Cadent

Your Gas Network

# Vehicle-Based Advanced Leak Detection – Net Zero and Small Projects Re-opener

# 1. Governance table

The table below outlines where each section of this application relates to Special Condition 3.9 of our Gas Transporter licence, as well as Ofgem's requirements as set out in Special Condition 9.4.

| Ofgem Requirement | Application Chapter/Section |
|---|---|
| **Special Condition 3.9 Net Zero Pre-Construction Work and Small Projects Re-opener ($NZP_t$)** | |
| Support the achievement of Net Zero (3.9.1) | Chapter 2 – Executive summary<br>Chapter 4.2 – Problem scope |
| Application Requirements (3.9.4 a-d) | Chapter 4.2 – Problem scope<br>Chapter 6.2 – Options summary<br>Chapter 7 – Preferred option<br>Chapter 8.3 - Costs |
| **Re-opener Guidance and Application Requirements document (Feb 2023)** | |
| Introduction (value and justification of adjustment)<br>(para 3.1 to 3.5) | Chapter 4.1 – Project history and RIIO-GD2 alignment<br>Chapter 4.2 – Problem scope |
| Gas Distribution Sectors (para 3.6 to 3.7) | Chapter 2 – Executive summary<br>Chapter 4.2 - Problem scope<br>Chapter 8.3 – Costs |
| Needs case and preferred option (para 3.8) | Chapter 4.2 - Problem scope<br>Chapter 7 – Preferred option |
| Alignment with overall business strategy and commitments (para 3.10) | Chapter 5.1 – GD3 alignment |
| Demonstration of Needs case/problem statement (para 3.11) | Chapter 4.2 - Problem scope |
| Consideration of Options and Methodology for Preferred Option (para 3.13) | Chapter 6 - Options and selection methodology<br>Chapter 7 – Preferred option |
| The Preferred Option (para 3.14) | Chapter 7 – Preferred option |
| Project Delivery and Project Monitoring (para 3.15) | Chapter 9.1 – Funding plan<br>Chapter 9.3 – Roll out plan |
| Stakeholder engagement and whole system opportunities (para 3.16 to 3.18) | Chapter 5.1 – GD3 alignment |
| Cost Information (para 3.19 to 3.21) | Chapter 8.3 – Costs |
| Cost Benefit Analysis & Engineering Justification (para 3.22 & 3.23) | Chapter 4.2 - Problem scope<br>Chapter 8.2 – Benefits |
| **Net Zero Pre-Construction Work and Small Projects Re-opener Governance Document (March 2023)** | |
| Scope and Eligible Projects (para 2.1 to 2.3) | Chapter 4.2 - Problem scope |
| Materiality Threshold (para 2.4 to 2.6) | Chapter 8.3 – Costs |
| Process (para 2.7 to 2.9) | Chapter 4.2 - Problem scope<br>Chapter 5 – Formulation of scope |
| Regulatory Treatment (para 2.17, 2.22 & 2.23) | Chapter 8.4 – Regulatory treatment |
| NZASP Contribution (para 2.10 to 2.13) | Chapter 8.5 – Contribution |

## 1.1. Key Contacts

The Key contacts for this Re-opener and to who questions regarding this submission should be made are:

- **[Redacted]**
  - **[Redacted]**
  - **[Redacted]**
- **[Redacted]**
  - **[Redacted]**
  - **[Redacted]**

# 2. Executive summary

The carbon footprint that gas networks around the world are responsible for is dominated by fugitive methane emissions. Within Cadent, 77% of our footprint in 2023/24 was due to methane emissions from our Low and Medium Pressure (LP/MP) networks. To effectively tackle these emissions, we need to be able to identify the location and size of emission sources in a proactive way, so that we can plan and deliver targeted interventions. We cannot do this today, as we rely on the public notifying us where gas is emitting from our network, which we respond to reactively. Data on where we respond trickles into our Mains Replacement Programme (MRP), which is primarily driven by safety risk mitigation.

We have proposed an Advanced Leakage Management Approach (ALMA) in our RIIO-GD3 plan, which will enable us to identify, measure, prioritise and reduce leakage by 10% more than our baseline MRP alone. This is based on a new emission method being in place by 2028.

The ALMA consists of three parts: Advanced Leak Detection (ALD), where assets are measured for emissions using in-field technology; the Digital Platform for Leakage Analytics (DPLA), where results from ALD are processed (and combined with data from a machine learning model analysing higher pressure assets) to present one source of the truth for network emissions; and the Advanced Leakage Intervention Programme (ALIP), where assets found with high emissions are replaced, repaired or remediated.

This NZASP submission seeks to bring forward **[Redacted]** of allowances sought as part of our RIIO-GD3 plan for vehicle-based ALD, which measures emissions from our LP/MP networks, and includes a proposed reduction to our RIIO-GD3 allowances by the same amount. The funding would allow Cadent to scale-up from our present four vehicle-based ALD units in North London, costing **[Redacted]** which we will fund through an overspend of our Totex allowances, to **[Redacted]** units across all of our networks to deliver a survey frequency of once per year, everywhere, in time for RIIO-GD3. This will enable us to implement the new emission method one year earlier, by 2027. We do not have allowances to do this in RIIO-GD2, therefore this request does not constitute to duplicated funding of this technology.

The benefits of bringing forward investment in vehicle-based ALD and starting sooner on this critical emissions reduction journey are clear: over **[Redacted]** of additional whole life net benefit to 2040; enabling DPLA implementation faster; alignment with HSE's revised enforcement policy, and; enabling targeted, proactive repair works to start sooner, championing the UK's pledge towards rapid action on reducing methane which is directly connected to the UK's Net Zero Carbon targets.

*Table 1 - NZASP requested TOTEX costs 18/19 prices*

| **Vehicle-based ALD re-opener costs TOTEX (£m)** | **'25/26** |
|---|---|
| North London | **[Redacted]** |
| Eastern | **[Redacted]** |
| West Midlands | **[Redacted]** |
| North West | **[Redacted]** |
| **Sum** | **[Redacted]** |

# 3. Contents

# 4. Introduction

## 4.1. Project history and RIIO-GD2 alignment

Fugitive methane emissions represent the vast majority of Gas Distribution companies' carbon footprints around the world. Some gas distributors, outside of the UK, have made radical steps to reduce their fugitive emissions through using Advanced Leak Detection (ALD) to drive intervention plans. This submission is focused at accelerating that same progress in the UK to act as a fast follower to technological advancements that have been implemented abroad.

Cadent has been piloting vehicle-based ALD* technology in its North London network since 2021 with the aim to improve Cadent's carbon footprint by minimising the amount of methane that is emitted to the atmosphere by finding and intervening on areas of high emissions. We purchased **[Redacted]** for this pilot costing **[Redacted]** and will fund this though an overspend of our Totex allowances. Without this pilot, we expect that GB GDNs would not be in a position to roll out this technology as early in RIIO-GD3.

Cadent previously submitted a request through the Non-Operational IT Capex (NOITC) Re-opener mechanism in September 2023 to assist with the roll out of this technology beyond London.

Ofgem acknowledged the clear case for investing in vehicle-based ALD ahead of RIIO-GD3, but had concerns about a potential overlap of costs and funding for the IT aspects of the NOITC-submission with the Digital Platform for Leakage Analytics (DPLA) project, which is funded through the Strategic Innovation Fund (SIF). The Final Determination was to not fund this project, however, Ofgem noted that if the concerns could be addressed then a revised proposal through the Net Zero Pre-Construction and Smal Project (NZASP) Re-opener could be made.[1]

This document has been drafted as an application to the NZASP Re-opener mechanism, to seek funding to roll out vehicle-based ALD across Cadent in the final year of RIIO-GD2, establishing capacity to survey our Low and Medium Pressure (LP/MP) network once per year by the start of RIIO-GD3.

To address the concerns from the previous NOITC reopener request, we have:

1. Removed IT costs from our funding request.
2. Worked thoroughly with the DPLA team to plan how an expedited vehicle-based ALD scale up can flow into the platform, given the recent project direction change through the DPLA Continuation Plan.

In order to comply with Ofgem's RIIO-3 Sector Specific Methodology Decision, per paragraphs 2.55 and 2.56[2] of the document we have included a request for the implementation of ALD in our base plan for RIIO-GD3. If this NZASP submission is approved in full for scale-up during RIIO-GD2 then a corresponding reduction in our RIIO-GD3 requirements will apply and this is set out clearly within this document in the section titled 'RIIO-GD3 plan implications'.

**Vehicle-based ALD was formerly referred to as NIVMT (Non-Invasive Vehicle Mounted Technology).*

## 4.2. Problem scope

Methane is the primary component in natural gas and its escape from the gas distribution network into the atmosphere dominates the carbon footprint of the industry. Within Cadent, c.77% of our carbon footprint in 2023/24[3] was due to methane emissions from the LP/MP distribution network. The emissions from this network are managed primarily through two processes:

- Replacement of our metallic gas distribution network with polyethylene pipe.

[1] Non-Operational IT Capex Re-opener Final Determinations – page 18
[2] RIIO-3 Sector Specific Methodology Decision – GD Annex – page 19/20
[3] CALC_01 – Cadent Carbon Footprint Calculations

- Reactive repair of our network when public reports of escape/smell of gas are made.

## Replacement

The gradual replacement of iron pipes is driven by the Iron Mains Risk Reduction Programme (IMRRP),[4] a programme introduced by the Health and Safety Executive (HSE) in 2002 to reduce safety risk. Reducing the industry's carbon footprint is a secondary impact of this programme.

Whilst we have the flexibility as part of the mains replacement programme (MRP) to select work which prioritises the replacement of assets with larger emissions, our ability is limited because without ALD we don't have measurement data to confirm which assets are really causing emissions. Currently we use the Shrinkage and Leakage Model (SLM), which presents methane emissions at cohort level. On average, the size of each cohort is c.4,400km, making it impossible to identify individual assets that are leaking.[5] When we use measured data from ALD, we see that asset emission rates have a wide range, with a small proportion of leaks representing a large proportion of emissions. In Cadent's case, 10% of the leaks found in its North London pilot so far represent 33% of its emissions, as demonstrated in the figure below. The only way to identify this 10% and the other leaks towards the right-hand side of the figure is by measuring in the field. The higher the coverage and frequency of survey, the higher the ability to identify leaks on the right-hand side of the figure.

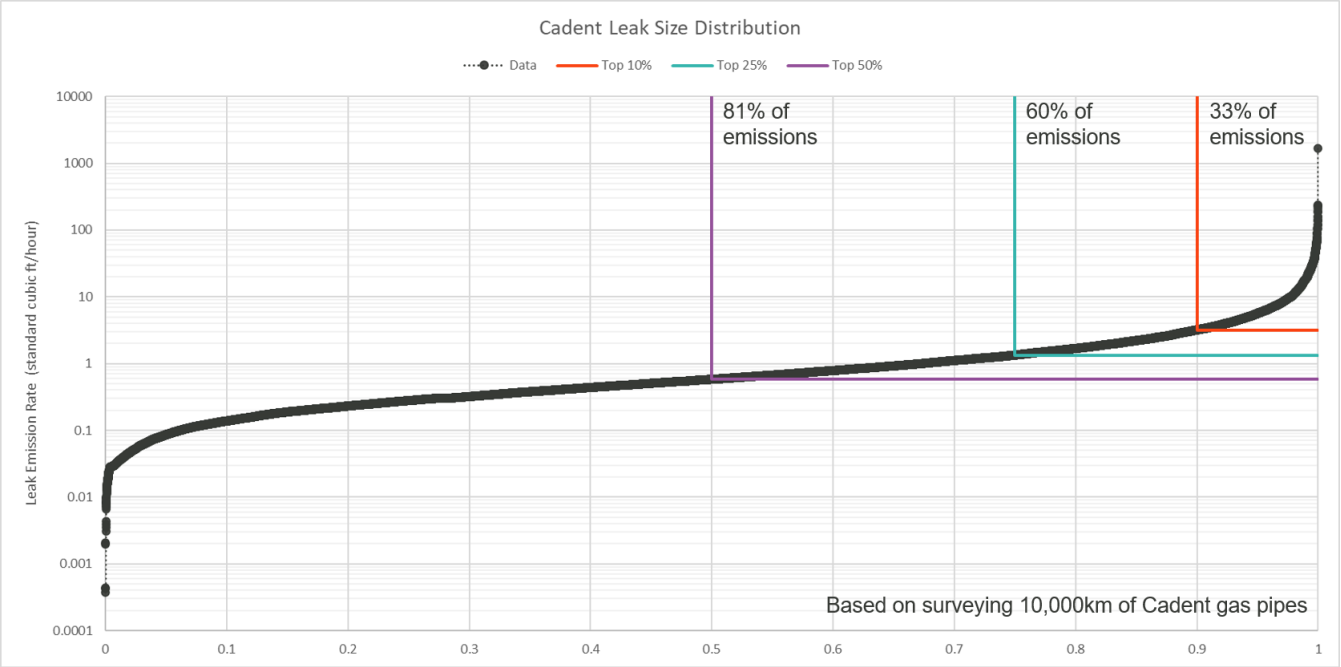


*Figure 1 - Results from Cadent's vehicle-based ALD pilot in its London network*

In our RIIO-GD3 plan, we presented an approach using a 'Hybrid SLM' model,[6] which simulated the effect of vehicle-based ALD monitoring our entire LP/MP network, using a small sample size covered by the pilot of vehicle-based ALD in North London. We have tested these rates against samples taken in the other networks, demonstrating its effectiveness in identifying high emitting pipes. This represents a step change in our ability for business planning and will improve upon the SLM-alone and therefore represents progress and innovation using data. This approach can be enhanced further through increased local measurement using vehicle-based ALD and identifying the largest emitters for mains replacement prioritisation, which represent a large component of emissions.

[4] Iron mains risk reduction - HSE
[5] CALC_02 **-** Cadent Shrinkage & Leakage Model Coefficient Populations
[6] Cadent RIIO-GD3 Business Plan – Environmental Action Plan - appendix_06 – section 2.2.6

### Repair

Cadent runs the National Gas Emergency Service phoneline, where members of the public report where they have smelt gas. Almost all Cadent's repair workload is identified through this method, except a small amount of safety driven proactive surveys.

Natural gas must be present in a high enough concentration to be identified with the human nose. This is important for safety, as a high concentration of natural gas could lead to an explosive atmosphere and cause safety incidents. Safety driven proactive surveys using previous generation gas detection equipment use a concentration threshold set to highlight gas readings at or above 500 parts per million (ppm) methane. This threshold has been used to try to sift potentially hazardous leaks from non-hazardous ones.

Perhaps counterintuitively, there is no correlation found between measured gas concentration reading and the flowrate from a real gas leak. There are many reasons for this including: variations in distance between the leak detection location and the leak source, wind direction and speed, as well as factors relating to if and how much gas accumulates or disperses. These are all factors that cannot be controlled or accounted for when a member of the public smells natural gas and reports it, or when conducting safety driven proactive surveys with previous-generation gas detection equipment. This means that the human nose is not an effective tool at identifying the emission flowrate of a leak of natural gas. It is important to say that the human nose is an excellent tool for identifying gas concentrations that are potentially dangerous, and the careful and precise odourisation of gas will continue to be a critical and central part of gas safety.

The key point to note is that the primary method of identifying Cadent's repair workload – public reports of a smell of gas – does not prioritise higher emission flowrate leaks above low emission leaks. This is why we think that the repair process keeps Cadent's emission inventory about the same, but without measuring we cannot be sure.

To be able to use repair as a tool to reduce emissions through a programme of targeted works, a method of survey that allows the emission flowrate of each leak to be understood is required.

# 5. Formulation of scope

The capability to survey Cadent's network for methane emissions using vehicle-based ALD would unlock the ability to:

1. Abate more methane by prioritising the replacement of the highest emitting gas pipes.
2. Transform the repair process into a tool that can reduce our carbon footprint by fixing our largest emitters.

The two points above will help Cadent to reach its vision of net-zero operations quicker, and allow Ofgem to clearly demonstrate action on its duty to deliver on net-zero.[7]

The above two points also form some of the outputs of the SIF funded Digital Platform for Leakage Analytics (DPLA) project. Under this project, fixed sensor technology for above ground gas sites and an alternative vehicle-based ALD provider are being trialled in RIIO-GD2 so that the platform can be designed appropriately to have the capability to ingest data from multiple sources.

DPLA funding is not being used in RIIO-GD2 to fund a widespread scale up of vehicle-based ALD or subsidise the Cadent self-funded TOTEX vehicle-based ALD Pilot in our London network.

## 5.1. GD3 alignment

In our RIIO-GD3 business plan Cadent introduced its Advanced Leakage Management Approach (ALMA). This consists of three parts: Advanced Leak Detection (ALD), where assets are

[7] Energy Act 2023 – Chapter 1 – (5) and (6)

measured for emissions using in-field technology; the Digital Platform for Leakage Analytics (DPLA), where results from ALD are processed (and combined with data from a machine learning model analysing higher pressure assets) to present one source of the truth for network emissions; and the Advanced Leakage Intervention Programme (ALIP), which is an intervention programme on 150km/year of our leakiest assets throughout the period.

By adopting ALD, more mature methods of emissions estimation are possible, above the current industry standard Shrinkage and Leakage Model (SLM). Two of these are compared to the SLM in the table below. Once online, in one of its data processing steps, the DPLA will host the 'Observed' method for emissions estimation on our LP/MP network.

*Table 2 - Details of each emission estimation method*

| *Emission estimation method* | **SLM** | **Enhanced** | **Observed** (Hybrid SLM) |
|---|---|---|---|
| *Summary* | Estimates leakage using coefficients determined in 2002/03. | Estimates leakage by scaling up results of vehicle-based ALD from a modest sample population in London from 2022-24.<br><br>Uses the same framework as the SLM, but with more predictor factors. | Measures leakage by covering the entire network with vehicle-based ALD.<br><br>A simulation of this method has been used for Cadent's RIIO-GD3 plan. |
| *Pros* | • Consistent reporting based on asset length<br>• No ALD required | • Lower vehicle-based ALD capacity (statistically relevant sample) | • Excellent ability to find and address specific large emitters first<br>• Alignment with HSE position |
| *Cons* | • No opportunity to find and fix large emitters<br>• Poor when used for business planning<br>• Does not align with HSE ALD position | • Cannot identify specific large emitters<br>• Limited alignment with HSE ALD position | • Larger vehicle-based ALD capacity (full network once per year) |
| *Maturity** | Level 2/3[8] | Level 3 | Level 4/5 |

**As defined by the Oil & Gas Methane Partnership (OGMP) 2.0*

Following the North London vehicle-based ALD pilot, Cadent can model its emissions by the 'Enhanced' method. We went one step further in our RIIO-GD3 plan, using the Hybrid SLM (simulating the effects of the 'Observed' method) which has been used to estimate the costs and benefits we might deliver through a targeted intervention programme. This process showed that the 'Observed' method is much better at locating assets with higher emissions. However, we will need vehicle-based ALD capability to pinpoint the specific assets to intervene on that have been estimated. Hence ALD rollout has been assumed and included in our business plan.

If we started scaling our vehicle-based ALD capacity from the start of RIIO-GD3, (as per our business plan), we would not see the full benefits of using the 'Observed' method until year 3 of the period. This is due to the time to procure and mobilise, as well as the timeline involved in the annual selection, design and procurement of mains replacement projects. If Cadent scales-up

[8] REPORT_01 – Cadent Internal OGMP Assessment

during RIIO-GD2 year 5, it allows us to better optimise mains replacement from year 2 of RIIO-GD3. A one-year acceleration brings with it a significant benefit, which is discussed and quantified later within this document.

# 6. Options and selection methodology

## 6.1. Selection methodology

The impact each option has on the prioritisation of the mains replacement programme has been computed using the Network Asset Risk Metric (NARM) framework. This creates a scenario that is consistent with our RIIO-GD3 business plan[9] so that a comparison can be made. Benefits aligned with moving from reactive to proactive repair sooner are described qualitatively.

## 6.2. Option summary

*Table 3 – Vehicle-based ALD options*

| Option | Preferred | Narrative |
|---|---|---|
| **1 – Do not deviate from our RIIO-GD3 plan** | No | Assumes that the allowances included within the RIIO-GD3 plan for vehicle-based ALD are approved and full scale roll out of the technology starts from year 1 of GD3, with baseline capacity achieved by April 2027.<br><br>*This option is not preferred as it represents a loss of value, that can be achieved through an earlier scale-up, that is not in full alignment with the UK's commitment to the Global Methane Pledge (GMP).* |
| **2 – Full vehicle-based ALD scale up in RIIO-GD2** | Yes | Expand the usage of vehicle-based ALD across all Cadent networks (EE, NL, NW, WM), establishing a baseline capability to survey all LP/MP networks at a frequency of once per year from April 2026, one year earlier than option 1.<br><br>We believe a survey frequency of once a year for our LP/MP networks is justified and we proposed this in our RIIO-GD3 plan[10] and provided further rationale for annual surveys in SQ_01.[11]<br><br>This allows an extra **[Redacted]** whole life net benefit compared to option 1 by 2040, through pipe replacement activities alone.<br><br>Further benefits will be realised through changes to repair processes.<br><br>*This option is preferred as it maximises benefits to customers and UK plc in supporting our Global Methane Pledge (GMP) commitment and UKs Net Zero Carbon targets.* |

[9] Cadent RIIO-GD3 Business Plan – Environmental Action Plan - appendix_06 – section 2.2.6 – figure 9
[10] Cadent RIIO-GD3 Business Plan – Environmental Action Plan - appendix_06 – section 2.2.5
[11] SQ_01 - Cadent038 Advanced Leakage Detection Rollout Proposal

# 7. Preferred option

In the absence of an acceleration, our RIIO-GD3 plan is the best approach to reduce methane emission from our networks. Through this re-opener, we hope to accelerate our vision of net-zero operations, and therefore Option 2 is preferred. Its benefits vs Option 1 is shown below.

*Table 4 - Option benefit matrix*

| | #1 Do not deviate from our RIIO-GD3 Plan | #2 Full vehicle-based ALD scale up in GD2 |
|---|---|---|
| Whole life net present benefit @ 2040 | Baseline[12] | + **[Redacted]** compared to #1 |
| Methane Emission Abatement | Baseline[13] | c.91,000 $tCO_2e$ extra removed |
| Global Methane Pledge alignment | Moderate – whilst we are not leading internationally, we are ahead of many gas network companies in using vehicle-based ALD, having trialled and rolled out **[Redacted]** units as part of a pilot in North London. We expect our GD3 plan position to strengthen this.<br><br>There is however, more we could do in GD2 to increase the speed at which we abate methane, bringing us closer in alignment with the GMP commitment to fast action on methane.[14] | Strong – represents the quickest possible way of reducing methane emissions on our MP/LP networks. |
| Effort to implement | Moderate | Moderate |
| HSE Iron Mains Enforcement Policy compliance | Scale during the first year of GD3 means that compliance is unlikely in the first year of the period. | Full capacity established by the end of GD2 means compliance will be achieved from the start of GD3. |
| Cost to implement (18/19 prices) | **[Redacted]** | **[Redacted]** |

# 8. Cost benefit analysis

## 8.1. Summary

Mains Replacement Programme (MRP) analysis for this re-opener used the NARM framework methodology and replaced emission values for each pipe, usually calculated through the incumbent SLM, with values from either the Enhanced or Observed emissions estimation method.

[12] Cadent RIIO-GD3 Business Plan – Environmental Action Plan - appendix_06 – section 2.2.6
[13] Cadent RIIO-GD3 Business Plan – Environmental Action Plan - appendix_06 – section 2.2.6
[14] Homepage | Global Methane Pledge

Our RIIO-GD3 plan used the 'Hybrid SLM' (a simulation of the Observed model) to forecast emission values for each pipe across the entire period. To realise the full magnitude of these benefits, the roll out of vehicle-based ALD needs to occur rapidly to find the large emitters that this model has simulated.

Costs have been used in line with current representative market prices from our most recent completed procurement event for vehicle-based ALD. Experience from our North London pilot project has been paramount to building the phasing assumptions.

## 8.2. Benefits

### Replacement

Benefits were modelled by running two scenarios of identical replacement constraints through the ICS Asset Investment Manager (AIM) Optimisation tool for Cadent's LP/MP pipe assets across all its networks. The length constraints are identical to the scenario used for our RIIO-GD3 business plan, and includes our IMRRP programme, as well as the ALIP.

To calculate the difference in cumulative value to 2040 between the 2 options, the emissions estimation method used was altered, as shown in the table below.

*Table 5 – Summary of MRP emission modelling methods used for each option*

| **MRP emission modelling method** | **GD3** | | | | |
|---|---|---|---|---|---|
| | '26/27 | '27/28 | '28/29 | '29/30 | '30/31 |
| Option 1 (baseline) | Enhanced | Enhanced | Observed | Observed | Observed |
| Option 2 | Enhanced | Observed | Observed | Observed | Observed |

A one-year acceleration of an improved emissions estimation method (option 2) results in an extra **[Redacted]** benefit by 2040 when compared with option 1.

### Repair

Additional benefits, over and above the **[Redacted]**, will be realised through proactive repair processes. Due to a combination of limited volumes of measured emissions data, and the lack of an established process (i.e. NARM) to baseline and compare emissions benefits associated with a proactive repair process, we have not quantified these in this analysis. It should be noted that other countries using ALD, and academic studies, note proactive repair as an effective tool in aggressive emissions reduction.[15] [16] [17] This is the most conservative position we can take, and we expect significant benefit here.

### Wider benefits

Option 2 allows Cadent to comply with the HSE's requirement for ALD deployment and data processing as part of its Iron Mains Enforcement Policy from its expected implementation date of April 2026. Furthermore, Cadent's ALIP is intended to enable the delivery of both environmental and asset risk-related requirements.

Tackling our leakiest pipes sooner also helps us ready the network for other green gases and helps to mitigate an increasingly likely public perception risk of inadequate investment into critical national infrastructure, as has been seen across the water sector recently. With proven technology and the increasing certainty that the gas network will operate in a similar capacity today for decades to come, any decision not to invest into projects such as this are likely to be subjected to high levels of public scrutiny.

[15] PG&E Corporation - PG&E Reduces Emissions from Gas Pipelines by More than 20%
[16] Picarro_Gas_Italgas Case Study_041924 v7.pdf
[17] Measurement-based emissions assessment and reduction through accelerated detection and repair of large leaks in a gas distribution network - ScienceDirect

In addition to greenhouse gas savings, there are multiple additional benefits. Replacing or repairing leaky assets reduces waste of a finite natural resource, which customers place more importance on than environmental factors. Better targeting of MRP earlier helps us to alleviate this.

### 8.3. Costs

In our NOITC Re-opener, we asked for **[Redacted]** funding for the same **[Redacted]**, our request in this re-opener is different due to:

- Removing the costs for the North London Pilot - we will incur **[Redacted]** through an overspend of our Totex allowance, and this now represents our contribution to the project after TIM is applied (see Contribution for further detail).
- Using a different cost model:
  - In the NOITC, upfront CAPEX costs were flat phased through the life of each unit.
  - In this NZASP, front loaded costs have been used, in line with our GD3 plan. This makes the subsequent RIIO-GD3 allowance smaller.
- Different funding timeframes.

Costs have been built using Cadent's extensive experience in running **[Redacted]** vehicle-based ALD units in North London since April 2023. Key criteria include:

- Unit survey capability of 4,000km gas main per year.
- Survey target length of c.127,000km, our entire LP/MP network length.
- Costs from our most recent procurement event.
- Fair and realistic costs for drivers, vehicles and fuel.
- **[Redacted]** CAPEX/OPEX technology cost split, as per our RIIO-GD3 business plan.

Costs presented in the main body of the document are in 18/19 prices. For easy reference between this document and our RIIO-GD3 plan, costs are also available in 23/24 prices in section 12.

*Table 6 - NZASP requested CAPEX costs 18/19 prices*

| **Vehicle-based ALD re-opener costs CAPEX (£m)** | **'25/26** | | | |
|---|---|---|---|---|
| | **Q1** | **Q2** | **Q3** | **Q4** |
| North London | **[Redacted]** | - | - | - |
| Eastern | - | **[Redacted]** | **[Redacted]** | **[Redacted]** |
| West Midlands | - | **[Redacted]** | **[Redacted]** | - |
| North West | - | - | - | **[Redacted]** |
| **Sum** | **[Redacted]** | | | |

*Table 7 - NZASP requested OPEX costs 18/19 prices*

| **Vehicle-based ALD re-opener costs OPEX (£m)** | **'25/26** | | | |
|---|---|---|---|---|
| | **Q1** | **Q2** | **Q3** | **Q4** |
| North London | **[Redacted]** | **[Redacted]** | **[Redacted]** | **[Redacted]** |
| Eastern | - | **[Redacted]** | **[Redacted]** | **[Redacted]** |
| West Midlands | - | **[Redacted]** | **[Redacted]** | **[Redacted]** |
| North West | - | - | - | **[Redacted]** |
| **Sum** | **[Redacted]** | | | |

Whilst this cost is equivalent in magnitude to the improved whole life net present benefit of **[Redacted]** of option 2, the two are not directly comparable. This is because these additional allowances in RIIO-2, totalling **[Redacted]**, will be offset by an equal reduction in the allowances requested for RIIO-3. They form a request to bring forward money that we have sought allowances for in our RIIO-GD3 plan.

## 8.4. Regulatory treatment

We propose the cost of this project is funded through additional network specific RIIO-2 Totex allowances. We had considered the socialisation of costs as we do with all projects delivering net zero benefits, however as Cadent's network consumers will directly benefit from reduced emissions and the broader benefits outlined above, we believe it is fairer for this project to be funded through additional network specific RIIO-2 Totex allowances.

## 8.5. Contribution

This project aims to scale-up our existing vehicle-based ALD units from **[Redacted]** to **[Redacted]**. In order to make progress in the establishment of ALD we undertook a pilot in North London by purchasing **[Redacted]** vehicle-based ALD units. We did not have a specific allowance for these **[Redacted]** units and will have incurred a cost of **[Redacted]** in RIIO-GD2 which we have funded through an overspend of our Totex allowances. As this overspend will be subject to the Totex Incentive Mechanism (TIM), we have contributed 50% of this overspend i.e. **[Redacted]**. This corresponds to **[Redacted]** of the total costs to be incurred during RIIO-2 (i.e. **[Redacted]** + **[Redacted]**).

## 8.6. RIIO-GD3 plan implications

This re-opener effectively requests that some vehicle-based ALD investment costs **[Redacted]** are brought forward by one year, from the first year of RIIO-GD3 to the last year of RIIO-GD2.

**[Redacted]** was requested in Cadent's RIIO-GD3 business plan for vehicle-based ALD, which makes up the majority of ALD allowances requested in **[Redacted]** and **[Redacted].**

If this NZASP submission is accepted in full, Cadent would expect that the allowances requested in our RIIO-GD3 business plan for ALD should decrease by the same value: **[Redacted]**. This would reduce our expected RIIO-GD3 residual costs for ALD to **[Redacted]**.

*Table 8 - Allowance calculations 18/19 prices*

| ***Allowance*** | **Value (£m)** | **Comment** |
|---|---|---|
| **RIIO-GD3 vehicle-based ALD request** | **[Redacted]** | Majority of the contribution to ALD costs in **[Redacted]** and **[Redacted]** |
| **RIIO-GD2 NZASP re-opener request** | **[Redacted]** | Cost of scale up in GD2 Y5. Based on cost calculations in **[Redacted]**. |
| Cadent TOTEX contribution | **[Redacted]** | Cost for the North London pilot in GD2. Based on cost calculation in **[Redacted]**. |
| *Of which Cadent funded* | **[Redacted]** | Contribution after TIM applied. Totals **[Redacted]** of (**[Redacted]** +**[Redacted]**). |
| **RIIO-GD3 subsequent request** | **[Redacted]** | Based on cost calculations in **[Redacted]**. (**[Redacted]** – **[Redacted]**). |

# 9. Delivery plan

## 9.1. Funding plan

*Table 9 – Funding arrangements for vehicle-based ALD projects in RIIO-GD2 and RIIO-GD3*

| Vehicle-based ALD project funding arrangements | GD2 | | | | | GD3 |
|---|---|---|---|---|---|---|
| | '21/22 | '22/23 | '23/24 | '24/25 | '25/26 | |
| Trial* | | | | | | |
| *North London network*** | | | | | | |
| Cadent-wide scale up | | | | | | |
| Business as usual | | | | | | |
| **Funding method key** | | | | | | |
| Funded thro' TfL | Funded thro' TOTEX | Funding thro' NZASP | Funding thro' GD3 | | | |

**No costs from the trial are included in this re-opener. **Units purchased for the North London pilot will continue to be TOTEX funded through RIIO-GD2. Costs for the final two years of the pilot have been included in our RIIO-GD3 business plan.*

## 9.2. Stakeholder engagement

As part of our Environmental Action Plan (EAP) for RIIO-GD3, we engaged stakeholders to explore fugitive emissions, or shrinkage, from multiple perspectives, considering its impact on energy bills, gas security, and environmental concerns. Customer feedback highlighted a strong emphasis on managing energy costs and ensuring gas security, particularly given the current cost-of-living crisis and geopolitical instability. While the underlying data is extensive, several clear high-level trends emerged. Customers expressed significant concern about the financial implications of wasting a valuable and expensive resource. We also maintained regular engagement with gas shippers through established business channels and conducted annual reviews to solicit feedback on how we could improve our service. Shrinkage emerged as a key topic for shippers and suppliers due to its direct commercial consequences related to any methodological changes. Their primary focus, however, is the accuracy of shrinkage data, and they generally support the industry's transition from a modelled calculation to a fully measured approach. Furthermore, we introduced a highly experienced, expert Sustainability Challenge Group to provide robust challenge across our entire environmental strategy. They have been very complimentary of our ambition in this area, recognising that proactively identifying and reducing methane leakage from our assets offers the greatest positive environmental impact any GDN can make. However, they have also challenged us to work with Ofgem to demonstrate the additional societal value of introducing new technologies at the earliest opportunity. This reopener directly responds to this crucial challenge.

## 9.3. Roll out plan

This plan has been phased with operational change in mind (mobilising ALD technology effectively and communicating and changing business processes associated with replacement and repair, in which hundreds of people are engaged, is not to be under-estimated), while allowing a Cadent-wide surveying capacity of **[Redacted]** units to be brought online in readiness for RIIO-GD3. It has been shaped by Cadent's extensive experience of operating the **[Redacted]** units in North London and provides a quarterly view of our roll out plan.

*Table 10 – Roll out plan by Cadent network for option 2, including colour coding for funding method, as per the key in Table 9*

| Vehicle-based ALD roll out plan (cumulative) | '25/26 | | | |
|---|---|---|---|---|
| | Q1 | Q2 | Q3 | Q4 |
| *North London / Pilot* | [Redacted] | [Redacted] | [Redacted] | [Redacted] |
| North London | [Redacted] | [Redacted] | [Redacted] | [Redacted] |
| Eastern | | [Redacted] | [Redacted] | [Redacted] |
| West Midlands | | [Redacted] | [Redacted] | [Redacted] |
| North West | | | | [Redacted] |
| **Sum** | [Redacted] | [Redacted] | [Redacted] | [Redacted] |

Cadent is currently running a procurement event, in anticipation of acceptance of this NZASP request.

## 9.4. Deliverables

By the end of RIIO-GD2, Cadent will deliver capability to survey its entire LP/MP network at a frequency of once per year. To consider this investment successful, by the end of year 1 of RIIO-GD3, we should have prioritised our MRP workstack based on vehicle-based ALD data for year 2 of the period in all our networks and be delivering targeted repair works.

If this plan is supported, Cadent will report on the progress of its emission reduction through the DPLA platform once it is rolled out for all our networks, which will be reported alongside the SLM throughout RIIO-GD3. It will also produce the deliverables proposed below to demonstrate progress.

*Table 11 - Proposed deliverables*

| Reference | Proposed deliverable | Indicative deadline | Evidence |
|---|---|---|---|
| 1 | Interim vehicle-based ALD roll out report | 30/10/2025 | The report should set out:<br>1. Current vehicle-based ALD capacity:<br>a. Number of units purchased.<br>b. Number of units mobilised.<br>c. Length of network surveyed.<br>d. Follow on interventions commissioned.<br>2. Roadmap for the next 5 months of roll out. |
| 2 | Final vehicle-based ALD roll out report | 31/03/2026 | The report should set out:<br>1. Vehicle-based ALD capacity vs re-opener targets:<br>a. Number of units purchased.<br>b. Number of units mobilised.<br>c. Length of network surveyed.<br>d. Follow on interventions commissioned.<br>2. Progress update on emissions estimation method capability. |
| 3 | Mobilisation of full LP/MP network coverage capacity | 31/03/2026 | Evidence showing survey capacity. |

# 10. Glossary

| Term | Definition |
|---|---|
| **AIM** | Asset Investment Manager, a product from ICS |
| **ALD** | Advanced Leak Detection |
| **BPDT** | Business Plan Data Table |
| **CBA** | Cost Benefit Analysis |
| **Distribution Network** | Cadent's network of pipe running at Medium and Low Pressure, including gas distribution mains and services |
| **DPLA** | Digital Platform for Leakage Analytics |
| **GDNs** | Gas Distribution Networks |
| **GMP** | Global Methane Pledge |
| **HSE** | Health and Safety Executive |
| **ICS** | Consultants specialising in risk, investment and portfolio planning |
| **IMRRP** | Iron Mains Risk Reduction Programme |
| **LP/MP** | Low and Medium Pressure |
| **MRP** | Mains Replacement Programme |
| **NOITC** | Non-Operation IT Capex Re-opener |
| **NZASP** | Net Zero Pre-construction Work and Small Net Zero Projects Re-opener |
| **PPM** | Parts per million [methane] |
| **SIF** | Strategic Innovation Fund |
| **SLM** | Shrinkage and Leakage Model |
| **TfL** | Transport for London |

# 11. Supporting documents

| File Name | Summary |
|---|---|
| CALC_01 – Cadent Carbon Footprint Calculations | Calculations using Cadent's 2023/24 Annual Environmental Report to highlight certain part of our carbon footprint. |
| CALC_02 - Cadent Shrinkage & Leakage Model Coefficient Populations | Asset populations in kilometres represented by each leakage coefficient of the Shrinkage & Leakage Model (SLM). |
| CALC_03 – Cost Tracker | Cost tracker for the request funds with for RIIO-GD2, as well as knock on impacts to RIIO-GD3 allowances. |
| **[Redacted]** | **[Redacted]** |
| **[Redacted]** | **[Redacted]** |

# 12. Appendix 1 – 23/24 prices

As per guidance for RIIO-GD2 re-openers, we have presented costs in 18/19 prices in the main body of this document. However, as there is significant reference to our RIIO-GD3 plan, we have provided costs in 23/24 prices in this section.

*Table 12 - NZASP requested CAPEX costs 23/24 prices*

| **Vehicle-based ALD re-opener costs CAPEX (£m)** | **'25/26** | | | |
|---|---|---|---|---|
| | **Q1** | **Q2** | **Q3** | **Q4** |
| North London | [Redacted] | - | - | - |
| Eastern | - | [Redacted] | [Redacted] | [Redacted] |
| West Midlands | - | [Redacted] | [Redacted] | - |
| North West | - | - | - | [Redacted] |
| **Sum** | [Redacted] | | | |

*Table 13 - NZASP requested OPEX costs 23/24 prices*

| **Vehicle-based ALD re-opener costs OPEX (£m)** | **'25/26** | | | |
|---|---|---|---|---|
| | **Q1** | **Q2** | **Q3** | **Q4** |
| North London | [Redacted] | [Redacted] | [Redacted] | [Redacted] |
| Eastern | - | [Redacted] | [Redacted] | [Redacted] |
| West Midlands | - | [Redacted] | [Redacted] | [Redacted] |
| North West | - | - | - | [Redacted] |
| **Sum** | [Redacted] | | | |

*Table 14 - NZASP requested TOTEX costs 23/24 prices*

| **Vehicle-based ALD re-opener costs TOTEX (£m)** | **'25/26** |
|---|---|
| North London | [Redacted] |
| Eastern | [Redacted] |
| West Midlands | [Redacted] |
| North West | [Redacted] |
| **Sum** | [Redacted] |

*Table 15 - Allowance calculations 23/24 prices*

| ***Allowance*** | **Value (£m)** | **Comment** |
|---|---|---|
| **RIIO-GD3 vehicle-based ALD request** | [Redacted] | Majority of the contribution to ALD costs in BPDTs **[Redacted]** and **[Redacted]**. |
| **RIIO-GD2 NZASP re-opener request** | [Redacted] | Cost of scale up in GD2 Y5. Based on cost calculations in **[Redacted]**. |
| Cadent TOTEX contribution | [Redacted] | Cost for the North London pilot in GD2. Based on cost calculation in **[Redacted]**. |
| *Of which Cadent funded* | [Redacted] | Contribution after TIM applied. Totals **[Redacted]** of (**[Redacted]** +**[Redacted]**). |
| **RIIO-GD3 subsequent request** | [Redacted] | Based on cost calculations in **[Redacted]**. (**[Redacted]** – **[Redacted]**). |

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