Engineering Justification Paper: EJP10

Multiple Occupancy Buildings (MOB) Risers

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1 Summary Table

Name of Project	MOBs Risers		
Programme Reference	EJP 10		
Primary Investment Driver	Safety		
Project Initiation Year	2026		
Project Close Out Year	2031		
Total Installed Cost Estimate (£m)	[Cost data redacted]		
Cost Estimate Accuracy (%)	+/-5%		
Project Spend to date (£)	N/A		
Current Project Stage Gate	N/A		
Reporting Table Ref	CV6.09		
Outputs included in RIIO-2 Business Plan	Yes		
Spend apportionment	**RIIO-2**	**RIIO-3**	**RIIO-4**
	[Cost data redacted]	[Cost data redacted]	[Cost data redacted]
Proposed Regulatory Treatment	NARM		

Table 1: Summary Table

Prices are pre-efficiency and are in 2023/24 price base. This investment case does not satisfy the criteria for late competition or early competition and pursuing these activities would not be in the interests of the customer. We recognise the benefits that competition can bring to customers through efficiency and innovation. We continue to challenge ourselves as a business to ensure that we are harnessing competitive forces where they can provide these benefits. For specific detail on how we have assessed competition, please see Chapter 6 of the Workforce and Supply Chain Strategy (Appendix 17).

2 Executive summary

We convey gas to multiple meter points by means of pipes within and attached to the external walls of 3,430 High Rise residential buildings (HRB) and 50,991 Medium Rise residential buildings (MRB). These multiple occupancy buildings (MOBs) range significantly in size and scale from three-floor, medium-rise buildings with six apartments (for example) to high-rise tower blocks with 40 floors or more and over 200 apartments. Pipeline systems within MOBs are often referred to as riser pipes or riser pipe systems and are used to pipe gas to some or all units within the building, supplying gas for heating, hot water and/or cooking.

This investment case covers the work to repair and replace the riser pipe systems, to mitigate pipeline integrity risks caused by asset deterioration.

We maintain our pipe integrity through appropriate targeted condition-inspections and appropriate interventions (repair, replace, decommission) to provide a safe, efficient and reliable gas supply for our customers, to ensure compliance with the Pipeline Safety Regulations 1996.

We have used our Asset Investment Manager (AIM) model to develop a range of potential interventions including, refurbishment or replacement of the riser-pipe system. Permanent isolation can also be used as an option, typically where there are few gas users in a building, and it is cost beneficial to exchange them for electric.

Within our AIM model we have tested potential options to manage risk, including addressing the highest process safety risks, minimising whole life net benefit, maintaining asset health stable and minimising carbon.

The preferred programme scenario addresses process safety risk, which comprises the [Commercially Sensitive Information Redacted].

[Commercially Sensitive Information Redacted]

Table 2: Summary of costs and volumes

Our RIIO-3 plan is a continuation of the RIIO–2 work programme pro-actively working on 10% of the total risers in use and yet it removes 66% of remaining process safety risk. As a continuation of our RIIO-2 plan, the number of outputs is broadly stable with a total of 9,775 in RIIO-3 compared to 9,473 in RIIO-2. We have improved the accuracy of our costing approach, moving away from a flat rate replacement cost to a process based on the number of floors in a MOB, this has driven the change in overall investment from [Cost data redacted] in RIIO-2 to [Cost data redacted] in RIIO-3. See our network asset management strategy for more information on cost efficiency

3 Introduction

This document covers the engineering justification for investment to refurbish or replace metallic riser pipe systems within multiple occupancy buildings, this paper does not include the costs for surveys or maintenance. A separate paper covers our investment approach to polyethylene (PE) risers.

This asset health engineering justification paper has been developed using our standardised Asset Health Investment Decision making process, which utilises investment decision making models. This considers the asset base, condition grade, deterioration rate and performance to forecast future failures, associated risks and consequences, supporting decision making. For more detailed information on our approach, please refer to "investment methodology" within the Annex of the Network Asset Management Strategy (NAMS).

Our MOBs safety programme was based on the foundations of our fundamental regulatory obligations. Under the Pipeline safety regulations (1996), regulation 13 (PSR13), we are required to ensure pipelines are maintained in an efficient state, working order and good repair. To support the industry in meeting the maintenance requirements set out in PSR13, the institute of gas engineers and managers (IGEM) have developed code G/5 Gas for multi-occupancy buildings (2023). The Health and Safety Executive (HSE) supported the development of code G/5 and were on the panel that developed this industry standard. We used code G/5 to develop our internal MOBs policies.

4 Equipment Summary

4.1 Overview of the assets

MOB customers are supplied with gas using riser pipe systems. Each MOB will have one or more riser systems. We operate 114,300 riser pipe systems. Riser pipe systems comprise:

- Approach main links the main in the street with the building
- Pipeline Isolation Valve (PIV) to shut off the gas in emergency
- Building entry (for internal risers only, with isolation valve)
- Above ground riser pipe or pipes that penetrates the building or in the case of outside risers run up the outside of the building. These pipes should have riser isolation valves where they branch enabling sectional isolation
- Lateral pipes that connect the riser pipes with customers (laterals should have lateral isolation valves (LIV) to enable individual customers to be isolated e.g. in response to their not using gas)
- Emergency Control Valves (ECV) at each meter position

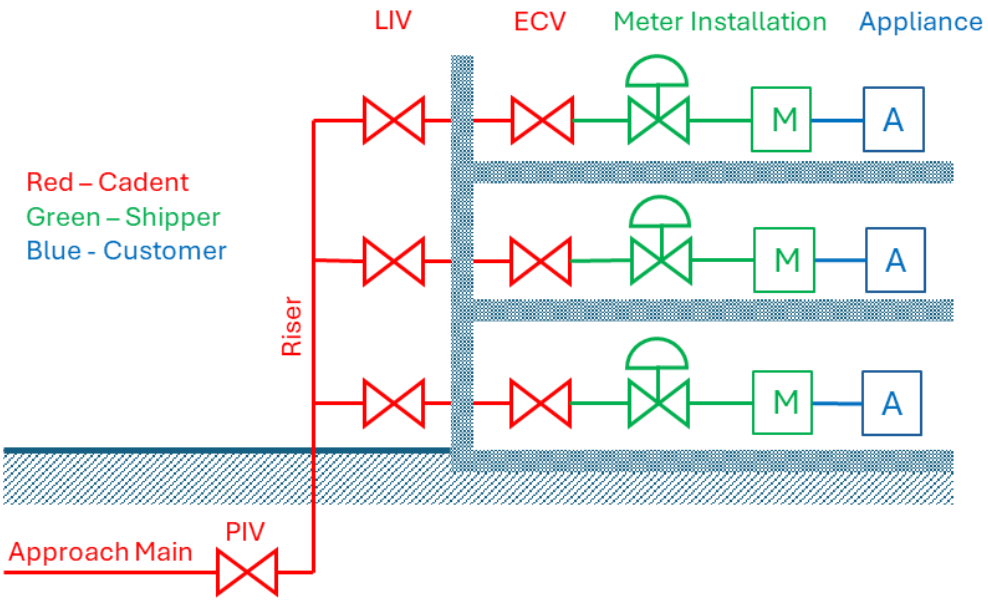

Figure 1: Diagram of riser system

[Commercially Sensitive Information Redacted]

Table 3: Historic Riser Investment

4.2 Detailed equipment summary

Our North London network has the most MOBs, surpassing all our other networks combined, therefore this investment paper focuses on it.

	Eastern	North London	North West	West Midlands	Total Number
MRB Risers – Total	20,517	52,177	12,813	9,527	95,034
HRB Risers – Total	1,094	16,360	474	1,338	19,266
TOTAL	21,611	68,537	13,287	10,865	114,300

Table 4: Total number of risers across each operating network split by HRB & MRB (correct at Oct 2024)

[Commercially Sensitive Information Redacted].

5 Problem Statement

The investment driver for these assets is safety risk. Asset deterioration and failure of our MOBs riser systems causes escapes of gas from the network increasing the risk of unplanned interruptions and explosion.

Customers are clear that safety, reliability and cost are the central elements of the service we offer. We can quantify these requirements in monetary terms using the NARMs methodology, although this approach has limitations with regards to articulating safety risks.

Assets have a finite life. The actual life of each riser pipe system is influenced by its design, the environmental factors it is exposed to, and how it has been maintained. This includes the quality of building maintenance undertaken by the building owner and occupiers. For example, a riser in a duct with a cracked drainpipe may become wet when the designer anticipated a dry environment for the pipe. This would promote corrosion and impact its life.

Major intervention is required when riser pipe systems can no longer be safely operated. It can be required following failure, or done pro-actively to forestall future failure. Proactive intervention is identified by condition assessment or where we are onsite replacing adjacent assets and condition is poor.

The concentration of total process safety risk in a minority of high scoring buildings means that a targeted intervention programme can offer significant benefit. Risks are identified during our survey programme and are combined to generate the building risk score. Risk scores are aligned to our safety requirements allowing us to mitigate potential safety hazards before they occur. This is not easily modelled in [Sensitive Data]. Without using a process safety risk measure within AIM, the model disproportionately values the cost of carbon, making all interventions appear non cost beneficial. Using this approach allows us to manage our highest safety risks whilst acknowledging the modelling process is not perfect. The top 10% of risk scoring risers are pre-selected and the model optimises interventions to allow these key safety risks to be addressed.

Proactive interventions are intended to forestall reactive work. Our plans deliver the least work required to eliminate high risk scoring risers during a 10-year (RIIO-2 & 3) period. In RIIO-3 [Sensitive Data].

Riser work associated with mains replacement: common to all options we have a volume of riser interventions, where a riser is within 30m of a mandated mains replacement. This work must be completed to facilitate the HSE mandated iron mains risk reduction programme (IMRRP) and does not influence the option choice. This work is needed because existing riser pipe systems, which may be in good condition, may not be able to be simply transferred onto a replacement main e.g. they may be embedded deep in a building making a transfer very difficult. In this case, if we do not do riser work then either the main cannot be replaced or the supply of gas to the customers would have to be disconnected permanently.

This activity is being shown within the risers' part of our business plan but is not required to deliver riser deliverables and is not optimised to deliver such outputs. We have however considered the fact that some mains that are due to be replaced have risers that would also be replaced because of the risk that they pose and ensured that there is no double counting in this plan of either work delivery or cost or benefits.

5.1 What happens if we do nothing

The assets will deteriorate and will pose the following service risks if we do nothing:

- Safety: The lack of intervention on a riser system poses a safety risk, due to the fire and explosion risk from a leak, following failure. The consequences modelled in our model are fatalities and minor injuries following ignition. The model does however

  underestimate secondary consequences e.g. fire which could cause wider safety issues.

- Environmental: Any leaks will result in a gas-release to the atmosphere, with a resulting impact to carbon emissions.
- Regulatory compliance: We have a legal obligation to inspect and maintain these assets under the Pipeline Safety Regulations 1996 (PSR).
- Security of Supply: Riser system failures could cause site outage, resulting in customer supply interruptions. Depending on the configuration of the network and the size of the site, this could result in hundreds of customers being impacted.
- Financial: Any riser system failure will have resulting costs to respond and mitigate the failure, to re-establish operation, repair and restore service.

5.2 Key outcomes and understanding success

[Commercially Sensitive Information Redacted]

5.3 Narrative real-life example of problem

Figure 2: Photo of a defective pipework on the riser system

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5.4 Project Boundaries

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6 Probability of Failure

[Commercially Sensitive Information Redacted]

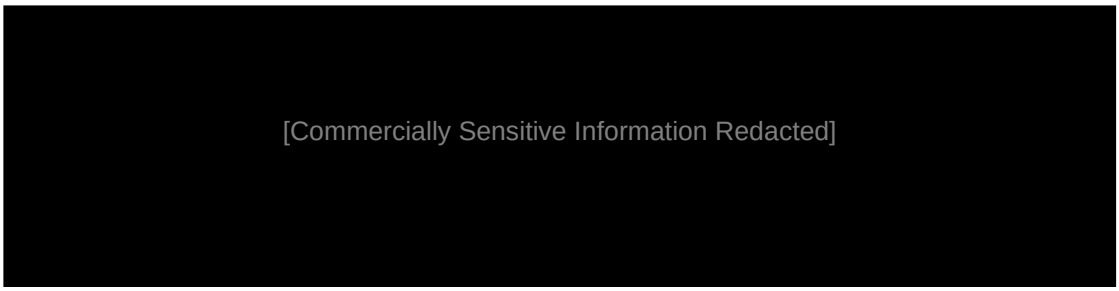

Figure 3: AIM Model configuration

6.1 Failure modes

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6.2 Failure rates for each failure mode

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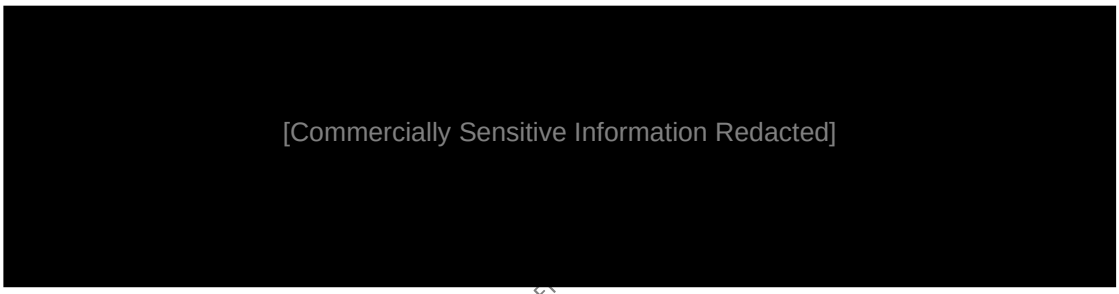

Figure 4: Predicted failure rate of Riser pipe systems

[Commercially Sensitive Information Redacted]

6.3 Probability of Failure Data Assurance

[Commercially Sensitive Information Redacted]

7 Consequence of Failure

[Commercially Sensitive Information Redacted]

[Commercially Sensitive Information Redacted]

Table 5: Service risk consequences.

[Commercially Sensitive Information Redacted]

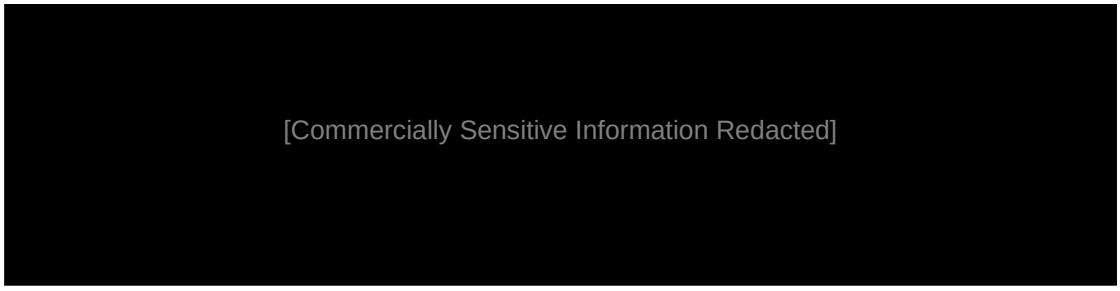

Figure 5 : Monetised risk from no proactive investment

[Commercially Sensitive Information Redacted]

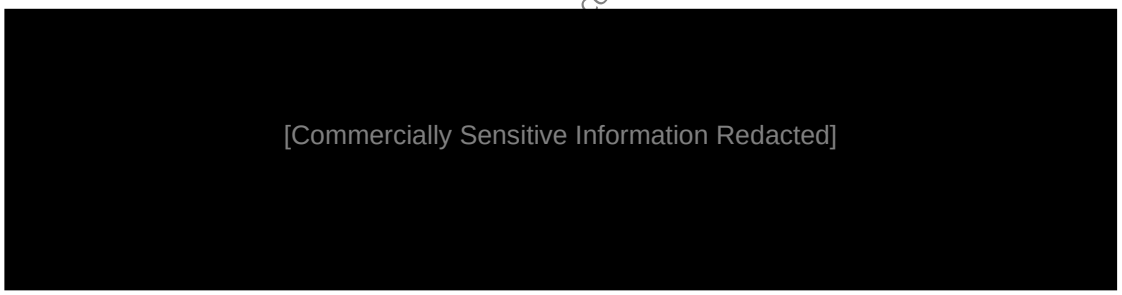

Figure 6: Do Nothing leakage deterioration and failing to invest in our riser assets will result in [Sensitive Data]

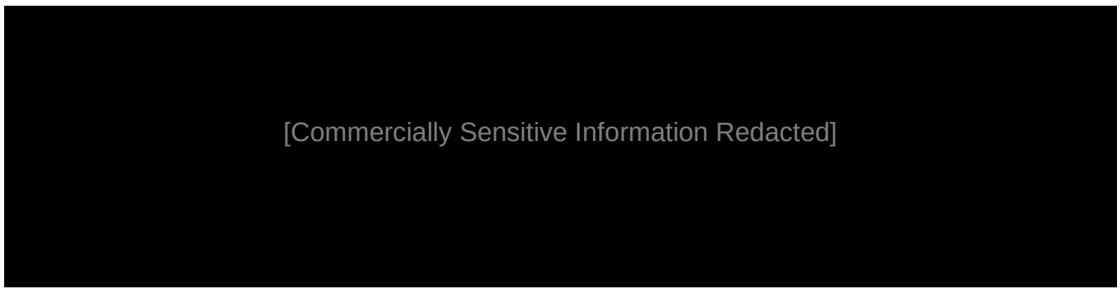

Figure 7: Do nothing safety risk (£m)

[Commercially Sensitive Information Redacted]

8 Options Considered

8.1 How we have structured this section

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8.2 Modes of Intervention

[Commercially Sensitive Information Redacted]

[Commercially Sensitive Information Redacted]

Table 6: Intervention modes

[Commercially Sensitive Information Redacted]

8.2.1 Option 1: Riser refurbishment

[Commercially Sensitive Information Redacted]

Table 7: Option summary: proactive refurbishment of riser pipe system

8.2.2 Option 2: Riser replacement

[Commercially Sensitive Information Redacted]

Table 8: Option summary: proactive replacement of riser pipe system

8.2.3 Option 3: Energy Exchange

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Table 9: Energy exchange option intervention

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8.3 Timing choices

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8.4 Options

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[Commercially Sensitive Information Redacted]

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Table 10: Programme options summary

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8.4.1 Option 0: Baseline Reactive Refurbishment or Repair Only

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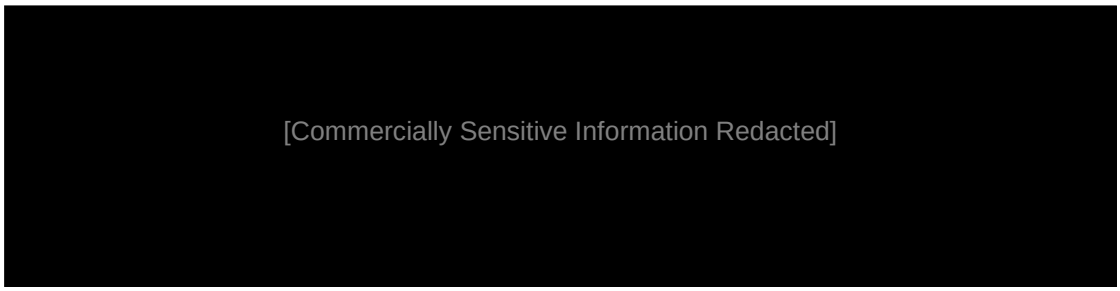

Table 11: Programme Scenario 0: Summary

8.4.2 Option 1: Engineering Volumes Multi Obj RIIO-3 - Process Safety Risk

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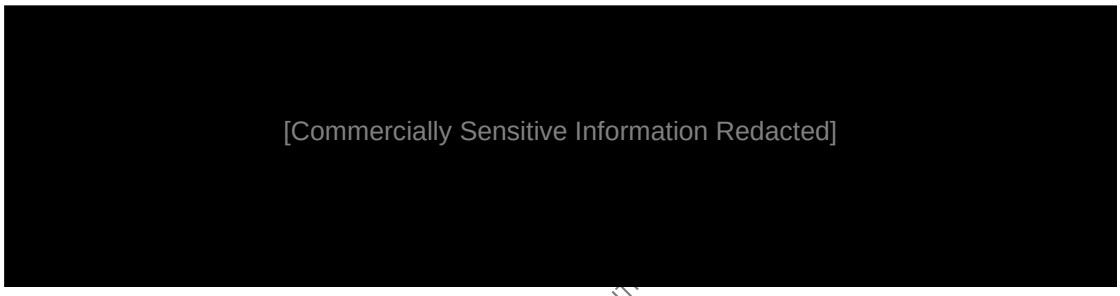

Table 12: Programme Scenario 1: Summary

8.4.3 Option 2: Max whole life net benefit with RIIO-2 spend cap

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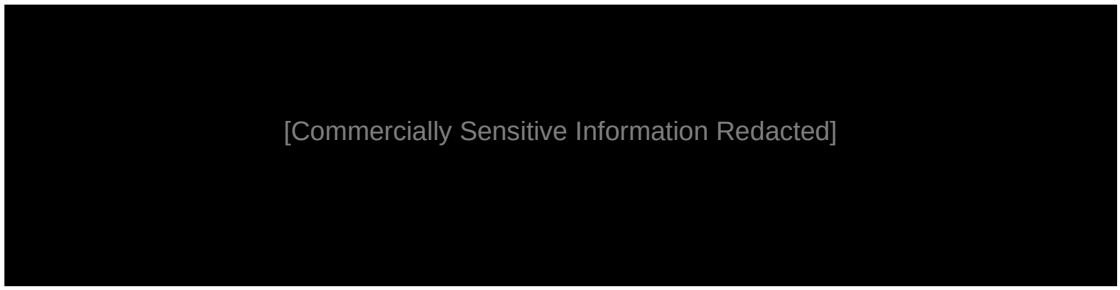

Table 13: Programme Scenario 2: Summary

8.4.4 Option 5: Minimum investment to maintain stable asset health

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Table 14: Programme Scenario 5: Summary

8.4.5 Option 6: Minimise carbon impact with RIIO-2 spend cap

[Commercially Sensitive Data Redacted]

[Commercially Sensitive Information Redacted]

Table 15: Programme Scenario 6: Summary

8.5 Technical Summary Table: Programme Scenarios

[Commercially Sensitive Information Redacted]

Table 16: Summary of Programme Scenarios

9 Business Case Outline and Discussion

9.1 Key Business Case Drivers Description

[Commercially Sensitive Information Redacted]

9.2 Business Case Summary

9.2.1 Summary of results

[Commercially Sensitive Information Redacted]

[Commercially Sensitive Information Redacted]

Table 17: Summary of NPV results

9.2.2 Discussion of results

[Commercially Sensitive Information Redacted]

[Commercially Sensitive Information Redacted]

Figure 8: Shows the total building safety risk removed by intervening on [Sensitive Data].

[Commercially Sensitive Information Redacted]

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Figure 9: HRB & MRB Risk Reduction

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9.2.3 Conclusions

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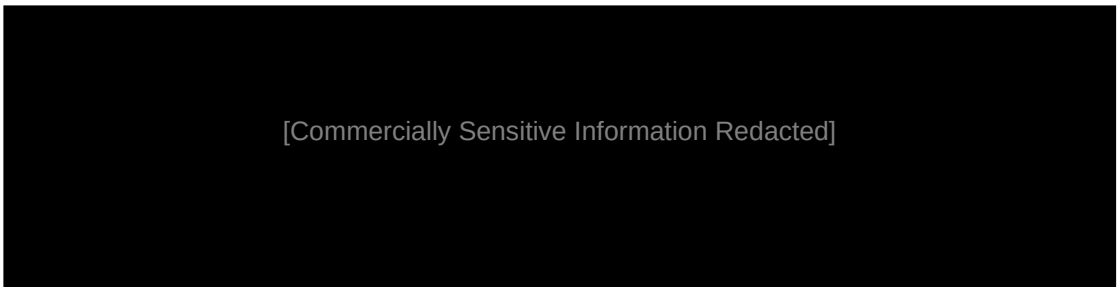

Figure 10: Total Monetised risk position pre and post RIIO-3 investment

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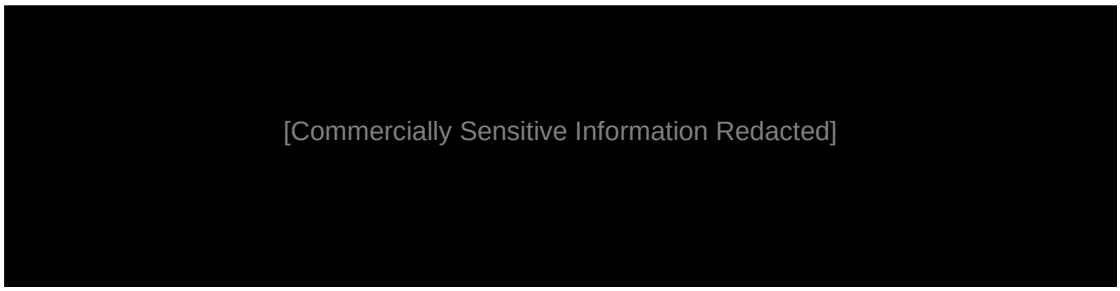

Table 18: Performance under preferred scenario vs baseline

9.3 Sensitivity tests

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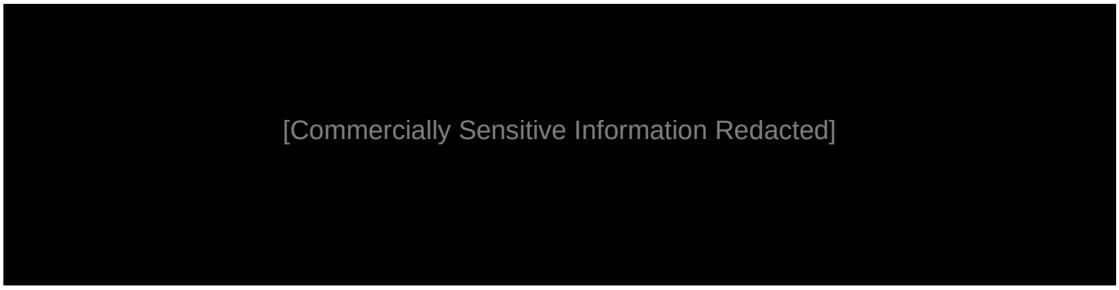

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10 Preferred Option Scope and Project Plan

10.1 Preferred Option

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10.2 Asset Health Spend Profile

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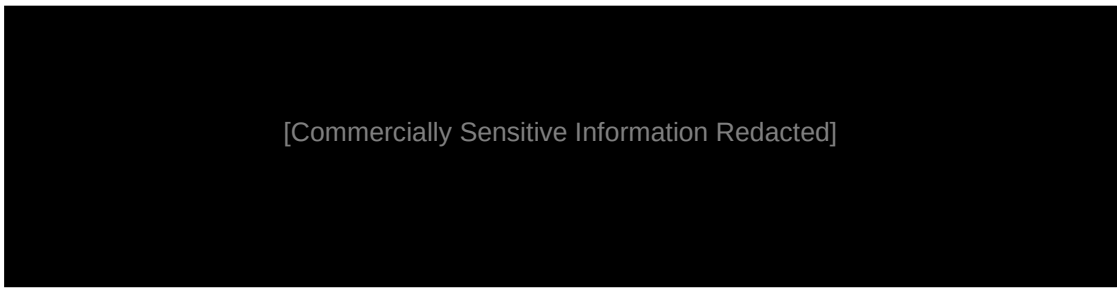

Table 19: Spend per network over RIIO-3 on Option 1 Riser Program.

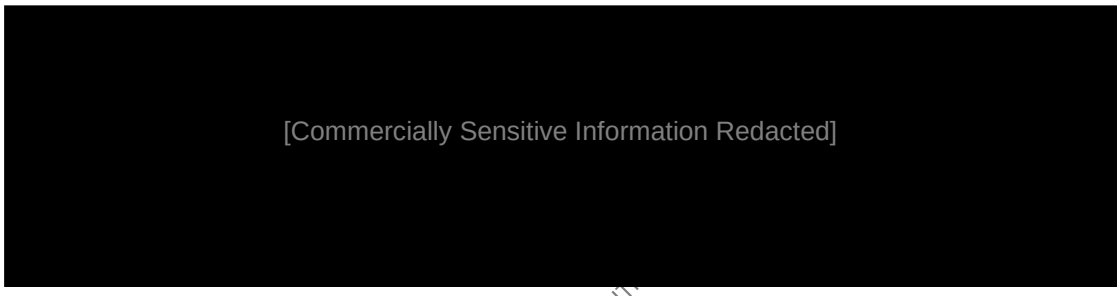

Table 20: No. of interventions per network in Option 1 Riser Program

10.3 Investment Risk Discussion

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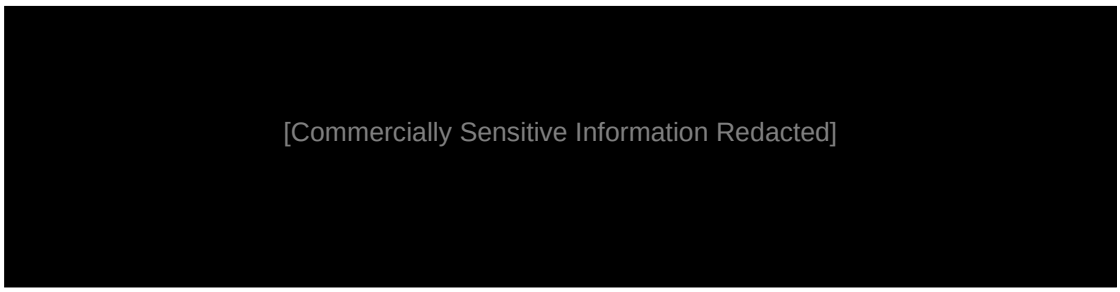

Table 21: Business Risks

10.4 Project Plan

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10.5 Key Business Risks and Opportunities

[Commercially Sensitive Information Redacted]

10.6 Outputs included in RIIO-2 Plans

[Commercially Sensitive Information Redacted]

10.7 Regulatory Treatment

[Commercially Sensitive Information Redacted]

11 Glossary

Term	Definition
HRB	High Rise residential buildings
MRB	Medium Rise residential buildings
Mobs	Multiple Occupancy Buildings
AIM	Asset Investment Manager
PE	polyethylene
NAMS	Network Asset Management Strategy
PIV	Pipeline Isolation Valve
ECV	Emergency Control Valves
GIB	Gas in Building
NPV	Net Present Value