Cadent

Your Gas Network

Appendix 8

Innovation Strategy

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Cadent
Your Gas Network

Executive Summary

We've listened to our stakeholders and made meaningful changes to ensure our innovation priorities are ambitious, accessible, and reflect the needs of our customers, the industry, and the wider community.

We've streamlined our processes, making it easier than ever for stakeholders to engage and collaborate with us on new ideas and projects. This refresh reflects our commitment to open innovation and ensures we're well-positioned to drive positive change for our customers.

At Cadent, innovation plays a crucial role in how we operate, we understand the importance of providing efficient and affordable energy systems. That's why we've developed a comprehensive innovation strategy that focuses on delivering value for all our stakeholders, both through our core business activities and dedicated innovation initiatives.

This appendix outlines our commitment to innovation, demonstrating how we will deliver for all our customers and particularly for those in vulnerable situations. We believe that innovation is crucial for not only enhancing our service and addressing wider UK challenges, but also for driving industry-wide productivity, efficiency, cost reduction and net zero, ultimately benefiting our customers. Our innovation strategy is set out to address our core themes of: High Quality Service, System Efficiency and long-term value for money, Safe, Secure and Resilient networks and Infrastructure fit for a low-cost transition to net zero.

Drawing on the lessons learned and achievements of past regulatory periods, this document details our approach for RIIO-3, showcasing our innovative initiatives and outlining how we plan to deploy innovation into our business activities. We also detail how we plan to collaborate to drive our innovation strategy forward. Finally, we discuss how we are developing and implementing 'Operations 4.0', a strategy for delivering change mainly utilising business as usual (BAU) innovation, but also stimulus funding to drive system, environmental and cultural change at Cadent.

1. Our strategic approach to innovation

Recognising the evolving global energy landscape, we are committed to driving innovation that meets the needs of the present and future energy ecosystem. Aligned with industry priorities, we are focusing our innovation efforts on: High Quality Service, System Efficiency and long-term value for money, Safe, Secure and Resilient Networks and Infrastructure fit for a low-cost transition to Net Zero. We've set out our innovation strategy to utilise financial investment within our company, relevant funding mechanisms and external funding.

Our innovation culture empowers people working across the company to think creatively and explore new ideas through our employee recognition awards, this is explored in more detail in section 9.5. Innovation is delivered through our company Purpose, Values and Behaviours. We seek support from our supply chain as well as reaching out to new innovators and suppliers to bring forth new ideas and innovations that can improve our ways of working and thinking. And finally, we work with our customers to develop innovative ideas such as the EasyAssist Emergency Control Valve (ECV) to deliver real solutions that make a difference to those who need it most.

Our innovation vision is to become a more sustainable, forward-thinking, and efficient organisation, equipped to confidently meet the challenges of the future. To achieve this, we have launched Operations 4.0, a comprehensive program designed to drive cultural change and accelerate BAU innovation within our operations. This initiative will enable us to explore and implement new technologies and approaches, leading to more efficient network upgrades. We will do this by exploring new partnerships with innovators and technology companies to drive collaboration. Detailed information on Operations 4.0, including its role in driving cultural transformation, is available in section 8.2 and how it will drive delivery of innovation.

In RIIO-2 we identified two key components to innovation which remain relevant today:

- Step-change innovation which refers to the practical implementation of an idea that creates a step-change for the industry or market, government or society and is usually associated with higher risk.
- Continuous innovation is brought about by multiple incremental improvements for existing products, services and processes.

These definitions are still appropriate for our strategy in RIIO-3 as we continue to utilise both continuous innovation through BAU activities and step-change innovation driven by a focus on the energy system transition, improving customer service and operational efficiency.

We value our innovation engagement as the best in class at helping to support our supply chain to develop initiates through research and development, network trials, and approval for first time use in the gas industry for new products and services. This process will remain an imperative part of our innovation message as we continuously engage with innovators to implement new techniques, and technologies and instruments that improve our ways of working.

2. Building on the success of RIIO-2

2.1. Our innovation developments across RIIO-2

We are harnessing successes from RIIO-2 to continue developing our innovation approach. Utilising our successes, we aim to build on past projects such as the DPLA, Easy Assist and Duraseal by further developing them past the initial innovation scope to meet further requirements across the business. We have applied our learning from successes in past regulatory periods to our strategy for RIIO-3 in the form of further collaboration, speeding the process of fast following from our network colleagues and being inquisitive of international gas distributors.

To date, we have been involved in 35 funded projects, 29 aligning to the Network Innovation Allowance (NIA) and 6 to the Strategic Innovation Fund (SIF).

Table 1 shows an example of projects we have developed or implemented in RIIO-2.

RIIO-2 innovation theme	Project	NIA	SIF	BAU	Benefit	Status	Internal Network	SMEs	University	Network operators
Protecting supply, improving safety and reducing disruption	STASS			✓	Minimises disruption for road users through a robotic system that can be strategically deployed in gas mains to carry out remediation works	Implemented	✓	✓	✓	✓
	KOBUS Pipe Puller			✓	A trenchless technology that reduces disruption to stakeholders and improves efficiency for service replacements	Implemented	✓	✓		
	Extension of Duraseal			✓	Quick repair method for up to 12" metallic mains that can be applied by Cadent Operatives as opposed to contract repair services	Implemented	✓	✓		
Customers (especially customers in vulnerable situations)	Low Power Hot Water	✓			An alternative solution to current hot water heating appliances provided when a customer is off gas	Development	✓	✓		
	Easyassist Remote Actuation	✓			Enables customers, particularly those in vulnerable situations, to isolate an ECV when the ECV is not easily accessible via the push of a button	Development	✓	✓		
	Digital Exclusion	✓			A solution that ensures energy networks can communicate to all its customers including those who would usually be excluded due to digital communications.	Implemented	✓	✓		✓
Whole system approach	Hydrogen Blending Infrastructure	✓			Prove the technical viability of blending hydrogen into the UK's existing gas networks.	Research	✓	✓		✓
	Hynet homes understand phase	✓			Technical feasibility study to understand the impacts of hydrogen in homes ahead of deployment	Research	✓	✓	✓	✓
	Hynet Homes Understand Phase	✓			Understand hydrogen production and resilience, network considerations and infrastructural requirements, in-home considerations, commercial and regulatory implications of a village trial hydrogen and safety case considerations	Completed	✓	✓		✓

RIIO-2 innovation theme	Project	NIA	SIF	BAU	Benefit	Status	Internal Network	SMEs	University	Network operators
Carbon neutral operations	Digital Platform for Leakage Analytics		✓		To provide a comprehensive view of emissions by reviewing shrinkage and it's subsequent reporting across our asset landscape	Development and trials of technology	✓	✓	✓	✓
	Advanced Leak Detection			✓	Using vehicles to collect methane emission figures so that, mains replacement can be prioritised to accelerate the decrease of emissions	Implemented	✓	✓		
	GECO (Gas Eco) Pump			✓	An intrinsically safe gas-eco pump, to prevent the gas from mains abandonment activities from being vented into the atmosphere	Trial	✓			
Influencing behaviours and enhanced engagement	Connecting with Customers			✓	Enabling our customers to easily engage with us through video recording technology to query work or report issues	Development	✓	✓		
	Welfare Decision Tool	✓			A tool that allows engineers to tailor welfare products and services for customers who might find themselves in a vulnerable situation	Implemented	✓	✓		
	Be Scam Aware			✓	Training that provides tools and knowledge to spot, stop and prevent scams against our customers	Implemented	✓	✓		✓

Table 1: Example of projects that we developed in RIIO-2.

2.2. Step-change Innovation

Throughout RIIO-2 we have undertaken a range of projects that are helping to create a step change in our industry. The Industrial Decarbonisation with Hydrogen, Digital Platform for Leakage Analytics (DPLA), and Advanced Leak Detection (ALD) are a few examples of how we are utilising step-change innovation to reduce greenhouse gas emissions from the gas network (each project will be discussed in more detail further on in this section). These projects are a significant step change and highlight how we have embraced the substantial changes to our landscape, as we prepare to accelerate the UK's transition to net zero. Throughout this section, we will discuss step-change innovation that has been in development throughout RIIO-2.

Industrial decarbonisation with hydrogen

Our regional hydrogen development programme has made huge progress this regulatory period, with hydrogen for industry and power generation being clearly supported by the UK Government. The purpose of this programme is to establish where the first hydrogen production, hydrogen storage and industrial demand will be and how Cadent can facilitate in connecting these with pipeline infrastructure. The regional programme has established a series of projects that helps us to engage with stakeholders. This programme is largely funded through the Net Zero Development Fund Use It or Lose It allowance and Price Control Deliverables and consists of the regional projects called HyNet, East Coast Hydrogen, Capital Hydrogen, East Midlands Hydrogen and Hydrogen Valley. Refer to figure 1 for a geographical view of our regional development projects.

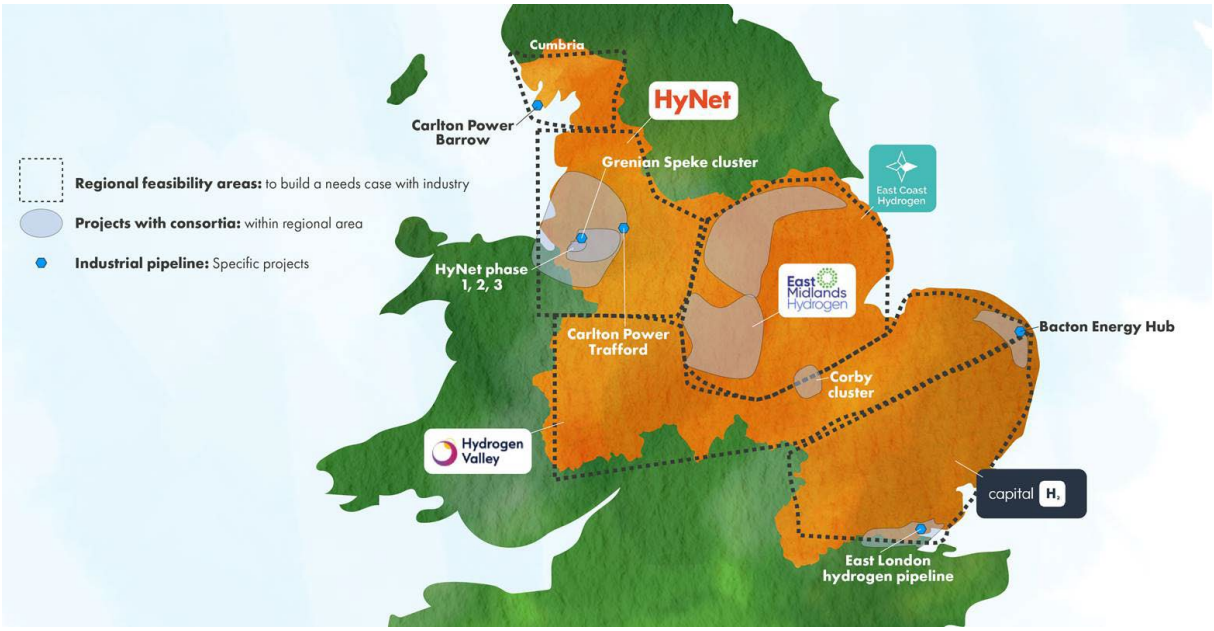

Figure 1: Industrial decarbonisation, regional development projects

HyNet continues to be the UK's flagship industrial decarbonisation project incorporating the full value chain of the future hydrogen economy. Figure 2 illustrates how HyNet includes hydrogen production, carbon capture and storage, hydrogen pipelines, hydrogen storage and the fuel switching of industry and power generation. The HyNet project is split into several phases and relies upon a series of supportive business models that are in development by the Government. In RIIO-2 the first hydrogen production plant was supported, along with the CO2 infrastructure. We plan to bid for the HyNet hydrogen pipeline as part of a competitive process in 2025. Throughout RIIO-2, we continued to lead the development of the detailed design and consenting for the hydrogen pipeline. The programme has been supported by NIA funding. This has been used to conduct research into understanding the risk and opportunities in the development of a future hydrogen village.

Figure 2: Hynet will produce, store and distribute hydrogen as well as capture and store carbon dioxide from industry in the Northwest of England and North Wales

Blending

We have taken a lead across the gas networks in evaluating the role of hydrogen blending as an enabler to increasing the growth of hydrogen production. Over the course of 2022/23 we continued to deliver the HyDeploy2 project in conjunction with Northern Gas Networks (NGN), where we successfully completed a second live demonstration trial. During an 11-month period, a hydrogen blend of up to 20%vol was delivered to 660 homes in the village of Winlaton. The trial showed that the pipe and component materials performed well throughout the demonstration, with no increase in component failure frequencies when compared to the historical performance of this network on natural gas. Overall, residents receiving a blend were found to be positively engaged and receptive to the trial, with a high degree of local support. The HyDeploy2 project has also focused on developing an evidence base for wider scale roll out. This included exploring the impact of hydrogen blends on industrial and commercial customers' heating appliances. In late 2023, the UK Government committed its support of hydrogen blending into the gas distribution networks (GDNs). This project has been funded majority by the Network Innovation Competition (NIC) and further work through the NIA.

Digital Platform for Leakage Analytics and Advanced Leak Detection

Cadent recognises its pivotal role in shaping a sustainable energy future for the UK. As the nation's largest GDN, serving over 11 million customers, we are deeply committed to minimising our environmental impact and ensuring that we continue to operate a safe, reliable and resilient network for our diverse customer base. A key element of this commitment is proactively addressing methane emissions from our extensive network. During RIIO-2, we led a number of innovation projects in leakage management, paving the way for a greener, safer network going into RIIO-3. The pinnacle of these innovations has been the successful trials of ALD technology and the development of the DPLA.

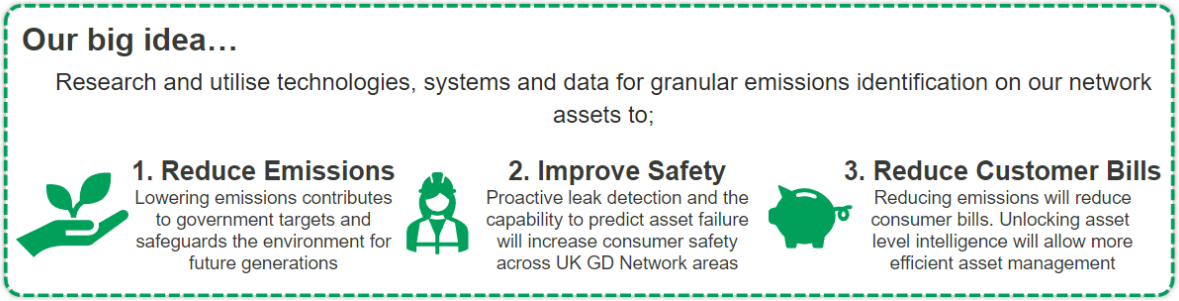

Figure 3: The DPLA big idea

Recognising the limitations of the traditional Shrinkage Leakage Model (SLM), we championed the development of the DPLA project, funded through the SIF in RIIO-2. This collaborative effort, involving Guidehouse Europe, fellow GDNs, and National Gas Transmission. The DPLA has shown how combining real time data observed through cutting edge technologies like ALD, coupled with sophisticated probabilistic hydraulic models will allow GDNs to quantify emissions and pinpoint the precise location of leaks, enabling rapid targeted repairs and strategically targeted asset interventions.

Trials of ALD-equipped vehicles are already underway in our North London and East of England networks, delivering real-time leak location and quantification for swift, targeted repairs. We are looking to roll out ALD technology across our four regulatory networks in RIIO-3, aligning with the Health and Safety Executive (HSE) mandate for annual asset monitoring using Advanced Emission Detection (AED) equipment by April 2026, and will underscore our commitment to observe our extensive 131,000KM network.

Through successful completion of the DPLA project in June 2025, we will look to complement the roll out of ALD technology with the deployment of the DPLA across all four of our regulatory networks at the start of RIIO-3. This will empower a decisive shift from reactive repairs to a proactive, strategic approach, optimising asset interventions for a maximised emissions reduction, improving the safety of the network.

Furthermore, we are looking to continue to partner with organisations like ICS Consulting to utilise sophisticated machine learning (ML) algorithms like the world-leading Optimisation Decision Intelligence engine, Gurobi. Enabling us to process vast datasets, including detailed asset-level data and predictive risk modelling, to identify and prioritise emission-reducing investments. Through balancing risk with the impact on emissions, we can develop robust and efficient asset replacement schemes, optimising spend and maximise our impact on methane reduction.

These innovations are already yielding tangible benefits. Early results suggest that transitioning from an SLM-based approach to one driven by real-time data and sophisticated modelling can deliver significantly greater emissions reductions per kilometre of pipe replaced. This translates into a reduced environmental footprint and cost savings for our customers.

The full implementation and roll out of DPLA and ALD across all of our networks is projected for completion within the first two years of RIIO-3, the initial benefits will be realised much sooner. Our North London and East of England networks are already actively gathering emissions data through the DPLA project. As ALD technology and DPLA platforms are rolled out asset interventions will be able to be prioritised within the first year of RIIO-3. This phased implementation ensures immediate value delivery as we refine and optimise our approach, solidifying Cadent's position at the forefront of a sustainable energy future. Refer to our Appendix 6[1] for more information on the DPLA and ALD.

2.3. What we have achieved through Continuous Innovation

We use continuous innovation to deliver incremental changes to existing products, services and processes. These changes focus on efficiency and localised enhancements that refine our operations to better our performance. These changes are critical to regular improvements which sustain a dynamic and proactive way of thinking. In this section we discuss how we've implemented another robotic solution for gas main repairs and what we have achieved for our customers.

Robotics

In RIIO-1 we were proud to work collaboratively with other gas distributors to implement robotics to conduct necessary gas works whilst minimising disruption to customers and stakeholders. This technology is now part of our BAU activities. Building on the success of robotic technology, and continuous innovation, we have fully adopted another robotic system, System Two Assess and Seal Solution (STASS), further committing to reducing disruption and interruptions through greener solutions. In RIIO-2, one of our themes committed to "Protecting supply, improving safety and reducing disruption", we aimed to continue developing tethered robotic technology to a cost-effective scale to reduce the need for manual and disruptive solutions in the field. With the implementation of STASS and continued use of CISBOT (Cast Iron Joint Sealing Robot) we have reduced the number of disruptions through strategic launch spots and multiple joint access.

This award-winning NIA funded project (System Two Assess and Seal System NIA_NGN_205) was developed in conjunction with NGN and ALH Systems. The solution is a tethered robotic system that can be deployed at a strategic launch location to significantly reduce disruption. Since approval on Cadent's network in June 2023, 115 jobs have been completed, sealing a total of 2,564 joints across 7,798m of pipe. Through its tactical deployment and extensive reach, STASS has helped reduce roughly 2,000 excavations that under traditional methods would have taken place. STASS is allowing us to carry out necessary gas works with greater efficiency whilst also reducing disruption to stakeholders and minimising environmental impact.

Improving Customer Experience

To improve our customers experience we have forged long-term, two-way partnerships with Charities to better help the company understand how we can support our customers and colleagues, especially those in vulnerable situations. We have worked with charitable organisations such as, the Royal National Institute of Blind People (RNIB), Queen Alexanda College, The Royal Association for Deaf people and the British Red Cross to consult on innovation projects and use their expertise so that we can be more deliberate in our actions and responsive to needs. We're very proud to have secured an International Standard Kitemark certification for Inclusive Service, which demonstrates how we support customers in vulnerable situations across the business. The audit specifies requirements and guidelines for organisations on how to design and deliver fair, flexible and inclusive services that will increase positive outcomes for customers in vulnerable situations and minimise the risk of consumer harm. It covers organisational culture and strategy, inclusive design and how to identify and respond to consumer vulnerability.

We feel privileged to be able to protect our customers through innovation and as part of our business operations and have been doing so through campaigns. For example, making the community aware of the dangers of Carbon Monoxide, helping reduce Fuel Poverty, promoting services such as the Priority Services Register (PSR) and the Utilities Against Scams scheme to name a few. In 2023 our winter CO and PSR Awareness Campaign

[1] Environmental Action Plan, section 2.2.3, page 12

launched in collaboration with NGN, SGN and WWU to help highlight the potential dangers of CO and encourage sign ups to the PSR. These campaigns include posters on the London Underground reaching around 2.4m people as they travel across the capital, leaflet door drops to 280,000 households across our network, social media posts and radio adverts.

We are also proud of our work on the EasyAssist™ ECV in collaboration with Oxford Gas Products. In 2022 we concluded the EasyAssist™ ECV project which enables customers to press a button to close the ECV rather than turning the handle (NIA project reference number NIA_CAD0042 and NIA_CAD0063). We are now working towards completing a follow on EasyAssist™ Remote Actuation (NIA_CAD0085) which shall be installed in the homes of domestic gas customers where the situation warrants additional accessibility. It will provide a connected triggering method for the EasyAssist™ up to 2m away from the ECV. The installation of the EasyAssist™ ECV is now a free service provided by us through our Services Beyond the Meter team.

3. Lessons learned from RIIO-2

During the RIIO-2 period, our innovation portfolio yielded learnings that have shaped our approach in RIIO-3. Key among these is the need for increased inquisitiveness, actively seeking out emerging technologies and anticipating future challenges. We recognise that the pace of innovation is accelerating, requiring us to enhance agility and responsiveness in our processes. Furthermore, RIIO-2 highlighted the critical importance of robust industry partnerships to effectively drive innovation and share knowledge. Finally, our experience demonstrated that centrally aligned innovation teams, benefiting from shared resources and expertise, deliver greater impact. These learnings have been integrated into our RIIO-3 business plan, informing our strategy and ensuring we are well-positioned to navigate the evolving energy landscape.

3.1. Lessons Learned

To be inquisitive of our industry partners

Throughout RIIO-2 we benefited from learning from others and sharing our experience with other gas distributors nationally and internationally. Our inquisitiveness saw us work closely with Italgas (Italian Gas Distributor) on the trial of Picarro. Being inquisitive is helping us solve problems together, it prompts collaboration to solve common challenges that benefit all involved. This is more important today as we need to future proof our infrastructure to be a safe, reliable and resilient network. By collaborating on the Picarro project we have been able to fast follow the successes of Italgas through working closely and sharing of best practices. We want to adopt this success story and use it to shape further collaboration, which is why in RIIO-3 our inquisitiveness is being continued through national and international collaboration with gas companies and broadening our interest in other areas including Distribution Network Operators (DNOs), other utilities and technology companies.

Rate of change of innovation is speeding up

Traditionally, due to the nature of our industry, the gas industry has dealt with innovations that are implemented through stages of incremental changes rather than substantial disruptive shifts. In RIIO-1 we saw an increase in step-change innovation that has continued to flow through into RIIO-2 which is changing how we approach projects. We understand that due to rapid advancements in technology new solutions are constantly evolving and to stay informed it's important to forge relationships between stakeholders. We have also found it important to maintain a presence at industry events to build more integrated networks of relationships. We will continue to use this approach to ensure we have a good understanding of the current market capabilities so that we can deliver changes and address the challenges we face with the best partners and solutions. The DPLA is a great example of this, by using a hybrid hydraulic model we will be able to 'plug and play' with the latest advancements in technology allowing the system to be future-proof.

Work collaboratively to share best practice

A key lesson learned from RIIO-2 is the importance of collaborative working to disseminate best practice and drive innovation. We actively engage with industry bodies (such as IGEM, Future Energy Networks, Energy Networks Association and Department of Energy Security and Net Zero (DESNZ)), charities (Blind in Business, National Energy Action and the RNIB), technical assurance specialists (such as DNV and ROSEN) and local communities, to expand our knowledge and ensure alignment on best practice across innovation activities. Our participation in initiatives like the Gas Industry Innovation groups fosters collaboration with other UK gas networks, facilitating the sharing of insights and exploration of joint opportunities, thereby avoiding duplication of effort. A good example of one of our collaborative approaches extending past traditional solutions is the development and launch of a Minecraft educational game designed to raise awareness amongst children about the potential hazards around roadworks and encourage active travel to school. This project, delivered in partnership with primary schools, Transport for London, and local authorities, exemplifies the value of stakeholder collaboration in achieving impactful outcomes.

Figure 4: Inspiring children to travel responsibly with the Minecraft game

Centrally aligned Innovation teams promote best practice

In RIIO2, our innovation teams were aligned with each network area alongside a central innovation team. This allowed regionally specific projects to progress as well as a focus on delivery of company-wide projects under SIF and NIA. This approach was successful in that it enabled innovation specific to the regional geographies and consumers. However, an unintended outcome was a reduction in collaboration across the regions that resulted in a greater focus on continuous innovation rather than step change. We plan to change this for RIIO-3 with the innovation resources being centrally coordinated with a focus on transformational innovation. The central teams will continue to work with the networks to deliver localised innovation.

4. Partnerships and collaboration

4.1. How we collaborated in RIIO-2

Our experience in RIIO-2 highlighted the crucial role of collaboration in driving innovation across our organisation. Our commitment to partnerships will remain central to our RIIO-3 strategy. We acknowledge a need to leverage our relationships with industry experts to access their specialised knowledge, particularly as we navigate the transition to net zero and accelerate the delivery of our innovation goals.

In RIIO-2 we focused on deepening our understanding of the energy transition and the future expectations of the gas network to help shape our innovation programme. We maintain relationships with organisations such as the Climate Change Committee, the National Infrastructure Commission, the new National Energy System Operator, Energy Systems Catapult, the Department of Energy and Net Zero, and Citizens Advice (as examples) so that we understand the longer-term horizon for our customers and the company. We also continue to input and collaborate as a contributor to local and regional innovation and decarbonisation strategies that are under development. For example, the Midlands Engine Energy Security Taskforce, and regional Local Area Energy Plans such as the West London sub region, the West Midlands Combined Authority, Lancashire, Liverpool, Greater London Authority, and Westminster to name a few. In doing so, we have proactively engaged with local authorities to ensure that a balanced approach is taken to decarbonisation, championing the inclusion of scenarios which accurately reflect the benefits and opportunities presented by hydrogen, biomethane, leakage reduction and hybrid heating solutions to ensure the right transition pathways and scenarios are developed that are achievable and deliver on the needs of local authorities and customers.

We continue to utilise relationships with trade associations and technical groups to co-create innovation and enable dissemination and data sharing. This includes organisations such as IGEM, the Energy Networks Association (soon to be the Future Energy Networks), the Renewable Energy Association and Hydrogen UK. Examples include the Energy Innovation Basecamp, Energy Innovation Summit (EIS), Utility Week, Ready4H2 and the European Pipeline Research Group (EPRG).

Collaboration with other networks (gas, electricity and water) continue to be a key area for innovation development. Throughout RIIO2, there has been collaboration with other gas networks on the hydrogen technical programme for example. We have also completed several projects working in partnerships with electricity networks, such as delivering the Greater Manchester Combined Authority Decarbonisation Plan in collaboration with Electricity North West. We have also partnered with Openreach, Thames Water and Transport for London on a fibre sensing innovation project to use existing fibre cables to proactively detect anomalies across our networks. We acknowledge there is more we can do over RIO-3 in collaboration with electricity networks on whole systems coordination and innovation.

Universities are a key part of our innovation strategy and over RIIO2 we have co-ordinated several research projects and PhD sponsorships. As an example, we have worked closely with Chester University (Professor Joe Howe) on the regional community impact brought by the HyNet project in the North West. We have also explored the social and consumer impact of a switch to hydrogen heating by sponsoring a PhD student at Cranfield University (under Professor Nazmiye Ozkan). As part of our support for industrial decarbonisation, we support the research group Hydrogen Integration for Accelerated Energy Transitions (HI ACT). HI ACT is a consortium of 27 academics from 10 universities and project partners. We have also sat on the Independent Advisory Board of the Industrial Decarbonisation Research and Innovation Centre, a UK Research and Innovation (UKRI) funded programme as part of the Government's Industrial Decarbonisation Challenge. The IDRIC programme has provided £20m in funding to university research programmes supporting industrial decarbonisation.

We have also been actively engaged with Innovate UK through the Knowledge Transfer Network Innovation Exchange (KTN-iX™) program that supports innovation transfer by matching industry challenges to innovative companies. Innovate UK is helping us connect with UK businesses to grow the development of new products and services, for example, in RIIO-2 we utilised the Innovation agency's process to explore Internal Pipework Surveying Equipment, Remote isolation of an ECV, and Barholing techniques. The KTN-iX ™ is an essential channel to partnering with SME's (small to medium enterprises) as it connects us with suppliers that are outside our current reach.

We have hosted numerous events such as the Innovation Showcasing Event in the East Midlands, which had over 25 vendors hosting stands, and a further Innovation Showcasing Event at our head office at Ansty. The

purpose of these events is to put our partners products on show and connect them directly with decision-makers in Cadent to facilitate conversations that drives innovation through the business.

Taking that one step further, we're also proud of our yearly-hosted Cadent Roadshows, which through an operational stand-down day have been connecting our operational workforce, with suppliers and innovators. The Roadshows allow challenge statements to be shared by our workforce who are operational and work with our customers daily. This bottom-up approach encourages greater buy-in from all stakeholders given the opportunity to influence decisions.

4.2. RIIO-3 plans to build our partnerships and collaborative efforts

We will continue attending industry events as they are a vital step towards fostering innovation and building robust third-party engagement. Industry events such as Innovation Zero, Utility Week and the EIS serve as fruitful ground for cross-pollination of ideas, providing a platform for our representatives to connect, share insights, and collaborate with like-minded innovative peers, experts, and potential partners. These interactions not only support innovation within our organisation but also cultivate a strong network of third-party collaborators, enhancing market reach and competitive advantage.

Transparency and open communication will underpin our approach to innovation. Throughout the RIIO-3 period, we will actively share learnings with stakeholders and seek best practices, fostering an environment of collaboration and knowledge exchange. Network governance groups and forums will enable us to share our problem statements and innovative ideas to increase collaboration across energy companies. Ideas that benefit our customers and working practices are also likely to benefit other network companies, as such we will share ideas at governance groups before initiating project kick-off to provide collaboration opportunities. Through working together, we can accelerate the pace of innovation, deliver tangible benefits for our customers and contribute to a cleaner, more sustainable energy future for the UK.

We will continue to utilise the KTN-iX process to explore innovation that falls outside of our current supply chain capabilities, we see value in being directly linked with industry innovators who may not been in our existing supply chain. These innovators tend to be small to medium businesses who can work at pace to develop solutions tailored to our requirements.

Building on the outstanding success of our RIIO-2 Roadshows and Innovation Showcasing events, we will continue to host these valuable forums throughout the next regulatory period. These events offer a platform for third parties to engage with Cadent through pitches and safety talks, showcase their innovations, and participate in ideation sessions. Importantly, these events provide our operational workforce, who typically may not engage directly with innovators, an opportunity to interact with these third parties. Establishing relationships between Cadent decision makers and innovators via these showcasing events is critical in driving innovation across our business.

To foster a more collaborative industry environment during the RIIO-3 period, we are committed to leveraging digital platforms for knowledge sharing and stakeholder engagement. We will host webinars showcasing our innovations which will provide a forum for industry experts and peers to exchange insights, discuss potential solutions, and identify collaborative opportunities. In tandem, we will utilise dedicated social media channels to disseminate key learnings, promote ongoing initiatives, and facilitate open dialogue amongst industry participants. This multi-pronged approach to communication and knowledge exchange will foster a more connected and collaborative industry, accelerating innovation and supporting the achievement of RIIO-3's overarching objectives.

The importance of engagement, partnerships and collaboration remains key to the delivery of our innovation RIIO-3 strategy.

5. Our RIIO-3 innovation themes

5.1. Innovation themes for RIIO-3 underpinned by stakeholder engagement

Our innovation themes are consistent with the priorities of our customers, our industry partners and Ofgem. They also align with our purpose to 'Keep People Warm whilst protecting the planet' and are underpinned by our values to 'work together, drive performance, shape the future and take responsibility. Our themes support step-change and continuous innovation throughout RIIO-3 as we strive towards providing the best service to our customers whilst supporting the energy transition. They will also be supported by new delivery mechanisms as we adopt 'Operations 4.0' thinking across our company.

Building upon the successes and lessons learned from our RIIO-2 themes, our RIIO-3 innovation strategy incorporates the continued development and company-wide rollout of previous projects. To ensure alignment with stakeholder expectations, we have conducted extensive consultations, gathering both qualitative and quantitative feedback from stakeholders and the public on their desired outcomes from a GDN. By integrating these insights with Ofgem's key deliverables, we have defined our core themes, further elaborated upon through specific focus areas, as detailed in figure 5. To effectively drive these innovation activities, we have established a dedicated innovation team tasked with delivering projects under the banner of Operations 4.0. This framework, structured around five key pillars, aims to unify the entire company under a single, cohesive message for innovation.

Ahead of our RIIO-3 plan we engaged with stakeholders and our customers to understand the key areas they believe Cadent should focus on.

Our stakeholders told us that we should:

- Maintain a safe gas network: Our customers emphasise the paramount importance of safety. We are committed to continuous improvement in this area, leveraging innovation to enhance network resilience, leak detection, and emergency response capabilities.
- Ensure a reliable gas supply: Customers value a dependable gas supply. We are actively pursuing innovations that improve network infrastructure, optimise gas flow, and minimise disruptions.
- Support UK energy security: We recognise the critical role of natural gas in the UK's energy security. We are exploring innovative solutions to diversify our supply sources, enhance storage capabilities, and promote energy independence.
- Act sustainably and protect the environment: Customers are increasingly concerned about environmental sustainability. We are committed to reducing our carbon footprint through innovations in green gas solutions, renewable energy integration, and carbon capture technologies.
- Provide high quality customer service: To strive to deliver exceptional customer service. Cadent must provide customer service and want more information provided to them about planned maintenance and disruptions[2]

The diagram below outlines our innovation themes for RIIO-3, the high level focus areas and how they align to our innovation delivery mechanism, Operations 4.0.

[2] Regional Workshops, DJS Research. (December 2023).

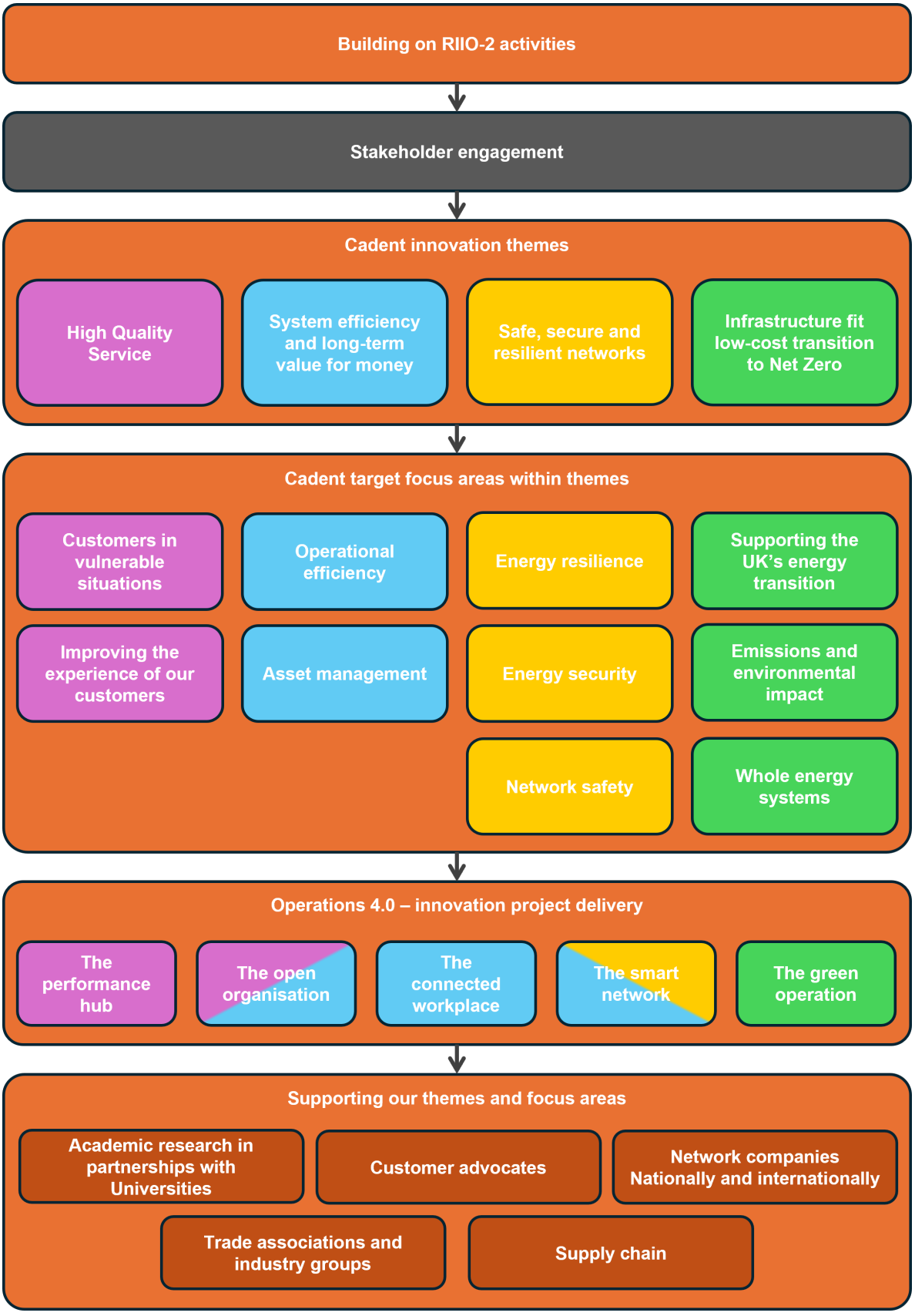

Figure 5: Our Innovation strategy driven by customer priorities, industry shared thinking and regulatory challenges

Below we discuss our direction for the innovation themes we will be undertaking throughout RIIO-3 and the focus areas within each theme.

5.2. High Quality Service (particularly supporting customers in vulnerable situations)

Providing a high-quality service is a key commitment of ours in RIIO-3. This is in line with Ofgem's requirement to support customers by providing the best service possible at the lowest cost. Furthermore, this aligns with the Energy Networks Innovation strategy as we collectively "move to a smarter system, we need to better understand all types of vulnerability, and its changing nature, to ensure no one is left behind[3]. Our stakeholder engagement has indicated that there is an expectation on energy companies to protect society which is why we're committed to supporting our customers through innovation. As customer needs change, so should our service. Our regional stakeholder workshops indicate that customers prioritise 'good service' as "important", this is further upgraded to "critically important" in emergency situations[4]. Furthermore, the study concluded that customers are supportive of innovation to support customers in vulnerable situations. 75% of consumers agree that energy companies have a particular responsibility for protecting the most vulnerable in our society[5]. The report also concluded that more clarity and awareness is needed on how customers can receive support through services such as the PSR.

We will explore ideas that specifically target providing a high quality service for our customers focusing on the following areas:

- Innovation across our business to be inclusive of all our customers through enhanced data collection to support cross sector asset collaboration.
- Innovative new products and services to support off-gas and power cut circumstances, such as providing welfare items that provide temporary heating solutions.
- Continue to understand and support the transient and situational nature of vulnerability and to ensure fuel poverty vulnerability is better understood.
- Explore and research in how to reduce the financial impact of net zero on customers in vulnerable situations as well as ensuring there is "choice for all".
- Empower customer facing colleagues by providing them with appropriate tools enabling them to offer the right support as soon as possible to support "independent living" for those customers that need it most.
- Collaborate with appropriate and relevant organisations to form a pipeline of ideas and proposals for future innovation projects to better support customers in vulnerable situations.

Where appropriate we will continue to put our customers at the heart of our business activities. We are committed to doing the right thing and we work hard to keep our customers and their loved one's safe by offering numerous free or discounted services that contribute in keeping them safe, warm and independent in their own homes.

We will use the focus areas to help our customers to understand the range of additional support available to them and work closely with a diverse range of partners to develop the right services through our innovation projects to make sure we help those who need it. This theme will be covered by BAU innovation through our totex allowance, as well as stimulus funding mechanisms like the NIA.

5.3. System Efficiency and long-term value for money

Beyond addressing broader UK challenges through innovation, we must also prioritise innovations that boost our productivity directly impacting how efficient we are and thereby having a positive impact for our customers. This efficiency can directly translate to customer cost savings. Our customers are very much aware of rising energy bills and are supportive of utilising innovation to create efficiencies that lower costs. Further to this, customers also noted that innovation into technology that costs less than the cost of gas leakage is a good investment[6]. Our ambition within this theme is to build on data and digitalisation initiatives to optimise our use of data and enable cultural change within our organisation to improve our employees' knowledge and usage of data. By doing so we will be able to use analytics to take a more proactive and informed approach across our business activities.

Our plan for system efficiency and long-term value for money deploys technology from digital innovation such as the DPLA to drive a more targeted approach to asset intervention and leakage which generates significant social benefits as well as cost savings.

[3] ENA Energy Networks Innovation Strategy (April 2024. Pg 28.)
[4] Regional Workshops, DJS Research. (December 2023).
[5] Thinks Insight & Strategy. (November 2023). Energy Diaries: Fair Sustainability Wave Three Survey.
[6] RIIO-2 Expert Customer Panel Report (October 2024)

We plan to utilise totex allowances and external forms of funding to investigate the following:

- Digital Twin of our above ground sites that allow us to make more informed decisions rather than using disparate data sets of the past.
- Utilise artificial intelligence (AI) and ML technologies to automate time consuming processes and tasks where possible.
- Product and tooling improvements to create productivity improvements, at the same time as reducing environmental impacts, such as through the adoption of battery powered jackhammers, road-saws and other essential operational tooling.
- Combined video and AI technology solutions that enable site monitoring, visibility site conditions and notify for corrective measures when needed.
- Safety improvements to the way we operate such as wearable technology to support lone working and tooling that reduces or eliminate Hand Arm Vibration (HAVS).
- Trenchless technologies to support mains replacement and service replacement.
- Customer experience and productivity gains using video technology and AI.
- Solutions that enable Cadent to move from valuable data to information rich insights.

5.4. Safe, Secure and Resilient Networks

Delivering a safe, secure, and resilient gas network is paramount to our customers and our business plan. Our commitment to safety is demonstrated through robust asset management and operational practices, all of which are rigorously defined in our Safety Case and overseen by the HSE.

To ensure our network remains robust in the face of a changing climate, innovation is crucial. Our recent stakeholder engagement underscores the public's deep concern for network reliability, security, and safety, with these issues ranking as the top three priorities when asked about the most important topics about gas distribution, garnering 56%, 52%, and 52% of the votes respectively. This represents 59% of all votes cast, demonstrating the public's clear focus on these areas[7]. This also aligns with the ENA's "Optimising our Assets and Practices" theme and the broader industry consensus. We agree that it's imperative to proactively prepare our network for a changing environment whilst maintaining safety and its security. This requires implementing innovative solutions that future-proof our infrastructure and support the energy system transition. We are committed to working with the regulator and industry partners to explore and implement innovative solutions that enhance the safety, security, and resilience of our gas network.

Providing a safe, secure and resilient network is more than just new innovative products or services. Innovation around this theme can accelerate the optimisation of our assets and practices, transforming our BAU processes. Examples of projects or areas we will focus on are:

- Network Resilience Modelling – Develop the capability to objectively assess the impact of the loss of individual sites, pipe/pipelines, or assets on site so that we fully understand our vulnerabilities. With that information, we can reduce and mitigate future unplanned outages, supply interruptions, operational constraints, and wider disruptions.
- Workforce Resilience – Innovative methods using AR/VR to upskill our workforce when performing inspections on our network to ensure network security and safety.
- Climate Resilience – Understand how we can assess cross industry interdependencies so that cumulative customer risk can be modelled, assessed and planned for.
- Shrinkage and Fugitive emissions - Target reducing our environmental impact by using innovation to focus on all aspects of shrinkage and fugitive emissions: those from pipes, Above Ground Installations (AGIs) or our operations.
- Field Sensors - Asset data and monitoring through the use of in field sensors to enable capabilities to optimise asset inventions to maintain 99.99% reliability.
- Predictive Analysis - improved use of data to enable foresight of network anomalies allowing proactive maintenance, investment or repair before faults affect our services.

We will fund this innovation activity through totex allowance, the NIA specifically for climate resilience, digitalisation and external funding streams available to us.

[7] National Survey 2024 for Cadent

5.5. Infrastructure fit for a low-cost transition to Net Zero

The UK government has published a strategy for our transition to net zero by 2050, with planned carbon budgets. We need a multi-faceted, whole-systems approach to delivery and this will require effective engagement with customers on the supporting role of the gas network for both domestic and commercial customers. To do this, we will initiate collaboration with our stakeholders, supply chains, regional bodies and academia to support the energy system transition and a whole system approach. There is an expectation from Ofgem that Cadent supports the transition to a low-cost, environmentally sustainable, low carbon energy system in RIIO-3[8]. Our customers also support this direction, when asked to rank the importance of topics relating to energy, results showed that 37% of respondents placed environmental sustainability in their top three[9].

To achieve this, we must create new and better solutions which we aim to address industry challenges and work towards net zero targets by exploring the following:

- Network Resilience – Understand how climate threats will change the way we model risk of service failure (i.e. by changing the likelihood of failure of the severity of failure / failure mode).
- Climate Resilience – Research to develop different options to manage the risk to our assets. This is likely to require a range of interventions from enhanced monitoring, alarms and early warning systems through to wholesale asset modifications and upgrades.
- Optimising Disconnections and Decommissioning – To support a future whole system, we need to optimise the process of decommissioning to reduce overall cost to the customer. And to understand the regulatory and safety implications to disconnections and the impact on our customers.
- Net Zero and low-carbon Construction – To continue to develop innovative solutions for decarbonising construction operations throughout our supply chain.
- Emissions Reductions – Further explore innovative technologies with regards to emissions reductions, monitoring and reporting, building on the work already started.
- Readying our network for more green gases - Whether that is for growth in biomethane, readiness for hydrogen blend or 100% hydrogen subject to policy decisions.
- Facilitate and support the adoption of flexibility and smart systems - Explore how we seek to balance supply and demand profiles with storage capacity.
- Regional energy system plans - Solutions to join up approaches to regional network planning and forecasting.

To pursue this innovation theme, we expect to utilise different stimulus funding for this theme, with some projects funded through our totex plan. We intend to use NIA and SIF for the medium and larger initiatives. We will also explore other external funding streams to minimise costs to bill payers.

5.6. Data and Digitalisation is an overlaying factor throughout each theme

Our Data and Digitalisation strategy outlines our Digital Framework which includes three main priorities: Interoperability, Data and Digital Literacy and Open Data. These are not innovation outcomes, but they are key enablers for our innovation portfolio throughout RIIO-3.

Interoperability is key to increasing safety, security resilience and efficiency of the energy system. There is value in breaking down the existing data siloes within and between organisations and harnessing the emerging interactions of different digital assets. Suitable digital standards, tools and platforms are required to realise the vision of an efficient energy system. Using the example of Climate Resiliency and the innovation needed to create modelling, we need standards, protocols and technologies that allow diverse system to talk to each other and share information in real time.

Prioritising Data and Digital Literacy will allow people to succeed in delivering a digital energy system that is ready to deal with the management of complex digital systems. It will ensure people understand Data Best Practice. This is particularly important for new digital innovations, such as flow and meter sensors (outlined in section 9.2) as we are required to manage data appropriately. By adhering to Data Best Practice the organisation and its people understand who is creating or processing data and that it follows relevant governance to drive better data use through new digital innovations.

[8] Future Systems and Network Regulation Core Document Ofgem (2023)
[9] National Survey 2024 for Cadent

Finally, there is significant opportunities with respect to innovation if we have strong Open Data offerings. By developing and publishing open data, Cadent is providing the information which can be used internally and externally to develop solutions which has the potential to benefit industry-wide future innovation activities. Cadent's data will be instrumental in providing innovation in cross industry work, supporting the development of the UK energy sector as a whole.

We recognise the critical role of data and digitalisation and the connection to innovation has in driving the energy system's modernisation. Our Data and Digitalisation strategy (Chapter 4 – Summary of Data and Digitalisation outlines how we plan to modernise our data infrastructure and enhance interoperability, ensuring a robust foundation for the development of innovative products and services.

6. Network innovation allowance

6.1. Our proposal and the importance of the NIA

For RIIO-3 we support the retention of the flexible allowance currently available in the form of the NIA to deliver projects that address customers in vulnerable situations and facilitate the energy system transition. The NIA is critical to providing value for our customers and is important for the dissemination of knowledge within the sector to help networks achieve shared goals. This mechanism has a proven track record of delivering benefits to customers and the wider energy system thereby supporting the transition to net zero. Similar to RIIO-2, and supportive of the current guidelines for NIA spending, we will utilise NIA funding on projects that are low in technology readiness for solutions that has not previously been used in the UK energy industry.

Our proposal for the NIA is underpinned by the UK's vision for a decarbonised economy by 2050, inclusive of future climate resiliency requirements and benefiting customers in vulnerable situations. It is centred around enabling a resilient and sustainable future energy system which requires research and development in the form of innovation projects to facilitate a forward-looking industry. Typically, without the NIA these type of projects would not be undertaken highlighting its significance in the energy industry. We see the NIA as an important innovation mechanism for the following purposes:

- The NIA supports the undertaking of essential early-stage research and development in a flexible way, allowing network companies to address important industry challenges that may otherwise be deemed too risky.
- Our stakeholder engagement has highlighted the significance of focus areas that the NIA supports and the importance of them to our customers. The focus areas of the NIA were highlighted as priority areas by our customers.
- Lessons learned in RIIO-2 highlighted that there is a practical limit on how many projects we can undertake through self-funding totex allowances, particular low technology readiness and high-risk projects and the NIA offers a collaborative avenue to support these high risk innovation projects.
- NIA offers a compelling opportunity for our supply chain by empowering it to innovate to support the development of tailored solutions.
- NIA provides flexibility to managing change in projects. Innovation is not a linear process, so whilst NIA projects are bound to scope, budget and timelines, appropriate change controls exist to allow adaption.
- Promotes collaboration with other energy networks and reduces duplication and optimises the focus on new innovative approaches, for example the Hydrogen Heat programme.

We support the continued treatment of the NIA. Having the allowance last the length of RIIO-3 rather than be being split annually allows projects to naturally occur and not hinder development due to funding or time constraints. This approach adopts a fluid innovation perspective which can be responsive to changes in the industry or climate. We also propose to maintain the 90%:10% funding split, 90% NIA and 10% from the company. This approach has been successful for RIIO-2, and we believe it reflects the higher risk associated with low technical readiness levels projects. Therefore, the level of risk we are willing to commit towards NIA projects to support high risk innovation is 10%, this contribution is necessary as it holds all networks accountable and shows a level of commitment but is also reflective of the risk involved.

Due to the nature of innovation, we are only able to forecast the types of projects we expect to deliver in RIIO-3. These projects are heavily influenced by the political landscape of the UK, the economic pressures and the environment our company and our stakeholders operate in. The amount of funding that we are proposing is listed below in Table 2, the table outlines how each of the innovation themes will be funded, the amount of NIA funding required and outcomes these will deliver.

NIA investment		Project outcomes	NIA funding
Benefit customers in vulnerable situations		• To be inclusive of all customers, ensuring there is equal access to all of our services particularly supporting customers during the energy system transition. • Developed new products that provide welfare provisions for customers such as heating solutions during planned and unplanned works. • Developed services and campaigns to educate customers in vulnerable situations on gas safety as well promoting what is currently available. • Improved management of data security and communication of future works to allow for proactive customer planning. • Enable independent living for customers when impacted by our works.	£8.00m
Facilitate the energy system transition	Energy system transition	• Developed innovative solutions that achieve green gas blending into the existing gas network by supporting the addition of more biomethane connections. • Optimisation of disconnections and decommissioning processes to reduce the overall cost of conversion and the impact on customer bills. • Whole system optimisation to assess where the gas networks can support in the provision of capacity and flexibility services in support of electrification. • Conducted valuable research to ready our network operationally for conversion, whether that is for biomethane, hydrogen blend (up to 20%) or 100% concentration subject to policy decisions. • Facilitated and supported the adoption of flexibility and smart systems by exploring how to manage our networks as we start to consider future transitions. • Have explored, in conjunction with gas network colleagues, how to balance the supply and demand profiles with storage capabilities. • Undertaken research with our gas and electricity colleagues to provide visibility and guidance in support of Local Authorities, industries and businesses as they seek to plan their transition to net zero.	£7.70m
	Climate resilience	• Complete research and developed systems that inform how different climate threats will change the way we model risk of failure. • The climate resilience pathway will require R&D to develop a range of interventions from enhanced monitoring, alarm and early warning systems through to wholesale asset modifications and upgrades. • To have modelled and assessed cumulative customer risk through cross industry interdependencies to use for investment cases. • To be identifying and responding to alarm conditions on the network so that we can deploy resources effectively to manage incidents enabled by research into autonomous alarm diagnosis.	£5.00m
	Discovery projects	• Provision for pivotal research/ discovery type projects within the NIA reflecting the change of format to SIF aligning discovery phase to NIA.	£0.75m

Table 2: NIA funding and anticipated project outcomes broken down by criteria alignment

We are proposing an NIA of £21.45m, the split between networks is shown below in table 3.

	Eastern	North West	North London	West Midlands	Cadent Total
RIIO-3	£7.89m	£5.27m	£4.4m	£3.85m	£21.45m

Table 3: NIA breakdown by Cadent network

Our RIIO-3 proposed allowances equates to £21.45m, the total allowance for RIIO-2 was £40.48m (in 23/24 prices). When compared, our NIA proposal for RIIO-3 is less than RIIO-2 mainly because the safety and technical evidence has largely been concluded for the hydrogen HSE Comprehensive Formal Assessment which has been an area of the energy system transition we have been leading the way in. Further to this point, we have requested to carry over £5.50m RIIO-2 NIA funding required for remaining heat policy evidence for DESNZ relating to roll out and feasibility.

We anticipate the volume and spend level of projects that relate to supporting customers in vulnerable situations to be consistent with that in RIIO-2. We are on track to deliver our allocated spend aligned to supporting customers in vulnerable situations for RIIO-2.

6.2. Cadent's area of focus for the NIA

Energy System Transition

As shown in table 2, over the course of RIIO-3 we have specified a budget of £13.45m for projects utilising our NIA, in support of the energy system transition. Our assumption is based on the anticipated innovation needed to facilitate integrating greener gases into our network, exploring optimum solutions for conversion and /or decommissioning and to seek improvements that enhance our climate resiliency.

For RIIO-3, following the blending evidence submission in RIIO-2, work will continue to focus on the review of evidence, the design and implementation of a blending market framework and plans to generate an understanding of what is required to be operationally ready. Therefore, we have included £7.70m to explore innovative methods to support identification of and conversation of assets, exploratory work to look at systems such as, within network controls rooms to balance systems across differing gaseous concentrations.

One consideration to progress with supportive innovation funding over RIIO-3 is on the topic of disconnections and decommissioning of the gas network. This should be considered regardless of the outcome of the hydrogen for heat policy decision, given that there is likely to be decommissioning in some parts across our network in every net zero scenario. As domestic and industrial customers exit the gas network in greater volumes, there will be a range of implications to address and this can be effectively supported with NIA, especially since the research to complete will be first of a kind, and sector-wide rather than GDN specific. The research and innovation required will support the work areas below, and whilst there will be some overlap, they will all be important to explore over time.

- Asset modelling and scenario assessments
  - Utilisation of data and modelling to establish the likely pattern of disconnections and decommissioning and the impact on asset decisions and policy
  - Whole system benefits
- Technical implications and cost optimisation
  - The impact of disconnections on network operations, maintenance, control and resilience
  - Optimisation of the disconnection and decommissioning process
  - Safety implications and minimising methane emissions
  - Asset planning implications
  - Decommissioning costs and impacts on bills
  - Repurposing opportunities
- Consumer impacts and fairness
  - Fairness and who pays for disconnections and asset stranding
  - Impacts and mitigations for consumers in vulnerable situations
  - Consumer impacts and considerations relating to the disconnections, decommissioning and electrification process
- Policy and regulatory implications
  - Who pays and how, implications on company valuation, depreciation and bill impact
  - Safety implications and impact on costs
  - How to deliver and regulate decommissioning
  - Network funding models and how they will need to adapt over time

We will also seek to look at innovation needed for readying our network for conversion, whether that is for biomethane, hydrogen blend (up to 20%), or 100% hydrogen concentration subject to policy decisions. We also see the importance of exploring how to control our networks as we start to consider the future transition. This will include exploring with our gas network colleagues how we will seek to balance supply and demand profiles with storage availability/ capability and present operating strategies to the system operator that ensure pipeline optimisation within safe operating parameters.

We will also seek to work with our gas and electricity network colleagues to collaborate on innovative ideas to provide visibility and guidance in support of Local Authorities, industry and businesses as they plan their transition to net zero. Our NIA submission therefore seeks to reflect both the innovation detailed above and the activities needed to further support customers in vulnerable situations (the former supporting the impact on customers through the retention of choice for heating for some time to come).

We see the importance of continuing to collaborate with our European and International counterparts. This will be through membership of international organisations like the EPRG, but also horizon scanning of international

developments. We intend to do this on behalf of the industry as we have led on this throughout RIIO-2 such as the International Evidence Gathering (Project NIA_CAD0105).

Further to this, in the budget assumptions, we have included £5m funding for climate resiliency that supports the energy system transition. With the implementation of different gases into our network, we will be required to focus on climate resilience modelling and understand where vulnerabilities exist so that we can develop forward-looking plans to adapt our networks to control them. We will need to understand how climate threats will change the way we model risk of service failure (i.e. by either changing the likelihood of failure or the severity of failure/ failure mode). We also believe there is a need to assess cross-industry interdependencies so that cumulative customer risk can be modelled and assessed.

We have included a provision for discovery-type projects within the NIA figures reflecting the change of format to SIF aligning the discovery phase to NIA and feeding into Alpha and Beta. This accounts for £0.75m of our NIA submission.

Customers in Vulnerable Situations

Building upon the strong foundation established in RIIO-2, particularly around customer safeguarding and vulnerability support, Cadent is committed to expediting innovation throughout RIIO-3. Successful projects will enter new phases, with a look to evolve based on valuable customer insight. Enabling us to expand our offerings and create comprehensive product ranges and supporting services tailored to our customers. Two such examples, 1) Low Power Hot Water (LPHW) project, now transitioning into a Low Power Heat (LPH) project, leveraging the innovative approaches developed in the LPHW phase and 2) The EasyAssistTM ECV which is soon to have phase 2 released as the EasyAssist^{TM} E-Remote.

The industry landscape is undergoing significant transformations. Innovation holds the key to addressing legacy challenges, we are committed to playing an active role. Our efforts within the NIA will encompass:

- Active involvement and support for cross-sector initiatives related to PSR data, action-based outcomes, and identifying gaps in market-ready products.
- Supporting consumer inclusion within the energy transition by creating better ways to co-create products and services. This will empower households across the UK and beyond to make informed decisions on their journey to net zero, considering communication needs, accessibility, safety, and potential financial vulnerabilities.

A strategic investment of £8 million across the coming regulatory period will continue to allow us to research, expand, refine, develop, test and introduce innovative solutions that directly benefit customers who need it most when impacted by our necessary works. This commitment will solidify Cadent's commitment to supporting customers in vulnerable situations.

6.3. How we will minimise the impact of innovation on customers in vulnerable situations

To minimise the impact of innovation on customers in vulnerable situations we have access to the Impact Assessment Tool to measure the impact of an innovation project against individual needs code circumstances. This tool recognises that customers are not all equal and there are many financial and non-financial barriers that exist. Included in the tool is a Customer Impact Calculator, which allows us to effectively assess the impact of an innovation project on customers affected by a specific situation of vulnerability.

Additionally, the Social Return on Investment (SROI) tool is a recognised method of assessing the investment made in a project, against the wider benefit to society. It is important that we fulfil our values as a GDN and to verify the impact, there must be a qualitative means of measuring it.

The following outlines our internal methodology that considers the impact of innovation on customers in vulnerable situations.

- Understanding Vulnerability: Our definition of vulnerability, developed in conjunction with input from our customers and stakeholders, provides guidance to all our initiatives. Vulnerability is dynamic and can be transient or permanent, arising from factors both within and outside the energy industry.
- Direct Project Impact: Projects we undertake must not create an adverse impact for our customers, more appropriately, our innovation activities should provide a greater benefit to our customers measured through Impact Assessment Tool or SROI method.

- Data Protection and Ethical Use: We will use data ethically and responsibly to identify and understand the needs of vulnerable customers while adhering to all data protection regulations. Our "needs analysis mapping tool", developed with the Centre for Sustainable Energy, will be further refined to identify geographic concentrations of vulnerability and tailor innovation services accordingly.
- Accessible Communication: Recognising that communication barriers can exacerbate vulnerability, we will communicate with customers through a variety of mediums and accessible channels, including face-to-face interactions, diverse media formats, and partnerships with trusted community organisations.
- Maintaining Affordability: Cadent are committed to ensuring that innovation does not disproportionately impact the affordability of our services for vulnerable customers. We will continue to offer financial assistance programs, energy efficiency advice, and work with partners to address fuel poverty.

6.4. NIA criteria alignment for our Energy System Transition and Customer Vulnerability initiatives

This section outlines how our proposed areas of focus for the energy system transition and customers in vulnerable situations aligns with the NIA criteria.

Energy System Transition

Cadent's proposed energy system transition initiatives align with the NIA criteria in the following ways:

- Delivering Net Zero: We will utilise the NIA to support innovation around our biomethane connections and readying our network for conversion subject to policy decisions whilst also considering how to decommission and or repurpose our network.
- Innovation and Learning: The continuation of work on green gas blending for biomethane or hydrogen. We also seek to address cross-industry interdependencies so that cumulative customer risk can be modelled and assessed relating to climate resilience.
- System Optimisation and Balancing: The proposed projects address the need for system optimisation by exploring the optimal strategy for integrating hydrogen, biomethane, and natural gas.
- Consumer Benefit: Our continued focus on our transition to greener gases in our networks will retain the option of choice for heat to customers subject to the policy decision. Moreover, by modelling climate impacts we will be able to maintain network reliability for all customers.

Customers in Vulnerable Situations

Our proposed initiatives supporting customers in vulnerable situations align with the NIA criteria in the following ways:

- Consumer engagement: The expansion of successful projects like the LPH initiative demonstrates our commitment to actively engaging with vulnerability. This aligns with the NIA's objective of ensuring that innovation benefits all customers, including those in vulnerable situations.
- Addressing market gaps: By focusing on co-creating products and services with vulnerable customers we are directly addressing the NIA's aim to identify and address gaps in the market for products and services that meet the needs of all customers.
- Social impact: The collaborative approach with third-sector organisations and the focus on empowering vulnerable communities aligns with the NIA's objective of delivering wider social, environmental, and economic benefits.
- Long-term impact: The strategic investment in supporting customers in vulnerable situations demonstrates our long-term commitment to ensuring that no one is left behind in the transition to a future energy system.

In conclusion, our proposed areas of focus for the energy system transition and supporting customers in vulnerable situations are well aligned with the NIA criteria. The focus areas will contribute to delivering a net-zero energy system, promote innovation and learning, facilitate system transformation, and ensure that all customers benefit from innovation activities.

6.5. Anticipated benefits from NIA funded projects

Benefits relating to the Energy System Transition

We recognise the crucial role the UK's gas networks play in today's energy system. We supply two-thirds of the energy consumed by over 20 million homes and businesses, ensuring their safety, warmth, and functionality. As we transition towards a low-carbon future, our gas networks will continue to be central, delivering twice the energy capacity of the current electricity grid.

Our NIA framework focuses on investing in solutions that facilitate a smooth and efficient energy system transition, ultimately delivering multiple benefits for our customers and the UK as a whole.

By strategically investing in innovation, we aim to achieve carbon reductions that directly support the UK's carbon budget targets through green gas alternatives, all while ensuring investments remain at an acceptable level. Our focus on leveraging the existing gas network, including the 60,000km of new plastic pipes installed since 2014, enables us to deliver greener gases like hydrogen and biomethane to homes and businesses with minimal disruption. This approach will minimise costs by utilising existing infrastructure, resulting in lower overall energy bills for customers during the energy transition.

Through the NIA framework, Cadent is committed to improving customer satisfaction by enhancing asset resilience and reliability. By investing in cutting-edge technologies and solutions, we can minimise potential disruptions and ensure a secure and dependable gas supply, even as we transition to low-carbon alternatives. This focus on resilience is particularly important for our vulnerable customers, who rely on a consistent and reliable energy supply.

Benefits Relating to Customers in Vulnerable Situations

By maintaining a focus on innovation for customers in vulnerable situations, we aim to continue developing a more inclusive and supportive experience for all our customers. While many people might not want to ask for help or be unaware they are entitled to it, vulnerability now takes many forms. This means that anyone at some point may become vulnerable. A ‘one size fits all’ approach is no longer sufficient, bespoke and targeted interventions remain the most effective way to drive better outcomes. Our efforts will focus on continuous and step-change innovation to develop a diverse range of new products and services specifically designed to meet the ever-changing needs of our customers, ensuring equal access to all. One example is NIA project (NIA_CAD0042) Easy Assist™ ECV, which is now being fitted via a free service from Cadent. We are committed to innovating with suppliers to develop products/ services that will help customers retain an expected level of independence and stay warm during gas outages or when impacted by our work. We will work with charitable organisations such as Citizens Advice, Carers Trust and RNIB to develop new products or services that ensure all our customers are safe and warm in their own homes.

Furthermore, enhancements to data security and communication protocols will provide transparent updates on future developments, empowering customers with the information they need to go about their lives during our works and unplanned outages. This commitment to innovation will allow us to better serve all customers and foster a more equitable and accessible environment.

6.6. Justification for NIA funding

We firmly believe that the NIA is essential for delivering innovation across RIIO-3. This stems from the previous success of the funding allowance across the industry and the multifaceted benefits the mechanism provides, directly addressing the critical innovation challenges facing the UK energy sector with much-needed research and development.

The flexibility of the NIA empowers network companies to explore innovative solutions in a rapidly evolving landscape. Crucial at a time when we need to respond to the urgent demands of decarbonisation, vulnerability, and emerging technologies. Unlike other funding sources, NIA allows network companies to adapt to rapidly changing circumstances, providing the freedom to adjust project scope, timelines, and partnerships if needed. This dynamic approach is vital for exploring and subsequently trialling new ideas, especially those at a low technology readiness level (TRL), where the inherent risk of a project is higher.

The non-competitive nature of the funding encourages networks to work together, learn from each other, successes and failures, and collectively develop solutions that benefit our industry. This open and constructive approach is far more effective than the siloed, inward-looking approach that would likely prevail in an

environment bereft of NIA funding and collaboration. We will continue to take on projects that promote collaboration with other energy networks, other utilities, industry bodies and academia to the benefit of all participants and our customers.

Finally, the NIA mechanism also plays a crucial role in bridging the gap between early-stage innovation and real-world implementation. Through the provision of funding for low TRL projects, NIA enables us to de-risk investment in promising technologies and accelerate its development. This is essential for bringing innovative solutions to the market and ensuring that UK gas and electric companies remain at the forefront of the energy transition. Due to the elevated risks associated with projects characterised with low TRL, funding by totex is deemed high-risk meaning that low-risk or high TRL projects receive the limited amount of totex funding available.

In conclusion, NIA funding is not merely beneficial but necessary for driving innovation in the UK energy sector. Its unique characteristics enable us to respond effectively to the challenges and opportunities of the energy transition, fostering a dynamic and impactful innovation ecosystem. Therefore, we strongly advocate for the continuation and enhancement of flexible allowance funding in RIIO-3 to work towards a sustainable future for the UK energy sector.

6.7. How we plan to disseminate learnings from innovation

We have a responsibility to share the learning from our innovation activities under customer funded initiatives. As a leading GDN, we recognise the importance of disseminating knowledge gained from our NIA projects as the outcomes are transferrable to other network companies. Therefore, it is important to disseminate our learning for the following reasons:

- To accelerate progress - Sharing knowledge and best practices from successful projects can help other networks avoid mistakes, replicate successes, and accelerate progress in the industry. This can lead to faster development and deployment of new technologies and solutions.
- Reducing duplication of effort - By sharing learnings, energy networks can avoid duplicating research and development efforts. This can save time and resources, allowing for more impactful allocation of customer funding.

How we will disseminate our progress and learning post completing of a project

We are committed to sharing valuable insights gained throughout our innovation journey with relevant stakeholders. To achieve this, we will leverage established industry events and existing network governance groups as platforms for presenting our findings. This approach enables us to engage directly with interested parties and facilitate knowledge transfer within the industry. Through these presentations, we will provide a comprehensive overview of our experiences, encompassing both successes and challenges encountered. We will attend industry events such as Innovation Zero and the EIS to share learnings and learn from other networks. In both 2022 and 2023 at the EIS we had panel speakers talking about our energy transition projects and showcased the award-winning Easy Assist (NIA: NIA_CAD0042) innovation project that is supporting independence for our customers (2022). And in 2023 we took to the stage to present the DPLA between its Alpha and Beta phases.

Our anticipation is to host webinars, led by subject matter experts, to take interested stakeholders through our scoping sessions, development and benefits. Webinars are a great way to reach a large audience whilst improving our innovation ‘brand’ awareness. We have hosted internal webinars disseminating innovation progress and have begun planning for wider reaching external webinars.

Another method of communication we plan to utilise for knowledge sharing is social media, our social media presence is growing with around 43,000 followers on LinkedIn. Using social media is beneficial for conveying short format information to a wide audience very quickly with images and videos. We have most recently shared posts about the DPLA trials on our page with additional information provided in the post via links.

The Hydeploy2 initiative on hydrogen blending serves as a prime illustration of successful dissemination of a project. Following the successful completion of the Winlaton Trial in August 2022, the Winlaton Trial Report was launched at an event held in the House of Lords. The event comprised of keynote speeches from Lord McNicol of West Kilbride and senior members of leadership teams from Cadent and SGN. The project team shared the progress and rounded off with a panel discussion addressing the challenges and highlighting opportunities that hydrogen blended networks have to offer.

6.8. Embedding innovation into BAU

Embedding innovation into BAU is crucial for long-term success but has historically presented challenges to the industry. To address this challenge, we have outlined our approach to implementing innovation post-trial completion and proof of concepts into BAU.

A key aspect of our approach to implementation lies in the appointment of dedicated project sponsors who champion innovation activities from inception to completion. These sponsors, carefully selected for their workstream alignment to the proposed benefits, play an instrumental role in driving innovation forward. Their seniority within the organisation allows them to garner broader business support for the evolving needs and opportunities of the transition. This translates to more efficient implementation of innovative solutions, with a focus on maximising real and lasting impact. The responsibilities of a project sponsor extend beyond mere oversight. They actively engage in guiding projects from start to finish, ensuring the necessary support and resources are readily available at each stage.

Furthermore, our innovation process involves key stakeholders from across the organisation, including Engineering, Safety, IT, Procurement, Legal, and the Operational workforce. This integrated approach guarantees a comprehensive understanding of the project throughout the implementation phase, fostering buy-in and ownership from all parties. Our dedicated Innovation workstream acts as a central hub, fostering close collaboration with all relevant stakeholders to work towards implementation.

In addition, we have built on an existing process to monitor previously proven innovation during the transition to BAU. This is explored in further detail in section 9.4.

This report contains information regarding the monitoring of adoption levels across the network, benefits, challenges, as well as any process difficulties realised. This continuous engagement with teams operating new innovations allows us to manage BAU adoption whilst also providing support to better the process. For RIIO-3 these assessments will take place quarterly rather than annually. The case studies below outline two projects that have successfully been deployed into BAU.

Innovation to BAU case studies	
KOBUS Pipe Puller	Duraseal Repair Method
Replacing services by open cut can be a costly process due to the excavation required. Insertion techniques are also not available for ¾" services due to engineering complexity and reduced internal diameter that could risk poor pressure. The KOBUS pipe puller is a minimal dig solution for the replacement of small diameter (3/4" and 1") underground metallic service pipes. Using the hydraulic system of an excavator the KOBUS pipe puller can remove the existing metallic service whilst simultaneously pulling the new pipe through the same bore path created by the extracted pipe.	Duraseal started as an NIA (NIA_CAD0041) project to qualify self-amalgamating tape as a recognised metallic joint repair method for pipe work. When a gas main needs repairing some techniques require bespoke repair clamps or encapsulation equipment to fix which can take days to manufacture and be costly. Duraseal is now used by Cadent Operatives, rather than using specialist service providers for leak repairs on low and medium gas mains up to 12". The approval of self-amalgamating tape as a recognised permanent repair on metallic mains can reduce the cost associated with some current methods by up to £5,000.

Table 4: Example of 2 NIA funded projects that have been implemented into BAU

6.8.1. Innovation Deployment Table

We have made a conscious decision not to pursue additional baseline funding to deploy previously proven innovation projects. This strategic choice stems from the understanding that initiatives demonstrating clear financial benefits should be resourced through our existing totex allowances. Our view was that additional customer funding for deployment would be justifiable for projects where financial benefits are not realised by the company.

When first reviewing this table, we identified four customer vulnerability projects nearing completion within the RIIO-2 period that were initially considered for inclusion in the baseline funding request. However, upon further assessment, it was determined that these projects, due to their tangible nature, are more appropriately funded through existing mechanisms already at the company's disposal.

Whilst we have given a nil return for table 9.00 at this stage, we would welcome the opportunity for open dialogue during RIIO3 and reconsideration of our position if innovations do come available for implementation.

This option becomes increasing important if another of the energy networks develops a solution to enable us to implement or deploy proven innovations without undue delay.

6.9. How we plan to collaborate on NIA projects

Building on the principles outlined in the partnerships and collaboration section, we will actively seek opportunities to work together on NIA projects. This collaborative approach not only benefits the energy industry but also customers. By avoiding the duplication of work, we can ensure the most efficient use of NIA, ultimately delivering greater value. Furthermore, embracing diverse perspectives, skills, and experiences through collaboration has the potential to create superior solutions for our customers. This openness to new ideas and approaches can also accelerate the pace of innovation, leading to faster implementation of impactful solutions.

To foster this collaborative environment, we will leverage industry forum groups, events, and cross-network meetings as platforms to discuss and develop innovative ideas. Before beginning the project journey, we will share our problems with other networks to provide an opportunity to collaborate. We believe these established channels are ideally suited to nurturing collaboration, providing fertile ground for the exchange of knowledge and the formation of partnerships. These communication channels are already integral to our operations, and we will continue to utilise them to drive innovation. For instance, cross-network meetings, often facilitated through platforms like Microsoft Teams, will serve as dedicated spaces to explore potential projects, ensuring originality and gathering feedback from stakeholders across different networks. Industry forum groups will act as hubs for us to share innovative ideas, garnering support for proposed projects, and allow us to commit to supporting initiatives led by other networks. Additionally, industry events such as Innovation Zero and Utility Week offer networks invaluable opportunities to connect with third parties, share challenge statements, and jointly scope out new and innovative proposals.

To ensure that we avoid duplication of effort under NIA, new projects we undertake will be cross referenced with the governing project portal (currently Smarter Networks Portal) as a means to check similar past projects. As a final measure of assurance, project owners will produce a proposal document setting out the purpose of the project to share with our energy network colleagues or industry groups, to gain their feedback and allow them to raise any concerns.

7. Strategic innovation funding

7.1. Our commitment to the SIF

We are supportive of the competition funding mechanism to design and fund ambitious innovative projects that will shape the future of the energy networks and accelerate the transition to net zero at the lowest costs to the gas and electric consumers. We acknowledge that the fund should remain competitive and governed by Ofgem and external experts to ensure high quality projects are aligned with the direction of the government.

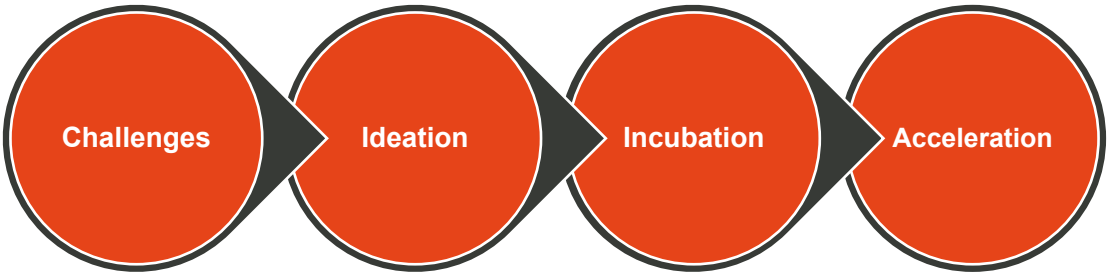

Figure 6: SIF innovation process: the Giant Leap Together

SIF is a valuable mechanism to enabling industry-wide large-scale innovation needs. We agree with the decision of Ofgem to reposition SIF from three stages (Discovery, Alpha and Beta) to two stages, realigning the discovery phase to NIA or other funding sources we have access to. The justification for using NIA for discovery is that resource is required to support a competitive process, and through SIF, funding only starts once a project has been approved for funding. Given the level of engagement with the market to review pitching, filter ideas, and work with innovators to develop the application means that a considerable amount of time and resources is required without the guarantee of success.

We are also in support of making SIF challenges longer term to better facilitate collaborative work on long-term strategic challenges. Shorter terms and dedicated time frames have had an impact on our ability to innovate, as we endeavour to support innovation proposals that answer challenge statements as opposed to innovation. For example, we have found that some of our innovation ideas had been most suitable for a previous challenge statement and not applicable to the latest. Further to this, there is value in challenge statements (or at least one challenge statement) lasting the whole of the RIIO-3 period to allow for more targeted research and development.

Throughout RIIO-2 we have developed a valuable understanding of the SIF process which will see our involvement in SIF projects continue into RIIO-3. Our ambition for the next regulatory period is to be the lead network for at least one Alpha project per year with the expectation that one would progress into Beta. We will always aim to collaborate with other networks on their projects where possible, to optimise a joined-up focus on initiatives that will benefit the industry and customers.

SIF has quickly established itself as an integral funding mechanism that is facilitating the energy system transition towards a low-carbon future and exhibits the capability of being able to address large, high-impact innovative concepts with wide-reaching impact.

8. Innovation outside of stimulus funding

8.1. How Cadent is aligned to enable BAU innovation

We are committed to developing innovation for delivering short-term and long-term benefits for both the company and our customers. These projects characterised by their achievable roll-out and lack of reliance on additional customer funding are vital for continuous improvement. We understand and support Ofgem's position that BAU innovation should be driven by existing incentives and allowances within the price control framework, separate from dedicated innovation funding. To that end, our BAU activities will leverage various funding streams, including totex allowances, external funding mechanisms, shareholder input and Government grants.

Our commitment to BAU innovation is further demonstrated through our programme approach to Operations 4.0, a framework modelled on Industry 4.0 principles, which will serve as a key delivery mechanism for BAU projects throughout RIIO-3. Embedded within our organisational structure, the framework will leverage innovation in automation, AI, and data-driven insights to deliver against our innovation themes. These innovation activities will typically be larger, leverage our data and digitalisation investments and involve system and process changes.

Operations 4.0 is structured around five key workstreams: The Smart Network, The Connected Workplace, The Green Operation, The Open Organisation, and The Performance Hub. These workstreams, elaborated on in the following sections, will guide our BAU innovation activities, ensuring alignment with customer needs and industry best practices from around the World. We have taken a broader perspective and engaged in dialogue with network companies and suppliers from across Europe and the Americas, with a view to becoming a more informed gas distributor that is well-placed to fast-follow and combine leading ideas and initiatives. Through Operations 4.0, we aim to deliver high-quality service, operational efficiencies, enhanced network resilience and reliability, safety improvements, and progress towards net zero targets – all of which directly contribute to Ofgem's four key outcomes for customers.

In addition, we will continue to work with industry suppliers to innovate on products, services and processes. Typically, these will be at a higher TRL that can be developed or implemented relatively quickly, usually within the same regulatory period, and deliver benefits in the same timeframe.

Our approach to BAU innovation revolves around leveraging key innovation themes – High Quality Service, System Efficiency and Long-Term Value for Money, Safe, Secure and Resilient Networks, and Infrastructure Fit for Low-Cost Transition to Net Zero – and combining them with the five Operations 4.0 workstreams to guide the projects we undertake. To achieve this, we will utilise Operations 4.0 as an internal delivery mechanism, which features dedicated Innovation Managers aligned to each of the five workstreams. This structure is designed to cultivate expertise among our delivery managers within their respective innovation fields. The alignment between our innovation themes and Operations 4.0 pillars is visually represented through the colour scheme in figure 7. Operations 4.0 workstreams driving BAU innovation for more information on the types of BAU projects we intend to undertake throughout RIIO-3.

Operations 4.0 will also work together with NIA and SIF-aligned projects as we seek to innovate and benefit from cross-industry collaboration and collective efforts. We foresee the Green Operation workstream developing initiatives that feed into NIA and SIF-funded projects where there is a clear benefit for the wider gas and electric industry towards the energy system transition. One such example is increasing biomethane connections to the gas grid, whilst an important part of our plan, increasing biomethane connections across all gas distributors will support a carbon reduction. Therefore, we expect to utilise stimulus funding and totex allowances on similar projects where the benefits are mutually shared in the industry.

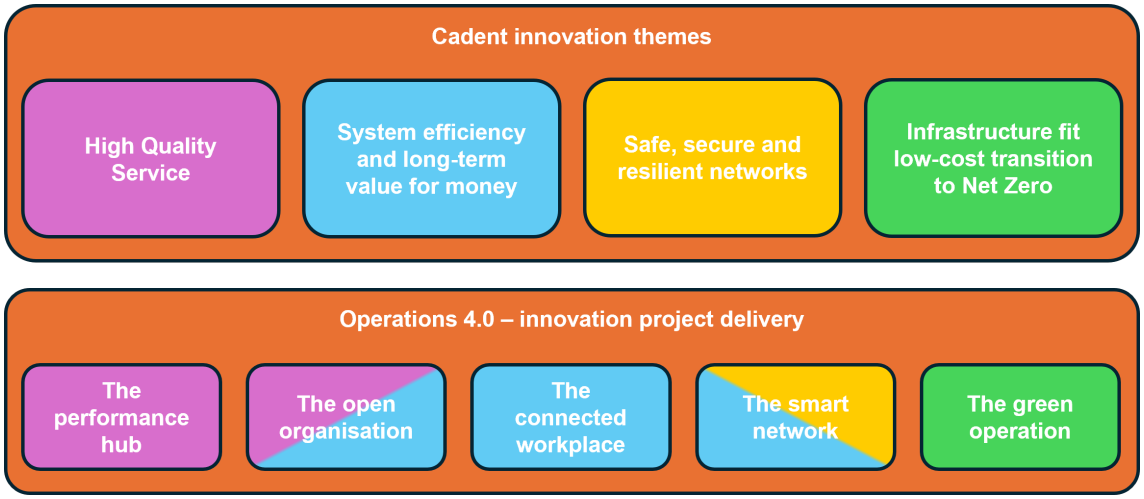

Figure 7: How our innovation themes aligns with Operations 4.0 visualised

We will also focus on developing past projects which have either been completed by us or other network companies as part of BAU innovation, taking them to the next stage or implementation/ scale-up. For example, in RIIO-2, we continued our work on Duraseal, originally an NIA project (project reference number: NIA_CAD0041), we have now developed the product from a repair method for above ground small diameter rising mains to underground metallic mains. Further to this, we are currently working on a project to develop Duraseal for use on PE mains as a permanent repair, a project which if successful would see this implemented by the end of 2027.

8.2. Operations 4.0 and how it will drive delivery of innovation

What does Operations 4.0 mean to Cadent? The world around our industry is changing fast, and we recognise that the business we know today will have to change and adjust to an ever-changing world. To prepare for this future we have devised and adopted Operations 4.0, this stems from Industry 4.0, a phrase coined for the fourth industrial revolution, triggered by exponential growth and capabilities of cyber-physical systems. Operations 4.0 is driven by increased volumes of data, powers for data processing, increased automation, AI/ML, lower costs of sensors, robotics and data acquisition, communication and processing. We're already exploring new opportunities to place ourselves near the front of global gas industry best practices. Figure 8 outlines our five workstreams, each page below in the image is described in further detail later in this section.

Figure 8: Operations 4.0 key workstreams for RIIO-3 BAU innovation

To attain a position at the forefront of the gas industry we need to understand how we can best deliver our services and operations in the ever-changing environment we exist in. When beginning to understand this we identified the following future changes that will impact us:

- Reactive work: Our planned asset investment has led to a considerable decline in reactive work volumes (such as those resulting from public-reported escapes and repairs).
- Climate change: its impacts on our network; our responsibility to reduce our contribution to emissions, and; our role in enabling access for greener gases (refer to our Appendix 2[10] for more information on how climate change is impacting Cadent).
- Volume of mains replacement works we do will reduce in 2032 when the Tier 1 HSE Iron Mains Risk Reduction Programme ends.
- Our industry and regulator continuing a drive for efficiency: reduced costs, reduced waste, acceleration between problems being identified and resolved, and more frequent preventative actions as opposed to reactive, often more disruptive, responses.
- Employee tenure in the organisation, and within roles, is reducing compared to historical norms. We need to accelerate 'time to competency' and support workers across the organisation with more engaging and intuitive ways to do their work well.
- Technology constantly developing, and our customers and regulator rightly expect improvements in our performance and in their experience of our services.

Only through change and adaptation will we address these factors. We recognise this change landscape offers us an opportunity to do things differently, and we want to seize the opportunities for our customers, employees and wider stakeholders. Outside of innovation, we have recognised a requirement to upskill our workforce to adapt to these factors, our Appendix 17[11] covers how we change our focus and multi-skill our workforce.

We are aware that to implement Operations 4.0 successfully we need to engage with stakeholders, some of which will be new relationships to us. To support this, we have begun making significant strides towards our culture commitments via strategy incorporation, bringing people on a journey via empowerment to think creatively and be open-minded to different ways of delivering work and solving problems. Operations 4.0 is a catalyst facilitating consideration on how to implement new technology across Cadent as part of improved, next-generation working practices. To disseminate our thinking, in June 2023 and September 2024, we hosted, what we called, the 'Global Technology Conference'. This event brought together technology pioneers from across the world to share learning and discuss challenge statements relevant to us and UK gas networks. Over the course of two and a half days, we discussed with thought-leaders and innovators ways to accelerate our change agenda for decarbonising our future and consequently the creation of high-quality green jobs within our sector. Greater than 65 different gas and IT companies from around the world attended the conference, helping us to shape our plans for intelligent, flexible, interconnected, low carbon, highly resilient, safe and secure asset operations.

8.3. Operations 4.0 workstreams driving BAU innovation

The key focus areas for Operations 4.0 are The Smart Network, The Connected Workplace, The Green Operations, The Open Organisation and The Performance Hub. The following tables (5 through 9) highlight the 5 workstreams and include innovation concepts that we will be exploring in RIIO-3.

8.3.1. The Smart Network

Technology and data are key to creating the Smart Network. A smart network is characterised by targeted proactive information collection and deliberate, frequently automated, responses with the objective of continuously refining the network to deliver benefits. At a high level the types of projects we're looking to undertake, but not limited to, are listed in Table 5 below.

[10] Climate Resilience Strategy, section 2, page 6
[11] Workforce and Supply Chain Resilience, section 3.4, page 15-17

Project	Description	Benefit
Proactive Leak Detection	We're currently trialling and reviewing solutions that would create a new business capability: leakage detection at scale. This will enable us to be proactive with our gas escapes rather than traditionally being reactive. With increased insights into our assets, we can optimise our repair and replacement activities.	A concerted effort to measure emissions and proactively target assets in poorer health: improves asset data and insight; reduces the risk of asset failure; will lead to lower operating costs (fewer public reported escapes (PREs) calls and jobs in time), and; lowering harmful emissions to atmosphere.
Intelligent Network Monitoring and Control	Network pressures have been controlled in large parts of the network remotely for many years. Typically, these systems are based on fixed pressures that vary through time, with assets acting in groups. This project is about evolving the existing technology to use computer algorithms that use AI/ML to learn the patterns of demand and individual governor supply so that individual points can be optimised for the benefits listed right.	Improved insight and control over network pressures has many benefits including: reducing excess pressures on the network and the corresponding emissions and leakage; improving green-gas entry, by favouring bio-injections over natural gas through pressure control; anomaly detection with the potential early identification of blockages before they interrupt supplies, and; reduced operational costs through remote network control in areas without existing remote pressure control systems.
Digital Twin	3D asset modelling with associated asset details tagged to the site's components (e.g. asset manufacturer; maintenance/ work history; specification etc) will create a digital database of key sites and their components. The digital assets provide capabilities for training, site maintenance checks, inspections and third party sharing.	Digital twins can be extremely valuable in all stages of an asset's life, from design and construction planning right through to decommissioning. Colleagues will be able to access a high-quality digital version of a site and its assets remotely with many benefits: planning works; replacing or maintaining components; reviewing asset criticality and health for investment decisions; evaluating site risks, for instance security risks or climate/ flooding risk.
Flow meters and Sensor	Flow measurements have primarily been taken and used for fiscal metering and billing purposes over the last 3-4 decades. These data points are critical to commercial agreements between GDNs and the transmission network, and also to support gas billing arrangements for customers downstream. With changes in customer behaviour and strong demand from bio-methane suppliers to grow their injection volumes there is increasing need to have adequate levels of flow sensors across the distribution network, not just at its entry points. Gas network simulation tools rely on adequate data inputs and this project is to evaluate where the meters are most required to get the most valuable for consumers.	Flow meters contained across the distribution networks provide critical data that can: enable network planners to optimise designs and avoid any unnecessary scope or investment; support network operators in enabling the accurate visualisation of gas flows, so that risk on the network can be minimised, the data can support increased automation of network control where computer systems adopt previously manual tasks, the data supports in enabling more bio/green gas connections and increased flows from them, flow meter data can enable leakage identification and verification. The live simulations and optimisation of operating strategies, pave the way for future technologies and innovations. As with the digital twin project, this data would be useful in all stages of an asset's life, right through to the potential planning for network decommissioning.

Table 5: Smart Network focus areas

Smart Network Example: Digital Twin

We want to build a digital asset repository of our significant sites that will enable our workforce, office staff, contractors, and key stakeholders to remotely visualise and review our sites without the need for extensive on-site inspections. Using 3D scans of our assets, we aim to create a 3D model that is completely interactive to change the way our engineers monitor, maintain, and visualise our complex engineering sites. The aim is to create a central hub for all data relating to each site to include each individual asset. Users will be able to visualise our technical sites (Above Ground Installations and Pressure Reduction Systems, for example) from point sound scans and high-definition imagery. This platform will allow operational teams across Cadent to have remote access to sites for training purposes, site walkthroughs and even third-party inductions before any work has started. A complete solution would allow users to view data about a site at a granular level, down to individual assets and all associated documentation in one location. Figure 9 shows one of our above-ground sites mapped with point cloud.

Figure 9: Sample of how our significant gas sites may look in a digital twin

Some of the benefits we are anticipating are:

- A reduction in unexpected costs associated with amendments received from suppliers or contractors.
- Digital records relating to each site are easily accessible from one platform with site visualisation.
- Any inconsistencies in documentation and reality are highlighted and easily corrected.
- Maintenance visit productivity and equipment record capture is improved by leveraging automation.
- A digital asset repository is collated that can be analysed to develop data-led, actionable insights.
- 3D scans of sites are developed more efficiently than the current processes.
- Planning capabilities for major future works, for example during site rebuilding or decommissioning.

8.3.2. The Connected Workplace

With increased automation and greater integration of people alongside technology, we want to ensure we have the right technology solutions and tools to help us be more efficient with our processes. We want to create a working environment where we use technology along the brilliance and expertise of people so we can all work more effectively and this is what the connected workplace is designed to achieve. The areas of focus for The Connected Workplace to bring people and technology closer together are listed in table 6.

Project	Description	Benefit
Enhanced data collection	Using asset tagging and video capture technology alongside high-accuracy geographical data, our workforce will be able to see the location of our assets, their condition and details of activities completed on the asset quickly and accurately. Enhanced data collection will also enable us to have a clear understanding of situations of vulnerability across our communities and how these situations impact our customers.	This information will be stored within our data environment and can be made available to the workforce as required to support future operational requirements. We anticipate that we can pass these benefits onto our customers through cost reductions. We will build on previous work completed with leading data providers including Google to generate high-quality, bespoke social mapping data management tools to enable us to target the services we offer. Refer to our Appendix 16[12], for more information on how the benefits of data collection impact our customers.
Drone-based surveys	Utilising asset tagging and video capture technology alongside high-accuracy geospatial data, our workforce will be able to remotely visualise assets quickly and more accurately. We anticipate that data	Safer and in some instances drone technology will enable faster pipeline inspections with enhanced data collection. Drones can operate to great heights and through hazardous environments. We have also began investigating how drones can be used to detect leaks over large areas.

[12] Customer Vulnerability Strategy, section 1.1, page 3

	captured will support future operational decision making.	Furthermore, drones can be used to lower operational costs by reducing the number of temporary structures.
Wearable technology	To be able to same provide the same level of functionality, imaging, and connectivity as a computer. Wearable technology has the potential to inform various aspects of our operations, extending far beyond the workplace. This type of technology could collect data related to equipment usage, and environmental conditions which can support on-site safety. Further use cases extend to enabling remote site assistance that will offer support with complex operations.	Remote site supervision could help us with safety improvements particular with lone workers, supervision of assets and workforce, compliance checks and assurance. Lone workers can be supported 24/7 through communication devices and alert our call centre when an operative is hurt or distressed.

Table 6: Connected Workplace focus areas

8.3.3. The Performance hub

The Performance Hub will create data and information we can share with our customers alongside near real-time or real-time updates on how our networks are operating, allowing us to react effectively and quickly to identified anomalies. The Energy Control and Data Analytics Centre and Performance Hub will work together to enable strategic asset management of our networks. Allowing visibility of all our work activities across our networks could provide opportunities for our customers to access regular updates of works in their area, reducing the need for them to contact us. By offering a range of new communication channels, our customers should have faster and more accurate access to information should they want to get in touch. Table 7 outlines our focus areas for the Performance Hub.

Project	Description	Benefit
Customer Job Progress Portal	We anticipate a future where customers can check on the status of their jobs in near real-time by viewing the job schedule. With the potential to provide our customers with access to photos, attachments and any additional comments from attending Engineers.	We intend to vastly improve the customer journey on our jobs. One way we could do this is by providing customers with step-by-step updates on jobs, to give the customer a greater understanding of our work build trust and keep them informed. Similar to a postal tracking service the portal allows customers to know that the job is progressing as planned, or maybe that an unexpected delay has happened and a reason to why has been provided.
Multi-Channel Proactive Messaging	A vision we have is to integrate multiple methods of communication channels, including a chat and messaging service, which will provide our customers with a straightforward communication line should they wish to contact us.	The benefit is anticipated through providing our customers with real-time proactive and consistent information of works in their area, utilising diverse communication channels to engage and proactively inform customers through a method that suits them most. It also opens the opportunity for customers to reach out to us to help solve any issues or provide much needed information regarding an existing or future job.
Dispatch and Customer Centre Real Time Situational Awareness	A solution we have already started exploring is the real time information in our key operational centres such as Dispatch Control Room and Customer Centre. We are displaying KPIs, performance dashboards and situational awareness information to help provide the information needed for better work delivery and jeopardy management to improve the efficiency of our gas escape management calls.	In today's fast-paced and ever-changing environment, the ability to navigate complex situations with clarity and composure is invaluable. While AI may continue to automate many tasks, the uniquely human skill of situational awareness remains irreplaceable. This ability to be constantly aware of one's surroundings and react effectively in real-time is crucial for navigating the dynamic challenges we face. Operational, mastering situational awareness empowers individuals to mitigate potential threats and make informed decisions in the face of unexpected events.

Table 7: Performance Hub focus areas

8.3.4. The Green Operation

We support the commitment to net zero emissions by 2050 and know the fossil gas we deliver through our network today is not part of this vision. A mix of low-carbon heating technologies will need to be deployed if we are to deliver this commitment. We believe green gases such as biomethane and hydrogen will play a significant part in the UK energy transition. We are currently exploring and investing in several areas which will help us to reduce our carbon footprint and become a greener, more sustainable business, these are shown in table 8 below.

Project	Description	Benefit
Green gas injection	We have committed to growing the number of biomethane connections on our network. We currently have 45 anaerobic digestion plants and are looking to increase this number. In addition, connected to our network are 13 Compressed Natural Gas Sites providing a greener alternative to vehicle fuel consumption.	Biomethane is a sustainable energy resource that could allow for a significant reduction in greenhouse gas emissions if developed at scale. At present, the 45 biomethane plants connected to our network have the potential to heat 300,000 homes annually. Biomethane has around 84% lower carbon emissions than natural gas. Due to biomethane's similarity to fossil gas, it can be transported using the existing gas infrastructure. Read more about our biomethane plans in our Appendix 6[13]
Zero-carbon construction sites	We are starting to consider how we deploy zero-carbon construction sites across our networks by working with our construction partners to trial numerous measures to reduce the carbon footprint of construction projects. We are already trialling a zero-carbon construction site at Burwell, which we are using the learning from to enable us to deploy more widely. We will focus of scope 1 and 2 emissions first.	To meet the 2050 commitment, we need to introduce new plants, tools and equipment that comply with zero-carbon construction. We have begun electrifying our fleet and tools to understand how we can integrate the equipment into our everyday operations. Electric tools can have safety benefits through reduced HAVS and a reduction in noise pollution. Solar and Hydrogen welfare units have the potential to be the hub of our net zero construction sites.
Reducing shrinkage	Targeting our interventions has been historically challenging as we did not have the ability to identify our leakiest pipes proactively. Using insight and technologies driven by the DPLA we can transition from a fully modelled to full observed leakage reporting. We will reduce and offset, where possible, uncontrolled emissions from leaks, repairs and replacement work. We are also beginning to trial new engineering techniques to reduce or eliminate methane leakage during the commissioning of new pipe.	Shrinkage made up 95.44% of our overall Business Carbon Footprint in 2022/23, by lowering our emissions through these innovations, we can not only improve our environmental footprint but also reduce customer bills. Using the insight from the DPLA we can allow for proactive repair, replacement and remediation intervention programme to maximise our emissions reductions. Refer to our Appendix 6[14] for more information.

Table 8: Open Organisation focus areas

8.3.5. The Open Organisation

Our flexible and innovative employment proposition, alongside our leading-edge training and support programme, means we can attract and retain people from a range of different backgrounds and experiences. We plan to offer more flexible working arrangements, a comprehensive and easy-to-navigate training programme to become a leading place to work in the energy sector. Table 9 below highlights our focus areas within the Open Organisation.

Project	Description	Benefit
Flexible contracting approach	Our future working environment is one that is allows more of our workforce to benefit from flexible working arrangements, such as part-time roles and reduced hours. Traditionally our industry has excluded people that have commitments which mean they can't work to set shift patterns.	Offering a more flexible contracting approach and agile working arrangements is one way we can create greater diversity in our workforce while also supporting operational efficiency. A flexible approach will allow us to attract expertise from people who traditionally have been excluded from certain jobs increasing our diversity.

[13] Environmental Action Plan, section 2.6.1, page 30
[14] Environmental Action Plan, section 2.2.10, page 19

Upskilling to enable cross-skilling of our operational workforce	Focus on upskilling to enable cross-skilling, supported by a training and development plan, which will ensure that we have the right skills and accountability we need to maintain and operate our networks. This is particular important as we integrate more digital solutions into our ways of working.	By cross-skilling our operational workforce to work in different activities we are able to create greater flexibility in the organisation. Building capability within our workforce supports our current operations and will underpin our move towards our digital and future energy system.
Review and adaption of the Employee Value Proposition	Our Employee Value Proposition which defines why people should join and stay with us, is quite traditional in its current form. We are currently reviewing and adapting our offering to attract greater diversity and discover fresh thinking and experience.	Workplace diversity unleashes a surge of innovative potential. Picture a homogeneous team, where everyone thinks, acts, and solves problems in a strikingly similar manner. The results are predictable outcomes and a dearth of creative solutions. This is why we champion neurodiversity in the workplace. A diverse team brings a kaleidoscope of unique perspectives to the table. This diverse tapestry of experiences, thought patterns, and approaches fuels innovative breakthroughs, leading to solutions that wouldn't have emerged from a uniform group.
Educational Gaming - Minecraft	Accelerating climate and social action through digital education. Using bespoke designed Minecraft worlds, the game we built aims to attract a new audience to deliver education around energy efficiency, water demand management and safety awareness.	Creating bespoke educational and gaming engagement tools is providing a new vehicle to involve and stimulate interest in young people in subjects which would otherwise seem hard to reach. We are able to work with local schools using technology that resonates with young people to deliver social benefits to local communities.

Table 9: Open Organisation focus areas

9. How we plan to deliver innovation activities and monitor benefits

9.1. Cadent innovation team structure

For RIIO-3 our innovation team boasts a dynamic structure designed to drive effective collaboration and accelerate innovation delivery. We are continuing to grow our innovation culture with the implementation of Operations 4.0 which will see the introduction of specialised workstreams under the Head of Smart Networks to focus on each of the individual Operations 4.0 specific workstreams.

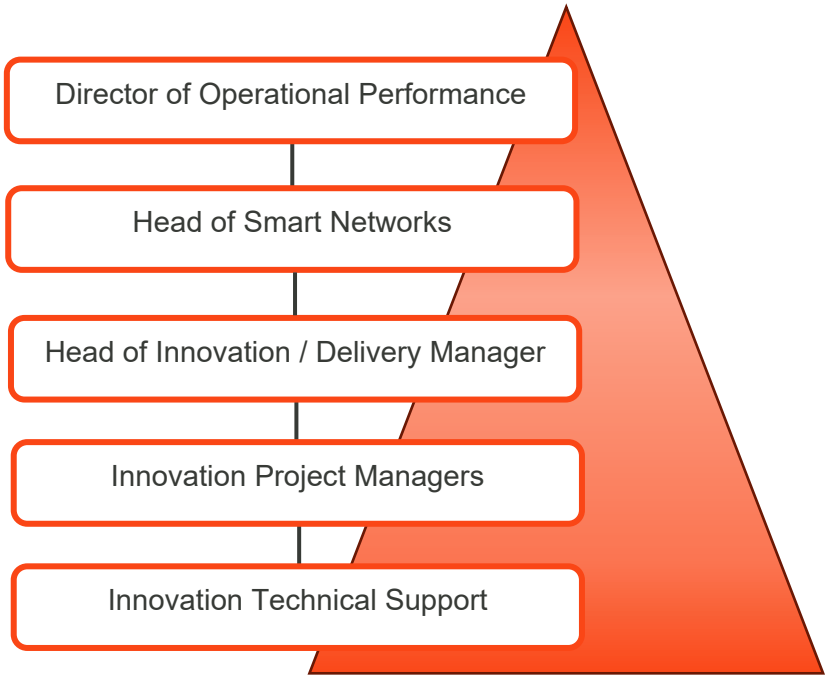

Figure 10: Our refreshed innovation team structure for RIIO-3

Our Innovation team structure is outlined in figure 10, it has been refreshed for RIIO-3 which hinges on a cohesive and integrated approach, which is why we have centralised the innovation team under one function. While previously, the innovation team was dispersed across different networks, aligning everyone under a single umbrella ensures clarity of purpose, streamlines decision-making, and fosters a collaborative environment. This centralised structure will allow us to break down silos and enable cross-functional implementation. By bringing together individuals with diverse expertise we can approach challenges from multiple perspectives, generating a more diverse and creative environment. A unified team also ensures everyone is working towards the same strategic objectives, maximising efficiency and minimising duplication of effort. This alignment will be crucial for successfully delivering our RIIO-3 commitments, allowing us to pool resources, share knowledge, and drive innovation across all areas of our business.

9.2. Project delivery methodology

This section outlines the processes for delivering innovation activities. Where appropriate, relevant governance processes and procedures will be used to manage stimulus funded projects. Furthermore, our Change Management Framework (CMF) is an internal framework used to manage BAU projects.

We are conscious that we have a duty to spend our customers' money wisely and continuously improve the service we offer them at a reasonable cost. That is why we have an existing project governance framework, the CMF, which allows us to undertake change or innovation in a controlled, safe and consistent way, increasing the likelihood of delivering successful projects. The CMF is outlined below in figure 11.

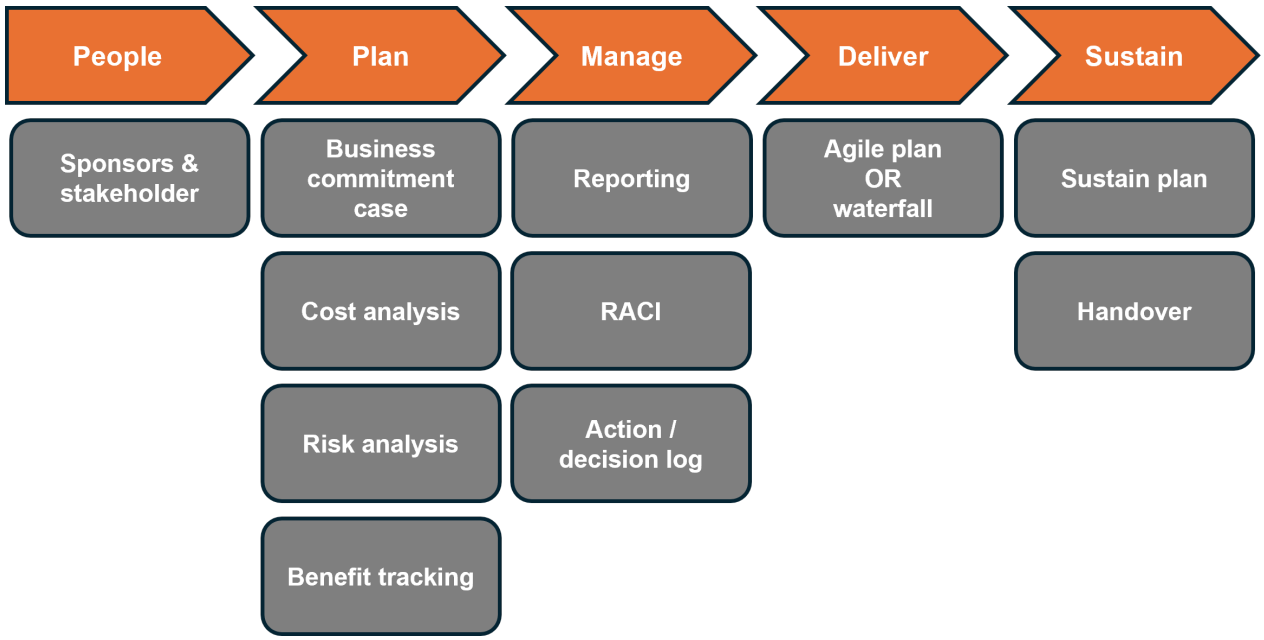

Figure 11: Change management framework

To deliver BAU innovation activities, we will follow our CMF, a thorough but easy-to-use set of change management tools to support management of developmental or transitional projects. It covers an effective project management checklist, such as, assigning relevant stakeholders, pre-project planning activities, project management tools, delivery, and handover to implementation. This framework ensures transparency so that projects can be tracked easily by stakeholders throughout its duration. The framework will be managed by our Innovation team.

The CMF is designed to be flexible, acknowledging that not every project follows a linear path from concept to implementation. The process begins with idea generation, sourced from various internal and external channels, such as direct submissions from third-party innovators, network-led calls for proposals, and challenges identified through stakeholder engagement.

Once an idea is submitted and taken forward, relevant sponsors and stakeholders are aligned to the project. The change management booklet is then populated, followed by the project undergoing a pre-screening process to determine the appropriate funding – shareholder, totex, NIA, SIF or external funding – based on project scope, potential impact, and alignment with strategic priorities. We assess the project's viability against predefined criteria such as the value proposition, alignment with regulatory guidelines, and potential for successful implementation. This stage ensures that projects are directed towards the most suitable funding stream. To avoid duplication, ideas that are identified to be funded through flexible allowance are shared with industry groups and forums.

Upon successful registration, projects enter the delivery phase. Regular progress updates and reviews are conducted, with learning disseminated internally (and externally where appropriate) to further avoid duplication. Upon project completion, a formal closedown report is produced and shared with key stakeholders. Projects that complete this lifecycle are then considered for implementation where appropriate. The inherent nature of innovation means not all projects will progress to implementation but where there is clear benefits these projects will be transitioned into BAU.

Following implementation, we closely monitor the solution's performance to ensure it continues to meet expectations, we leverage key performance indicators (KPIs) and established metrics to track its effectiveness under BAU deployment monitoring. Additionally, we maintain open communication with stakeholders to identify and address any potential issues promptly. During BAU monitoring, we aim to establish confidence in the solution's long-term success and seamless integration into daily operations. Upon completion of any change project or initiative, the onus falls our business and Innovation team to integrate the implemented modifications into its standard operating practices. The project's deliverables, rigorously tested during the sustain phase, should become the established way of working. To ensure the efficacy of these new practices, our system of deployment performance, described in section 9.4 of this document, is crucial. This system will enable the team to monitor performance and promptly identify any deviations from what is expected. Should opportunities for

further improvement arise, the established CMF provides a structured approach for progressing such enhancements.

9.3. Building on past projects and fast following

Building upon the success of past projects, both internal and external, this section outlines our initiatives for implementing proven innovation. For RIIO-3 we agree with Ofgem that more work needs to be done on ensuring innovation projects become BAU. Therefore, we have outlined the following factors that we believe can improve the rate of deployment in figure 12.

Figure 12: Key factors we can influence to further improve innovation deployment

9.3.1. How we plan to build on past projects

Building on past projects is important for many reasons, one of these is that even if a project is unsuccessful, in terms of delivering a solution, there is still a vast amount of learning and experience gained during the process that can be utilised going forward. This can be redirected to a new project to increase the chances of delivering a successful solution next time round. Furthermore, it is also important we learn from previous projects to avoid duplication of efforts and avoid wasting critical resources. We will utilise our position in innovation groups and forums to propose challenge statements and request any prior projects that other network companies have undertaken that are similar to our challenge statements. While we are committed to pioneering groundbreaking research and development, we also understand the significant benefits of fast following – the practice of swiftly adopting and deploying externally proven innovations. This approach allows us to:

- Accelerate Implementation and Value Realisation: Fast following bypasses the time and resource-intensive research and development phases, enabling us to bring proven solutions to market significantly faster. This translates into quicker benefits for our customers, stakeholders, and the environment.
- Mitigate Risk and Optimise Investment: Adopting established technologies and practices allows us to leverage the experience and learnings of early adopters. This de-risking strategy ensures greater confidence in the technology's efficacy and allows us to optimise investment by avoiding potential pitfalls.
- Foster Collaboration and Industry Best Practices: Fast following encourages engagement with innovators, technology providers, and other GDNs. This fosters a collaborative environment, facilitating the sharing of best practices and accelerating the overall advancement of the industry.

Below are two examples of how we have built on past projects by either ourselves or others.

Example: Remote Operated Hornet® Rockdrill

One example of how we have built on past projects is by further improving the Hornet® RockDrill to reduce HAVS. The Hornet® Rockdrill uses a proprietary drill stand and drive mechanism that has been designed to accept a standard pneumatic rock drill. The system is designed to be self-supporting when in operation and minimise contact with the drill during the rockdrill operation. We are currently working with the supplier to develop a touchless version of the rock drill that is controlled via a wireless device to completely remove the need for contact and therefore significantly reduce HAVS from rock drilling activities.

Example: STASS

Another successful example from RIIO-2 of fast following is the deployment STASS. This technology, initially developed and proven by NGN and Synthotech, provides advantages for repairing tier 2 and tier 3 assets through keyhole access resulting in minimised disruption for the pedestrians and road users. By rapidly adopting and integrating this solution into our operations, we were able to remove the need for over 2000 excavations since deployment when repairing leaking assets.

9.4. How we plan to monitor benefits of previously proven innovation

Building upon an existing framework, we have refined our approach to serve a dual purpose of monitoring innovation benefits during transition to BAU and to further support innovation deployment.

This enhanced process introduces additional stage gates to ensure robust monitoring and oversight throughout the implementation phase. While our last version featured a similar process with a final 12-month BAU check-in, the revised process incorporates three additional stage gates. These will be managed by Innovation Project Managers who will support the implementing phase to monitor deployment progress more closely.

The inclusion of these additional stages addresses a key learning from the previous process as the final check-in point occurred too late in the deployment cycle, making it challenging to implement timely corrective actions. This more proactive approach will facilitate greater control and support during the critical transition period.

Furthermore, this enhanced process enables improved benefits tracking. Each project will have clearly defined links to specific benefit categories and business functions, allowing for streamlined data capture and analysis. This granular approach will provide a more comprehensive and accurate assessment of the value generated by innovation projects.

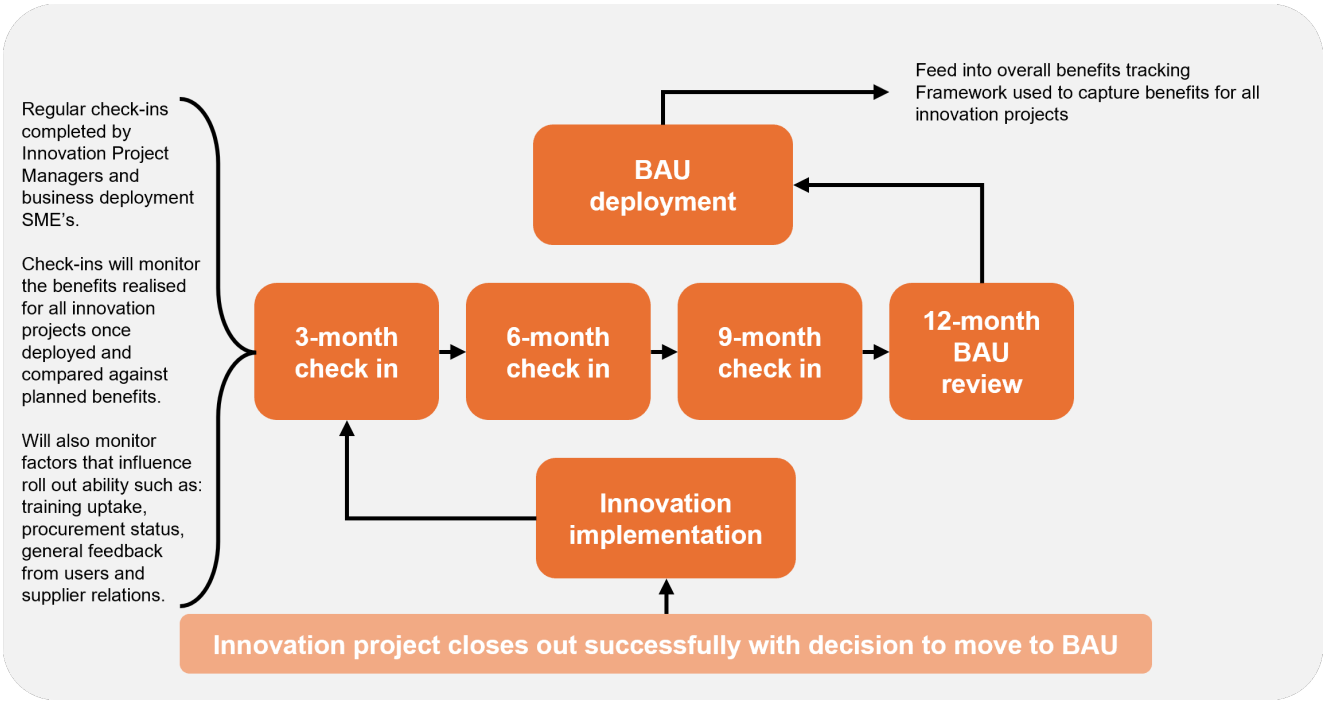

Figure 13: Process for monitoring benefits of innovation through deployment

The benefits of our RIIO-3 innovation activities, once proven and transitioned to BAU, will be continuously monitored through a structured process illustrated in figure 13. This process incorporates quarterly check-ins, facilitated by our central innovation function. These check-ins will assess the ongoing utilisation of the innovation and its integration into BAU deployment. Post-implementation, a series of follow-up sessions will monitor progress across various aspects, including procurement, training sign-ups (where applicable), business adoption, realised benefits, and general feedback. These feedback sessions serve a dual purpose: informing the dissemination of our findings both internally and externally, as appropriate, and supporting wider adoption across Cadent.

In addition to this, we, and other energy networks, are redesigning the Innovation Measurement Framework which is used to report on a broad range of innovation outcomes and benefits from projects, including collaboration and partnerships, the speed at which successful innovation is transitioned into BAU and the benefits delivered for network customers.

Refer to our Cost Appendix for how our efficiencies created through RIIO-2 innovation have been reflected throughout our business plan.

9.5. Innovation is delivered through our Company Purpose, Values and Behaviours

In 2021 we launched our new company purpose: To 'Keep People Warm, while Protecting the Planet', this purpose is supported by our values and behaviours which underpins how we do things across our innovation portfolio. This commitment goes further to encompass a responsibility for protecting our planet as we recognise the biggest impact we can have as a gas distribution company is to encourage and enable the switching away from fossil gas, that we transport through our pipes today, to green gases such as hydrogen. Our purpose is woven into our values and behaviours that defines our innovation landscape: **we work together** to find innovative solutions, **we take responsibility** for our environmental footprint, **we drive performance** in sustainable practices, and **we shape the future** to a greener world. To pursue these values and drive innovation excellence we support our employees through the 'Cadent Hero Award' and 'Cadent Congratulations'. To date, we have issued 329 awards to highlight those people who have gone above and beyond in their role and demonstrating our values.

Three of our company values are specifically aimed at developing a culture of innovation for our employees and the way we approach the work that we do.

'We Work Together' to collaborate and deliver the best solutions. We firmly believe that working together is not just a value, but a driving force behind our innovative spirit. By fostering a collaborative environment, we empower our employees to share ideas, learn from one another, and tackle challenges with a united front.

'We Drive Performance' by striving for excellence and ensure our customers are a focal part of our planning. Driving performance is far more than just striving for efficiency. It's a pivotal message we set to build our culture of innovation on, constantly pushing the boundaries of what's possible to deliver exceptional value to our customers and stakeholders. Pushing for excellence by setting high standards creates an environment where new ideas can flourish and empowers teams to challenge the status quo to explore ideas beyond the ordinary.

'We Shape the Future' through exploring new ideas and different ways of thinking. At Cadent, we understand that the actions we make today are going to impact the future of our industry and our stakeholders, therefore it is important we make the right decisions today to support the energy system transition to net zero. This core value drives our commitment to innovation, pushing us to constantly evolve and adapt to the changing needs of our customers and the wider energy landscape. This commitment to progress extends beyond internal processes. We actively engage with external stakeholders, collaborating with universities, startups, and other industry leaders to explore cutting-edge technologies and approaches.

Our values remain a crucial part of our managerial and staff performance assessments, which are linked to pay and reward.

Our approach to innovation has been to form a culture where people feel empowered to think creatively and explore new ways of working that drive value for all our customers and ensure a sustainable future through improved products, services, and processes. We have been enabling innovation through a bottom-up approach by bringing together different business departments who are essential in the customer experience and have valuable customer insight to share through workshops. These workshops are driving continuous engagement to understand our customers priorities.

Figure 14: Cadent values

Where appropriate, we will continue to place innovation at the center of our operations to build on our progress in RIIO-2 by facing opportunities head on and playing a pivotal role in achieving industry net zero targets through the energy system transition. We have set out a culture and vision that encompasses a blend of values that allows us to excel on our innovative mission to achieve net zero and deliver the right benefits to our customers.

10. Framework for determining RIIO-3 Funding for innovation projects

10.1. How we will determine innovation funding to ensure customer funding is best utilised

Striving to be 'best in class' to us also means we have to consider how we retain this position going forward, recognising that what got us there in the past may not necessarily allow us to retain that position in the future.

With this in mind, we have further developed our innovation framework for RIIO-3, allowing us to bridge the gap between ensuring we can effectively access and compete for innovation funding (both across routes which Ofgem makes available to us and other innovation funding schemes) but also recognise that our business needs to find a structured approach to accessing internal funds to deliver innovation projects where we deem these critical for the future development of our business.

At the heart of our approach stands the premise that we recognise fully that our industry, and therefore our business, is facing an uncertain future in the medium term. Irrespective of this, there is a continued expectation on us to find new ways of driving value for both our current customers and our future customer base whilst maintaining a safe and resilient network. In parallel, we must ensure we position our business in a way that allows us to provide different pathways for the nation to reach net zero by 2050 while policymakers and regulators home in on the ultimate path we will be taking.

Against this backdrop, we have developed a framework that allows us to group, qualify, and identify funding streams for innovation projects (outlined in figure 15).

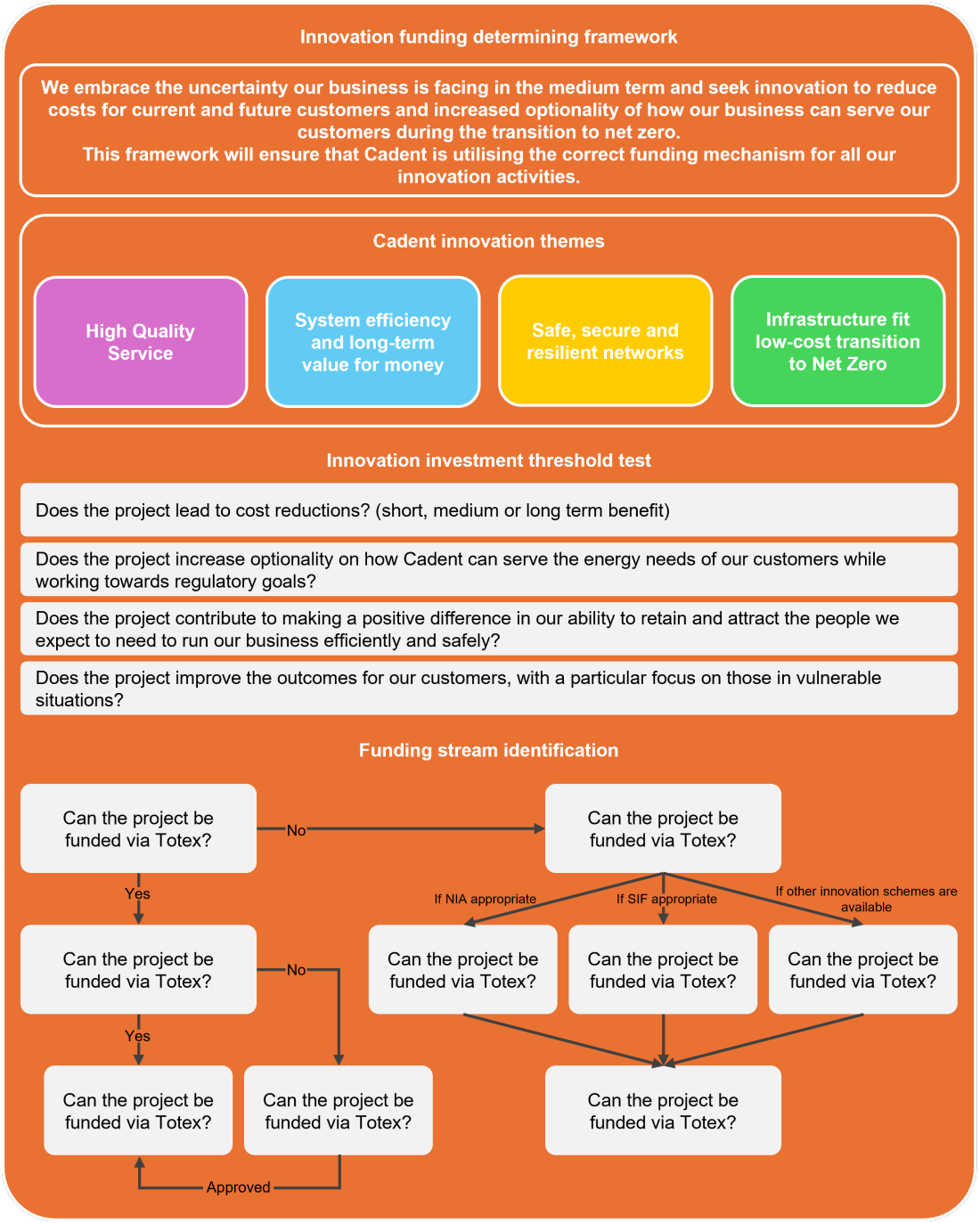

Figure 15: Innovation framework to determine correct funding stream for projects in RIIO-3

Innovation Themes

Our innovation themes are derived from customer priorities, shared industry thinking and our own thoughts on how we need to innovate to reach the nations net zero goals in line with the policymakers and regulators. Our themes are an integral part of our innovation activities as they ultimately shape the type of work we take on, therefore to ensure we have a coherent measure throughout RIIO-3 it is important we maintain these throughout the regulatory period. This framework will ensure projects we undertake meet our theme criteria and have benefits consisting with our industry requirements. The innovation themes (High Quality Service, System Efficiency and long-term value for money, Safe, Secure and Resilient networks and Infrastructure fit for low-cost transition to net zero) are outlined in detail in section 5 of this document.

Innovation Investment Threshold Test

This stage of our framework has been developed to aid our ability to identify in a project-agnostic way whether projects should be pursued as these drive sustainable cost reductions against the operational and strategic challenges we are faced with.

These tests also provide a first-line assurance to Ofgem that the projects we are putting forward for innovation funding have been qualified against a standardised approach. We are of the view this adds further transparency to the project identification process, a critical component to underlining our 'best in class' role when it comes to innovation. This qualification also acts as a precursor to the development of business cases for Cadent-funded innovation projects.

Funding Stream Identification

This decision tree in figure 15 illustrates how we are seeking to guide the identification of funding streams for the projects that we have been able to qualify through our investment threshold test. The premise is to consider all possible funding streams to allow us to pursue the projects we deem relevant and ensure that we're spending innovation allowances appropriately. It is therefore only right to expend efforts on understanding how these projects might align with the funding mechanisms that are accessible to us. Where these may not permit the pursuit of specific projects, we are primed to consider across our business where to identify and release funding our totex allowance. We would pursue this channel for funding where we think pursuing projects is critical for the development of our business against the backdrop of uncertainty and the benefits are expected to accrue in the RIIO-3 period.

10.2. BAU innovation table

BAU innovation activity	Plan Section
KOBUS Gas Pipe Puller	Innovation Strategy - Section 2.1 and 6.8
Digital Twin	Innovation Strategy - Section 8.3 and 8.3.1
STASS	Innovation Strategy - Section 2.1 and 2.3
Duraseal	Innovation Strategy - Section 6.8
Purging and Venting Operational Advancements	Appendix 6[15]
Neto Zero Construction Sites	• Appendix 6[16] • Innovation Strategy - Section 8.3.4
Flow Meters and Sensor	Innovation Strategy - Section 8.3.1
DPLA and ALD	• Innovation Strategy - Section 2.2 • Appendix 6[17]
Microstop and EzyValve	Main Business Plan[18]
GECO Pump	Innovation Strategy - Section 2.1
Intelligent Network Monitoring & Control	Innovation Strategy - Section 8.3.1
Drone-based Surveys	Innovation Strategy - Section 8.3.2
Wearable Technology	Innovation Strategy - Section 8.3.2
Customer Job Progress Portal	Innovation Strategy - Section 8.3.3
Multi-channel Proactive Messaging	Innovation Strategy - Section 8.3.3
Real Time Situational Awareness	Innovation Strategy - Section 8.3.3
Reducing Shrinkage	Innovation Strategy - Section 8.3.4
Educational Gaming – Minecraft	Innovation Strategy - Section 8.3.5

Table 10: BAU innovation projects mentioned through our business plan

[15] Environmental Action Plan, section 2.2.8, page 18
[16] Environmental Action Plan, section 2.2.13, page 20
[17] Environmental Action Plan, ALD section 2.2.3, page 12, DPLA section 2.2.4, page 13
[18] Asset Health Considerations, section A2, page 33

11. Glossary

Term	Definition
AI	Artificial Intelligence
ALD	Advanced Leak Detection
BAU	Business As Usual
CMF	Change Management Framework
DESNZ	Department for Energy Security and Net Zero
DPLA	Digital Platform for Leakage Analytics
ECV	Emergency Control Valve
EIS	Energy Innovation Summit
EPRG	European Pipeline Research Group
GDN	Gas Distribution Network
HAVS	Hand Arm Vibration Syndrome
HI ACT	Hydrogen Integration for Accelerated Energy Transitions
HSE	Health and Safety Executive
IGEM	Institution of Gas Engineers and Managers
IT	Information Technology
KTN iX	Knowledge Transfer Network Innovation Exchange
LPH	Low Power Heat
LPHW	Low Power Hot Water
ML	Machine Learning
NGN	Northern Gas Networks
NIA	Network Innovation Allowance
PSR	Priority Services Register
RNIB	Royal National Institute of Blind People
SGN	Scotia Gas Networks
SIF	Strategic Innovation Fund
SLM	Shrinkage and Leakage Model
SROI	Social Return on Investment
STASS	System Two Assess and Seal Solution
TRL	Technology Readiness Level