Major Project Justification Paper: MJP04

London Medium Pressure

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1 Summary Table

Name of Project	London Medium Pressure (LMP)		
Scheme Reference	London Medium Pressure MJP04		
Primary Investment Driver	Asset Health and Resilience		
Project Initiation Year	2013		
Project Close Out Year	2036		
Total Installed cost estimate (£)	[cost data]		
Cost Estimate accuracy (%)	+ or -10%		
Project Spend to date (£)	[cost data].		
Current Project Stage Gate	Delivery of Phase 2 (RIIO-2) and feasibility and planning for RIIO-3		
Reporting Table Ref	Repex Tables 6.04 & 6.05 Capex: Tables 5.01 and 5.06 (design-costs only)		
Outputs included in RIIO-2 Business Plan	Yes, this project was a Price Control Deliverable in RIIO-2.		
Spend apportionment (for RIIO-3 plan)	RIIO-2	RIIO-3	RIIO-4
	[cost data]	[cost data]	[cost data]
Proposed Regulatory Treatment	Price Control Deliverable in RIIO-3		

Table 1: Summary Table for London Medium Pressure

All costs in this paper are pre-efficiency and 23/24 price base.

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. 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. 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

The London Medium Pressure (LMP) strategy, initially proposed in RIIO-1, was seen as a 10-to-15-year strategy to proactively maintain high-risk Tier 3 pipes in North London and enable the removal of gas-holder sites facilitated by the increase in operating pressure. It was shown that to do this cost-effectively the pipe-replacement needed to use pipe-insertion methods, which in-turn requires an increased operating pressure due to the reduction in pipe-diameter; without this increase in pressure, you would need to open-cut at a considerably higher-unit rate.

The added benefit of this renewed Tier 3, 2 bar medium pressure (MP) system is that it links the east and west networks back together and therefore provides a back-feed into the network, to support maintaining supply in the event of an incident at the regulators or pipework / standpipes.

By the end of RIIO-2, [sensitive data] of Tier 3 pipe-replacement and [sensitive data] of pipe-decommissioning will have been completed, in west and central London, which is fed from uprated 2 bar regulators at [sensitive data]. Further Tier 3 pipe-interventions are required to the east to complete the 2-bar system envisaged.

This paper has considered a range of proactive pipe-replacement routes and phasing, to address different Tier 3 metallic pipes at high-risk of failure, as part of completing the LMP strategy.

This investment case has assessed eight different options, which consider three alternative routes and different phasing, including the do minimum option of continuing to reactive repair pipes following failure.

Our preferred option for delivery in RIIO-3 is based on delivering Route 2, this has been deemed as the most deliverable [sensitive data] and affordable for customers [cost data] and has the second-best cost-benefit (CBA) of all proactive options assessed, with a [cost data]. Options 3 and 5, both deliver Route 2 in the RIIO-3 period and have the same cost benefit for the RIIO-3 work-scope, however option 5 considers delivering an additional [sensitive data] of high-risk Tier 3 main in RIIO-4. The cost benefit analysis demonstrates that there is further benefit in considering delivering additional pipe-replacement in RIIO-4, over and above route 2. For the purposes of this justification paper, we have assumed that our preferred long-term strategy is option 5, however this decision will be revisited as part of our RIIO-4 submission.

[Commercially Sensitive Information Redacted]

Table 2: Summary of LMP Strategy for RIIO-1 to RIIO-4

3 Project Status and Request Summary

[Commercially Sensitive Information Redacted]

[Commercially Sensitive Information Redacted]

Table 3: London Medium Pressure programme delivered to date

4 Problem/Opportunity Statement

Our customers expect a safe, secure and reliable network. Within our North London Network we have a significant volume of high-risk, large diameter pipes [sensitive data] that supply a considerable volume of gas to millions of our customers in central and greater London.

These metallic Tier 3 mains, carry a significant risk due to the high volume of gas that they carry and the high density of people near these pipes at any given time. These pipes are adjacent to [sensitive data], which are critical to the British economy. These pipes are also considerably more expensive to replace than a smaller pipe in a less-congested urban or rural area. To minimise disruption and cost of pipe replacement we need to replace these pipes through pipe-insertion rather than open-dig, wherever possible. Typically, open-cut methods are twice as expensive than pipe insertion, but to enable pipe insertion methods, the operating pressures need to be increased to compensate for the smaller diameter replacement pipework. This drives the need to upgrade governors for the new operating pressure and carry out the pipe-replacement work in a specific sequence, rather than being able to merely target the highest risk pipes first.

The following section sets out:

- Background to the LMP strategy
- The drivers, problems, and opportunities
- The challenges with delivery
- Project Timescales
- Related projects
- Project boundaries

4.1 Background to the LMP Strategy

As discussed earlier, this paper outlines the remaining work to complete the LMP strategy originally proposed in RIIO-GD1, to proactively replace the highest risk mains and elevate the network to 2 bar to improve resilience.

At the end of the RIIO-2 period the Central London MP system will be split and made up of 2 different maximum operating pressures (MOP). The west area of the network is an all-polyethylene (PE) network constructed during the RIIO-1 & RIIO-2 price control periods and is supplied from new 2bar regulators at [sensitive data]. The central and east system will remain at [sensitive data] (which is a mix of inserted PE mains and existing iron/steel mains) and is supplied predominantly from [sensitive data] pressure reduction stations. The original strategy will provide a new 2bar MP ring main in central London

effectively providing a critical cross connection between the East & West of London supplied by multiple 2bar regulators at [sensitive data]

This renewed Tier 3, 2 bar MP system links the east and west networks back together as originally planned, which provides additional resilience in the event of pipe failures on other areas of the network.

The remaining section of the strategy requires replacement or abandonment of pipes to the eastern side of London. There are various route options under consideration, which will replace sections of high-risk metallic tier 3 mains and connects the 2bar [sensitive data]. Other route options have also been considered that also incorporate the offtakes at [sensitive data].

Through our delivery of RIIO-1 and 2, we have learnt more about the risks and complexities involved with replacing high-risk mains in London subways. As we have evolved our strategy, we have looked at identifying the highest-risk pipes to replace or abandon, to complete the RIIO-3 strategy with the intention of minimising the volume of works within subways (other than abandonment), because of the higher replacement costs per meter.

The following diagram shows the 2 bar MP network that will have been created once the RIIO-1 and 2 scope is completed.

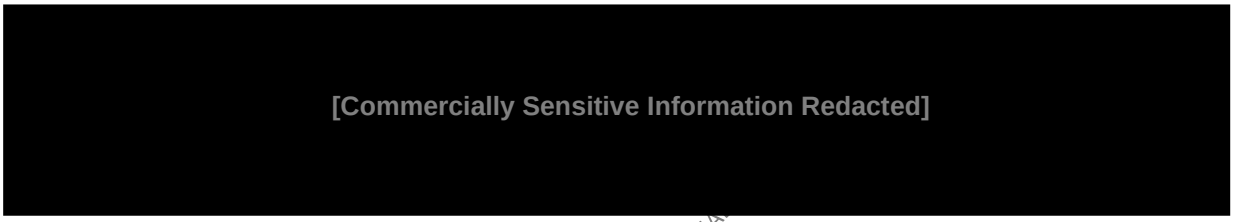

Figure 1 LMP operating pressures, based on work completed at the end of RIIO-2

4.2 Investment Driver, problems and opportunities

The investment driver for LMP is asset health and resilience.

Failure of our mains pose the following risks:

- Safety: a failure or leak on a gas pipeline poses a fire and explosion risk to the public. Almost all Tier 3 pipes under consideration for intervention are within 30 meters of offices, homes, flats shops and national landmarks. Almost all buildings are multi-storey with very high-density occupancy, compared to other areas of the country. These pipes also cross roads, railway lines, tube-lines and canals, which also pose an increased safety risk
- Environmental impact: a leak causes an environment impact through the release of gas to the atmosphere with the resulting impact on carbon emissions (greenhouse gas)
- Traffic disruption: a failure or leak on a gas pipeline will require the pipe to be isolated and roads and buildings to be closed / evacuated to enable the repair leading to extensive traffic disruption. In London, the emergency response would be hugely disruptive with large areas of flats, offices, and shops requiring evacuation, road closures impacting bus routes, red-routes, train links, underground stations, taxis, and other road-users. This would lead to significant potential business and social impact
- Damage to buildings and critical national infrastructure: a leak could lead to fire and explosion and the risk of damage to adjacent buildings and infrastructure with the resulting financial impact.
  Property prices in London and the national importance of many of these buildings, result in a considerable financial risk from the potential property damage following a fire or explosion caused by a gas-leak. These pipelines cross bridges, utility-tunnels, and train lines (overground

and underground lines and stations), and communication, water, and sewerage services. A fire or explosion caused by a gas-leak could lead to damage to this critical infrastructure

- Security & resilience: if a leak is identified, the response will be to isolate the affected pipe for repair. Some customers are directly fed from these large diameter pipes, and downstream governors may also be impacted, having a further impact to the low-pressure system
- Financial: Cost of a reactive repair. The cost of responding to a failure or leak on a large diameter main in these congested streets and areas of London is very expensive due to the size and scale of pipes involved, in such challenging locations. There are only a limited number of qualified sub-contractors able to carry out repair work on such large diameter pipes

An opportunity to improve resilience within central London: the completion of the LMP strategy presents an opportunity to improve resilience, through removing the reliance on gas-holder sites for capacity. Central London is critical to the UK and a large gas supply failure preventing customers from accessing energy is not an option. The pressure uprating to a 2 bar network, facilitated through pipe insertion and governor rebuilds, enables a secure, safe and resilient supply of gas to strategically significant parts of the London network.

Understanding Project success: project success will therefore reduce the above risks through the targeted replacement of these large diameter high-risk mains and elevate the pressure of this new MP ring main to 2 bar to improve resilience across the central London network.

The number of failures and the do-nothing monetised risk (i.e. baseline: reactive intervention only) for the specific pipes in-scope for replacement post RIIO-2 is shown below.

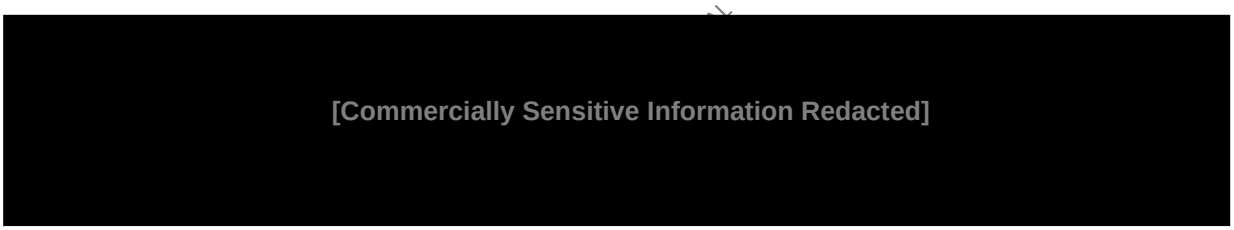

Figure 2: Number of failures of Tier 3 London pipelines in scope for replacement post RIIO-2

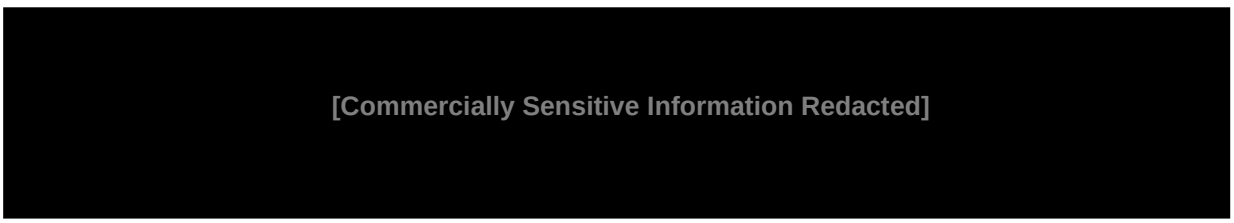

Figure 3: Monetised risk of baseline option (reactive intervention only)

4.3 Key challenges

[Commercially Sensitive Information Redacted]

4.4 Key milestone dates

[Commercially Sensitive Information Redacted]

4.5 Related Projects

4.5.1 Lessons learnt:

[Commercially Sensitive Information Redacted]

4.5.2 Other related activities

[Commercially Sensitive Information Redacted]

4.6 Project Boundaries

[Commercially Sensitive Information Redacted]

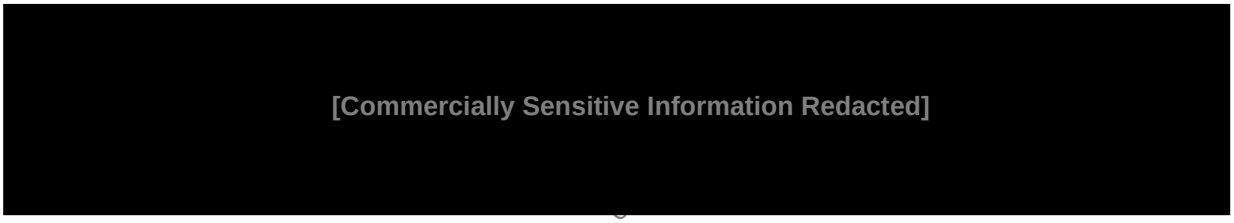

Figure 4: LMP Strategy Project Boundary

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5 Project Definition

5.1 Supply and Demand Scenario Discussion and Selection

Our license states that we must have a network that can meet 1 in 20 yr peak winter daily demand.

We have reviewed the appropriateness of the Future Energy Solutions (FES) Holistic Transition pathway as our core supply-demand scenario. Due to the lack of local, specific data and reviewing our historic actual demands, holistic transition is significantly under-estimating peak demand (1 in 20yr license obligation) and is therefore not a robust scenario for use in RIIO-3.

As such, our base-case supply demand scenario selected for this Engineering Justification Paper (EJP)/Major Engineering Project Justification Paper (MJP), is the 5-year centralised Supply-Demand forecast which is developed with National Energy System Operator (NESO) taking actual demand and historic requirements from us into account. For 2030 to 32 this forecast has assumed a regressional reduction in demand in relation to each networks forecasted volumes. For further information on our review of the FES future energy scenarios refer to the Network Asset Management Strategy (NAMS section 3).

5.2 Project Scope Summary

[Commercially Sensitive Information Redacted]

6 Options Considered

[Commercially Sensitive Information Redacted]

[Commercially Sensitive Information Redacted]

Table 4: Programme Options

6.1 Baseline: Reactive repair

[Commercially Sensitive Information Redacted]

6.1.1 Option summary

[Commercially Sensitive Information Redacted]

Table 5: Baseline Option summary: Reactive repair or replace pipeline upon failure

6.2 Option 1: Route Option 1 (RIIO3)

[Commercially Sensitive Information Redacted]

6.2.1 Option Summary

[Commercially Sensitive Information Redacted]

Table 6: Option Summary table: Option 1: Route 1

[Commercially Sensitive Information Redacted]

Table 7: Option 1, Route 1 – Pipeline Delivery plan

6.2.2 Options Cost Estimate Details

[Commercially Sensitive Information Redacted]

[Commercially Sensitive Information Redacted]

Table 8: Option 1, Route 1 - Repex cost breakdown

[Commercially Sensitive Information Redacted]

[Commercially Sensitive Information Redacted]

Table 9: Option 1, Route 1 - Capex cost breakdown

[Commercially Sensitive Information Redacted]

Table 10: Option 1, Route 1- Proposed Totex Spend profile. (including RIIO4 design enabling costs)

6.3 Option 2: Route 1 (RIIO4 / Defer)

[Commercially Sensitive Information Redacted]

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6.4 Option 3: Route 2 (RIIO3)

6.4.1 Option Summary

[Commercially Sensitive Information Redacted]

[Commercially Sensitive Information Redacted]

Table 11: Option 3: Route 2 Option Summary

[Commercially Sensitive Information Redacted]

Table 12: Delivery plan for pipeline interventions

6.4.2 Options Cost Estimate Details

[Commercially Sensitive Information Redacted]

Table 13: Option 3 (Route 2): Repex cost breakdown

[Commercially Sensitive Information Redacted]

Table 14: Option 3 (route 2): Capex cost breakdown

[Commercially Sensitive Information Redacted]

Table 15: Option 3 (route 2): Proposed Totex Spend profile. (including RIIO4 design-enabling costs)

6.5 Option 4: Route 2 (RIIO4 / Defer)

[Commercially Sensitive Information Redacted]

6.6 Option 5: Route 2, with additional high-risk sections of pipe

[Commercially Sensitive Information Redacted]

[Commercially Sensitive Information Redacted]

Table 16: Option summary Option 5, Route 2

[Commercially Sensitive Information Redacted]

Table 17: Option 5: Route 2 + additional high-risk pipes

6.6.1 Options Cost Estimate Details

[Commercially Sensitive Information Redacted]

[Commercially Sensitive Information Redacted]

Table 18: Option 5 (Route 2): Repex cost breakdown

[Commercially Sensitive Information Redacted]

[Commercially Sensitive Information Redacted]

Table 19: Option 5: Proposed Spend profile. (including RIIO-4 enabling design-costs)

6.7 Option 6: Route 2, with additional high-risk sections of pipe

[Commercially Sensitive Information Redacted]

[Commercially Sensitive Information Redacted]

Table 20: Additional pipeline replacement compared to Route 2 (Option 6)

[Commercially Sensitive Information Redacted]

[Commercially Sensitive Information Redacted]

Table 21: Option 6: Proposed Spend profile (£m)

6.8 Option 7: Route 2, with additional high-risk sections of pipe

[Commercially Sensitive Information Redacted]

[Commercially Sensitive Information Redacted]

Table 22: Additional pipeline replacement lengths, in addition to Route 2. (Option 7)

6.8.1 Options Cost Estimate Details

[Commercially Sensitive Information Redacted]

[Commercially Sensitive Information Redacted]

Table 23: Option 7 Total Repex Estimate

[Commercially Sensitive Information Redacted]

[Commercially Sensitive Information Redacted]

Table 24: Totex spend profile for option 7

6.9 Option 8: Route 3, delivery RIIO-3 & 4.

6.9.1 Option Summary

[Commercially Sensitive Information Redacted]

[Commercially Sensitive Information Redacted]

Table 25: Option summary Option 8, Route 3

[Commercially Sensitive Information Redacted]

Table 26: Route 3 Proposed Delivery Plan. (Pipeline interventions) – metres

6.9.2 Options Cost Estimate Details

[Commercially Sensitive Information Redacted]

Table 27: Option 8 (Route 3): Repex cost breakdown

[Commercially Sensitive Information Redacted]

Table 28: Option 8: Capex cost breakdown

[Commercially Sensitive Information Redacted]

Table 29: Totex spend profile for Route 3 / option 8 (including RIIO-GD4 enabling design costs)

6.10 Programme option summaries

[Commercially Sensitive Information Redacted]

[Commercially Sensitive Information Redacted]

Table 30: Programme option Summary Table

7 Business Case Outline and Discussion

7.1 Key Business Case Drivers Description

[Commercially Sensitive Information Redacted]

[Commercially Sensitive Information Redacted]

Table 31: CBA Benefits Methodology

7.2 Supply and Demand Scenario Sensitivities

[Commercially Sensitive Information Redacted]

7.3 Business Case Summary

[Commercially Sensitive Information Redacted]

[Commercially Sensitive Information Redacted]

Table 32: Business Case Summary: Costs and CBA comparison.

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Table 33: Detailed comparison of Option 5 & 6

[Commercially Sensitive Information Redacted]

Table 34: Performance of preferred option (Option 5) relative to the baseline option.

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[Commercially Sensitive Information Redacted]

Table 35: Sensitivity Test Results

8 Preferred Option Scope and Project Plan

8.1 Preferred Option for this Request

[Commercially Sensitive Information Redacted]

8.2 Project Spend Profile

[Commercially Sensitive Information Redacted]

[Commercially Sensitive Information Redacted]

Table 36: Spend profile for RIIO-3 (Proposed LMP option)

8.3 Efficient Cost

[Commercially Sensitive Information Redacted]

8.4 Project Plan

[Commercially Sensitive Information Redacted]

[Commercially Sensitive Information Redacted]

Table 37: Delivery plan for Repex: RIIO-3 (metres)

[Commercially Sensitive Information Redacted]

[Commercially Sensitive Information Redacted]

Table 38: Delivery Plan for District Governors: RIIO-31

8.5 Key Business Risks and Opportunities

[Commercially Sensitive Information Redacted]

[Commercially Sensitive Information Redacted]

Table 39:Key Business risks that are applicable to LMP.

[Commercially Sensitive Information Redacted]

Table 40: Key Risks and Mitigations

8.6 Outputs included in RIIO-2 Plans

[Commercially Sensitive Information Redacted]

9 Glossary

Term	Definition
DLR	Docklands Light Railway
FES	Future Energy Solutions
LMP	London Medium Pressure
MP	Medium Pressure
PE	Polyethylene
TfL	Transport for London