Digital Platform for Leakage Analytics (DPLA)

Annual Progress Report – Year 1

Project Number CAD_SIF0005	**Project Title** Digital Platform for Leakage Analytics (DPLA)
Date of issue 08/10/2024	**Author and Contact Details** Howard Hughes (howard.x.hughes@cadentgas.com)
Version V1.0	**Summary of Changes** Final version Annual Progress Report for Year 1

Contents

1. Executive Summary

Project Background

The Digital Platform for Leakage Analytics (DPLA) is an innovative project that utilises digital technology and data to provide an accurate view of gas leakage across Cadent's network, with potential application for all Gas Distribution Networks (GDNs) in Great Britain.

DPLA is one of SIF (Strategic Innovation Fund) projects for the Gas Transmission and Distribution sectors which taps into the best of UK and international innovation whilst aligning with other public innovation funding for the benefit of network users and consumers.

The project is led by Cadent in partnership with SGN, Northern Gas Networks (NGN), Wales and West Utilities (WWU) and National Gas Transmission (NGT), and with Guidehouse as technology delivery partner.

Scope of the Project

Gas leakage from the UK GDNs represents approximately 1% of the country's total GHG emissions. The lack of accurate, real-time leakage information has limited the networks' ability to make data-driven decisions and more effectively reduce their business carbon footprint, of which shrinkage forms the majority. Shaping the future network, the DPLA's mission is to reduce carbon emissions, realise customer benefits and improve safety in a cost-effective manner.

The incumbent model for emissions reporting, the Shrinkage and Leakage Model (SLM), is based on emission coefficients derived over 20 years ago. This model does not have the ability to locate leaks to the level of accuracy needed to drive emissions reduction through targeted asset management programme.

By developing and demonstrating a Minimum Viable Product (MVP) for how data, analytics and models can be used to identify and locate gas leaks in the gas distribution network, DPLA will allow to rapidly find and act on high-emission assets to accelerate a reduction in emissions.

General progress

The Project has been developed according to the three SIF Phases (Discovery, Alpha, and Beta):

- the **Discovery Phase** (March-April 2022) focused on feasibility, defining the problem the Project was trying to solve, and the value in solving it;
- the **Alpha Phase** (August 2022 – February 2023) which delivered initial business, technology, and regulatory recommendations setting the framework before moving to large scale implementation;
- the **Beta Phase** (September 2023 – June 2025) which aims at building, testing, and implementing a functional Minimum Viable Product (MVP).

Currently DPLA is commencing the second year into the Beta Phase and deliverables and milestones are being delivered across eight work-packages (WPs):

- *WP1 – Programme management and business case*, ensures continued coordination of the project across work packages;

- *WP2 - Models, Analytics & Data Development*, prepares and develops relevant data and builds the required models to enable DPLA functionality;
- *WP3 - Physical Sensor Trials & Deployment*, selects, trials, and assesses multiple in-field leak sensing technologies;
- *WP4 - IS System Architecture Design & Integration*, develops the solution architecture and data population approach;
- *WP5 - Business Change Management & BAU transition*, prepares the organization for business-as-usual (BAU) operational changes;
- *WP6 - Regulatory Reporting, Policy, License, & Network Code Change*, identifies, and enacts the necessary changes required to regulatory reporting, policies, licenses, and network codes to enable the solution to be rolled out across all networks;
- *WP7 - Internal and External Communications & Knowledge Dissemination*, develops knowledge dissemination processes to ensure sharing of DPLA key learnings with external and internal audiences;
- *WP8 - Open data, Interoperability, Emerging trends and Technologies*, identifies technology and market trends to enhance the design of the solution.

Overview of delays or problems encountered

The initial project scope was highly ambitious and whilst the outcome was clear, the path to it was not. The scale-up from Alpha to Beta was significant and the complexity of the ambition impacted our ability to deliver and communicate clearly.

Building from the insights gathered during the first year of the Beta Phase and feedback received from Innovate UK and Ofgem we reviewed our approach and articulated a project direction with a significant reduction in complexity. With the scope change we will deliver similar benefits to the ones outlined in the SIF Beta application with less complexity and an expedited timeframe with completion in June 2025, seven months shorter than the original timeframe.

Main learning generated to date

Our DPLA approach so far was aimed at building a deterministic hydraulic model of the gas network, based on real time operational data, which would enable a low cost ongoing in-field leakage detection programme. As we learned more about this approach, we found that there were several barriers to its success. Hydraulic modelling for leakage detection is a novel approach on the gas network and a challenging and complex process. Through our work to date, we now know that developing a deterministic hydraulic model of the network is not currently practical given the existing level of network sensorisation. The project therefore is pivoting away from the deterministic hydraulic model to a lower complexity and lower cost pathway to remain feasible, as presented in the new feasibility window (shown in Figure 1 below).

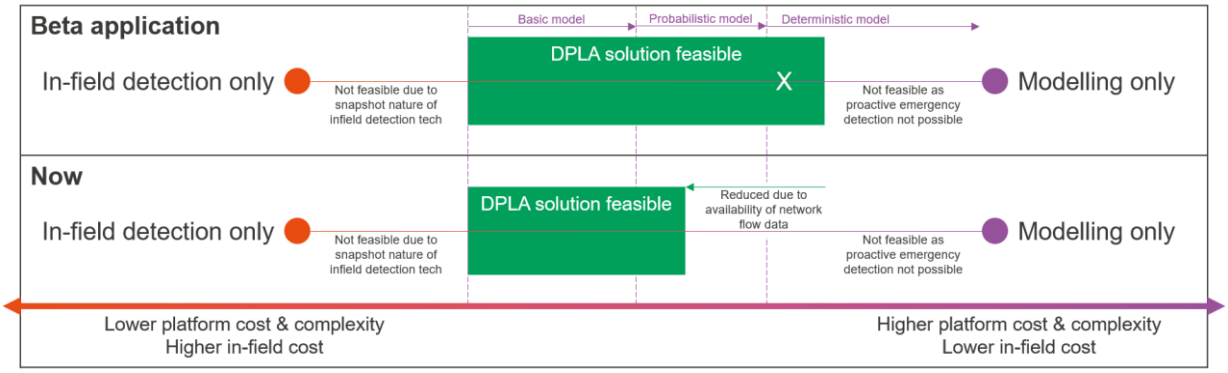

Figure 1 - DPLA project feasibility window, including indication of where the original submission sat in the feasibility window, marked by the white X

In building the optimal MVP we are testing and refining the optimal mix of in-field detection and modelling through a series of stage gates to identify the best approach based on asset and pressure tier. In one of the most recent tests, we ran the probabilistic model on unseen operational data and compared the resulting predictions to the recorded historical leak. The predicted leak locations were within 60 metres of actual leak locations, demonstrating promising model accuracy and performance and progress in the right direction. However, there is still a significant amount of work ahead as well as other tests and reviews on the suitability and robustness of the model.

Key metrics developed

In our SIF Beta application, we estimated that in a 10-year period the decrease in methane emissions from pipes and AGIs via DPLA could be up to 58%, which supports the government priority to tackle methane emissions as a Participant of the Global Methane Pledge which was committed to at COP 26 in November 2021. This is enabled by the DPLA being able to show emissions at the asset level, rather than at a portfolio level, which is what is currently offered by the Shrinkage and Leakage Model (SLM).

Summary of dissemination activities carried out

DPLA brings together all of Great Britain's distribution networks, National Gas Transmission, regulatory bodies, governing bodies, and many other stakeholders to realise cross industry collaboration as they work towards a common mission to reduce carbon emissions and realise customer benefits.

Stakeholder engagement and collaboration are essential throughout the duration of the Project. In Year 1 engagement activities focused on showcasing what the project is about, why it is important for Cadent and what are the expected benefits were carried out. From the Project Launch in October 2023 to industry related events such as the Innovation Summit and Utility Week, the Project team has been disseminating knowledge and informing relevant stakeholder groups such as Cadent employees, Project Partners, and the wider gas industry. Once engaged, stakeholders are updated on Project progress through in-person meetings, conferences, and/or social media.

2. Project Summary

How the Project is meeting the aims of the relevant SIF Innovation Challenge

The DPLA is an innovative project that utilises digital technology and data to provide an

accurate view of gas leakage across Cadent's network, with potential application for all Gas Distribution Networks in Great Britain. This is expected to enable efficient operational and investment decisions to reduce leakage, improve network safety and reduce customer bills.

DPLA addresses the whole system integration and data and digitalisation Innovation Challenges set by Ofgem, whilst simultaneously addressing a range of user needs. The Project will enhance the coordination between the distribution networks and regulatory bodies as they work towards a common goal: reduce carbon emissions, realise customer benefits, and improve safety in a cost-effective manner. By combining upgraded modelling capabilities, the Project will deliver the next generation of user driven digital processes accelerating progress in methane leakage detection, as well as unlock opportunities across hydrogen leakage detection. The DPLA will directly improve data monitoring and insights improving efficiency and resilience of the networks through the innovative system architecture unique to the Project.

The problem and opportunity the Project aims to resolve and how it is helping to solve the issue

As part of their licence condition, Gas Distribution Networks (GDNs) report their annual leakage emissions using the Shrinkage and Leakage Model (SLM). The SLM utilises real asset data, localised performance measurements, leakage rates and factors to form an overall view of Distribution Network emissions. The SLM provides a static theoretical value of total gas leakage, but it is unable to identify actual leak locations or volumes and it will not be compatible with a hydrogen blended network, which is likely to be a major issue for all GDNs in future. The DPLA project intends to replace the SLM, providing a new real time emissions platform improving the accuracy of leakage modelling and enabling the proactive identification of leaks before the public identify them.

Deliverables and milestones achieved in the first year of the Beta Phase

During the first year of the Beta Phase the eight WPs completed the following **22 key deliverables**:

Table 1 – Deliverables completed in Year 1

Deliverable	Description
D1.1 Commercialisation Strategy	Strategy that identifies the pathways to commercialisation (updated every six months)
D1.2 Business Case Update	Business case justification for the continued undertaking of the DPLA (updated based on project progress, e.g., performance of trialled technologies)
D1.3 Roadmap Post Beta Phase	Roadmap that identifies the activities to be carried out at the end of the Beta Phase (updated every six months)
D2.1 Data Catalogue and Suitability Report	*Data Catalogue*: list of required/potential data sources with associated data dictionaries, extraction processes *Suitability report*: evaluation of the quality and uncertainty of the data analysed highlighting the potential benefits from additional data improvements
D2.2 Historic Leak Map	Temporarily and spatially map of past leaks to static and operational data in trial zone

Deliverable	Description
D3.1 Technology assessment and trial strategy	Re-mapping of the technology landscape and recommendation of the final set of technologies to be trialled in the DPLA solution
D3.2 Validation Post Feasibility report	Feasibility report on the possibility of deploying additional fixed sensors to existing validation posts
D3.4 Sensor Strategy	Deployment plan for In-field Sensors to allow Technolog to begin surveying and installation
D3.5 Revised Trial strategy	Inclusion of the additional technologies (Gas agnostic, vehicular mounted) identified by the CBA revisions, for inclusion within the final set of technologies to be trialled in the DPLA solution
D5.1 Change Impact Assessment	Full guide to changes anticipated across all relevant business impacted areas (updated based on project progress)
D5.2 Interim Business Process Maps	Maps of the interim processes for the Beta Phase (updated based on project progress)
D5.3 As-Is Process Maps	Current processes relating to leak management, visualised through as–is process maps
D6.1 Regulatory Impact Assessment	Detailed impact assessment of DPLA on the Regulatory Framework
D6.5A Policy Impact Assessment	Review of DPLA impact on relevant policies (part of regulatory impact assessment)
D6.6A Networks Code Change Assessment	Summary of code sections impacted by DPLA (part of regulatory impact assessment)
D7.1 Knowledge Sharing Approach and Channels	Summary of knowledge sharing approach and channels, including branding and marketing approach
D7.2 Web page Launch	DPLA webpage with relevant logo embedded on Cadent's external website
D7.3 Outreach Materials and Sharing Process	List of outreach materials developed and shared across the various channels highlighting processes in place to ensure the continuous sharing of knowledge
D7.7 Consumer Engagement Plan	Engagement plan for sharing project progress and create awareness around DPLA and its impacts with energy consumers (updated every six months)
D8.2.1 Quarterly reviews	Report and presentation summarizing emerging technologies and recommendations for their integration into the projects
D8.2.2 Quarterly reviews	Report and webinar on "Demystifying Digital Twins" summarising the technology, its current and future integration into the project.
D8.2.3 Quarterly reviews	Report and webinar on "Simplifying Gas and Water" to highlight the commonalities between the industries, encourage collaboration and knowledge sharing.

How the Project is performing relative to its aims and objectives

One of the key objectives of Year 1 was demonstrating that Cadent's data was sufficiently robust to start model development. The model development workstream (WP2) during the first six months of the Project delivered a data catalogue listing required/potential data source with associated data dictionaries and through the suitability report evaluated the quality and uncertainty of the data analysed. In the upcoming months we will keep evaluating the most appropriate form of modelling in line

with the lower complexity and lower cost pathway through detailed decision criteria. This approach will allow us to assess whether the scenario taken forwards represents the best choice for the DPLA project and our customers.

Project's outputs and outcomes in the first year of the Beta Phase

During Year 1 we re-mapped the technology landscape, initially assessed during the Alpha Phase, to recommend a final set of leak detection and quantification technologies to be trialled. We interviewed more than 20 technology providers shortlisting five of them according to agreed criteria such as cost, smallest detectable leak, smallest quantifiable leak, integration of their data to Cadent's systems, usage limitations (e.g., weather, temperature, topology), etc.

From July 2024, trials of in-field methane detection technologies are being carried out to assess the effectiveness of a technology in detecting, quantifying, and reporting on total emissions from an asset. The trialled technologies include vehicle mounted technology Bohr, continuous fixed sensor technologies Qube and Sensirion, handheld technology Distran and satellite captures from Satelytics.

Improvements this innovation has made to new processes, products, or services

DPLA's innovative nature consists of enhanced network coordination, reduced operational complexities, and improved user experiences, all evidenced via a key project output: the user interface. The user interface (UI) is designed to enable networks to view and interact with leakage data quickly, and effectively through real time alerts, visual heatmaps and detailed reports. The interface will be developed during the second year of the project.

Difficulties or delays encountered during the first year of the Beta Phase

During the first year of the Beta Phase, several barriers to the implementation and success of the initial approach have been identified. Specifically, data limitations have prevented the implementation of a fully deterministic hydraulic model. The project therefore has moved to a lower complexity and lower cost pathway to remain feasible, with detailed decision criteria to ensure the scenario taken forwards represents the best choice for the Project and customers.

Due to challenges on reporting and the timing of project components, in July 2024 Cadent has also strengthened their PMO to improve delivery effectiveness and ensure clear and transparent progress tracking, in line with the feedback received from Innovate UK.

How learning is developing over the course of the Project

The Project has a dedicated communications workstream (WP7) aimed at developing knowledge dissemination processes to ensure that key learnings are shared with the relevant audiences.

3. Knowledge creation and dissemination

All the Work Packages are part of the knowledge creation process which involves collaboration, research, and the integration of existing knowledge into the Project. Collaboration across different workstreams is encouraged through weekly meetings and dedicated workshops to leverage diverse expertise and perspectives.

Knowledge dissemination channels are crucial for effectively sharing information and insights and ensure that the knowledge created reaches the right audience at the right time. During Year 1, the main dissemination processes and channels in place have been the following:

- **Events and conferences**: industry events (e.g., Innovation Zero, Utility Week Live), SIF Community Forums and other conferences, where Cadent and Guidehouse representatives discuss innovation, future of gas and DPLA as well as present new findings and strategic updates;
- **Workshops and meetings**: employees and Project Partners are updated on the project and are encouraged to exchange knowledge and discuss challenges through on-site and virtual workshops or training sessions. Other stakeholders are informed on general progress, benefits, and timelines as well as specific topics of interest through virtual and on-site meetings. During the sessions, attendees are invited to raise questions and provide feedback and ad hoc materials are drafted and shared;
- **External Communication Channels**: blogs, social media posts and/or newsletters are published to keep the general public informed on the DPLA project and share achievements. In Year 2 of the project, we plan to publish on external channels at least every two months.

One example of wider knowledge creation and dissemination are the webinars presented through WP8. These open-invite webinars occur quarterly with the aim to educate stakeholders across the project, business, and sector on emerging technologies and how they are linked to the DPLA.

In the first three months, the key internal and external stakeholders were identified, and we drafted an ad hoc plan that summarizes knowledge sharing approach and channels, including branding and marketing approach. The engagement plans for stakeholders will be updated and reviewed in line with the insights matured during the first year of Beta Phase and the feedback collected from internal and external stakeholders.

4. Intellectual Property Rights Generation

Intellectual Property Rights (IPR) clauses are in place in the contract between Cadent and the Delivery Partner (Guidehouse). We will be able to provide a description of relevant IPR developed from the Project once the modelling activities will be completed as well as how to disseminate this knowledge across the networks.

5. Data access details

The whitepaper on data and analytics that will be part of the end of Beta Phase report will describe how the Project Partners could use DPLA's data, analytics and models.

6. Route to Market / Business as usual

How Cadent (and other Networks) will adjust their own networks processes, products and services based on the insights gained from the Project

The DPLA project is designed to integrate into business-as-usual (BAU) practices, ensuring long-term sustainability and minimal disruption. A dedicated workstream, WP5, is working towards preparing the organization for BAU operational changes.

During the first year of the Beta Phase, the Project team began to engage Cadent internal stakeholders to align project goals with existing business objectives, facilitating buy-in and support. Additional communication channels will be established as well as regular training sessions to keep staff informed and prepared for the new processes. We are also encouraging questions and feedback to identify and address any issues early, allowing for continuous improvement and adaptation. By embedding change management strategies and fostering a culture of continuous learning, we aim to drive efficiency and innovation in line with the Project's scope.

At the end of the Beta Phase, the Project will have set the framework for a full scale BAU rollout for Cadent's network. Before DPLA is rolled out to the other Gas Distribution Networks (GDNs), information and data for each GDN needs to be gathered as models might need to be adjusted and customised for each network. Once models are adjusted, technologies are selected, and the onboarding is carried out DPLA can be adopted.

The necessary steps and additional work required before it can be adopted by Cadent

Before adopting DPLA, the model suitability is going to be tested against clear decision criteria to ensure that the minimum required system to achieve the five highest important use cases will be developed. Once a final model determination is provided, the development of the User Interface (UI) will commence. In the meanwhile, the solution architecture will be configured and successfully integrated using Cadent's ecosystem with data pipelines designed, built, and operational to support the modelling platform.

From a change management perspective, several dimensions are expected to be impacted by DPLA and therefore need to be carefully managed across the Beta Phase to enable a rapid rollout and ensure a scalable BAU innovation. For instance, systems and tools will need to evolve to support advanced analytics and a new user interface and job roles and skills will need to adapt to the changing landscape of a model driven approach to gas leak detection, monitoring, and mitigation.

From a regulatory perspective, the accelerated timeline has presented a change for the subsequent roll out and BAU implementation of DPLA, as it no longer finishes just before the start of RIIO-GD3, where these phases were anticipated to be funded with new regulatory allowances as part of the new settlement. Regulatory options and mechanisms are currently under review to provide the funding for this.

Once the model development and the technology and business readiness activities are completed, the solution can be rolled out to the rest of Cadent's network for the geographic areas in scope.

The likelihood that the innovation will be deployed on a large scale in future

DPLA is a project supported by all Great Britain's GDNs and National Gas Transmission (NGT). If proven successful during trials, the solution can be rolled out across GDNs and NGT. The Project will develop and demonstrate a blueprint for how data, analytics and models can be used to identify and locate leaks. The blueprint can be replicated by other GDNs using their own data and preferred technology vendors, hence enabling competitive markets to drive value for Great Britain's gas distribution customers. Considering commercial readiness, all GDNs are supportive of the value from the DPLA and have demonstrated this by partnering on the project.

Recommendations on how to further exploit the outcomes of the Project

As the innovation is still under development, insights on how to further exploit the outcomes will be assessed during the second year of the project. In the meanwhile, the ongoing collaboration with IGG (Intelligent Gas Grid) a SIF funded project led by SGN is, among others, assessing the additional benefits provided by both solutions together through technical sessions and a dedicated paper.

Any differences between the work undertaken during the Beta Phase and the approach outlined in the SIF Beta application

The DPLA approach outlined in the SIF Beta application was aimed at building a deterministic hydraulic model of the gas network, based on real time operational data, which would enable a low cost ongoing in-field leakage detection programme. As now this approach presents a high level of complexity and several barriers to its success have been identified, leading to a review and change of the initial approach. The project therefore has pivoted away from the deterministic hydraulic model to a lower complexity and lower cost pathway to remain feasible.

7. Policy, Regulatory and Standard Barriers

Regulatory impact assessment

In our SIF Beta application, we explained the elements of the Regulatory Framework that could be impacted by the DPLA. Throughout this phase, we have been working to understand the scale of the impact and, where required, developed our proposals through a change impact assessment to best manage these impacts. The impacted elements of the regulatory framework include:

- **The Shrinkage and Leakage model (SLM):** with various Gas Transporter License conditions related to this.
- **Regulatory Outputs:** of which we have suggested alternatives as part of the RIIO-GD3 planning process.

- **Regulatory Reporting:** with the annual RRP submission and environmental reporting to be impacted.
- **Asset Management:** DPLA technologies will likely better inform our asset management decisions and impact our Iron Mains Replacement Programme (IMRP).
- **UNC Change Requirements:** Various elements of the Uniform Network Code (UNC) may be impacted, requiring some alteration and additions.

GD3 Sector Specific Methodology Consultation (SSMC) Response and Ofgem Engagement

On 6th March 2024, we responded to Ofgem's RIIO-3 Sector Specific Methodology Consultation (SSMC). Our response emphasised that there is no greater positive impact that GDNs can have on reducing the climate impact than tackling leakage from our network and the move from modelled to observed leakage reporting must be a priority for RIIO-GD3. With respect to timelines, we agreed with Ofgem's observations that the timing of the DPLA project makes it a challenge to have the outputs from the project fully implemented for the beginning of RIIO-GD3. Whilst some of the components of the measurement infrastructure can be deployed rapidly, a full implementation will likely extend well into GD3.

Likewise, we fully support the proposal of a use-it-or-lose-it (UIOLI) allowance for shrinkage reduction activities, with the mechanism providing flexibility and agility to ensure the societal benefits are captured at the earliest opportunity. The benefits available support a significant sized UIOLI as in our footprint alone, targeting the leakiest assets to reduce emissions by ~80% would deliver around ~£600m of benefits over a five-year period, with around ~£60m through reduced shrinkage gas commodity costs.

On a wider scale, we continue to keep Ofgem engaged and informed on key project developments. We have also agreed to share full rollout costs and Cost Benefit Analysis (CBA) with Ofgem prior to the submission of final RIIO-3 Business Plan, which we are currently working through.

GD3 Sector Specific Methodology Decision (SSMD)

On the 18th of July, Ofgem released their RIIO-3 Sector Specific Methodology Decision (SSMD). This decision confirmed Ofgem's position to fund the roll-out of leak detection technologies and requested that all GDNs provide further details on the roll out of DPLA in their business plans. As the development of the business plans for both the leak detection technologies and roll-out of DPLA are dependent on the work undertaken by Cadent, engagement with the other GDNs has been fostered as detailed further below.

In the SIF Beta application, the initial project end date was aligned with the start of RIIO-GD3. The adjustment to a lower complexity pathway has led to a significant project acceleration, leaving some uncertainty on how the roll out and BAU activities will be funded. This could be addressed through increasing the scope of the SIF project to cover DPLA roll out across all networks and provision of allowances, or alternatively, the use of re-opener mechanisms (e.g. Net Zero and Small Projects re-opener) to provide the funding for this. These mechanisms are currently under review.

GDN Engagement & Co-ordination

We recognise the need for and importance of GDN co-ordination to aid the successful implementation of the DPLA project. It is also important we take a consistent approach

when influencing Ofgem's GD3 strategy with regards to the project and the wider implications across network shrinkage. With this in mind, we are currently in the process of holding GDN workshops, whereby we take key regulatory stakeholders through key project developments and progress, regulatory barriers, and the shared-data requirements needed to enforce the digital platform. To date, the workshops have been a success, with the most recent workshops providing additional detail on the project progress and data required by the GDNs for their GD3 business plans.

In September 2024 we shared project progress, modelling results, and indicative costs and timelines for scale-up during GD3 with the other GDNs to enable the forecasting of cost. Further engagement thorough the cross-GDN regulatory forum will allow for ongoing issues to be discussed. We have also given updates to GDNs and shippers through the Joint Office's Shrinkage Forum, and to key GDN shrinkage stakeholders through their monthly GDN Shrinkage Meeting.

Future Regulatory Sandbox (FRS)

Regulatory flexibility is required to deliver the DPLA, for example, the expectation is that DPLA will be implemented on an LDZ-by-LDZ basis, whereas licence and the UNC currently apply on a network company and industry-wide basis. The FRS is an Ofgem policy tool under development that proposes to permit the temporary amendment/relaxation of regulations to facilitate the trialling of new innovations. Cadent have commenced positive engagement with Ofgem with the view to exploring DPLA as a use case for the FRS (once implemented).

8. User needs

The DPLA enables gas networks to intervene and manage their networks in a smarter way setting, examples for other operators and countries to follow. It paves the way for best-in-class approaches to regulatory and operational methane emissions reduction.

The solution will impact job roles, people & skills as they need to adapt to the changing landscape of a model driven approach to gas leak detection, monitoring, and mitigation.

The prioritised users for the solution are the following:

- **Shrinkage experts**, since DPLA will provide predictive leak management capabilities as the solution will predict the growth rate of the escape leaks and growth rate of a known leak;
- **Regulatory reporting teams**, as the DPLA tool, combined with modelling and sensor technology, will generate real time information enabling more accurate calculations of gas loss volumes, and supports Ofgem in setting revised performance measures and modifying regulatory approaches;
- **Dispatch operatives**, as predictive capabilities and gas leakage localisation will improve by using modelling and sensor technology, offering proactive emergency intervention and reduced risk to the public.

Based on the prioritised users' needs and the key uses cases described in the SIF Beta application, five 'highest relative importance' use cases have been identified. These five are described in **Error! Reference source not found.**.

Table 2 - High importance DPLA use cases

No.	Benefit	Description
1	Gas Leakage Regulatory Reporting	A need to provide more accurate annual reports of gas leakage quantity to Ofgem, compared to the current Shrinkage and Leakage Model (SLM).
2	Condition based monitoring	A need to improve the understanding of the state of network assets by proactively detecting leaks rather than relying on models alone.
3	Regulatory Performance and Revenue Generation	A need to accurately measure network performance in reducing shrinkage/leakage and develop a fair incentive mechanism for reward and/or penalty.
4	Proactive emergency intervention	A need to reduce the risk to humans and properties via smarter and earlier identification, characterisation, and localisation of gas leaks.
5	Improved Asset Replacement and Maintenance	A need to leverage an improved understanding of the network and leakage hotspots to tailor the schedule of the Mains Replacement Programme and better target maintenance cycles and AGI replacement.

9. Impacts and benefits

In the SIF Beta application for DPLA, we estimated the decrease in methane emissions from pipes and AGIs between 2020 to 2030 via DPLA as up to 58%, which supports the government priority to tackle methane emissions as a Participant of the Global Methane Pledge which was committed to at COP 26 in November 2021. This is enabled by the DPLA being able to show emissions at the asset level, rather than at a portfolio level, which is what is currently offered by the incumbent Shrinkage and Leakage Model (SLM).

In terms of avoided emissions, during the Alpha Phase we initially quantified the following benefits in the core modelled scenario:

- 12,435 GWh of avoided natural gas and/or hydrogen loss volumes by 2050 (benefit to the end consumer).
- 14,856 ktCO2e of avoided greenhouse gas emissions from distribution network shrinkage and leakage by 2050 (carbon reductions).

Any changes to proposed impacts

Following the same methodology as the DPLA Beta submission, the Cost Benefit Analysis (CBA) was updated during the first year of the Beta Phase to reflect the progress of the project and changes in the approach.

In the CBA review, we analysed costs and benefits of different scenarios and identified a preferred option to take forward, whose benefits are described below. Other scenarios are maintained as contingencies in case the preferred scenario is not technically or financially feasible anymore.

The benefits are quantified through the Net Present Value (NPV) and derived from the avoided leakage of gas, and in-particular the speed at which this is achieved. The lower complexity probabilistic model that will be delivered with the preferred option requires additional training to reach the same level of model performance as originally intended in the SIF Beta application, delaying the reduction in shrinkage and subsequently

providing a marginally lower NPV (-7,5%). At the same time, this scenario has a lower lifecycle expenditure (59% lower) driving the most value for our customers while delivering similar benefits to the initial approach.

The NPV has also been adjusted to reflect the updated the technology costs for the providers selected for trials, which were slightly different from those shortlisted in Alpha. This change has happened due to an additional market analysis that was carried out at the beginning of the Beta Phase, and it has more applicable and advanced technologies for leak detection. The final list consists of 5 new providers going into trials – Sensirion, Qube, Bohr, Satelytics, and Distran, in addition to the existing Picarro vehicle-based solution (funded with budget external to DPLA). The latest selection has proven to be more robust in terms of coverage of Cadent's assets, enabling it to cover both pipelines and AGIs in detail.

Progress towards the benefits

Analysis of data from Cadent's existing vehicle-based advanced leak detection trial supports the assumption that a large proportion of shrinkage emissions are driven by a small proportion of leaks – this is evidence that large reductions in emissions could be achieved by moving from modelled to observed leakage data, allowing the GDNs to identify super emitters and prioritise their repair.

Beta Phase trials of five advanced leak detection technologies (vehicle-based, satellite, two fixed sensors, and one handheld sensor) has commenced in August and will carry on for six months. The data gathered from these trials will allow us to better understand and quantify the emissions reductions that could be achieved by a full DPLA rollout and the lowest cost at which this could be done.

Any additional impacts and benefits achieved over and above that predicted at the start of the Project

Additional benefits can be achieved based on the data received from the trials. As throughout the Beta, more advanced technologies have been selected in comparison to the ones in the SIF Beta application and there is a potential for higher quantities of methane to be detected, resulting in higher greenhouse gas emission reduction. More information will be obtained once the trials conclude and results are compared to the expectations set in the application.

Future value to customers

With the preferred option, the proposed solution would result in £2.45 billion present value by 2050, where a lot of the benefits associated spread across the 9 million customers of the Cadent network.

10. Risks, issues and constraints

The innovative nature of the DPLA Project leads to risks that require proactive management and regular reviews. DPLA's risk management process aims at identifying, assessing, and mitigating potential issues that could adversely impact project objectives.

WP1 reviews risks and keeps track of mitigating actions on a regular basis through dedicated risk workshops aimed at assessing the overall DPLA risk profile. High-priority risks are then escalated to the Steering Group to ensure that these are addressed before they become critical problems, thereby safeguarding project timelines, budgets, and quality.

In terms of actual or potential risks DPLA is subject to an innovation risk linked to the innovative nature of the project. A significant number of solution and delivery assumptions are being made while progressing on the modelling, with the delivery method potentially being revisited based on the results of these activities and with impacts on the GD3 and roll-out planning.

11. Working in the open

Working in the open and collecting feedback from stakeholders is crucial for the success and sustainability of DPLA. Stakeholders' feedback helps identify potential issues early, allowing for timely adjustments and improvements, thus enhancing the overall quality and effectiveness of the Project. Moreover, it builds trust and transparency as stakeholders feel their voices are heard and valued increasing their satisfaction and contributing to better decision-making.

We delivered a Communication Plan that sets out objectives, channels and frequency of engagement and it is periodically updated to reflect progress and feedback.

The messaging is tailored to the audience's level of understanding and interest, technical details are communicated for example to employees, Project Partners, and the regulator, while high-level summaries are shared with the wider gas industry.

In terms of feedback mechanisms, we established regular feedback loops through different channels as for example Q&A sessions at the end of briefings and workshops to capture insights and address concerns properly and a DPLA mailbox available to all stakeholders on the external webpage.

To avoid duplication of efforts and accelerate industry progress, DPLA is collaborating with IGG (Intelligent Gas Grid) a SIF funded project led by SGN. WP8 is part of an IGG working group that has been set at the beginning of Year 1 to share insights and establish a framework for assessing the additional benefits provided by both solutions together. WP8 also holds Tech Talk sessions on a quarterly basis inviting both internal and external stakeholders to attend and ask questions.

Table 3 below provides a summarized overview of some of the key internal and external engagements carried out during Year 1.

Table 3 – Key stakeholder groups engaged in Year 1

Audience	Messaging	Channel	Examples of engagement
Cadent employees	Educate and inform on the DPLA project and its progress	Briefings, in-person meetings, workshops, articles on Cadent's intranet ("The Depot")	Project Launch, Briefings with Cadent Directors / Heads of, Workshops, meetings with Cadent data owners
Project Partners	Update on low level progress, focus on activities and achievements of the different WPs, Q&A	Virtual and in-person sessions, workshops	Joint DN Shrinkage Meetings, Quarterly Review Meetings, Stage Gate, Project Launch

Audience	Messaging	Channel	Examples of engagement
UKRI	Update on the project and adherence to SIF conditions, review feedback	Virtual and in-person sessions, community forums	Project Launch, Quarterly Review Meetings, Stage Gate, SIF Community Forum
OFGEM	Provide project overview, focus on regulatory considerations and next steps (RIIO3 impacts), feedback review	Virtual sessions	Stage Gate, Quarterly Review Meetings, dedicated virtual sessions
DESNZ	Provide project overview, feedback review	Virtual sessions	Virtual session
Shipper community	Update on DPLA as the project progresses through the stages, Q&A, feedback review	Virtual sessions, FAQs	Shippers Forum, 1:1s meetings with Shippers
Wider Gas Industry	Share research findings on emerging technologies and data practices optimising the dissemination of knowledge	Webinars, industry events / conferences, community forums, social media	Quarterly webinars on technologies, Utility Week Live, Innovation Zero
General public	Inform the general public on the DPLA project and its progress	Webpage, social media, newsletter (for customers)	Articles on LinkedIn, dedicated page on Cadent website

12. Costs and value for money

In the SIF Beta application three cost pathways (low, medium, high) were identified. The project now is progressing on a low-cost pathway aimed at delivering a low complexity solution with similar benefits and with a budget for the Project delivery 22% lower (£7.43m) than the original Beta budget forecasted (£9.50m). Most work packages have reduced in cost, generally due to a more compressed timeframe and, in the cases of WP2 and WP4, due to the lower complexity of the project scope.

13. Special Conditions

Adherence to Project-specific conditions during the first year of Beta Phase

As a SIF Beta project, DPLA is subject to 19 Project-specific conditions. Table 5 summarizes the requirements set out in the Project Direction and how they have been met during the first year of the Beta Phase ("Year 1"):

Table 4 – Adherence to SIF Conditions in Year 1

Project condition	Requirement	Compliance to the requirement	Status
1. Funding	No SIF fundings will be spent until contracts are signed	Contract signed at the beginning of October, UKRI funding received at the end of October	Complete

Project condition	Requirement	Compliance to the requirement	Status
2. Financial contribution	Report information on financial contributions and include it within the Project costs template	Updates on financials provided during Quarterly Review Meetings (QRMs) and at Stage Gate 1	On target
3. Meeting arrangements	Participate to project related meetings upon invitation by Ofgem, UKRI and DESNZ during and after the Beta Phase	Cadent attended meetings with Ofgem, UKRI and DESNZ during Year 1. Updates on the engagements were provided during QRMs	On target
4.Stage gate scoping	Scope the requirements and success criteria before the stage gates, and share the information in the QRMs ahead of the stage gates	For Stage Gate 1, criteria reviewed and finalized with UKRI ahead of the stage gate. To be started for the next Stage Gate	Complete for Year 1
5. Dissemination of annual progress report	Upload annual progress reports on ENA's Portal	The report will be uploaded on ENA's portal and shared with external and internal stakeholders	On target
6. Impact monitoring	Produce a Project Impact Monitoring and Evaluation Plan to be included in the end of project phase report	Cadent will draft a Project Impact Monitoring and Evaluation Plan	Not started
7. SIF community forums	Attendance to the SIF Community Forums events and on a quarterly basis will provide updates on events' participation	Representatives from the project team attended the SIF Community Forum in February 2024	Complete for Year 1
8. Policy, regulatory and standards barriers	At each QRM an update on policy, regulatory and standards barriers will be provided	Written updates have been provided at each QRM in Year 1	On target
	The annual progress report will contain a section reporting any updates on policy, regulatory and standards barriers	Section 7 of this annual progress report details updates on policy, regulatory and standards barriers	Complete for Year 1
	The end of project phase report will contain a section reporting any updates on policy, regulatory and standards barriers as well as considerations for future work	The end of project phase report will contain a dedicated section for regulatory and policy updates	Not started
9. Updated 60-second video	A 60-second video will be developed within the first 3 months	Developed video in October '23 and shared with internal and external stakeholders during events, meetings, and workshops	Complete

Project condition	Requirement	Compliance to the requirement	Status
	A 60-second video will be developed for the mid-point meeting	A video will be developed in January 2025	On target
	A 60-second video will be developed as part of end Project	A video will be developed for end of Project	Not started
10. Consumer engagement	A consumer engagement plan will be defined to assess the impacts on energy consumers and updates will be shared every six months	Drafted a Consumer Engagement Plan, updates are provided periodically during QRMs	On target
11. Post-Beta Phase roadmap	A post-Beta Phase roadmap will be drafted within the first 6 months of the project	Drafted and shared an initial roadmap	Complete
	The roadmap will be updated periodically, and updates will be shared every six months	Updates on the roadmap are shared every six months during QRMs	On target
	The final version of the roadmap will be included in the final report	The final report will include a final version of the roadmap	Not started
12. Commercialisation strategy	A commercialisation strategy will be defined, and updates will be shared every six months	Drafted and shared Commercialisation strategy	On target
	The final version of the commercialisation strategy will be included in the final report	The final report will include a final version of the commercialisation strategy	Not started
13. Data Best Practice and Digital Strategy and Action Plan Guidance alignment	Summary on compliance with Ofgem's Data Best Practice Guidance, and Digitalization Strategy and Action Plan Guidance	Defined in Q1 a strategy to cover the requirements based on current practices and documentation and shared with UKRI	Complete
	As part of the annual progress report, update on incorporation and application of data best practices in the Project will be provided	The paragraph on "Condition 1"" of this annual progress report details updates on incorporation and application of data best practices	Complete
14. Low, medium and high-cost pathways	Breakdown of how the Project can be delivered in low, medium and high-cost pathway	Shared overview of low, medium and high-cost pathways shared during Q1	Complete
	Provide a summary of the spend control and governance approach for the Project	Provided updates on cost pathways provided at Stage Gate 1, second QRM and Q3	Complete

Project condition	Requirement	Compliance to the requirement	Status
	Update on the Project's alignment with the cost pathways as an attachment to each of its annual progress report and at stage gates	Section 12 of this annual progress report details updates on cost pathways	Complete for Year 1
15. Data modelling	Demonstrate that all data has been triaged as requested. Provide sufficiently strong justification and evidence for any data or modelling methods which have not been published	Set and address data validation during Stage Gate 1	Complete
	Evidence of dissemination and publication of the data modelling used for gas leakage analytics developed in this Project to ensure there are opportunities for other gas distribution networks to adopt this technology	Project documentation is continuously shared with the GDNs directly as they are project partners and sessions and meetings have been carried out to foster engagement	Complete
16. Engagement with GDNs on data and analytics and models	Update on ongoing governance of the Project describing the approach for how data, analytics and models can be used to identify and locate leaks and how this approach can be replicated by other GDNs	As project partners, GDNs are attending DPLA governance meetings (e.g., Stage Gate 1, QRMs) and sessions on models and analytics and technologies have been conducted	On target
	Update on engagement with other GDNs not included as stakeholders in the Project to ensure the ontology that the Project produces is adoptable	All UK GDNs are stakeholders and project partners of DPLA	On target
	Whitepaper to describe how other GDNs could use the models and the data	A Whitepaper will be drafted before the end of the project	Not started
17. Engagement with Ofgem	Engagement plan describing how it will update and engage with Ofgem subject matter experts on specific shrinkage and leakage regulation	Updates on engagement with Ofgem are provided during QRMs	On target

Project condition	Requirement	Compliance to the requirement	Status
18. Gap analysis	Provide a gap analysis or detailed benefits analysis outlining the progress of the Project against the counterfactual of the Shrinkage and Leakage Model	A gap analysis will be drafted before the end of the project	Not started
19. Working group with Intelligent Gas Grid (IGG)	Establish a working group with the team of 'Intelligent Gas Grid' to identify areas of potential overlap or duplication, periodic updates, and opportunities for collaborative working	The DPLA team is participating to the IGG working group and provides updates during QRMs on the outcomes of the collaboration	On target

Adherence to Condition 13 - Application of data best practices

At the beginning of the Beta Phase the Project team defined a proposed approach highlighting how it intends to comply with Ofgem's Data Best Practice Guidance, and Digitalisation Strategy and Action Plan Guidance.

During the first year of the Beta Phase the WP2 team have been applying the data best practices in their activities as shown in Table 6 below:

Table 6 – Adherence to Condition 13

Data Best Practice Principle	Proposed approach for compliance at the beginning of the Beta Phase	Compliance to the Principle in Year 1
1. Identify the roles of stakeholders of Data Assets	We will target live data inventory through a live working document, data request and data requirement	Data dictionaries with stakeholder owners have been created
2. Use common terms within Data Assets, Metadata and supporting information	As the source data are not under the project's control, using common terms will be Cadent's responsibility, however, the data inventory must define all the modelling and data analytics terms and use it consistently across the DPLA lifecycle. Guidehouse' s data team will provide more insights as to how they would describe, document and publish models and their consumption in DPLA dashboards as well as other potential systems/users at Cadent	Guidehouse have created data dictionaries and are creating model guides as we progress with the Project
3. Describe data accurately using industry standard Metadata		
4. Enable potential Data Users to understand Data Assets by providing supporting information	A DPLA stakeholder register, will have the list of Data Users mapped to different data/analytics that DPLA will implement. Guidehouse will look at Personas	DPLA personas and their respective roles and responsibilities have been identified. A plan for how DPLA outputs map to individual personas will be defined in December '24

Data Best Practice Principle	Proposed approach for compliance at the beginning of the Beta Phase	Compliance to the Principle in Year 1
5. Make Data Assets discoverable for potential Data Users	The stakeholder Data User mapping will have a column around Access Control categories (e.g. read-write, read-only, write-only, admin, etc.)	Data dictionaries with stakeholder owners have been created, and access control privileges will be finalized post MVP phase. Until MVP phase is complete the data governance process shall follow existing Cadent policies
6. Learn and deliver to the needs of current and prospective Data Users	A DPLA stakeholder register will track the needs of the Data Users	
7. Ensure data quality maintenance and improvement is prioritized by Data User needs	The DPLA stakeholder register will also propose a RACI matrix and to ensure data quality maintenance and improvement will be one of the many possible activities/roles/responsibilities.	RACI matrix to be created when plans for how DPLA outputs map to individual personas will be drafted (December '24)
8. Ensure Data Assets are interoperable with Data Assets from other data and digital services	The data access in/out of DPLA platform will add an attribute around whether the data is public facing and needs to be interoperable. Cadent will provide guidance as to their digital/data strategy/policy that DPLA will adhere to. DPLA's data/modelling pipeline (i.e. the end-to-end flow of data, information, and decisions) will adhere to SPaR. Guidehouse data team will provide more perspective on this as to how this would be supported by Databrics platform	During model development phase, Guidehouse have followed Cadent's guidance regarding data SPaR. During production and rollout planning interoperability privacy and security standards will be finalized and instituted
9. Protect Data Assets and systems in accordance with Security, Privacy and Resilience (SPaR) best practice		
10. Store, archive and provide access to Data Assets in ways that ensure sustained benefits		
11. Treat all Data Assets, their associated Metadata and Software Scripts used to process Data Assets as Presumed Open	Guidehouse' s data team will provide more insights to the work products (data/modelling pipeline, models, etc.) that are open and Guidehouse' s IP. Guidehouse corporate policies around opening Guidehouse' s IP to client or to wider Ofgem stakeholders/ecosystem partners	Guidehouse recognises the sensitive and confidential nature of Cadent's data especially the data related to Critical National Infrastructure (CNI). In partnership with Cadent, until models are developed and ready to be rolled out, data is treated as confidential and limited access has been provided to only relevant Cadent and Guidehouse stakeholders. Work products (data/modelling pipeline, models, etc.) have been shared with Cadent's data science team

14. Material changes

The project completion has been anticipated to be the end of June 2025, seven months earlier than the submitted end date of February 2026, constituting a material change for the Project. A PDCR has been required to deliver the low complexity and low-cost pathway for DPLA. This option represents the minimum required system to achieve the

five highest important use cases but will involve developing a less complex platform than presented in the original scope with less focus on multiple systems of measurement. From a budget perspective. this project direction will deliver similar benefits to the SIF Beta application for a 22% lower budget.

In the first year of the Beta Phase, the list of technologies to be trialled has been updated and reviewed, leading to another material change with respect to the SIF Beta application submission. Along with the findings on the development of other technologies that were not investigated in Alpha, a previously assessed provider of a laser-based system integrated into a helicopter was not deemed as beneficial as others. Therefore, we selected a software company that uses satellite captures to gives us more coverage at a lower price while avoiding more complex aspects as having to deal with aviation protocols/regulations. From a budget perspective there were no impacts on the costs forecasted for the trials.

Cadent Gas Limited

@CadentGasLtd

@Cadentgas

0800 389 8000

DPLA - Cadent Gas Ltd