted benefits, whichever is the smallest time period. The RIIO-GD3 Business Plan Guidance states that a 16-year payback period is appropriate for the GD sector (page 45)[1], meaning that any new, refurbished or replaced equipment that pays back within this time frame will be deemed suitable for investment.

For Risers, where investment is health and safety and compliance led, we have carried out CBAs but not held ourselves to meeting a payback requirement as we see the proposed investments in Risers as necessary to ensure the continuing safety of our network and our customers and compliance with legislative and licence requirements. See further discussion in Sections 8.1 to 8.5 and Section 9.

How will we understand if the spend has been successful?

The spend will be successful if the risk of failure and interruption is successfully managed and the building is compliant with the current regulations set out by the HSE. The risk is measured by our Riser model score and compliance, which is detailed in section 6. One of the key failure modes is leakage from a Riser. When a Riser is replaced, this leakage is eliminated, and this mode is then reset to 0 and the risk score is adjusted. Excluding the legislative high-rise buildings the remaining sites average survey score is 3575 and average replacement score would fall to 101.

Performance of the replaced asset will be visible in our RRP reporting from RIIO-GD3 onwards as part of the new average unplanned interruptions output for MOBs.

This asset class is covered within the NARM Methodology, and we have set a relative risk target on which we will annually report performance against. In addition to the NARM target, we would expect to keep the number of supply interruptions from Riser asset failure at a manageable level. Our Decision Support Software allows us to understand various service measures associated with each asset and how these change over time with and without investment.

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

5.1. Narrative real-life example of problem

As part of the investment, we are looking to replace the remaining Risers in [redacted]

[redacted]

CASE STUDY– [redacted] RISER 4

In 2024, we experienced an unplanned interruption on [redacted] an assisted-living block with 29 flats housing mostly vulnerable customers.

Due to its high-risk score, this property was surveyed yearly. [redacted] the annual survey took place. Three days later, [redacted] a leak was detected on the below ground Riser entry. Due to its location, a repair was not possible, and the readings required immediate action to be taken. This resulted in Riser 4 being decommissioned later the same day to make safe and an emergency replacement was required.

The installation of the new Riser was undertaken by our direct labour and contractor teams, the building already being surrounded in scaffolding due to other issues with the structure. Minor modifications to scaffolding were required for our works.

- We installed an External Riser, a 76mm Geberit Mapress to the exterior of building.
- 28mm above ground services were relayed through flats back to original meter positions.
- Boxing was installed for aesthetics within flats, with branch isolation valves fitted at entry points.
- Certified fire stopping was required at penetrations.

This incident reinforced the need to invest in Risers with below ground entries where owners are intending to keep gas.

5.2. Project boundaries

The spend boundaries for this justification paper are limited to investment directly related to Risers. As each MOB is approached on a case-by-case basis, spend incorporated in this justification paper can relate to investment on the Riser asset to extend its life through replacement or decommissioning. We also approach the building owner to understand their intention for the building first, so we can ensure the asset investment is not lost.

6. Probability of failure

Likely failure modes

The Riser risk ranking model was implemented by NGN in 2012 and has been used to prioritise buildings to be surveyed based on their predicted Riser risk score.

Where data is unknown, worst-case assumptions are applied. As the survey programme has progressed, data fields have been corrected, deleted, or added as appropriate.

A review of the model's application carried out in 2015 concluded that the risk, likelihood, and consequence score trends indicated that the model is providing a good interpretation of the survey data. However, the model is complex and considers a large number of parameters: 7 building parameters, 25 Riser parameters and 14 AGS (above ground services) parameters. The risk model uses these parameters to calculate factors affecting the likelihood and consequences of failure and combines these to calculate a risk score. The model defaults to the highest score where no answer is assigned to a parameter which will result in a higher risk score.

The number of parameters and the sequence for calculating the hazard and failure risk factors means that it is difficult to identify parameters and factors which have a dominant influence on the risk score. However, the scope of the model allows the potential for specific scores which represent particular factors, e.g. fitness for purpose of assets, building hazards, and compliance with standards to be calculated.

It is proposed that going forward a fitness for purpose or condition score is used to identify Risers which should be considered for possible replacement. To focus on current condition, only those points which represent current condition should be assessed. The age and type of building and asset parameters such as diameter and length will remain the same post-replacement, and therefore should not be included in the score.

The potential for gas to accumulate in an unventilated area should also be considered by using unventilated voids and cellars parameters reported in the surveys. In addition to Riser condition and the potential for gas to accumulate, the number and type of leaks detected during surveys must be considered.

There are other specific areas which cannot be easily modelled and are best managed as individual issues:

- Where an internal Riser is a made of a non-standard material such as cast iron, ductile iron or copper, for which the mode and likelihood of failure is significantly different from steel. These assets should be treated as high risk and prioritised for investigation and replacement where necessary.
- External Risers which are well ventilated present the lowest risk of a gas leak causing an incident. PE may only be used for external Risers, if PE is located inside a building, then it should be prioritised for replacement. If an external PE Riser has been enclosed in cladding it should be treated the same as an internal Riser and prioritised for replacement.
- The location of building isolation valves. Where the survey has recorded these as "not fitted" then these buildings should be prioritised for investigation to either locate the isolation valve or replace with a new building isolation valve.

In addition to the above methodology, the following categories have been added:

- Risers with below-ground entries. If these failed, they would likely require immediate, full isolation of the Riser and significant interruption time consequences (as in the [redacted] case study).

- Buildings with non-compliances around Risers in unventilated voids, where it is not possible for the building owner to install ventilation.
- 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 (ref. https://www.gov.uk/guidance/ban-on-combustible-materials). These Risers were fitted in 2017 - we have listed them in case a policy change requires us to retrospectively remove them.

Damage mechanisms resulting in leakage

Riser condition is influenced by damage mechanisms which may result in failure through leakage. The primary damage mechanisms which influence Riser condition are external interference and corrosion. External interference is a random damage mechanism, corrosion of steel pipes is time related and influenced by the environment around the pipework. The likelihood of occurrence of external interference is greater for the buried service supplying gas to the building, which may be struck by third parties working in the vicinity who are unaware of the location of the pipe, the likelihood is lower for pipework located within the building.

In terms of corrosion, steel pipework located within buildings in general is not exposed to environments which will cause corrosion. Leakage causes a hazard when it occurs within the building. The corrosivity of the atmosphere within buildings is usually low or medium, which results in corrosion growth rates which will result in time to severe corrosion of approximately 70 years. An assessment of corrosion rates in different environments given in BS EN ISO 9223. In addition to external interference and corrosion, age related degradation of screwed joints occurs, in which the sealing tape applied to the joint threads dries out, resulting in low leakage across the joint threads.

Leakage surveys are undertaken during the MOB building surveys using detectors capable of detecting parts per million of gas in air, which is below the level which poses a hazard. The volume of leakage from screwed joints is low and is limited, as the leak size remains restricted by the clearance between the joint threads. The volume of leakage due to through wall damage due to external interference or corrosion presents a greater hazard, as the hole size will be dependent upon the extent of the damage and is not limited as it would be for joint leakage.

Small gas leaks generated at joints and valves in steel Risers would generally pose minimal risk, as any gas leak would dissipate easily by general ventilation in the building. Such leaks would only become a significant risk if there is the potential for the gas leak to accumulate in an unventilated area such as a shaft or a cellar.

Requirements for repair and replacement

Any positive detection of leakage from pipework within a building is classed as a gas in building (GIB) incident and will trigger the requirement for an immediate repair. Leakage from joints and small holes may be locally repaired. Similarly, the identification of required remediation of corrosion protection or localised corrosion of steel pipework recorded during building surveys will trigger the requirement for remediation and repair. In cases where NGN Operations identify the need for a repeated number of remediation and/or repair activities on pipework within the same building, the requirement to consider replacement of pipework of deteriorating condition will be actioned.

The Model Scoring Logic

The risk prioritisation model allocates scores to:

- Hazards associated with the installation of the Risers and AGSs in the building
- Risk of external interference of Risers and AGSs
- Risk of corrosion of Risers and AGSs
- Leaks found on inspection

- Consequences

The model then calculates scores for:

- The likelihood of a significant gas leak
- Consequences
- Total risk

The model logic is shown in the Figure below:

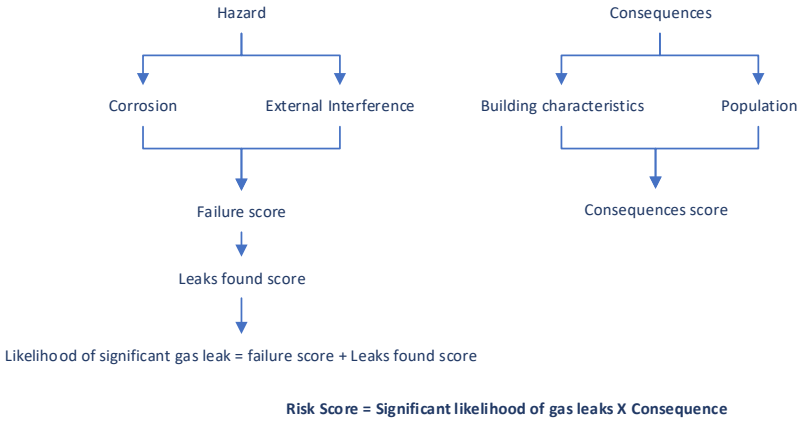

Figure 3 Model logic for creating risk score

The proposed scoring method using the Riser condition data currently recorded in the building survey and the current scoring of this data is:

Variable	Value	Score
Joint	Welded/Screwed or flanged/Crimped/Other	1/2/1/3
Protection required	N/Y	0/1
Environment	Dry/damp/other	1/5/10
Corrosion	None/minimal/other	1/5/10
Material	Steel	5
Gas accumulation factors	Unventilated Cellar / Unventilated voids (Riser)	50/50
Leaks found	Total/Joints/Pipe wall/Valves/Others	700/70/350/70/350

Table 5 Riser Model Scoring

- Riser condition score = (protection required + joint type+ environment + corrosion) *material
- Applying the scoring given for protection required, joint type, environment, corrosion and material, the minimum condition score for assessment of replacement is:
    - **Riser condition score = (1 + 2 + 5 + 5) *5 = 65**

- In addition to Riser condition, the number and location of leaks detected during a survey must be considered. The current scoring applied to detected leaks is significantly higher than the scoring applied to the above condition factors, and as the leak score is multiplied by the number of leaks detected, the score increases by an order of magnitude. The assessment of current data shows that the minimum and maximum number of leaks per building currently recorded is:

Leak Location	Minimum		Maximum	
	Number	Score	Number	Score
Joint	1	70	14	980
Pipe wall	1	350	5	1750
Valve	1	70	12	840

Table 6 Minimum and Maximum Numbers and Scores for Building Leaks

- To provide a reasonable indication of the need to consider Riser replacement, the applied scoring given to condition factors, and the number of detected leaks should be equivalent.
- The allocated scoring of pipe wall leaks given in Table 5, 5 times that applied to joint and valve leaks. The maximum number of joint/valve leaks is 2.8/2.4 times the number of pipe wall leaks. Using the allocated scoring and the numbers of the leaks occurring in the different locations, a simple weighting is proposed as follows:
    - $2.8x + 5x + 2.4x = 65$
    - Therefore $x \approx 6$

The proposed leaks detected score for inclusion in the Riser replacement score is therefore:

Leaks detected (Leakage Score) = 6 x number Joint leaks + 30 x number pipe wall leaks + 6 x number valve leaks

- The potential for a gas explosion is then considered by including the Risers in unventilated areas by including the score for unventilated voids and unventilated cellars.
- **Gas accumulation score = (unventilated area + unventilated cellar**)
- Combining the Riser condition, leaks detected, and gas accumulation scores gives the following Replacement Score:
    - **Riser Replacement Score = Riser condition score + Leakage Score + Gas Accumulation Score**
- Applying the above scoring produces a list of building priorities there are 32 buildings with a score >120 with the highest score of 275 (See Appendix 2).
- There are a further 62 buildings with a score greater than 70 and less than 120 which include buildings where leaks have been reported (See Appendix 3).

Failure Modes included within NARM Modelling

The key data source for NARM base data is survey information. Each company currently undertakes comprehensive surveys at asset level that provide condition scores for both the vertical Risers and laterals for various failure modes, as well as risk scores for potential consequence of failure (see Model Scoring – above). Where surveys have not yet been undertaken, default values or population average values are applied at the base data processing stage.

The failure modes have that have been identified for Risers and laterals include:

- **General Emissions** – background leakage / shrinkage from the Riser or Lateral

- **Joint failure** – including welding, fittings.
- **Interference failure** – external interference caused by third parties.
- **Corrosion failure** – corrosion of the pipe containing gas.

The failure rate for Risers was based upon actual leak and population data from Risers from all 4 Gas Distribution Networks (GDNs). Detail of failure rate calculations can be found in Appendix F of the NARM methodology, but in general form:

Failure rate = Initial failure rate x Asset Length x exp (deterioration rate x number of years since initial failure rate determined)

Changes to the NARM Methodology

LTRB (Long term risk benefit project) Updates

The NARM methodology has been updated since RIIO-GD2 to incorporate changes for long term risk modelling and some changes in failure rates and deterioration rates to better reflect reality. This was carried out as a cross GDN project, underwent a consultation process and is awaiting approval by Ofgem. Please refer to full details of updated methodology changes in the updated version of the NARM Risk Methodology document. A brief summary of the updates includes updates enabling GDNs to report on Long Term Risk (LTR) increases and impact of investments on this metric. For Risers, the only changes have been to allow presentation of long-term risk, failure rates and deterioration for this asset class were not updated as part of the project.

Data has been pooled across networks enabling an update to deterioration curves to include an end of life (EOL) assumption to eliminate artificially high rates of deterioration towards EOL in the previous models for governor and offtake and PRS mechanical asset. These now taper off towards end of life (EOL) and provide much more realistic LTR analysis. Pressure control, governor's regulator and slam shut failure analysis was also updated, and now provides a system view of reliability and failure in the updated version of the model. Mains deterioration was also reviewed as part of the project. The effect of these changes, which have been implemented in the production of the RIIO-GD3 business plan analysis, is to better reflect the reality of operation of the above-mentioned assets.

Updates to the methodology have been discussed with Ofgem during their development and have gone out to consultation. Formal approval is to follow on from the consultation. It was agreed with Ofgem that model updates as part of this project including long term risk would be used for RIIO-GD3 business planning purposes.

6.1. Probability of failure data assurance

This section details how the data is assured and how we determine the survey frequency. This data collected from the surveys is then fed into the replacement Riser model to understand the risk.

The supplies to all in-scope high rise buildings of six storeys or above containing a gas supply are inspected. The NGN Risk Ranking Model for prioritisation of Risers in High Rise Buildings must be used to determine the minimum inspection frequency.

Survey Frequency	Building Riser Risk Score
Yearly Survey	>1000
5 Yearly Survey	≥400 ≤1000
10 Yearly Survey	<400

Table 7 Survey Frequencies

A review of the ranking of each category is undertaken to ensure that additional buildings with a similar risk score are not excluded from the yearly or 5 yearly surveys.

Any Riser with leakage detected on the previous year's survey must be included in the current year's survey schedule.

The following year's survey workload is determined by NGN Risk Ranking Model.

The Risk Ranking Model is refreshed with a new data extract before analysis is undertaken. Asset Integrity is confirmed with Customer Operations Support that has been updated with the previous year surveys and remedial work actions before the data is extracted.

Changes in data following surveys can result in changes to risk scores and in some cases changes to the survey frequency. A comparison is undertaken with the previous year's survey frequencies to investigate any changes and ensure no buildings become overdue for survey.

NARM Data Assurance

The data used in our probability of failure calculations comes directly from the NARM methodology. The failure models are based on various industry standard guidelines (see GDN Asset Health Risk Reporting Methodology document) and the failure rates have been statistically derived using actual asset information such as age or material and historic failure data taking into consideration other influencing factors such as weather or temperature.

We have an annual process for gathering asset data from the business to support NARM RRP delivery. There is a documented process where the business leads supplying the data carryout reasonableness checks on the data supplied to the Asset Strategy team, who then carryout validation and consistency checks.

Our 2024 Data improvement plan assesses key areas of data for robustness and completeness:

Our **Core Asset Data** (e.g. location, length, material) for Risers is assessed to be robust and complete. MOB and Riser data is robust due to a programme of MOB. Number of Laterals on each Riser is also known.

Our **Asset Health and Failure Data** for Risers is assessed to have some data gaps. We currently do not have an NGN-specific Riser leakage rate due to low numbers of failures and inconsistencies with how Riser failure data is captured. Failure analysis has been performed on all GDN data excluding NGN by DNV GL. GDNs are currently using these global formulae in the model.

Our **Financial Data** for Risers is assessed to have some data gaps. NGN do not currently have robust financial data on Risers to go into the model, arising from the fact that we do relatively little work compared to the other GDNs. NGN is therefore using the default costs built into the model that were agreed by the working group and detailed in the methodology. If assumed financial costs are lower than reality, this will lead to a conservative calculation of baseline risk and risk reduction on intervention, and vice versa.

It is recognised in the NARM methodology that the GDNs will have data gaps and will not hold the same level of asset data. To facilitate the population of the Monetised Risk modelling, a flexible but consistent methodology (with options) will be utilised to derive the probability of failure, deterioration, probability of consequence and associated impacts of intervention. This is set out in Table 6 of the NARM Methodology and ranges from Option A (GDN specific data from company systems) to Option B (Pooled/Shared data – where applicable) to Option C (Global/Assumed). Assumed data could be data that has been analysed to be representative of the population, arrived at by expert elicitation, or arrived at by researching relevant published studies/reports.

7. Consequence of failure

For each failure there may be a Consequence of Failure (CoF) which can be valued in monetary terms. The CoF is calculated as the Probability of Consequence (PoC) multiplied by the quantity and Cost of Consequence (CoC) and are linked directly to Failure Modes which categorise the asset failure.

Types of consequence

Our Value Framework sets out the Consequence Measures for each Failure Mode categorised into five risk groups: Compliance Risk, Customer Risk, Health & Safety Risk, Environmental Risk and Financial Risk. The types of consequences relating to these risk categories for Risers are detailed below.

Customer Risk

Supply interruptions – Loss of gas supply to our domestic, commercial, or industrial customers following a gas escape.

Health & Safety Risk

GIB /Explosion – Gas escape leading to a possible gas in building event, which in turn may lead to a possible explosion.

Structural & Fire Hazard – Where explosion leading to structure collapse and/or subsequent fire, which can in turn lead to injury and/or property damage.

Environmental Risk

Loss of Gas – Loss of gas following a gas escape with associated carbon impact.

Financial Risk

Loss of Gas – Loss of gas following a gas escape, resulting in financial cost associated with loss of gas.
Also includes the direct financial costs to the business for without-Intervention work to the assets such as such as repair.

Different supply/demand scenarios have not been considered during our modelling as our current modelling methodology does not include analysis for this. Overall, we are forecasting a slow recovery from impacts of the cost of living crisis and total domestic demand is forecast to return to 2021 levels between 2029 and 2031 for the NE and NO distribution zones of our network. This is based on established econometric modelling and demand forecasting methodologies.

Considering our Riser Scoring methodology set out in Section 6, we would not expect this slow return of demand levels to have a material impact on our investment decisions or their benefits during RIIO-GD3.

NGN's Value Framework

We have developed a Value Framework which we use to assess the value of intervention options consistently across asset classes. We use the NARM methodology as the basis of our Value Framework so it is consistent with the consequence measures. However, we have recategorised them into five risk groups instead of four, so that there is clear distinction between NGN and societal costs/benefits, and so that the present values being calculated are correct. This is further explained in our Network Asset Management Strategy. The five risk groups within our Value Framework are: customer risk, health & safety risk, environmental risk, compliance risk and financial risk.

To derive a monetary value for the cost of consequence, each consequence measure is allocated a monetary value which is multiplied by the quantity of the consequence. The monetary values used within our Value

Framework are based on the agreed NARM assumptions and use values common across GDN's, such as the base price year, industry approved values such as the cost of carbon or the social cost of an injury. In addition, we use values specific to our business, such as the cost of maintenance or the cost of loss of supply. The quantities used are specific to our network, for example the number of domestic properties at risk of a supply interruption, and have been derived from system data, network analysis or assumptions based on demands, flow and redundancy.

When justifying our RIIO-GD3 capital programme, the monetary value of each consequence measure is calculated to determine the benefit or avoided cost of an intervention. Examples include:

Health & Safety Risk – Societal benefits in avoided costs through reductions in the probability of a fatality or non-fatality injury. These costs are in accordance with the NARM methodology.

Customer Risk – Avoided GDN costs through a reduction in costs of supply incidents (loss of supply). These costs have been calculated from historic incidents and the probability and scale of the incidents are based on NARM models.

Compliance Risk – Avoided GDN costs through a reduction in costs of fines and paying for explosion damage. These costs are in accordance with the NARM methodology. They have been separated from direct Financial Risk as we consider them highly uncertain and likely significantly underestimated by the values in NARM, which does not consider reputation, legal and handling costs.

Financial Risk – Avoided GDN costs through reductions in the costs to fix assets on failure and the direct financial cost of the gas leaked from and consumed by our assets. These costs are in accordance with the NARM methodology.

Environmental Risk – Societal benefits in avoided costs through reductions in the volume of carbon emitted when gas is leaked or consumed. These costs are in accordance with the NARM methodology and industry approved values.

Our Commitment to Resilience

Chapter 5 of our Business Plan demonstrates our longstanding commitment to ensuring that we can operate and maintain a resilient network. We have formalised our Resilience Framework and developed several individual resilience strategies which allow us to maintain our high standards. Our Resilience Framework ensures that we continually review the hazards facing our business and assess whether mitigations that we have in place remain sufficient or need to change. This is relevant to our asset management strategies as we need to consider exogenous factors when considering both short- and long-term investment plans. Our Network Asset Management Strategy which is set out in **Appendix A18** brings this all together.

We have introduced a range of other resilience strategies, such as **Appendix A8 – Climate Resilience Strategy**. A climate risk assessment sets out the risks facing NGN currently, in 2050 and in 2100, as set out in section 1.5.2 of the strategy. The climate scenario risk analysis did not identify high risks for either the 2°C or worst-case 4°C warming scenarios assessed. As such, this recognises our resilience to material climate change risks in the long to very long term (2050+). This is due to our comprehensive asset integrity and management procedures that are in operation to ensure asset condition and performance. Resilience levels to climate change risks will be greater in lesser warming scenarios should they arise, due to lower climatic extremes.

We are taking a similar approach to RIIO-GD2 in putting together our investment plan, taking a balanced approach to asset management to ensure a safe, resilient, and compliant network – ensuring we can continue to meet our licence obligations whilst at the same time minimising costs for customers.

8. Options considered

Types of intervention

There are various ways in which we can intervene within this asset group. Each intervention has its own merits and drawbacks and the key to good asset management is to understand how the assets behave and use data and information to ensure the right decisions are made to balance risk and value to deliver a safe and reliable service for our customers. The interventions available for this asset group are:

Do nothing: Continue to monitor condition, but only intervene (either replace or repair) on failure. Not taking any action on failure would directly contradict our obligation as a gas distribution network operator to maintain a safe network and therefore contravene our licence to operate.

Decommission: In the instance that the building owner and customers agree we can remove supply, we would simply isolate the Riser.

Replacement: If no other option is viable then we would replace the Riser.

There can be varying levels of replacement, depending on the requirements for change and legislation.

Future Energy Pathways

Whilst based on the latest demand analysis, we are not expecting significant changes in methane demand during RIIO-GD3, we do recognise that in the long term, the demand will reduce which may have an impact on the benefits produced by our investments. We also understand that although this will have an impact on our network, our assets will continue to play a key role in the energy infrastructure set up. Overall, in RIIO-GD3, we are forecasting a slow recovery from impacts of the cost of living crisis and total domestic demand is forecast to return to 2021 levels between 2029 and 2031 for the NE (North East) and NO (North) distribution zones of our network. This is based on established econometric modelling and demand forecasting methodologies. We are therefore confident that our RIIO-GD3 investments are essential, with “low-regrets” options being prioritised.

Assumed proportion of methane is important within the CBA as the carbon equivalent of the methane content of the gas lost from our assets is quantified, resulting in a monetised Carbon Risk. Gas can be lost from our Riser assets through leakage or failure.

We have gone with the default assumption of current assumed proportion of methane CO2 in natural gas projected forwards due to uncertainties in the potential energy pathways and because this is reflective of the current gas quality legislation. However, we acknowledge that significant changes to gas demand or the allowed methane content of gas, for example due to the blending with or conversion to hydrogen, would impact the benefits of our investments.

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

How we make asset decisions

We aspire to make conscious decisions that are balanced across our asset portfolio to ensure we can leverage the most value out of our assets. In making conscious decisions we can evaluate the risk we hold as a business and the impact it has on our strategic objectives. Asset management relies on accurate data. During RIIO-GD2 we have been working to improve our data and the way we capture and store this information, so it can be used to benefit our decision-making process. We use a wide range of asset data, global values such as the cost of carbon and specific values such as the loss of supply, costs from our updated unit cost analysis and the NARM methodology to calculate risk and value. Technical experts analyse options and set constraints (such as a constraint with the objective of maintaining risk) within our Decision Support Tool which maximises the value of our investments for the given constraints. We use the value measures from our Decision Support Tool in Ofgem's Cost Benefit Analysis template to compare the Net Present Value (NPV) of each option against the baseline option to determine the most suitable Repex programme in RIIO-GD3. The diagram above is a simplified representation of this process.

Figure 4 How we make decisions

Options analysis

To ensure we continue to deliver a safe and reliable service, which we know is a key priority for our customers, we need to invest as our network assets deteriorate to safeguard life and property, reduce the risk of a supply interruptions, health and safety legislation and environmental incidents.

Our analysis ensures that we consider the broad spectrum of potential interventions and their associated risks and benefits. By doing so, we aim to remove risk within high-rise buildings where we have identified increased risk and potential legislation enforcement, where we believe sufficient monitoring is in place we have strike a balance between immediate needs and long-term sustainability, ensuring the mechanical integrity, security, and reliability of our network assets. This structured approach enables us to present a well-rounded set of options, each tailored to mitigate specific risks and enhance overall system performance.

8.1. Baseline – Do nothing

The option to do nothing is used as the baseline against which all other options are measured. It does not include any capital investment but instead considers the cost of ongoing maintenance activities and repairs on failure. These are included within the financial risk element of the NARM modelling. There are no direct benefits accrued under this option. However, it does include societal impacts associated with leakage, injury, and fatality.

While the baseline option appears to present a cost-effective approach in the short term by focusing solely on ongoing maintenance activities and repairs upon failure, it is not considered acceptable given the far-reaching ramifications of such an approach. Reacting only when a Riser has failed exposes the network to significant risks and potential consequences. These include, but are not limited to, the issuance of Health and Safety Executive (HSE) improvement notices, prosecution, or large penalties for interruption.

Moreover, when pipeline failures occur, the immediate consequences range from the leakage of gas into the atmosphere-a serious environmental concern- to more catastrophic outcomes such as an explosion. This may also result in loss of supply, affecting significant number of customers and leading to substantial socio-economic

impacts. In addition to these direct consequences, a lack of proactive planning means that repair works are often carried out under premium rates, driven by the urgency and unplanned nature of the required interventions. This reactive stance not only inflates costs but also compromises the reliability and integrity of the network.

As described in Chapter 3 for MOB unplanned average interruption, there are several areas outside NGN's control that would potentially delay an emergency replacement, for example a 26-week planning application, building regulation inspectors or the availability of scaffolding. Although we try and mitigate these via building relationships with local authorities, building owners and suppliers, the risk is that customers are adversely impacted.

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)	57	7.40	-£ 4.75	24.6%	26.0%	24.7%	N/A	Y

Table 11 shows that without intervention risk, SI and failure levels will all increase by 28% over RIIO-GD3 due primarily to deterioration in asset health of our non-PE assets. This baseline option makes no account to intervene on any of our assets to counteract this deterioration in asset health and service levels. Neither does it seek to address current or potential retrospective compliance issues regarding replacement of PE Risers for buildings over 18m (for the prevention of combustible materials being externally installed). Nor does it address compliance regarding unventilated voids. It is evident that a purely reactive approach, which intervenes only at the point of failure, is fundamentally flawed. It fails to account for the broader implications of Riser failures, including environmental, safety, and financial repercussions. A more proactive, strategic approach is essential to ensure the long-term sustainability and resilience of the network. For the above reasons, this option has been rejected.

8.2. First option summary - Carry out risk and below entry work (do minimum)

A 'do minimum' option has also been considered. This would involve replacing 35 Risers (at a cost of £5.90m) that meet the Riser risk modelling factors: Risers with below-ground entries and buildings with non-compliances around Risers in unventilated voids, where it is not possible for the building owner to install ventilation.

The building regulations were amended in 2018 to prevent combustible materials being externally installed on new buildings (ref. https://www.gov.uk/guidance/ban-on-combustible-materials). It is possible that the HSE may change policy and mandate for retrospective application of this to buildings predating 2018 during RIIO-GD3. This Do Minimum option **does not include** any provision for replacement of Risers on these types of building; and with the withdrawal of the MOB reopener, there is no scope for replacement provided here.

Compliance Objective: This approach does not allow for any replacement of PE Risers relating to the prevention of combustible materials being externally installed. This approach is also short-sighted because we could be retrospectively mandated to act on replacement of PE Risers on these buildings by the HSE during RIIO-GD2, leaving our regulatory commitments and company at risk. 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. For this reason, in Table 10 we have deemed this objective not to have been met.

Risk, SI and Failure objectives:

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)	57	7.40	-£ 4.75	24.6%	26.0%	24.7%	N/A	Y

Table 11 shows that risk increase by 25.0%, SI levels by 26.6% and failures by 24.8% over and above start of RIIO-GD3 levels. This is mitigation of -3.1%, -1.4% and -3.2% against baseline increases. As discussed in our objectives – Section 5, it is not possible to maintain risk, SI and failure levels as 84% of our population is non-PE and each individual Riser and lateral is seeing an increase in risk and service measures of 28% due to deterioration (asset health). We have in Table 10 deemed ourselves to be meeting the objectives of managing risk, service and failure levels as we are delivering similar levels to the Preferred option. In more detail:

Supply interruption increases from an expected event every 9-10 months to 7-8months over RIIO-GD3 with intervention (probabilistically across the entire population). However, the maximum expected supply interruption against an individual asset is much smaller.

Expected number of failures increases from 9.4 to 11.8 per year (probabilistically across the entire population). However, the maximum expected supply interruption against an individual asset is much smaller.

Efficiency: This option costs £4.40m above RIIO-GD2 spend. We have targeted investments from a deteriorating asset health and health and safety perspective and believe our analysis justifies increased spending is warranted. Figure 6 and Figure show the distribution of baseline risk for the baseline position and replaced assets under all options, including the Preferred option.

Uncertainty: This option does not pay back inside 50 years. As stated within our objectives Section 5, as investments in this asset class are carried out for reasons of health and safety and compliance, we believe a hurdle rate for payback should not apply as these investments are necessary to continue to provide a safe and reliant network for our customers and continue to meet our licence requirements. Payback is difficult to achieve in this case as risk reduction on an individual Riser basis does not pay back against the high cost of replacement which include significant costs to provide safe access (see Section 8.6 for our unit costs).

Overall, this option has been rejected as it does not meet compliance requirements.

8.3. Second option summary - Carry out additional sites 110 Risers (enhanced)

This option explores the possibility of increasing the rate of intervention. Unlike the previous option, this strategy would encompass enhanced risk reduction activity based on Riser scores. The rationale behind this methodology lies in the recognition that the replacement risk model provides a comprehensive indication of potential failure risks. This approach seeks to pre-emptively address deterioration before it manifests in critical condition scores, thereby reducing the likelihood of unplanned disruptions and enhancing overall safety and reliability. In this scenario, we would replace 110 Risers (at a cost of £9.90m), 53 of which fall within five high-rise buildings.

This forward-looking perspective could result in a more streamlined and effective investment regime, potentially lowering long-term disruption by mitigating the need for emergency repairs.

Moreover, this option would necessitate a re-evaluation of existing stakeholder arrangements, ensuring that all parties are aligned with the revised intervention timelines. By fostering closer collaboration with entities such as building owners and other relevant stakeholders, the strategy aims to facilitate smoother coordination and implementation processes.

Compliance Objective: This approach does allow 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. For this reason, in Table 10 we have deemed this objective to have been met.

Risk, SI and Failure objectives:

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)	57	7.40	-£ 4.75	24.6%	26.0%	24.7%	N/A	Y

Table 11 shows that risk increase by 22.6%, SI levels by 24.9% and failures by 22.5% over and above start of RIIO-GD3 levels. This is mitigation of -5.5%, -3.0% and -5.4% against baseline increases. As discussed in our objectives – Section 5, it is not possible to maintain risk, SI and failure levels as 84% of our population is non-PE and each individual Riser and lateral is seeing an increase in risk and service measures of 28% due to deterioration (asset health). We have in Table 10 deemed ourselves to be meeting the objectives of managing risk, service and failure levels as we are delivering better levels to the Preferred option. In more detail:

Supply interruption increases from an expected event every 9-10 months to 7-8months over RIIO-GD3 with intervention (probabilistically across the entire population). However, the maximum expected supply interruption against an individual asset is much smaller.

Expected number of failures increases from 9.4 to 11.6 per year (probabilistically across the entire population). However, the maximum expected supply interruption against an individual asset is much smaller.

Efficiency: This option costs £8.40m above RIIO-GD2 spend. Implementing this proactive intervention strategy requires significant investment and a revised asset management approach. Although the benefits of improved safety, reliability, and fewer emergency interventions are attractive, the costs and logistical hurdles are substantial, making this option less favourable. Our customer insight shows the priority levels from our stakeholders. When considering stakeholder feedback for keeping bills low and emerging strategies for decarbonisation, this is a less acceptable proposition – for this reason we have deemed this option not to be meeting this objective Table 10. Figure 6 and Figure show the distribution of baseline risk for the baseline position and replaced assets under all options, including the Preferred option. We are exploring the appetite for removal of gas from high-rises as part of our net zero customer journey and we are supporting local authorities who are exploring removal of gas within high-rise properties. There is a concern among this stakeholder community that early replacement could lead to poor investment decisions. If we were to replace assets earlier to

be proactive this could be counterproductive as the changing landscape in energy may see more building owners looking to remove gas in high-rise buildings.

Uncertainty: This option does not pay back inside 50 years. As stated within our objectives in Section 5, as investments in this asset class are carried out for reasons of health and safety and compliance, we believe a hurdle rate for payback should not apply as these investments are necessary to continue to provide a safe and resilient network for our customers and continue to meet our licence requirements. Payback is difficult to achieve in this case as risk reduction on an individual Riser basis does not pay back against the high cost of replacement which include significant costs to provide safe access (see Section 8.6 for our unit costs).

Overall, this option has been rejected as it does not meet cost efficiency requirements, namely balancing service delivery with keeping bills as low as possible in line with customers' expectations.

8.4. Third option summary - balanced (preferred option)

The third option represents a more pragmatic approach that lies between the two ends of the spectrum described by options two, and three and involves 57 interventions at a cost of £7.40m including:

- Higher risk scores,
- Below ground entry
- Non-compliant Risers in unventilated voids
- Intervention on buildings greater than 18m (prevention of combustible material external installation), including potential retrospective application by the HSE. But excluding additional buildings that could continue to be monitored.

The proposal aligns with the requirements needs for safety and would blend aspects from the second and third option, while moderating the frequency and intensity of interventions, ensuring both practicality and cost-efficiency.

Under this option, we can improve the safety and reliability of Risers where needed and comply with emerging legislative changes, without investing in assets that could be monitored and later looked to be decommissioned as part of wider energy plans. (As part of the "do more "path, almost doubling the number of Risers, an additional 51 Risers to the programme at a cost of £2.5m.) This will be done by investing in the 11 buildings that require the replacement Risers based on risk surveys, design and potential HSE mandated replacement. This includes the four sites where we have PE Risers to ensure we remain compliant with legislation.

This option looks to expand on Option 2 (Do Minimum) by extending the application to 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. It is possible that the HSE may change policy and apply this retrospectively. This has been allowed for in this option. This would ensure that the entire population of Risers are considered regardless of their risk profile and equated to 24 of the 57 Risers.

This approach also includes Risers with below-ground entries. If these failed, they would likely require immediate, full isolation of the Riser and significant interruption time consequences which equated to 15 of the 57 Risers identified.

Compliance Objective: This approach does allow 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. For this reason, in Table 10 we have deemed this objective to have been met.

Risk, SI and Failure objectives:

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)	57	7.40	-£ 4.75	24.6%	26.0%	24.7%	N/A	Y

Table 11 shows that risk increase by 24.6%, SI levels by 26.0% and failures by 24.7% over and above start of RIIO-GD3 levels. This is mitigation of -3.5%, -1.9% and -3.3% against baseline increases. As discussed in our objectives – Section 5, it is not possible to maintain risk, SI and failure levels as 84% of our population is non-PE and each individual Riser and lateral is seeing an increase in risk and service measures of 28% due to deterioration (asset health). We have in Table 10 deemed ourselves to be meeting the objectives of managing risk, service and failure levels as we are delivering similar levels to the Preferred option. In more detail:

Supply interruption increases from an expected event every 9-10 months to 7-8months over RIIO-GD3 with intervention (probabilistically across the entire population). However, the maximum expected supply interruption against an individual asset is much smaller.

Expected number of failures increases from 9.4 to 11.8 per year (probabilistically across the entire population). However, the maximum expected supply interruption against an individual asset is much smaller.

Efficiency: This option costs £5.90m above RIIO-GD2 spend. We have targeted investments from a deteriorating asset health and health and safety perspective and believe our analysis justifies increased spending is warranted. Figure 6 and Figure show the distribution of baseline risk for the baseline position and replaced assets under all options, including the Preferred option.

Uncertainty: This option does not pay back inside 50 years. As stated within our objectives in Section 5, as investments in this asset class are carried out for reasons of health and safety and compliance, we believe a hurdle rate for payback should not apply as these investments are necessary to continue to provide a safe and reliant network for our customers and continue to meet our licence requirements. Payback is difficult to achieve in this case as risk reduction on an individual Riser basis does not pay back against the high cost of replacement which include significant costs to provide safe access (see Section 8.6 for our unit costs).

Overall, this option has chosen as our Preferred option as it meets all objectives and is the best balance of managing service levels whilst keeping bills as low as possible in line with customer expectations. This balanced programme of work will allow us to continue to provide a safe, resilient and compliant network for our customers whilst providing value for money.

8.5. Fourth option summary - Deferred investment

This option considered the deferral of the preferred option (Section 8.4) into RIIO-GD4. This option makes no account to intervene on any of our assets to counteract this deterioration in asset health and service levels. Neither does it seek to address current or potential retrospective compliance issues regarding replacement of PE Risers for buildings over 18m (for the prevention of combustible materials being externally installed). Nor does it

address compliance regarding unventilated voids. It was deemed an unacceptable option for these reasons and was not, although risk and service levels in RIIO-GD3 would be akin to the baseline option.

8.6. Options technical summary table

NGN's expenditure forecasts are built on a tried and tested, robust and efficient process. This is founded in asset management principles that has seen NGN consistently benchmarked as the most efficient gas distribution company by Ofgem since 2005. It should be noted that "robust and efficient costs" should not be interpreted as lowest cost. We have and are currently experiencing external and internal cost drivers that are increasing the cost to deliver some workloads and maintain service and compliance objectives. 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. Notably, Health and Safety and Security of Supply are priority drivers in determining the appropriate balance of risk and cost which enables investment decision making. As such, our costs are efficient over the life of the intervention and not just at a point in time, which would reduce cost but risk service failures or increased costs in future periods.

NGN's efficient and robust process to determine expenditure is as follows:

- Historic analysis of previous investment programmes to understand how expenditure has been effective in managing network risk (NARM) and the service levels that have been delivered. This provides the actual delivered cost of reducing risk and delivering services levels.
- Forward looking analysis of risk profile, cost drivers and pressures to understand what the forecast programme of work is, and the cost associated with maintaining or enhancing performance. This allows a clear articulation of how actual delivered efficiency translates into future cost, accounting for any cost variance.

A comparison of historic cost base versus forward projection to ensure costs are targeted at addressing compliance requirements (HSE), supply demand and account for additional costs drivers or challenging areas of work.

No explicit efficiency allowance is included within this EJP appendix as our efficiency target is covered within the main business plan - a 0.5% Ongoing Efficiency (OE) target.

Table 8 details the unit costs used in our cost benefit analysis of Risers. The cost is priced per building as the primary driver is providing the required access to complete the works.

Intervention	Unit Cost (£) 23/24 prices
Riser replacement (steel) - per building	500,000
Riser replacement (pe) - per building	600,000

Table 8 Riser unit costs

Option	First Year of Spend	Final Year of Spend	Volume of Interventions	Equipment or Investment Design Life	Total installed cost (RIIO-GD3) £m 23/24 prices
Baseline (Do Nothing)	2026/27	2030/31	0	45	0.00
Carry out risk and below entry work (Do Minimum)	2026/27	2030/31	35	45	5.00
Carry out additional sites - 100 risers (Enhanced)	2026/27	2030/31	110	45	9.90
Preferred (Balanced)	2026/27	2030/31	57	45	7.40
Deferred Investment	2031/32	2036/37	57	45	7.40

Table 9 Options cost technical summary

The final consideration we made was about our ability within the time period to carry out the required work. As we have alluded to previously, planning and carrying out Riser replacement is time consuming and requires several levels of authorisation, from building owners to local authorities, as well as issues relating to perimeter access and equipment sourcing for 11 sites. This is factored into our workload mitigation and the ability to deliver what we say we can.

Ofgem CBA Template Assumptions

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

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

9. Business Case Outline and Discussion

Option	Description	Cost in RIIO-GD3 (£m)	Manage Risk Change over RIIO-GD3	Manage Supply Interruption Change over RIIO-GD3	Manage Change in Expected Failures over RIIO-GD3	Payback	Compliance (unventilated voids)	Complaince (Retrospective PE Replacement)
1	Baseline (Do Nothing)	0.00	Not Met	Not Met	Not Met	N/A	Not Met	Not Met
2	Carry out risk and below entry work (Do Minimum)	5.90 (4.40 above RIIO-GD2)	Met	Met	Met	N/A	Met	Not met
3	Carry out additional sites 110 risers (Enhanced)	9.90 (8.40 above RIIO-GD2)	Met	Met	Met	N/A	Met	Met
4	Preferred (Balanced)	7.40 (5.90 above RIIO-GD2)	Met	Met	Met	N/A	Met	Met
5	Deferral of Investment	0.00	Not Met	Not Met	Not Met	N/A	Not Met	Not Met

Table 10 Options appraisal summary

The NARM Methodology was used to underpin our risk, service level and CBA analysis. Data was updated to 2024 and a price base of 2023/24 was used.

Table 1Table 10 summarises our options appraisal – detailed discussion can be found in Sections 8.1 to 8.5.

To determine the optimum solution, we must consider the probability of failure, the consequences of failure, engineering options, and associated costs. Our risk analysis reveals that the likelihood of Riser failures is influenced by various factors such as location of asset and HSE legislation, maintenance history, and current condition assessments. The consequences of these failures can be dire, ranging from minor disruptions to significant safety hazards and financial burdens due to emergency repairs and potential legal implications.

This approach ensures that we proactively address the Risers most at risk while maintaining ongoing surveillance and maintenance of others that are showing early signs of deterioration. It mitigates immediate risks but also distributes the intervention efforts more evenly over time, thereby preventing overwhelming our resources.

In Summary, the Baseline and Deferred option were rejected as they make no account to intervene on any of our assets to counteract this deterioration in asset health and service levels. Neither do they seek to address current or potential retrospective compliance issues regarding replacement of PE Risers for buildings over 18m (for the prevention of combustible materials being externally installed). Nor do they address compliance regarding unventilated voids.

With their minimal approach, they overlook critical factors such as the potential risk of not carrying out timely replacements and the need for ongoing maintenance of Risers, thereby risking asset integrity and escalating long-term costs and risks.

The Do Minimum option was rejected based on not meeting the compliance objective. This focuses on risk score and Risers with below-ground entries but fails to consider a broader range of potential HSE requirements.

The Do Maximum option was rejected based on not meeting the efficiency objective. This is due to the proposal of a significant increase in the rate of risk profile-based interventions.

Option 4 was selected as out Preferred option as it meets all objectives and is the best balance of managing service levels whilst keeping bills as low as possible in line with customer expectations. In particular, it maintains compliance in relation to Risers associated with unventilated voids and PE replacement on buildings over 18m in respect of prevention of combustible materials being installed externally (including retrospectively). This balanced programme of work will allow us to continue to provide a safe, resilient and compliant network for our customers whilst providing value for money.

The CBA results for the Riser intervention are shown in

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)	57	7.40	-£ 4.75	24.6%	26.0%	24.7%	N/A	Y

Table 11 and Table 12. These show that the proposed investments do not payback under any of the options we have analysed. As discussed in our objectives Section 5, as investments in this asset class are carried out for reasons of health and safety and compliance, we believe a hurdle rate for payback should not apply as these investments are necessary to continue to provide a safe and reliant network for our customers and continue to meet our licence requirements. Payback is difficult to achieve in this case as risk reduction on an individual Riser basis does not pay back against the high cost of replacement which include significant costs to provide safe access (see Section 8.6 for our unit costs).

Throughout GD2 we have surveyed and been out to incidents where we have identified key building for replacement Risers, due to condition, leakage and configuration and new legislation is mandated we need to ensure that we have the funding to carry out the inventions needed to safeguard life and property. We strongly believe that these actions are essential to ensure the safety and reliability of our network.

9.1. Key Business Drivers Description

The primary drivers for this investment 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:

- Asset Health and Health & Safety: Our Riser risk ranking model, which was implemented by NGN in 2012 and has been used to prioritise buildings to be surveyed based on the predicted Riser risk score.
- Health and Safety: Risers with below-ground entries. If these failed, they would likely require immediate, full isolation of the Riser and significant interruption time consequences.
- Compliance: Buildings with non-compliances around Risers in unventilated voids
- Compliance: 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. It is possible that the HSE may also mandate retrospective compliance of this to Buildings pre-dating 2018 during RIIO-GD3. This has been addressed within our options analysis.

Conditionalities included within our options analysis are detailed in Section 7.

9.2. Business Case Summary

The analysis results for each of the options detailed in Sections 8.1-8.5 are summarised in

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)	57	7.40	-£ 4.75	24.6%	26.0%	24.7%	N/A	Y

Table 11, Table 12 and Table 13. Options appraisal is detailed in Sections 8.1 to 8.5 for each option and option selection is detailed at the start of Section 9.

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)	57	7.40	-£ 4.75	24.6%	26.0%	24.7%	N/A	Y

Table 11 Options Risk, SI, Failure and CBA summary

Option	Description	Total Expenditure over RIIO-GD3 (£m)		NPV relative to baseline (£m)					
		Capitalised	Non-Capitalised	2035	2040	2045	2050	2060	2070
1	Baseline (Do Nothing)	£ -	-£ 0.39	-£ 11.36	-£ 18.14	-£ 25.38	-£ 33.16	-£ 50.86	-£ 72.91
2	Carry out risk and below entry work (Do Minimum)	-£ 5.00	£ 0.00	-£ 2.44	-£ 3.39	-£ 3.68	-£ 3.53	-£ 2.83	-£ 1.98
3	Carry out additional sites 110 risers (Enhanced)	-£ 9.90	£ 0.01	-£ 5.03	-£ 7.08	-£ 7.84	-£ 7.75	-£ 6.82	-£ 5.71
4	Preferred (Balanced)	-£ 7.40	£ 0.01	-£ 3.81	-£ 5.40	-£ 6.03	-£ 6.02	-£ 5.44	-£ 4.75

Table 12 Options CBA NPV summary

Option	Description	Risk Change from start of RIIO-GD3					Total Risk
		Total VF Carbon Risk	Total VF Complaince Risk	Total VF Customer Risk	Total VF Financial Risk	Total VF Health & Safety Risk	
1	Baseline (Do Nothing)	60.6%	28.1%	28.0%	28.0%	28.1%	**28.1%**
2	Carry out risk and below entry work (Do Minimum)	56.6%	21.7%	25.0%	24.8%	25.5%	**25.0%**
3	Carry out additional sites 110 risers (Enhanced)	53.8%	18.6%	21.6%	22.5%	24.2%	**22.6%**
4	Preferred (Balanced)	56.5%	21.6%	24.1%	24.7%	25.4%	**24.6%**

Table 13 Options detailed risk summary

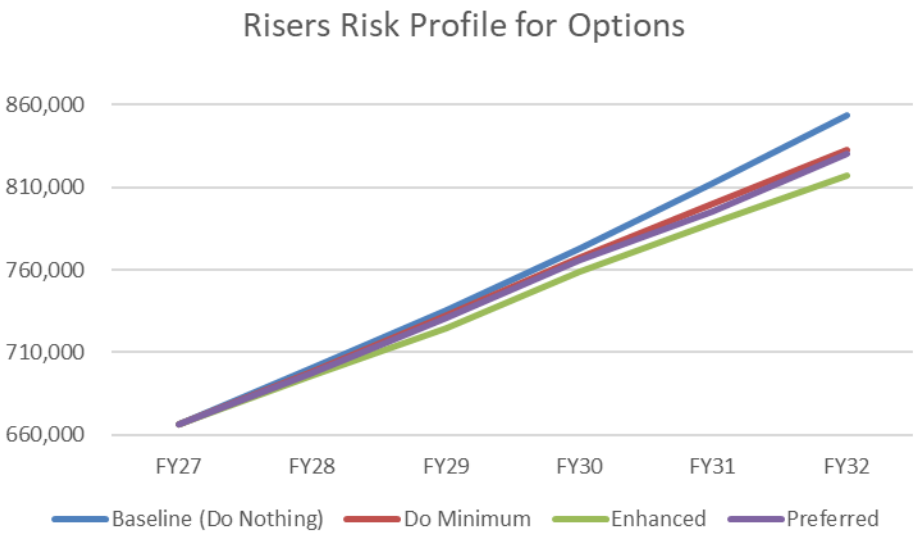

Figure 5 Risk Profile for Options

Individual Riser and Lateral Change over RIIO-GD3 (for Risk, SI and Failures)	Description	Proportion of the population of Risers and Laterals			
		Baseline	Do Minimum	Enhanced	Preferred
-35%	**Replaced Non-PE**	0.0%	0.9%	2.4%	1.6%
28%	**Non-PE** (*higher deterioration*)	83.6%	82.8%	81.2%	82.1%
1%	**PE** **(**lower deterioration**)**	16.4%	16.4%	16.4%	16.4%

Table 14 Individual Riser and Lateral % change for Risk, SI and Failures

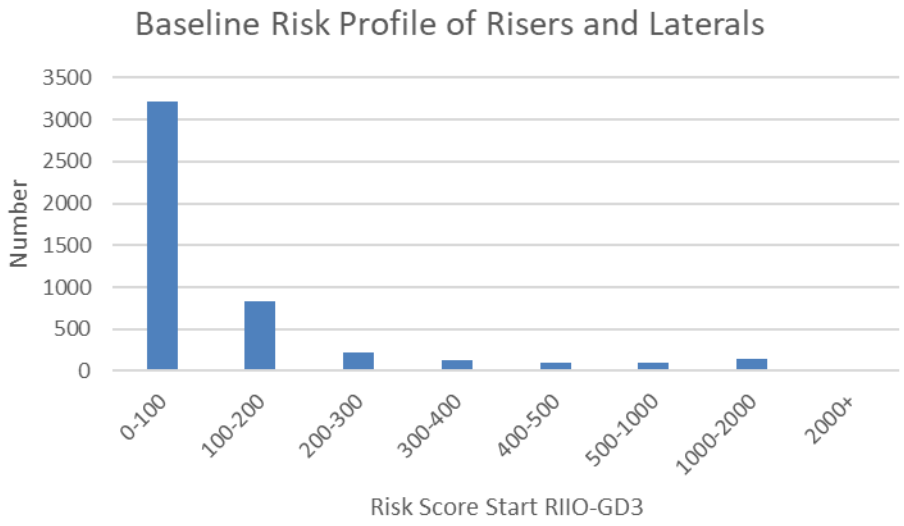

Figure 6 Baseline Risk score (NARM) Profile of Risers and Laterals at start RIIO-GD3

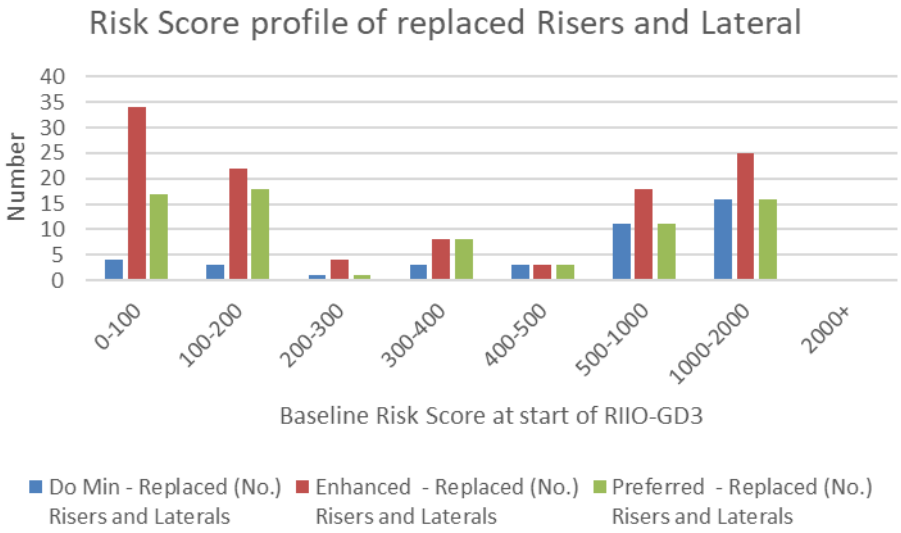

Figure 7 Risk score (NARM) profile of replaced Risers and Laterals under all options

10. Preferred Option Scope and Project Plan

This section intends to illustrate the outcomes of the optioneering process within this asset class. We have assessed each option against our objectives as set out in Section 5. Full detail of our options appraisal can be found in Sections 8.1 to 8.5 and Section 9.

10.1. Preferred Option

Option 4 was selected as out Preferred option as it meets all objectives and is the best balance of managing service levels whilst keeping bills as low as possible in line with customer expectations. In particular, it maintains compliance in relation to Risers associated with unventilated voids and PE replacement on buildings over 18m in respect of prevention of combustible materials being installed externally (including retrospectively). This balanced programme of work will allow us to continue to provide a safe, resilient and compliant network for our customers whilst providing value for money.

The Preferred Option (Option 4) involves 57 interventions at a cost of £7.40m including:

- Higher risk scores,
- Below ground entry
- Non-compliant Risers in unventilated voids
- Intervention on buildings greater than 18m (prevention of combustible material external installation), including potential retrospective application by the HSE. But excluding additional buildings that could continue to be monitored.

The primary drivers for investment are health and safety (responding to deteriorating asset health) and compliance.

RIIO-GD3 costs (£7.4m) are increased over RIIO-GD2 spend (£1.5m) due to deterioration of asset health and our focus on removal of non-compliant PE pipes (see Section 8.2) leading to increased workload (57 up from 23 interventions).

Long Term Risk impact on Preferred Option

Table 15 provides details of the Preferred option spend in RIIO-GD3 alongside Single Year Risk benefit and Long-Term Risk benefit output as shown in our NARM BPDT. Long Term Risk calculations allow for accrual of benefit over the life of the intervention. These intervention lives are detailed in full in our NARM BPDT submission.

We have provided undiscounted Long Term Risk benefit both here and in the NARM BPDT. Further clarification with SRWG is needed around the requirement for discounting LTR.

		NARM BPDT	
	Capex Spend (£m)	Single Year Risk Benefit (R£m)	RIIO-3 Long Term Benefit Output (R£m)
Risers (and Laterals)	3.83	0.05	5.31

Table 15 Risers long term risk

10.2. Asset Health Spend Profile

Throughout RIIO-GD3 we anticipate being able to deliver an ongoing efficiency cost reduction of 0.5% year-on-year (see Section 8.6). We also anticipate that the maintenance workloads for MOBs and associated costs will gradually decline through the period due to the intervention as the frequency of surveys will reduce and remedial works not required following intervention.

The total forecast capital expenditure for Risers has been included within the accompanying CBA. Table 16 shows our spend profile across the 5 years for each of our options.

Risers (and associated laterals) £m 23/24 prices	2026/27	2027/28	2028/29	2029/30	2030/31	Total
Baseline (Do Nothing)	0.00	0.00	0.00	0.00	0.00	**0.00**
Carry out risk and below entry work (Do Minimum)	1.00	1.00	1.00	1.00	1.00	**5.00**
Carry out additional sites 110 risers (Enhanced)	1.98	1.98	1.98	1.98	1.98	**9.90**
Preferred (Balanced)	1.48	1.48	1.48	1.48	1.48	**7.40**

Table 16 Spend Profile.

Comparison of RIIO-GD3 costs to RIIO-GD2 spend can be found in Section 10.1.

10.3. Investment risk discussion

We have controls and processes in place throughout the development of our RIIO-GD3 Capital Expenditure programme to ensure we mitigate both our customer's and our own exposure to risk. Workload and unit cost risks are inherent when forecasting failure rates and intervention solutions for large populations of assets. The bullet points below outline the steps we have undertaken to ensure we limit these risks to provide an accurate capital programme.

Workload risk mitigations

We used our Riser risk methodology based on known asset failure and deterioration rates. Over the past 3 years, we have surveyed our over 6 storey Risers in accordance with our inspection, maintenance, and monitoring. We update data to reflect ongoing deterioration in line with maintenance schedules.

We have weighed various options considering workload volumes and selected the solution balancing cost, risk, and service for customers. Subject matter experts contributed to the development of our strategy to ensure its validity and deliverability. Our RIIO-GD3 strategy builds on the successful RIIO-GD2 framework, proving our effective asset management.

Workload risks considered:

- We mitigate the risk of specialist resource requirement by distributing the workload across the 5 years.
- We have several specialist contractors that we can call upon to provide support and delivery as well as our inhouse specialist teams.
- Although we employ our inhouse project managers, we have a framework of project managers if we needed to draft additional support.

Unit cost risk mitigations

Unit costs have been calculated based on limited expenditure reported during RIIO-GD1 and RIIO-GD2 periods. We do not intend to initiate new work activities; all interventions have been previously conducted, with historic data available to support individual intervention cost estimates.

- We have a strong supplier infrastructure that support delivery of the replacement.
- We identify risks and opportunities as we continue to survey the sites as outlined in our policy.
- We employ experienced Project Managers with a proven history of successfully delivering similar projects, supported by a commercial team of quantity surveyors dedicated to ensuring value for money.

10.4. Project plan

Given that this is an ongoing programme focused on targeting deterioration, our strategy involves dividing the workload into manageable batches. This approach ensures that each batch of Risers is based on the most current condition data available and building availability to carry out the works. We would scope each high-rise individually and engage with the building owners, customers and local authority with regards to timelines and access. Each building will have its own set of requirements for access, design, customer requirements etc.

Furthermore, an opportunity presents itself to establish a risk provision if we can initiate the design process for the initial batch ahead of the RIIO-GD3 commencement. This proactive step could provide a buffer against uncertainties and enhance our ability to manage potential risks more effectively. An example of this would to be to start design and engagement for replacing the remaining Risers within [redacted] This site required an emergency replacement in 2024 as a result the remaining Risers have been identified for replacement. Early engagement will allow time for Local Authority Planning, building owner consent and customer engagement prior to works being carried out. Equipment lead in times can be factored in and provision for vulnerable customers catered for if required.

Priority is based on risk level but ultimately this is led by the building owner or manager.

Table 17 details our planned workload profile for each option over the course of RIIO-GD3. As can be seen, we have a balance of workload across each year of RIIO-GD3.

Risers (and associated laterals) Workload	2026/27	2027/28	2028/29	2029/30	2030/31	Total
Baseline (Do Nothing)	0	0	0	0	0	**0**
Carry out risk and below entry work (Do Minimum)	7	7	7	7	7	**35**
Carry out additional sites - 110 risers (Enhanced)	22	22	22	22	22	**110**
Preferred (Balanced)	12	11	12	11	11	**57**

Table 17 workload profile

A Risk Register for Risers investment over RIIO-GD3 is included within the CBA and the key risks and mitigations are covered in Sections 10.3 and 10.5.

10.5. Key business risks and opportunities

Risks

Building Access*:* We have been working alongside building owners and managers However, we are reliant on their support to carry out any intended inventions. This we see is a risk to the programme plan and could lead to delays. We intend to mitigate this risk by early interaction in RIIO-GD2 to enable us to hit the ground running in the first year of RIIO-GD3.

Building Regulation: There has been a lot of focus on MOBs since the Grenfell incident. The potential for additional and retrospective changes are very possible. The engineering team for MOBs keep abreast of any changes and adapt policy and strategies in accordance with any change. We have factored in the legislative changes we foresee by including the PE Riser into the programme of works for our Preferred Option.

As described in Chapter 3 for MOB unplanned average interruption, there are several areas outside NGN's control that would potentially delay an emergency replacement, for example a 26-week planning application, building regulation inspectors or the availability of scaffolding. Although we try and mitigate these via building relationships with local authorities, building owners and suppliers, the risk is that customers are adversely impacted.

Opportunities

Net Zero Opportunities: We are looking at a project in RIIO-GD3 to explore the customer journey to net-zero. This project will include the journey to remove gas in high rise buildings. Our region only holds 0.8% of the MOBs population in the UK and we have an excellent opportunity to work with local authorities and building owners to deliver this objective. This work has already started in RIIO-GD2 with the potential decommissioning of a site in Newcastle. All replacement work identified will also discuss the removal of gas from high-rise as part of the journey.

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

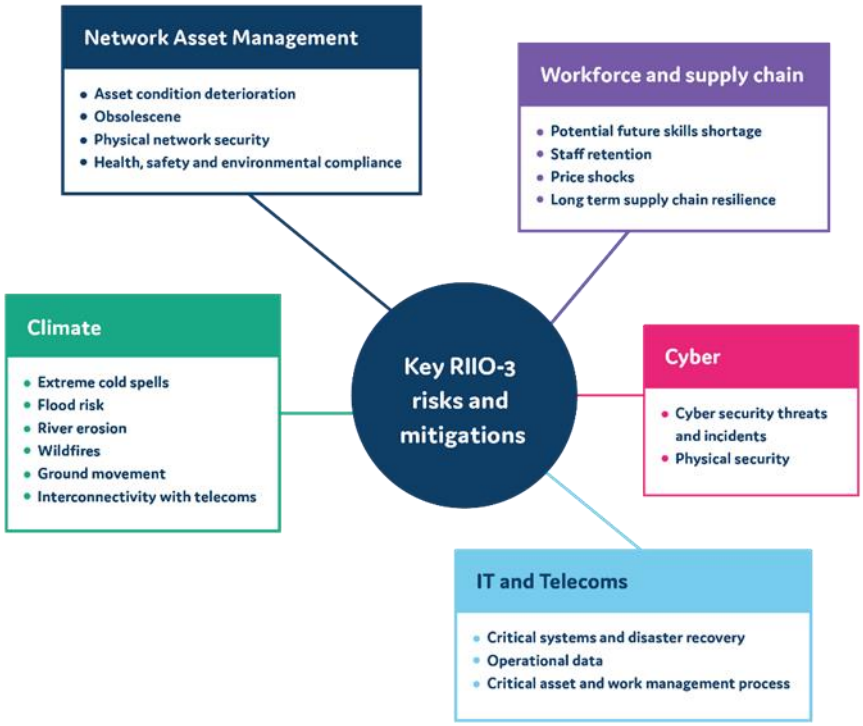

Figure 8 RIIO-GD3 Key risks and mitigations.

10.6. Outputs included in RIIO-GD2 plans

We anticipate finishing the RIIO-GD2 intervention programme before the start of RIIO-GD3, resulting in the reduction in safety risk for 5 high-rise building. The reduction in risk will only be calculated once the schemes are completed. The sites identified for RIIO GD3 are calculated based on their individual surveys and risk attributes, which full under the three categories highlighted in the paper. The risk reduction following intervention will reduce the risk of failure and be in line with legislation where permitted.