Northern Gas Networks

RIIO-GD2

Business Plan 2021-2026

together we are the network

What can you expect from our plan

Many different people have an interest in our plan – our customers, our investors and our wider stakeholders, as well as our regulator. So we've written it with everybody in mind. It started with a summary for our customers, and the remainder is in six main parts, with more detailed information in separate appendices.

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PART 1:
AN OVERVIEW OF OUR PLAN

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In this section

Here we introduce you to our business plan and explain how it was created, including an introduction from our CEO, a summary of what we will deliver and why our Board support it.

A message from our Chief Executive Officer

There is no doubt that we are in the most exciting and vibrant environment that the energy sector in the UK has faced in a long time. Of course, continuing to strive for real ambition in extending the very high standards of safety, reliability, customer service and value for money we have come to accept and enjoy, is accepted. However, we also all now recognise the need for us to do a lot more to help deliver the ambitions to limit society's impact on climate change and the wider environment. Whilst also ensuring that we protect those individuals and communities that we serve who are most vulnerable.

We fully embrace and support these challenges and the ever-increasing expectations that our customers place upon us. These match our own ambitions to be ranked amongst the very best companies in the UK and not just in the energy or utilities sectors. Together these objectives support and encourage a culture of innovation, efficiency and quality across the business as we constantly strive to extend the frontiers of performance.

This long-term ambition is what has taken us to the forefront of performance in the sector. Ofgem consistently benchmark us as the most efficient gas distribution network in the UK, our customer satisfaction scores at 9 out of 10 or higher and levels of network safety, reliability and environmental performance are higher than at any point in the past.

This business plan for 2021-2026 has been shaped by the most extensive consultation exercise in our company's history. More than 189,000 voices across the region have influenced our plan, and importantly 92% of customers have confirmed that they support the proposals they have helped to shape.

- Customers want us to strike the right balance between a high-quality service and affordable bills. We have answered this challenge, with a 8.6% real terms reduction in average domestic customer bills together with an ambitious programme of service improvement.
- Safety and reliability remain our customers' key priorities. From 2021, we will invest a further £800 million in our network, to ensure ever greater levels of reliability and safety. We will get the gas back on more quickly after a supply interruption, cut reinstatement times from five days to three, provide two-hour appointment slots for customers and offer a more streamlined, convenient connections service.
- Customers also told us they want us to be more ambitious in reducing our business carbon footprint and limit our impact on the wider environment. In response, we have developed a far-reaching programme that will see us create natural wildlife habitats on our sites and introduce new measures to reduce plastic wastage and eliminate waste from excavations. We have set out our ambition for our direct activities to be carbon neutral – net-zero – by 2031. We will, make our vehicle fleet cleaner and greener, plant 40,000 trees in our region and source all our energy from green, renewable sources. Additionally, over the period to 2026, we will reduce gas leakage (shrinkage) by a further 23%.
- Our region contains some of the most deprived places in the country, and stakeholders want us to use our reach and resources to support struggling customers and communities – but without trying to do the job of dedicated third-sector organisations. In response, we will train our colleagues to spot signs of vulnerability and offer appropriate support and referrals. We will launch a hardship fund for customers in immediate financial need; introduce a dedicated hotline for customers on the Priority Services Register, and continue our Community Partnership Fund, which provides grants for life-changing grass-roots projects. This will see us, and our shareholders, invest £1m into the communities we serve to help those most in need.
- Value for money of course also remains a key focus for our customers. Through embedding the significant efficiencies made to date, proposing further improvements in productivity and a reduction in shareholder returns we are proposing a significant reduction in bills over the period. Compared to RIIO-1, average domestic customers bills will be 8.6% lower over the five-year period to 2026.

With one eye constantly on the future, many of the customer outcomes and commitments we set out in this plan have been under development for several years and as such we are both certain of our ability to deliver and in almost all instances at no additional cost to customers. As such the Customer Value Proposition set out within this plan is significant - we estimate it will deliver over £90m of additional benefit to customers over the 5 years to 2026 when compared to 'business as usual'.

With the UK targeting net-zero carbon emissions by 2050, customers and stakeholders want us to continue to develop clean and sustainable forms of energy and to identify and deliver a very clear pathway towards this target. We recognise that the future of energy in the UK will become increasingly complex that will see a greater integration of energy systems, an increased role for data, smart systems and analytics that that leverage maximum benefit from the new technological solutions that will arise to meet these challenges. But also, a critical role for more established, but still developing energy technologies such as biomethane and heat pumps.

We have led the industry in the development of the case for role of hydrogen to replace natural gas, which can help deliver an affordable transition to a decarbonised UK.

This programme is at an exciting point, with around 700 of our customers being supplied with natural gas blended with up to 20% hydrogen as early as 2020 and several 'real-world' trials happening in the next regulatory period. These will put the theory into practice and complete the evidence base, to support government policy and decision-making on the appropriate pathways to net-zero by 2050.

Such an ambitious programme of service improvement is only possible because of the far-reaching reforms we have made across our business in recent years. These changes, which are detailed within the plan, have, against a basket of measures, placed us at the frontier of performance in the sector. Whilst also delivering and in many areas exceeding, all the commitments and targets set for the current regulatory period that ends in 2021.

We have attempted to leave no stone unturned in our efforts to ensure that our business is as efficient as it can be and measurably the most efficient gas distribution network in the UK. Using Ofgem's framework for assessing efficiency confirms that we have maintained that position consistently over the period since 2005.

Based on the total expenditure of each company, our analysis places us in a very strong position when compared to the rest of the sector – 6% ahead of the next most efficient Gas Distribution Network (GDN) or group of GDNs, 9% ahead of the sector average and close to 20% ahead of the least efficient in the sector. This creates long term value for our own customers through lower bills. Importantly, bringing all other networks into line with our benchmark levels of efficiency we estimate would reduce annual costs in the sector by £115m a year or £575m over the five-year period of RIIO-2 and delivering significant value for gas customers across the whole of the UK.

However, we have not stopped there and have included an ongoing productivity improvement of 0.5% pa within our expenditure forecasts – more than the forecast improvements in the wider economy over the same period. Cumulatively this delivers a further £18m reduction in planned expenditure over the period.

The ongoing support of our shareholders and their long-term commitment to our business and the communities that we serve, will remain a key feature of our success in RIIO-2. A strong ambition to be the best is matched by strong corporate governance and a prudent and conservative approach to the financial management of the business.

This has provided us with the flexibility to navigate a challenging financial landscape and support initiatives such as a direct shareholder investment of £30m to deliver the reforms mentioned above. We are now able to commit to an overall financial package that represents a 40% reduction in shareholder returns on a like for like basis whilst maintaining a financeable business over the period.

The journey to shape our business into the industry leading organisation we have today has been extremely challenging, but it has placed us in an enviable position.

The result is a plan in which we have great confidence and pride – a plan that quite simply delivers more for less and remains truly representative of priorities and aspirations of the people we serve.

It is vitally important that our stakeholders trust us to deliver on the promises and commitments included in this plan and our past performance helps to give confidence that we will deliver.

I would like to thank the many thousands of people who gave up their time to share their thoughts with us in the creation of this plan, through surveys, face-to-face interviews, workshops and the sector's first ever Citizens' Jury.

My thanks also go to our Customer Engagement Group (CEG), which has provided scrutiny, challenge and guidance at every stage of the process to ensure that we are delivering for our customers. I am delighted that the CEG will continue to work with us throughout the next period and play a central role in ensuring we exceed our customers' expectations.

Mark Horsley
Chief Executive Officer, Northern Gas Networks

1.1. A summary of our 2021-2026 business plan

We are in a period of significant change for energy in the UK. As we all progress towards our shared ambition of decarbonising the energy system in the UK, changes will be needed at all levels to achieve the target of net-zero carbon emissions by 2050. This business plan is set against this background and a clear pathway and the actions that we believe we, as a key part of the energy system, will need to take to help facilitate achieving this vision. Against the backdrop of this potentially significant and structural change in the industry some things also stay the same. The need to meaningfully engage with our customers and wider stakeholders to fully understand their requirements of us is now more important than ever. Our aim has been to ensure that whilst we have one-eye firmly on what is required of us in the longer term, we do not lose sight of the fundamental role we play today and during the intervening period.

1.1.1. Reducing customer bills

We recognise that affordable energy bills are a priority for all our customers. This business plan will deliver a £34m pa average reduction in revenue when compared to RIIO-1 – a £172m reduction over the five-year period when compared to RIIO-1. This will deliver an 8.6% reduction in average domestic customer bills which will fall from c.£139 p.a. in RIIO-1 to c.£127 p.a. in RIIO-2. This reduction will be made possible through:

- Embedding all the significant efficiency gains made over the RIIO-1 period into regulatory allowances for the period and delivering further productivity gains;
- A 40% reduction on returns available to our shareholders, from 6.7% (Real RPI) to 4% (Real, RPI).

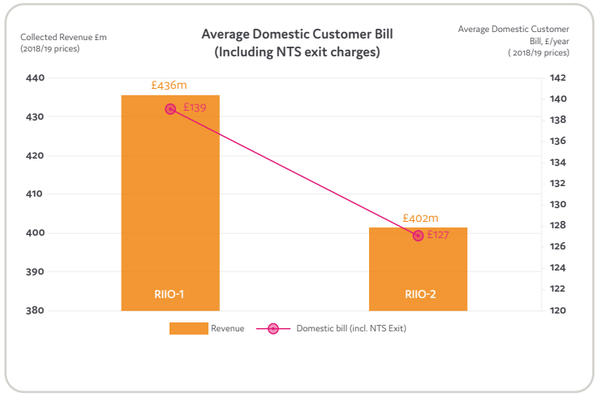

Figure 1.1: Average NGN revenue and average domestic customer bill in RIIO-1 and RIIO-2

This reduction will be delivered whilst maintaining the necessary levels of investment to deliver the level of network resilience and integrity that customers require, whilst also significantly increasing the levels of service that they will receive.

1.1.2. Our track record

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It has always been important to us that we have the support of our customers and stakeholders to deliver on their expectations. During RIIO-1 we have strived to illustrate that we can be trusted to deliver our promises during RIIO-2.

We will meet or exceed all the targets set for us during RIIO-1. We are one of only two GDNs that will achieve this outcome, delivering all of our outputs while delivering all the workload funded over the period leaving no cost or risk behind and no legacy issues carried forward into RIIO-2.

We are the most efficient gas distribution network in the UK. We have consistently ranked as the most efficient operator by Ofgem. Based on the total expenditure of each company, our analysis places us in a very strong position when compared to the rest of the sector – 6% ahead of the next most efficient GDN or group of GDNs, 9% ahead of the sector average and close to 20% ahead of the least efficient in the sector. We estimate would that these levels of performance would reduce annual costs in the sector by £115m a year or £575m over the five-year period of RIIO-2 and deliver significant value for gas customers across the whole of the UK. We have achieved this position by being innovative in our thinking and directly and aggressively challenging industry norms and practices by bringing forward market-led, commercially focussed business solutions across almost every areas of our business.

We have been amongst the best performing GDNs for customer service since 2013, with an average satisfaction rating of 9.1 out of 10. In every aspect of our operations we always put our customers first. We have sought to understand our customers better and improve our services by benchmarking ourselves outside of the sector and bringing initiatives into our business from other industries. Our award winning customer service and community engagement is globally recognised.

We have continually sought to do the right thing and voluntarily introduced minimum standards of performance across key elements of our business and doubled the level of compensation for customers when we fail to meet their expectations. We have a strong social ethos and are committed to supporting struggling customers and communities wherever we can.

This has included helping to establish hubs in rural areas where socially-isolated customers can go for warmth and company; training customer care colleagues to spot signs of vulnerability and provide appropriate support; working with experts to deliver energy audits and money-saving advice in customers' homes and launching a community grants programme for grass-roots schemes which make a difference.

Our environmental performance in our day-to-day operations has delivered significant, through greener work sites, offices and vehicles and a pipe network that is less prone to leaks. We have dramatically improved the amount of spoil we recycle or reuse on our worksites, and used innovative working practices, such as using solar-powered pumps to clean up contaminated land on former gas holder sites.

By the end of RIIO-1 we will have 17 biomethane facilities connected with a combined capacity of 17,000scmh, enough energy to heat over 60,000 homes a year. Through a targeted investment programme in mains replacement and pressure management capabilities to date in RIIO-1 we have reduced the amount of leakage from our network by 18% which represents a reduction of over 400,000 tonnes of CO_2 emissions. Our work in the field of research into hydrogen through projects such as Hydeploy and H21 and other forms of sustainable energy has established NGN as an expert with an international reputation. We have used this knowledge to support regional businesses with their own green ambitions, and to lead the national conversation. This work provides the key evidence to make informed policy decisions on key aspects of the net-zero pathway during the RIIO-2 period.

1.1.3. A plan developed in partnership with our customers and stakeholders

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To ensure we are getting this balance correct, the engagement programme for our RIIO-2 business plan has been the most far-reaching and detailed we have ever undertaken. Rather than defining the agenda ourselves, we asked customers and stakeholders to tell us what they wanted to talk about, and how they wanted to engage with us. We used a broad range of mechanisms, from online surveys to one-to-one interviews, to reach 26,000 stakeholders in the process. We were the first energy distribution company to create a Citizens' Panel – a 50-strong, demographically representative group of customers who deliberated on key aspects our plan.

Through a targeted and sensitive approach, such as interviews in customers' homes, we also engaged seldom heard and hard-to-reach voices. Alongside RIIO-2 specific engagement, we utilised the wealth of information available to us through our business-as-usual operations – close to 115,000 enquiries, 38,000 customer satisfaction surveys and nearly 10,000 complaints. Throughout the process, we were challenged and supported by our Customer Engagement Group (CEG). With membership drawn from across the stakeholder community, the CEG helped us refine the consultation process, scrutinised and challenged successive drafts of our business plan, and observed the consultation process in action.

In acceptability testing research, 92% of customers told us they found the resulting plan acceptable, with this number rising to 96% among future customers. Although stakeholder expectations vary, they are united by five core priorities, which underpin our plan:

92% of domestic customers find our plan acceptable

80+ business plan engagement meetings and workshops

189,000+ voices have been heard and shaped our plan

79% customers engaging for the first time

26,000+ engaged through our core business plan engagement

84% of customers find our plan affordable

6,400+ vulnerable customers engaging through our core engagement

1st energy company to establish a Citizens' Jury

Safety: providing a safe gas supply is most stakeholders' top priority

Reliability: stakeholders want reliable, uninterrupted supplies and want us to focus on minimising disruption to their lives

Value for money: bills should be no higher than necessary and services should be affordable for all

Protecting the environment: reducing the environmental impact of our operations is of increasing importance

Preparing for the future: play an active part in the UK's transition to a low carbon future

We have received strong support from our customers and stakeholders that would like this approach and level of engagement with the business to continue. We have committed to an enhanced programme of stakeholder engagement throughout RIIO-2 with an enduring role for our CEG and our Citizen's Jury. We will act and feed back on the issues that we hear and hold an annual stakeholder conference on the impact of stakeholder views on our business.

1.1.4. Our RIIO-2 outputs: highlights

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Our RIIO-2 business plan contains a total of 64 outputs, all with associated performance targets.

These outputs span three core themes:

- Meeting the needs of customers and network users
- Maintaining a safe and resilient network
- Delivering an environmentally sustainable network

All 64 outputs have been influenced by our extensive stakeholder and customer engagement programme. They are ambitious, bespoke outputs, and are aimed at improving service delivery and setting new benchmarks for our industry, at no additional cost to our customers. Through these outputs, we will deliver £90 million of additional value to our customers over the next five years. Several bespoke outputs are focused on improving customer convenience and removing commonly-cited frustrations. For example, we will reduce reinstatement times from five working days to three calendar days, so that excavations are filled in more quickly. We will also commit to restoring gas supplies to customers appliances (not just their gas meter) within set timeframes.

Where we fail to meet guaranteed industry levels of service, we will pay customers double the amount of statutory compensation – reflecting our determination to treat our customers fairly at all times. 10 outputs are specifically focused on improving services for vulnerable customers , in line with our strong social ethos. For example, we will introduce a new £150,000 per annum hardship fund, paid for through a direct contribution from our owners, and launch a 24 hour hotline for customers on the Priority Services Register.

We will reduce our business carbon footprint by 47% by the end of RIIO-2. From reducing vehicle emissions to planting 40,000 trees, we will implement a far-reaching environmental programme, with the aim of having net zero carbon emissions by 2031. Crucially, our full suite of outputs will be delivered at no additional cost to the customer. Bills will fall by 8.6%, compared to RIIO-1 levels.

64
Individual outputs covering all aspects of business

26
bespoke outputs reflecting customer priorities

Double payments for all GSoP failures £

Dedicated vulnerability strategy with measurable outputs
helping those who need it most

£150k every year
Hardship Fund to help individual customers in most need

Faster supply restoration following interruptions

Exceeding minimum standard for emergency response to gas escapes

Faster, cheaper, more efficient connections process

47%
reduction in BCF Scope 1 & 2 by 2026

Net Zero Business Carbon Emissions by 2031

1.1.5. A sustainable plan for the future

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The business plan is set against a background of a changing energy landscape and the challenges presented by the target of net-zero by 2050. We have developed a clear view of an appropriate pathway to this target and sought to ensure that we maintain the flexibility to adapt to an evolving environment whilst ensuring that costs for customers are minimised.

A whole systems approach that facilitates strong collaboration and integration across utilities, operations, markets and supporting processes forms the basis of our strategy and plans to deliver the sustainable energy solutions required to meet these targets. The plan builds upon the significant progress we have made during RIIO-1 with our industry leading research projects such as Hydeploy, H21 and Integrel. We have set out our plans and actions for RIIO-2 that will significantly advance the progress to wards net-zero over RIIO-2.

The business plan is built upon a common scenario of the future developed collaboratively with energy distribution and transmission companies across the industry that sets a consistent and whole systems view of future demand on the UK's energy system.

1.1.6. Driving efficiency & change through innovation

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Innovation has been key to our success in RIIO-1, allowing us to enhance service delivery and save money. From introducing new robotic systems which avoid the need to make large excavations in the road, to developing tools to clean up 'muck and mess', we have taken a wide-ranging and imaginative approach.

In RIIO-2, we will continue to innovate across all our activities, as well as investing over £11m in projects related to support the energy system transition and improving our services to vulnerable customers.

Our approach will include:

- Keep bills affordable by using innovative technology and processes to reduce the costs associated with running our network;
- Improve the customer experience by developing quicker, less intrusive and greener ways to deliver our core network services with focus on the needs of vulnerable customers;
- Inform policy decisions on future decarbonisation of the energy sector, through projects that demonstrate the contribution that can be made by green forms of gas, such as hydrogen and biomethane, in a whole systems energy landscape; and
- Improve the way we manage our network by creating a modern, data-driven organisation enabling the opportunity for evidence-based decision-making that is predictive, automated and technology driven.

1.1.7. Delivering value for money

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We will be continuing to invest in our network and wider business during RIIO-2 to ensure we can deliver the resilience, integrity and service levels that customers expect from us. Our network is now safer, more reliable and has a lower environmental impact due to the ongoing significant investment we have made during RIIO-1. However, to maintain network risk levels, we will be investing a further £800m over RIIO-2 and spend a further £440m in operating and maintaining the network.

These levels of expenditure are based upon our industry leading levels of cost efficiency and include a commitment to a further 0.5% pa improvement in efficiency over the RIIO-2 period which will deliver a further £18m in cost efficiency for customers.

Our expenditure plans fully support the delivery of the outcomes, priorities and preferences that have been clearly relayed to us via our enhanced stakeholder engagement programme. We have shaped the largest element of our investment plans, our mains replacement programme, to directly reflect stakeholder preferences for increased safety, reliability and environmental performance and increased our investment in replacement of large diameter mains to deliver this outcome.

Each element of our planned programme has been analysed in detail to ensure it is delivering maximum net value for our customers. Comprehensive sensitivity analysis and optioneering of investment solutions have been supported by cost benefit analysis and Network Asset Risk Measures (NARMs) to provide a robust and fully justified programme.

We are proud to have led the performance frontier for the Gas Distribution Networks in the UK over the last 15 years. The transformation of almost every element of our business during the RIIO-1 period means we are better placed than ever to meet the ambitions and expectations of our current and future customers. Our workforce, supply chain, systems, processes and organisational culture means we are certain of our ability to meet the challenges we will face.

However, we believe more can be achieved. We strive to continue lifting the industry's definition of frontier performance. We are excited about providing better value for money to our customers and improving the customer experience, as well as the efficiency, safety, reliability and environmental performance of our network.

The energy and drive to succeed comes from within our colleagues and their pride in delivering an industry leading set of services to our customers and communities. We will continue to push the boundaries of performance in the energy industry and keep giving our customers a world class service. Our aim is to keep providing stakeholders and the industry with an example of what is possible.

> 'This represents the most ambitious and innovative business plan we have ever developed.'

1.2. Board assurance statement

Our business strategy remains to consistently provide, develop and maintain a safe, affordable and secure distribution pipeline system, for the provision of energy supplies to the people and businesses within our region. This business plan represents the foundation of our business over the next five years and beyond. It has been our focus to ensure that it is underpinned by our core values and continue 'doing the right thing' for our customers in the short and longer term.

1.2.1. Business planning and NGN Board engagement

The plan has been developed over the last two years and the NGN Board and its members have engaged in every step of the process. Our business is underpinned by a strong and well-established compliance culture which the Board directly monitors through its risk management, audit, treasury and compliance committees. We have been collectively and individually actively engaged in the development of our plan:

- Our Chief Executive Officer and Executive Board member, Mr Mark Horsley, has overseen the day to day development of the plan through his executive function;
- This role has been supported by an NGN Board appointed RIIO-2 Steering Group comprised of both Board members and appointed representatives. They have played a vital and detailed role in reviewing, challenging and shaping the plan and updating the wider NGN Board throughout this process;
- We have collectively reviewed, challenged and shaped the elements of the plan and specific risk areas regularly at our Board meetings and Committees;
- Our two independent, Non-executive Directors have played a critical role in this process. Mr John Burnham was a full-time member of our NGN Board appointed RIIO-2 Steering Group providing direct challenge on the ambition and efficiency of the proposals. Mr Paul Rogerson provided a direct link to the NGN Board for the Chairperson and members our Customer Engagement Group (CEG) on the issues raised by our extensive engagement programme.

Our Board and customer engagement programme, combined with the completion of our assurance programme described below, has enabled us to provide high quality challenge, ownership of the overall strategy and provided the direction of the plan in the short and longer term.

As a result, we are satisfied that this represents an overall robust and deliverable plan that is of the highest quality - underpinned by an assurance framework and governance processes designed to deliver high-quality data.

We believe that the business and this business plan is based upon a strong understanding and is resilient against the key risks over the RIIO-2. We have a robust and long-established Risk Management framework for assessing and managing risks to the business which we review as a Board on a regular basis.

1.2.2. Ambitious commitments underpinned by robust assurance

Our approach to assurance of the business plan is based upon our robust assurance framework that is used for all our reporting and has been guided by our overarching Regulatory Reporting Policy for the business and the supporting Data Assurance Guidance ("DAG") processes which are operated in NGN overall regulatory reporting.

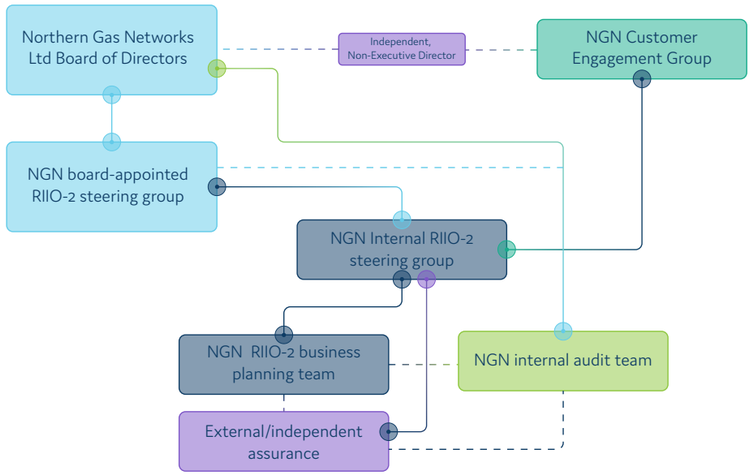

Figure 1.2: Average NGN revenue and average domestic customer bill in RIIO-1 and RIIO-2

We approved our RIIO-2 governance and assurance framework in 2018. This included approval of the objectives of the framework and a high-level assessment of the evidence points that would be used to provide that assurance.

The framework provides comprehensive coverage of the key aspects of the plan. Areas that were assessed as medium or high importance were subject to independent assessment to validate our proposals and conclusions, using both internal and external assurance providers targeting specific business knowledge and/or specific technical skills to ensure appropriate oversight. The work performed by external providers included a review of NGN's DAG processes over prior reporting to provide an independent opinion on the adequacy of these processes which have then been used to inform the assurance framework operated over the RIIO-2 business plan. The framework was managed by our internal RIIO-2 Steering Group.

On completion of the governance and assurance process, prior to finalising our RIIO-2 business plan for submission, we appointed Ernst & Young to perform further and final checks to confirm to the Board that all aspects of the pre-agreed assurance programme had been fully and satisfactorily completed and thus provides assurance that a robust and auditable quality assurance process has been followed in developing this plan. Having approved the assurance framework, reviewed the assurance findings and management's response, we have collectively satisfied ourselves that the assurance undertaken demonstrates that:

- The business plan has been informed by customer engagement and by feedback from our CEG about the quality of that customer engagement and how this has been incorporated into our plan;
- The outcomes and output commitments made within the plan are deliverable;

- The outcomes and performance commitments reflect customer needs and preferences and are ambitious;
- Is built on expenditure forecasts that are efficient which have been produced using a robust and efficient process.

Additionally, we have considered the assurance statement required by Ofgem under paragraph 4.117 of the "RIIO-2 Sector Specific Methodology Decision – Finance", dated 24 May 2019, and paragraph 3.28 of Ofgem's Business Plan Guidance, dated 31 October 2019. In response to this requirement, we have collectively satisfied ourselves that NGN would be financeable during the RIIO-2 price control period on both the notional and actual capital structure based using the Ofgem SSMD working assumptions, and that all applicable measures to aid financeability have been considered.

However, this assurance should not be interpreted as the board's acceptance of Ofgem's financial framework and the proposed working assumptions for cost of capital allowances nor that the business plan would be financeable beyond the RIIO-2 price control period. We continue to disagree with Ofgem on several of their SSMD working assumptions including Cost of Equity, Cost of Debt and the inclusion of an expected incentive outperformance. We have set out our justification for these differences in our attached appendices which also includes an appendix to this document that sets out the results of the financial and financeability analysis based on NGN's own base assumptions.

Our track-record over the period since 2005 provides a strong reference point for the level of commitment that we have in delivering on our promises to our customers and seeking to continue to push the frontiers of performance and exceed expectations. The focus of the Board will continue to support NGN in its ambitions through significant investments and innovations in the network, supporting infrastructure and people aimed at improving the performance of the business in both the short and longer term.

Our measure of success for the business over the RIIO-2 period will be NGN's performance against the commitments set out within the regulatory contract with our customers. The significant development to the terms and conditions of NGN's employees we have overseen during RIIO-1, means that we are very well placed to ensure that individuals at all levels of the organisation now face the right financial incentives to deliver on these commitments during RIIO-2.

Andrew John Hunter
Chairman, Northern Gas Networks

PART 2: GIVING CUSTOMERS CONFIDENCE THAT WE WILL DELIVER

IN THIS SECTION

In this section, we demonstrate how we have delivered industry leading cost efficiency whilst meeting all our commitments in the RIIO-1 regulatory contract. This track record provides confidence in our ability to delivery our RIIO-2 business plan.

Key topics covered include:

- meeting or exceeding our regulatory targets for RIIO-1, and the financial rewards we have gained as a result.
- how we have achieved a safe, reliable and modern distribution network, at the right price.
- the modernisation of our workforce and IT infrastructure, which will continue to deliver benefits in the next regulatory period.
- future energy and business carbon footprint reduction.

2.1. Our performance in RIIO-1

RIIO-1 has been a period of endeavour, change and learning across our whole business. We recognised that to deliver the outcomes that our customers desire, both in the short and longer term, we needed to deliver on several key objectives:

- As an absolute minimum, deliver on all our commitments set out in the RIIO-1 'Regulatory Contract';
- Ensure that our activities and decision making are led by a clear understanding of customer priorities and requirements. And, where possible, go over and beyond the minimum requirements set out within the Regulatory Contract;
- Make sure that everything we deliver is sustainable for the longer term, thereby ensuring that network performance, efficiency and productivity improvements and service improvements form the base level of performance for RIIO-2. We have always worked to the principle that 'we do not leave any cost or risk in the ground for future customers to deal with' and
- Endeavour to be the 'frontier' company and provide the benchmark for operational, financial and service performance. And additionally, provide leadership in the gas sector for addressing the decarbonisation challenge.

Consistent with these objectives our key achievements in RIIO-1 are that we:

- Delivered on all output commitments
- Made our network safer, more reliable and the most cost-efficient
- Provided industry-leading customer service
- Gone further for local communities
- Responded to climate change
- Used innovation to save money and improve service
- Created a dynamic, more efficient and happier workforce
- Aligned pay and reward to support our business plan commitments.

These achievements have enabled us to maintain our position as the most cost-efficient GDN. Results from Ofgem benchmarking shown below confirm this.

COLS (Upper Quartile)						
GDN	**2013/14**	**2014/15**	**2015/16**	**2016/17**	**2017/18**	**Ranking**
EoE	293.63	294.60	287.76	276.95	266.74	7
Lon	183.14	185.15	177.49	185.41	176.44	8
NW	230.25	213.61	224.72	209.87	200.87	6
WM	180.24	157.83	183.65	177.44	160.16	5
NGN	**253.35**	**255.11**	**228.52**	**226.31**	**244.15**	**1**
Sc	176.77	163.57	160.90	159.26	147.08	2
So	346.08	333.12	306.32	303.97	301.79	3
WWU	235.02	238.01	228.34	226.32	209.37	4
SFA						
GDN	**2013/14**	**2014/15**	**2015/16**	**2016/17**	**2017/18**	**Ranking**
EoE	268.30	275.53	274.00	267.54	261.05	6
Lon	164.78	170.55	166.36	176.78	170.35	8
NW	208.72	197.69	212.26	200.91	194.76	7
WM	162.08	144.63	172.32	168.93	154.14	5
NGN	**230.38**	**237.48**	**215.96**	**217.18**	**218.11**	**1**
Sc	158.86	150.06	150.32	151.09	141.16	2
So	317.93	312.81	292.27	294.54	296.54	3
WWU	213.19	221.06	215.78	217.19	203.28	4

Figure 2.1: Results of Ofgem benchmarking analysis

2.1.1. Delivered on all our output commitments

Our RIIO-1 regulatory contract requires us to meet 51 performance targets covering the key areas of our business and the services we provide. We are on course to meet or exceed all targets – making us one of only two Gas Distribution Networks (GDNs) set to achieve this outcome.

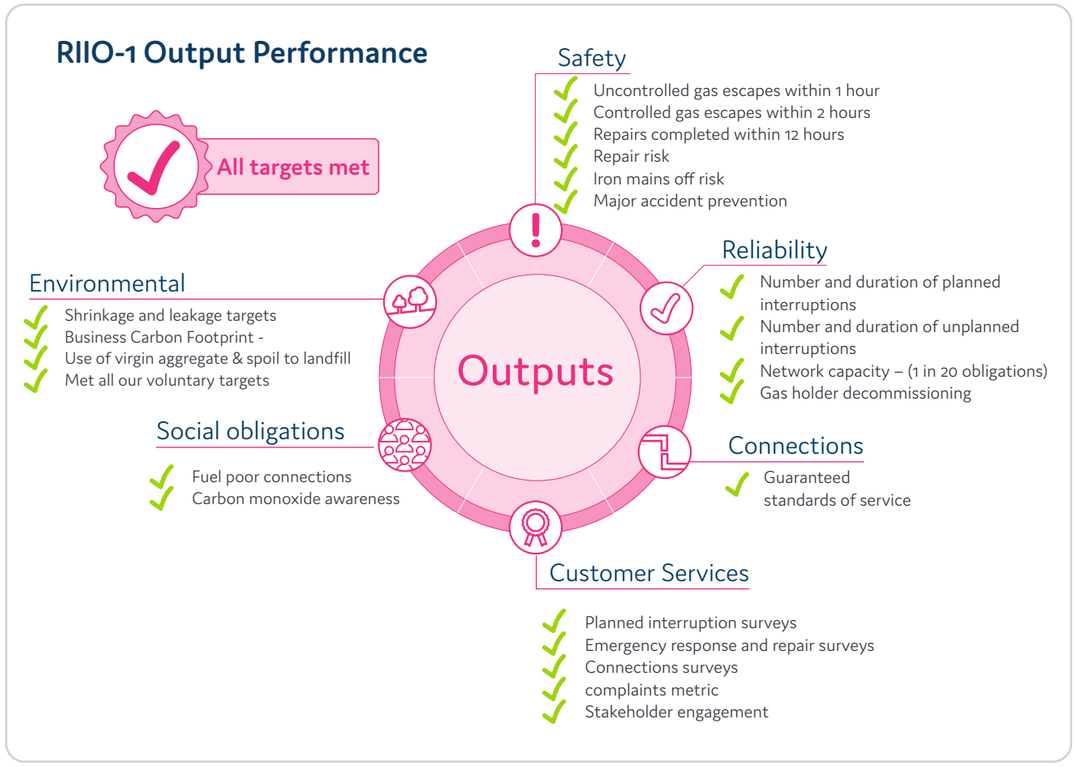

Figure 2.2: RIIO-1 Output Performance

Much more detail on our output delivery performance can be found in our RIIO-1 year 6 report on the NGN website (northerngasnetworks.co.uk/documents-library).

2.1.2. Made our network safer, more reliable and the most cost-effective

Our performance over RIIO-1 has ensured our network is safer, more reliable and more efficient to run than ever before. We have achieved this through:

A more modern network, one pipe at a time

We will exceed the mains replacement workload originally targeted in our RIIO-1 contract by c.190km. As a result, our RIIO-2 replacement workload will be lower, at 429km compared to 465km in RIIO-1. There will be no deferral of work from RIIO-1 to RIIO-2.

Replacing the highest-risk and most challenging pipes first

We have targeted the highest-risk gas pipes first, even though these are often the most technically challenging, expensive and disruptive jobs. We have also delivered the mix of pipe replacement work set out in our contract – targeting different pipe diameters and materials – rather than a bias towards lower-cost, smaller diameter jobs.

There are significant unit cost differences associated with working in different parts of our region, with areas such as Leeds and Pennines affected by difficult operating conditions and geology. We have focused a significant proportion of our workload in these areas in RIIO-1, as we promised, this limits cost impacts in the future and has improved network performance in those areas.

A local contractor model

Mains replacement (Repex) is our largest expenditure area. Our Direct Service Provider (DSP) model implemented during RIIO-1 uses local engineering firms to deliver mains replacement, rather than Large National (Tier 1) companies, which is the industry default. We have developed close, trusted partnerships with these companies, paying them weekly to manage cash flow and supporting them to develop their employees, using our training programmes.

By fully controlling programme management and work processes through the DSP model, we have been able to save close to £100 million during RIIO-1. The unit rate of delivering our Repex activity has reduced by 18% compared to 2010/11, with some types of work showing a 40% reduction in unit costs. Figure 2.3 below shows the steps we have taken over RIIO-1 in moving to this model and the cumulative savings that have resulted from this change. During RIIO-2, we will continue to develop this local model, sustaining benefits for customers.

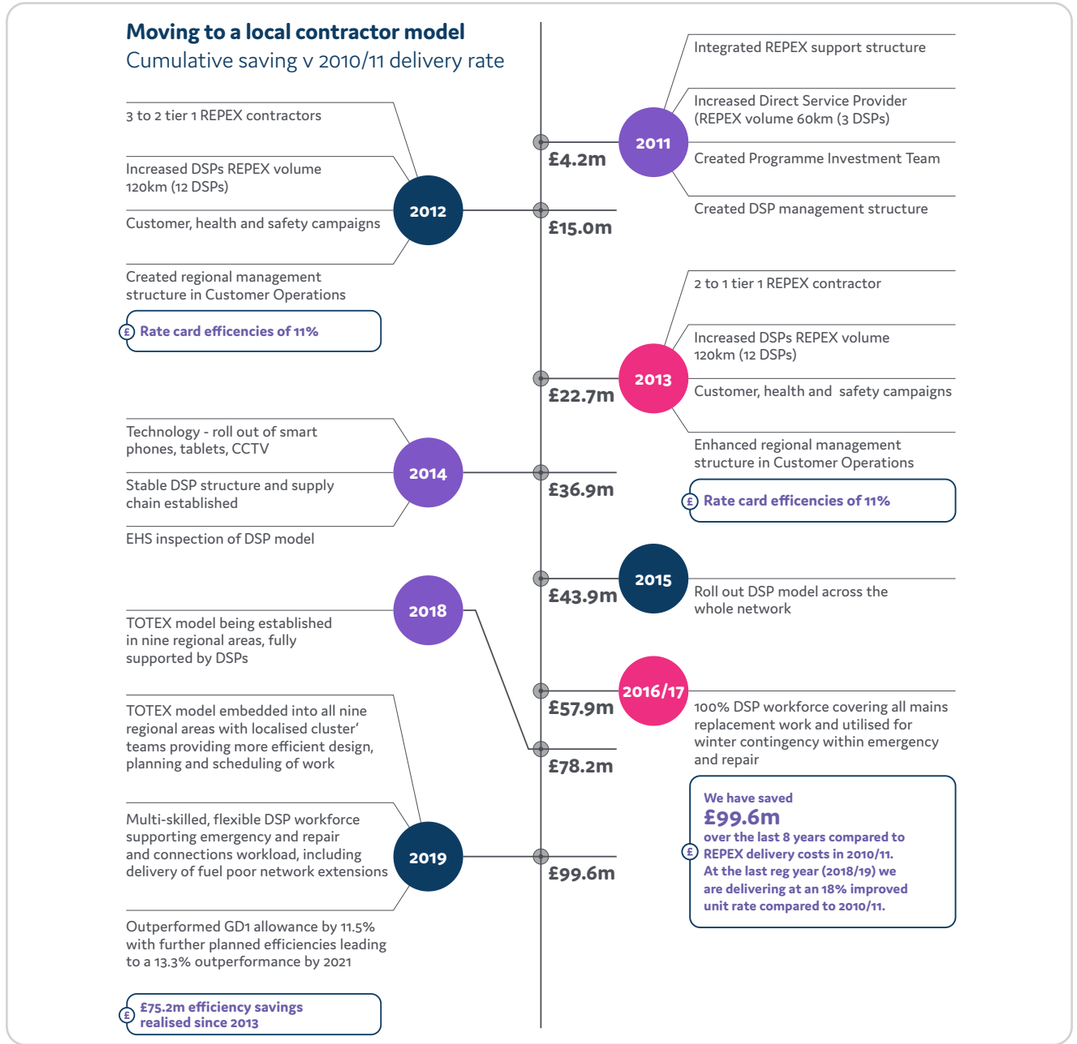

Figure 2.3: Cumulative savings vs 2010/11 delivery rate

Cycling the outsourcing and insourcing of our maintenance activity

We have a successful track record of using the wider market to drive improvements in performance – 'cycling' insourcing and outsourcing to get the best blend of both models.

In 2015, we became the only GDN to outsource our maintenance activity to an external contractor, which allowed us to embed new commercial thinking and improve productivity and performance. In 2018, and in response to market changes, we made the decision to insource this activity back into NGN so that we could embed this productivity and performance back into the business for RIIO-2.

There when customers need us

We attended gas escapes within the 1- or 2-hour requirement close to 100% of the time, an industry-leading performance.

Speedier repairs

We have completed more repairs to our pipeline network within 12 hours close to 69% of the time – an increase from around 60% at the start of the period.

Fewer disruptions

We have outperformed our targets for the number and duration of planned and unplanned interruptions to customers' gas supplies.

Accurate data

We have experienced no offtake meter errors, meaning we are providing consistently accurate information to avoid misallocation of costs across the gas industry.

almost £100m

savings through local contractor model

All

key safety targets exceeded

50%

risk reduction across our pipe network

mains replacement volumes ahead of target

2.1.3. Provided industry-leading customer service

We have consistently demonstrated excellent customer service in RIIO-1 with an average satisfaction rating of 9.1 out of 10 (based on Ofgem survey scores). This places us alongside the best-performing networks in our sector.

Key elements of our approach include:

Understanding our customers

We have carried out extensive research to better understand our customers and tailor our services. This has included a 4-year 'customer persona' project to map different types of customers and their priorities, the launch of a 'footpath feedback' project in which NGN colleagues and customers walk sites together, and 'willingness to pay' research to understand the value that customers place on different levels of service.

Doing the right thing

In 2016/17, we became the first gas distributor to double compensation payments to customers when we failed to meet minimum performance standards. These payments were set in 2005 and had not changed in over a decade. We went on to be the first GDN to make all compensation payments automatic, rather than requiring customers to claim. These voluntary decisions reflect our desire to do the right thing, even if it means challenging industry convention and being a first mover.

Setting our own standards around complaints

In 2013/14, we established our own internal 'gold' standard for complaints resolution – to agree resolution of 90% of complaints within 60 minutes of the customer call, email or social media post. We introduced a daily complaints conference call for colleagues across the business, to allow us to discuss live complaints and agree speedy resolutions. 85% of complaints now have an agreed resolution within the hour – and we intend to push this percentage even further during RIIO-2.

Looking beyond our own industry

We continually look beyond the utilities sector to improve the customer experience. In RIIO-1, we became the first utility company to sign up to the Considerate Constructors Scheme – which sees independent auditors assess the safety, public consideration and environmental performance of our worksites.

We were the first gas distribution network to become a member of the Chartered Institute of Customer Service, allowing us to benchmark our performance against the best companies in Britain. We were awarded a Customer Satisfaction Index of 90.4 – placing us ahead of leading companies such as John Lewis and Apple.

A more responsive connections service

We have evolved our connections service throughout RIIO-1, to provide a more user-friendly, streamlined service for all types of customers – from householders to large industrial users. Our RIIO-1 output targets for connections are significantly higher than the obligations required by our licence, reflecting our aim to provide a best in class service.

Gold standard to agree a resolution to 90% of complaints within the hour

1st utility company to take part in the Considerate Constructors Scheme

90.4

Customer Satisfaction Index placing us among the top performing UK companies in any industry.

2.1.4. Gone further for local communities

Our region contains some of the poorest communities in the UK, with disproportionately high levels of fuel poverty and low household income. We have a strong social ethos and are committed to supporting struggling customers and communities, but without encroaching on the role of specialist third-sector organisations.

Our achievements in RIIO-1 have included:

Fuel poor connections

We are confident we will deliver 16,000 free gas connections to customers who are suffering fuel poverty by the end of RIIO-1, against a target of 14,500, with each customer saving an average of £350 a year on their annual energy bill.

16,000

free gas connections for fuel poor customers

CO awareness levels up from 6.0 to

9.3 out of 10

6,000

direct beneficiaries of community grants scheme

Carbon Monoxide (CO) awareness

A public education programme around CO, including 22,000 awareness surveys with customers, has seen awareness increase from 6.0 to 9.3 out of 10 because of our efforts.

Working with local groups and charities

Through our Community Partnership programme, we allocate a grant fund of £100,000 each year to not-for-profit organisations which run projects that will help alleviate fuel poverty, raise awareness of CO, enhance energy efficiency and promote the Priority Services Register.

Almost 6,000 vulnerable people have benefited directly to date, with longer-term benefits including job creation, social behaviour change and cumulative financial savings. The initiative was recognised on a global scale when it was awarded an International CSR Excellence Award in 2019.

2.1.5. Responded to climate change

Our stakeholders expect us to do everything possible to reduce our business carbon footprint, as well as developing new, sustainable forms of energy, which can help the UK achieve its 2050 net zero carbon target.

In RIIO-1, we have reduced our business carbon footprint by 24% (excluding gas leakage) through a wide range of improvements and will be expanding the scope of this work in the next regulatory period.

We have also contributed to the evidence base for new, sustainable forms of gas, such as hydrogen, through a series of industry-leading projects, and by lobbying government and forging partnerships to help galvanise the industry's approach. This work will accelerate in the next regulatory period, as we and our partners trial new technologies in real-world conditions to develop deployable solutions to meet the 2050 net zero carbon target. Successes in RIIO-1 include:

Cutting network leakage

Leakage of natural gas from our network is our biggest source of carbon emissions. Through our mains replacement programme and use of more sophisticated technology and techniques to manage gas pressure, we have reduced overall leakage by 25%, with an estimated carbon saving of c.680,000 tonnes (tCO_2e).

Reducing vehicle emissions

We have seen a 15.9% reduction in carbon emissions associated with business mileage (Scope 1). Technology such as webex and skype is continually reducing our need to travel, and in 2018/19 we drove 860,000 fewer business miles in cars compared to the previous year.

Reducing electricity consumption

We have seen a 31.2% reduction in carbon emissions associated with electricity consumption in our buildings and gas infrastructure sites (Scope 2). As we refurbish our offices and depots, we install more energy-efficient lighting and equipment. We have also rationalised the number of buildings we need to operate.

Reducing worksite waste

We have dramatically reduced the amount of wasted spoil from our worksites, with just 0.4% of all spoil now going to landfill. Similarly, our use of virgin aggregate has been cut by approximately 78%. These major improvements are the result of a far-reaching programme which saw us campaign for more local recycling facilities, and educate and incentivise our supply chain to work in a more sustainable manner.

Biomethane and green gas connections

By early 2020, we will have 17 biomethane plants connected to our network with a combined capacity of just over 17,000scm/hour. This is enough biomethane to heat over 60,000 homes per year.

An overview of our plan | **Giving customers confidence that we will deliver** | Giving customers a stronger voice | Delivering better outcomes for customers | A sustainable plan for the future | Delivering value for money | Financing our plan

Making the case for hydrogen

Backed by the Innovation funding mechanisms in RIIO-1, our H21 programme explores the potential of converting the existing gas networks to 100% hydrogen. The project began as a desktop exercise, and progressed to a number of follow-on projects, including real-world trials. The range of partners has expanded to include utilities across the UK, academia and private enterprise, and the programme has attracted international attention.

Over the next five years, we and our partners will be continuing to develop the evidence required to assist the government in making a policy decision on hydrogen by 2025.

Shorter-term, our Hydeploy 2 project will see up to 20% Hydrogen blended with natural gas in one small part of our network from 2020. This Ofgem funded project in partnership with Cadent Gas, will see 600 homes in our network using this blended gas mix without any need for changes to appliances in the home. This project is helping to unlock the potential of hydrogen as a clean energy source and providing a stepping stone to a low carbon future at the lowest possible cost.

Developing integrated energy solutions

We consider that a low-carbon future does not rely on a binary choice between gas or electricity. Rather, it requires integrating different types of energy and technologies, to create the smart networks of the future. To support this integration, we launched InTEGReL – an incubator for integrated energy system technology, allowing utilities and businesses to test their ideas in real-world conditions, and on a big scale. InTEGReL is based at a 15-acre NGN site just outside Newcastle. The project is led by NGN, working alongside Northern Powergrid and Newcastle University and in partnership with the EPSRC National Centre for Energy Systems Integration (CESI).

Thought leadership

Our work in the field of hydrogen and other forms of sustainable energy has established NGN as an expert with an international reputation. We have used this knowledge to support regional businesses with their own green ambitions, and to lead the national conversation.

Notable achievements include helping to establish a 'hydrogen corridor' for the North of England; informing the North East's 'energy for growth' economic strategy and leading the formation of a national Hydrogen Transformation Group, to allow the industry to speak with one voice.

25% gas leakage reduction
saving c.680,000 tonnes of carbon

<1%
of all spoil now goes to landfill

860,000
fewer business miles in 2018/19

31.2% reduction in carbon emissions associated with electricity usage

2.1.6. Used innovation to save money and improve service

Whether we are replacing pipes, responding to gas emergencies, supporting vulnerable communities or exploring new forms of energy, innovation can help us do a better job, at a better price. Since 2013, the Network Innovation Allowance (NIA) has enabled us to deliver 117 innovation projects. Many of these have become business as usual, delivering cost savings and customer benefits every day.

Innovation will continue to be at the heart of everything we do from 2021, helping us to meet stretching performance and cost-reduction targets. We intend to be even more entrepreneurial in the way we approach this work, by developing more sources of funding and looking beyond the energy sector for potential projects.

Notable achievements include:

Robots to gas sniffer dogs: saving time, money and improving the customer experience

New techniques and new technologies have allowed us to deliver our core work more efficiently and more cost-effectively. From using a robot which can travel inside pipes to perform surveys and repairs, to recruiting a police-trained sniffer dog to detect gas leaks, these imaginative solutions are now embedded in the way we work, saving time, and money, and improving customer service.

A business-wide culture of innovation

We want all our colleagues, both front-line and office-based, to challenge convention and propose new and innovative ways of doing things. An innovations suggestions app, a three-stage professional development programme and an innovation 'think tank' group which assesses potential projects are all helping to foster this culture.

Industry-wide collaboration

Utility companies often face the same challenges, so collaboration around innovation is essential. The five UK gas transporters and distributors created a national innovation strategy to help share knowledge, avoid duplication and provide a clear steer to the supply chain. We have also collaborated on a new innovation measurement framework, to bring a consistent methodology to the way we all measure the impact of innovation projects.

Transforming our IT infrastructure

At the start of RIIO-1, we had an old and inefficient IT infrastructure model, with aged systems close to end of support life and inefficient, high-cost back office processes. Reporting was labour intensive and colleague frustration high.

Our Future Ways of Working Programme, known as FWOW, has transformed this model. This programme incudes the implementation of a central SAP S4 Hana platform that has brought our IT infrastructure bang up to date, as well as changing our processes around key issues such as data gathering.

This investment will pay dividends in RIIO-2, and its impact is already being felt. For example:

- Information reporting and processing are now dramatically quicker. For example, payroll has reduced from six hours to five minutes, and outstanding escape reports can be accessed in real time, whereas previously, it would take eight hours.
- Standardised, simplified processes across the business have removed manual processing of information and made using our systems enjoyable for colleagues.
- All data is encrypted at rest, improving security and supporting GDPR compliance.
- IT operating costs have reduced from a peak of £12.2 million to £6.6 million – a 45% reduction.

2.1.7. Created a dynamic, more efficient and happier workforce

We have transformed our workforce and culture since 2013, resulting in a modern dynamic business with the skills for a rapidly changing industry.

We are confident that the changes and investment we have made will continue to enable us to attract and retain the talent we need in RIIO-2. Key developments include:

A more dynamic workforce

The average age of our workforce has reduced from 48 to 38, through an over-55s retirement programme, which enabled 183 colleagues to leave the business on favourable terms. More than £30 million of funding for the scheme was provided directly by shareholders. This provided the opportunity to recruit a diverse range of new people and skills to drive the business forward.

New terms and conditions

We rolled out new terms and conditions for current employees and new starters, which are in line with the market and reflect the skill sets we require. Over 500 (c. 75%) operational colleagues are forecast to be on new terms and conditions by the end of RIIO-1. The new arrangements include an incentivised performance framework for colleagues, with bonus schemes aligned directly to RIIO-1 commitments as shown below.

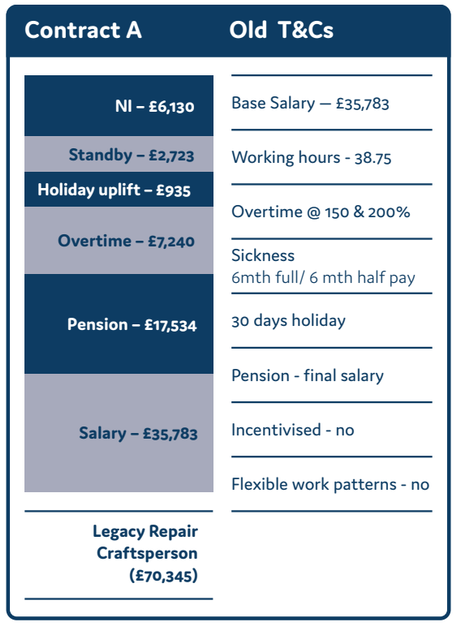

Figure 2.4: Legacy T&C's

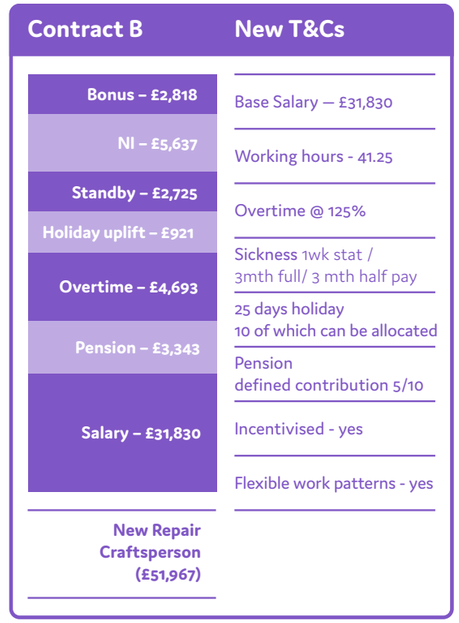

Figure 2.5: New T&C's

Better workload matching

These new terms and conditions additionally allowed us to match resource more accurately to the incoming workload without incurring overtime costs. Figure 2.5 below shows how we now have much better alignment of normal working hours.

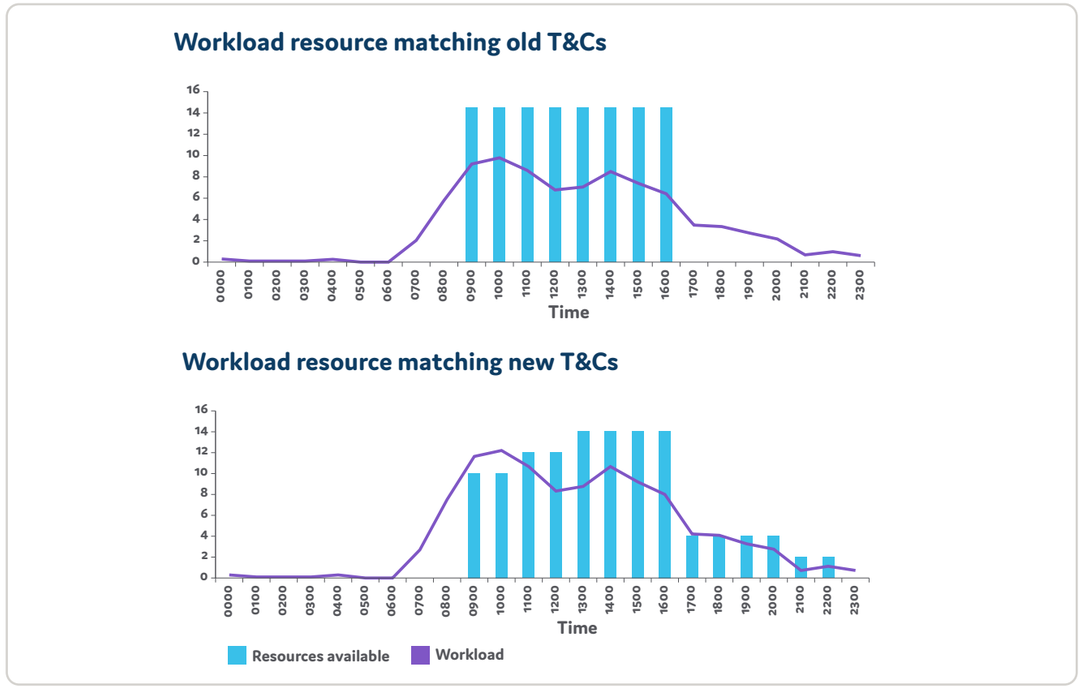

Figure 2.6: Workload resource matching

A new Engagement and Involvement strategy

This strategy has transformed our culture and opened channels of two-way communication, enabling colleagues to have a true voice within the organisation and the delivery of our objectives. Our approach is based on the concepts of Citizenship and the principle that all our colleagues, including those working for our service providers, have the right and opportunity to bring forward new ideas and challenge current working practices and principles. Colleagues are then supported with both time and expertise to examine and develop a business case for change for the senior management team to consider. This has resulted in several high-profile changes to parts of our business including colleague terms and conditions, and the quality and delivery of operational training.

Personal development

All colleagues now have personal development plans to ensure continual progress, career opportunities and acquisition of new skills, while a bespoke leadership development programme nurtures our next generation of senior leaders. A new training and development facility opened within our Leeds head office in 2019, to allow us to deliver bespoke training more easily. A mentoring scheme sees highly experienced colleagues mentor younger, less-experienced employees, providing them with on-site support as they encounter day-to-day challenges.

Mental health awareness

We have introduced a bespoke mental health awareness programme which - as part of a wide mental health and wellbeing strategy – which gives colleagues tools and techniques to recognise and manage the signs and challenges of low mental health.

Apprenticeships and graduate placements

In RIIO 1, we have successfully recruited and trained a new wave of apprentices and graduates across many areas of our business. We provided these colleagues with the necessary support, training and leadership to take the business forward, and these colleagues have brought new skills, ideas and energy into the business. We will continue to invest in the recruitment, training and retention of apprentices and graduate in RIIO-2., in order to ensure we maintain a dynamic and resilient workforce.

Office and depot refurbishment programme

We have invested £12m over the past five years to create modern and inspiring workplaces, for both front line and office-based colleagues. This investment has created working environments which promote collaboration and teamwork, and has ensured colleagues have access to the right equipment and facilities to do their jobs effectively.

We are confident the opportunities we provide and our performance during RIIO-1 will continue to enable us to attract and retain the talent we need. These activities have allowed us to right size our workforce, increase flexibility and reduce costs – delivering value for money and enhancing our ability to deliver key services and respond to future changes.

2.1.8. Aligned pay & reward to support business plan commitments

NGN has a well-established alignment mechanism that will continue for RIIO-2. Starting from the Board and senior leadership team, this alignment permeates all levels of the organisation. On an annual basis, the Board approves a range of financial and operational targets for the year ahead. These operational targets are selected from a range of key outputs in the RIIO-1 business plan, with the addition of operational safety targets. For example, in 2019 these covered:

- Mains replacement – length of pipe taken off risk
- Emergency response – percentage of uncontrolled/controlled gas escapes attended within 1/2 hours
- Operational safety – number of lost time injuries
- Operational safety – number of members of the public injuries
- Customer satisfaction survey scores
- Percentage of customer complaints resolved in 24 hours
- Percentage of connection quotes issued within relevant standard
- Percentage of connection commencement and completion dates issued within relevant standard

- Percentage of connection jobs completed on date agreed with customer
- Number of fuel poor connections delivered

For the senior leadership team, these corporate targets form 50% of their bonusable objectives, with the remaining 50% derived from personal objectives. Depending on their areas of responsibility, individual senior leadership team members will also have personal objectives linked to RIIO-1 business plan objectives. The majority of non-operational staff in NGN are on personal contracts with bonusable objectives which operate in a similar fashion to the senior leadership team, but with greater percentages linked to personal rather than corporate objectives.

At the end of each year, the Chairman will assess the CEO's performance against these annual targets and reflect this in the level of bonus awarded or not awarded. The CEO is the only Board Director remunerated by NGN other than the two sufficiently Independent Directors. The CEO will follow the same process for the senior leadership team, and so on throughout all non-operational staff on personal contracts. The framework is not rigid, in that any significant failure against a licence obligation or significant business plan deliverable would be taken into consideration even if this falls outside the formalised targets agreed.

For RIIO-2, the Board will continue to align these annual operational targets to the key RIIO-2 business plan commitments.

2.1.9. Managed the longer-term impact upon customer bills

One of our key objectives for RIIO-1 has been that we want to ensure that performance in RIIO-1 is the starting point for considering further improvements. We have worked to two key principles. Firstly, that we will not 'mortgage the future' or more directly 'we do not leave any cost or risk in the ground for future customers to deal with'. Secondly, that the efficiencies we deliver are not short term only and are enduring, therefore carry through into RIIO-2. Working to these two key principles means we avoid any impact on customer bills caused by RIIO-1 performance.

A key example of the first principle is how we have managed the mains replacement work basket, our largest area of expenditure. We have addressed several key issues in RIIO-1 to ensure that the programme does not push cost, risk or network performance in RIIO-2.

- **Geography –** we have delivered a profile of work in each part of our region. This has involved increasing workload in key areas in RIIO-1 to deliver this profile.
- **Regional Cost Differential –** there are significant unit cost differences working in different parts of our region, with areas such as Leeds and Pennines being impacted by difficult operating conditions and geology. We have focussed a significant portion of our workload in these regions during RIIO-1 to limit the cost impact going forward.
- **Risk and Network Performance issues –** there have historically been significant differences in measured risk and performance of the network, with the Yorkshire region having higher risk and poorer performance and higher unit costs. Significantly increasing the workload in these regions during RIIO-1 has largely removed this differential.
- **Diameter Band Mix –** we have delivered the range of work across the diameter bands that we promised in our RIIO-1 business plan. We have not done cheaper lower diameter band work at the expense of more expensive higher diameter band work. Indeed, we have delivered a work basket with a slightly higher diameter band profile and unit costs than targeted in RIIO-1. This has avoided any additional cost pressures in RIIO-2 for work funded in RIIO-1.

Adhering to this principle across all of our activities means that there is no deferral of work from RIIO-1 to RIIO-2 and in many areas, decisions already taken have led to cost savings going forward.

There are several examples outlined earlier in this section of our business plan of efficiency savings in RIIO-1 that are sustainable in RIIO-2. Notably, the change to operational workforce terms and conditions, the significantly reduced age profile of our workforce and the full implementation of the DSP model. These efficiency savings are fully reflected in our cost forecasts for RIIO-2 contained in section 6 of this plan.

2.2. Return on regulatory equity

The RIIO-1 regulatory contract provides financial rewards for companies which meet or exceed performance targets, and financial penalties for those that fall short. As the top performer in the industry, we will gain a Return on Regulatory Equity (RORE) of 11% over the period. This has largely been driven by the efficiencies we have delivered.

2.2.1. Totex performance

Over RIIO-1, we expect our Totex outperformance to be £253.9 million by the end of the period, generating a 2.8% RORE. Our customers will receive 36% of this outperformance, in the form of lower bills.

Totex forecasts 2017/18 prices (£m)	13/14 Actual	14/15 Actual	15/16 Actual	16/17 Actual	17/18 Actual	18/19 Actual	19/20	20/21	Total	Allowed	Variance
Opex	90.7	92.9	87.4	87.9	85.7	82.1	88.8	89.8	705.3	861.7	(156.4)
Capex	45.3	53.6	66.6	63.0	54.0	59.7	59.1	57.6	458.9	438.4	20.5
Repex	99.3	104.2	94.0	91.2	93.9	96.2	98.3	89.4	766.5	884.5	(118.0)
Totex	**235.3**	**250.7**	**248.0**	**242.2**	**233.5**	**238.1**	**246.2**	**236.8**	**1930.7**	**2184.6**	**(255.4)**
Allowance	**273.9**	**281.8**	**285.9**	**282.1**	**264.9**	**262.4**	**267.2**	**266.3**	**2184.6**		
Variance	(38.6)	(31.1)	(38.0)	(40.0)	(31.4)	(24.3)	(21.0)	(29.5)	(253.9)		
Cumulative Variance	(38.6)	(69.7)	(107.6)	(147.6)	(179.0)	(203.3)	(224.4)	(253.9)			

Figure 2.7: Totex performance in RIIO-1

The primary driver of this outperformance has been THE efficiencies we have delivered. Our performance has not been as a result of failing to do work or poorly calibrated price control assumptions. Indeed, we have delivered more work than we were funded for. The table below shows the make-up of our outperformance. Our performance will set the efficiency frontier for RIIO-2 and drive benefits across all gas networks, delivering benefits nationally.

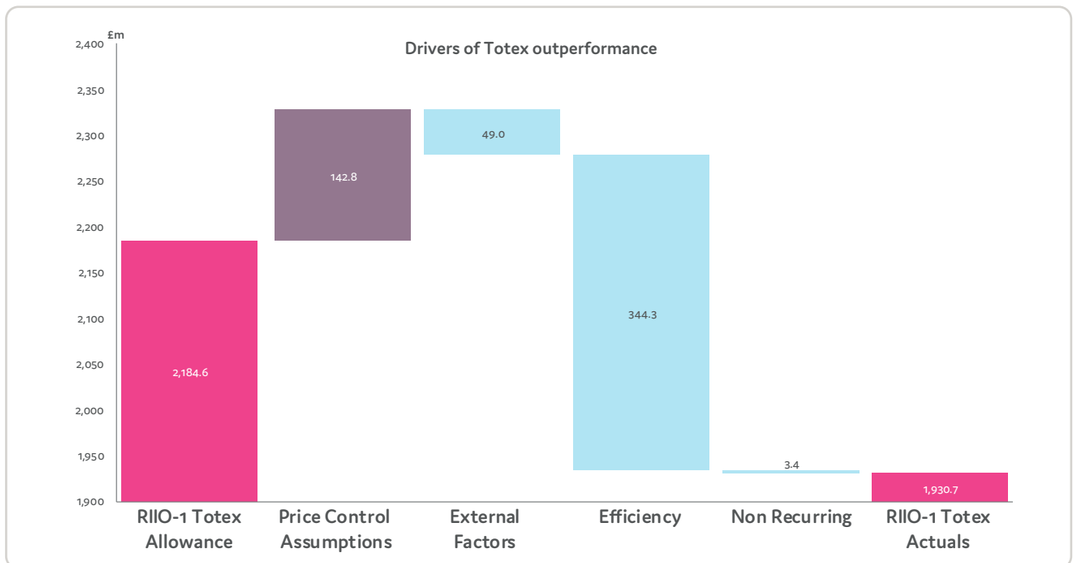

Figure 2.8: Drivers of Totex outperformance

2.2.2. Incentive performance

We have also performed well in other incentives within our regulatory contract.

Customer Satisfaction - Our results here have been consistently very strong, and overall have delivered an incentive of £2.9m and a RORE impact of 0.3%. Customer satisfaction has been a key focus over RIIO-1.

Customer Service - We have continued to deliver a very strong performance in our customer service outputs. We have achieved an average score of 9.01 across the three customer satisfaction survey areas over the first six years of RIIO-1.

Complaints Handling - Complaints handling performance is measured via the complaints metric, which is a composite score calculated as the weighted average of our performance against four elements – the percentage of complaints unresolved. Over RIIO-1, we have achieved a weighted complaint score of 2.8 which does not generate any penalties.

Environmental Emissions and Shrinkage Gas - We have invested heavily during RIIO-1 to significantly reduce the environmental impact of leakage from our network. New systems and processes in active pressure management have reduced average systems pressures by over 10% since 2013/14. We have also ensured we are optimising MEG (Monoethylene Glycol) levels in our metallic networks through an annual CBA on all MEG Foggers on our network, targeting investment in the most beneficial units. This ensures we operate a more efficient and cost-effective gas conditioning strategy. This has delivered an incentive of £4.8m pa or 0.5% of RORE.

NTS Exit Capacity - We have reduced the capacity held at the NTS Offtakes by close to 18%. We work closely with the National Grid on an annual basis to understand the challenges and constraints faced by the gas transmission network and the options that are available to utilise our network to deliver solutions at the transmission level. This has delivered an incentive of £1.3m pa.

Stakeholder Engagement Incentive Scheme - In 2018/19, we achieved a score of 5.96/10, maintaining our strong relative position within the scheme. We have worked extremely hard to continue to better demonstrate how input from our stakeholders is shaping our business and leading to measurable improvements and benefits, and will continue to build on this performance. The RIIO-2 enhanced stakeholder engagement programme has identified new and innovative ways of engaging with our stakeholders, and has provided us with significant further insight into our customers' and wider stakeholders' current and future expectations from us and our services. This has delivered an average incentive of £1m p.a.

2.2.3. Total Return on Regulatory Equity (RORE)

As a result of our Totex and incentive performance our RIIO-1 RORE forecast is summarised below[1]:

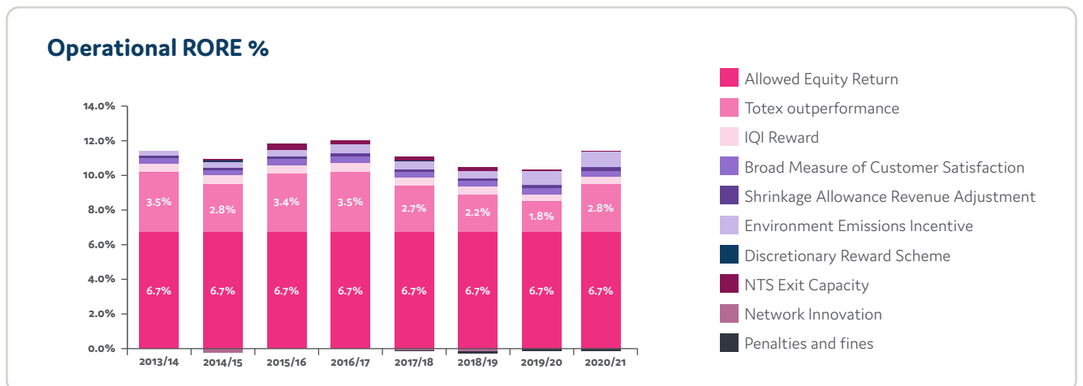

Figure 2.9: RIIO-1 RORE

1 Source: RIIO-1 Year 6 Report – NGN Website

2.3. Financial returns to shareholders

The revenue allowances within the RIIO-1 regulatory contract sets a base level of return for equity investors of 6.7%. This is the level of return that can be earned on the notional share of equity – set at 35% of the Regulatory Asset Value. As the frontier company in the sector, we were also given a 'Frontier Reward', equivalent to an additional 0.4% of RORE. We can then earn further rewards through our performance against the incentives outlined above. The graph compares the average returns we have 'earned' in RIIO-1 to date against the actual dividends paid. So far, we have paid out a dividend of £82m p.a. compared to an 'earned' value of £94m.

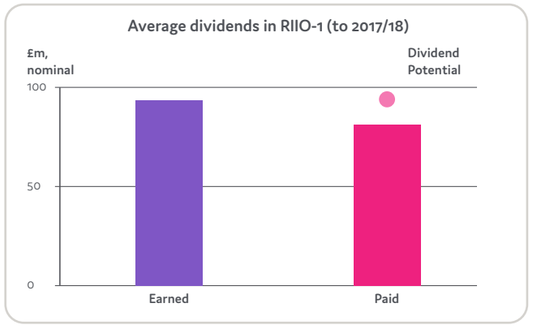

Figure 2.10: RIIO-1 Dividend Analysis

The levels of payment are consistent with the RORE envisaged for the top-performing company in the sector.

Importantly, these returns have been delivered through:

- Genuine and sustainable improvements in efficiency, and increases in the levels of service delivered to customers over the period;
- Maintaining a very prudent financing structure over the RIIO-1 period, with levels of borrowing (debt) maintained at a level (63%), below that set by the Regulator (65%). As an example, if we had increased our debt levels to 70% – possible under our banking covenants – our potential dividend would have been £95m p.a. as shown in the graph above; and
- Delivering all our commitments in the regulatory contract

This includes meeting and, in many areas, exceeding our output commitments, as well as all our investment promises. This includes the volumes and diameter band profiles which drive the iron mains replacement programme, our largest investment area.

2.4. Lower customer bills

Our approach in RIIO-1 and the key initiatives outlined above have contributed to the average domestic customer bill falling over RIIO 1.

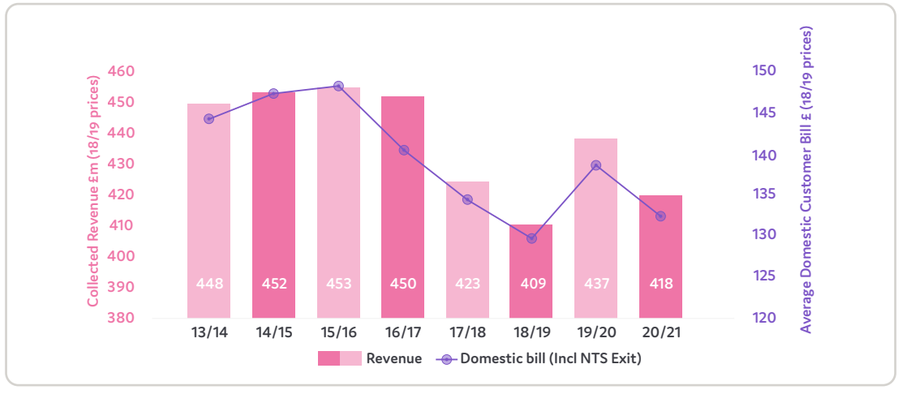

Figure 2.11: Collected revenue and average domestic customer bill (RIIO-1)

Average customer bills have fallen from £144 to £133 over the RIIO-1 period with an average bill of £139. (Average Domestic Customer bills for RIIO-1 have been derived from NGN's Transportation Pricing Model and are based on the following key parameters; based on Collected Revenue in each year, including NTS Exit Costs, Average AQ of 14,283 kWH, with an average load factor of 33.82%)

An overview of our plan | **Giving customers confidence that we will deliver** | Giving customers a stronger voice | Delivering better outcomes for customers | A sustainable plan for the future | Delivering value for money | Financing our plan

PART 3: GIVING CUSTOMERS A STRONGER VOICE

IN THIS SECTION

This section of the plan provides a detailed exploration of how our stakeholder community has shaped our plan. It highlights our stakeholders' core priorities and how we have responded to them in our commitments for the future.

In this section we also include information about how we have approached our engagement, the role of our Customer Engagement Group and the RIIO-2 Challenge Group, together with our strategy for engagement in RIIO-2.

An overview of our plan | Giving customers confidence that we will deliver | **Giving customers a stronger voice** | Delivering better outcomes for our customers | A sustainable plan for the future | Delivering value for money | Financing our plan

3.1. A plan that puts customers and communities first

3.1.1. Our holistic approach to engagement

We have used an extensive, inclusive and high-quality engagement programme to put stakeholders at the heart of our RIIO-2 business planning and decision-making. This has been supported by input, soundings and challenge from our Customer Engagement Group (CEG) and the RIIO-2 Challenge Group. Building on a firm foundation of engagement throughout RIIO-1, we've enhanced our approach in **reach and depth to gain views and insights from across the full spectrum of our stakeholder community**.

Three key principles have guided our approach:

1. **Meaningful:** rather than us defining the agenda, we asked stakeholders to tell us what they wanted to talk about and how they would like to engage with us. This allowed us to focus on the material issues most important to them, where there is real opportunity to influence our priorities and how we deliver them.
2. **Inclusive:** our engagement has reached all groups of stakeholders, through 10 core mechanisms and a range of bespoke channels. Through a targeted and sensitive approach, we've reached traditionally hard to reach and seldom heard voices – ensuring our findings are representative of our whole community.
3. **Iterative:** our integrated approach has ensured that every contact counts, utilising day-to-day feedback, third-party insight and specialist engagement. We've delivered a flexible engagement process that has continually evolved in response to insights gained from our communities, allowing us to iteratively test our proposals and calibrate across different groups.

You can find out more about how we've engaged with stakeholders to develop our plan in Appendix A3 – NGN RIIO-2 Stakeholder Engagement Strategy.

Our meaningful, inclusive and iterative dialogue has given us a greater understanding than ever before. **It is a process that has delivered real value and change – resulting in a more ambitious plan that truly reflects the expectations of our stakeholders.**

It is important to recognise that stakeholders are not just for price reviews; therefore, wherever possible we have had one conversation with them, combining our ongoing RIIO-1 engagement with planning for the future during RIIO-2. The richness and breadth of insight gained is much broader than the business plan and will continue to be used by the business and acted upon as part of our continual improvement.

Highlights of our approach

92% of domestic customers find our plan acceptable

96% of future customers find our plan acceptable

189,000+ voices have been heard and shaped our plan

92% of customers find our key promises acceptable

26,000+ engaged through our core business plan engagement

84% of customers find our plan affordable

6,400+ vulnerable customers engaging through our core engagement

10,000+ interactions with our online engagement hub

79% customers engaging for the first time

1st energy company to establish a Citizens' Jury

380+ organisations engaged, bringing 1,700+ seldom heard voices

80+ business plan engagement meetings and workshops

3.1.2. Our approach: meaningful, inclusive and iterative engagement

Meaningful

We consider engagement with stakeholders as a two-way process. Rather than structuring our conversation with them as passive receivers of services, we have resolutely sought for our engagement to be meaningful, enabling people to talk to us in a way that works best for them about the material things that matter most to them. In so doing, we have provided genuine opportunity to influence our priorities and shape how our services are delivered.

During 2018 we co-created our engagement plan, talking to over 250 stakeholders to better understand how they wanted to engage and what issues were important to them. This insight informed and complemented internal workshops, where our senior management team and colleagues explored the gaps in our existing knowledge and the insight needed to drive our core business decisions.

From this, we developed an initial range of potential topics clustered into categories and undertook an assessment to prioritise our engagement on those issues with the most material influence on customer experience and impact on bills. Our resulting plan, tested and refined with our CEG, created the framework to ensure that each piece of research and every discussion we have had to develop our business plan has focused on the things that really matter.

As well as asking the right questions, showing that we have listened and explaining how we have responded is key to meaningful engagement. To support this, we launched our online engagement hub, through which we have published the outcomes of our engagement on an ongoing basis, alongside regular newsletters reflecting back what we have heard. Furthermore, we have proactively re-contacted stakeholders who have expressed an interest in engagement outcomes, creating a continued dialogue.

The impact of this has been opportunity from the outset for stakeholders to co-create investment options, challenge rather than validate our own thinking and ensure business plan outputs reflect their expectations and priorities; and for this to have real influence on RIIO-2 planning.

Inclusive

We serve a large population of stakeholders who have varying interests and power to influence our services. Wherever we reference 'stakeholders' collectively in our business plan we allude to our entire stakeholder community, split into 45 segments as shown in the diagram below, including national policy shapers, local place makers and individual customers, and cutting across the breadth of our geographically, economically and socially diverse region.

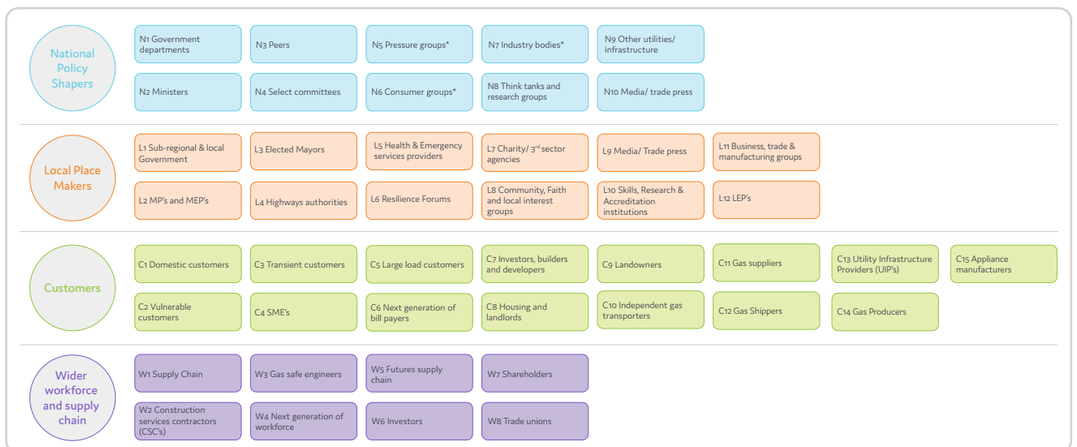

Figure 3.1: Stakeholder Taxonomy Map

In building our RIIO-2 plan, we used a comprehensive and inclusive engagement programme to reach each of these groups. Sometimes it was appropriate to focus our engagement on a specific stakeholder group to understand their views in more depth. For these insights we have clearly set out where we heard the feedback to differentiate it against the collective term stakeholders.

It has been vital to ensure that our engagement is representative of the diversity of our network area. We have built a comprehensive understanding of the socio-demographic profile of our region, including a commissioned review of 26 vulnerability indicators across all the local authority areas we cover, to inform the design of our research. We have used this to recruit samples that reflect distinct economic and social backgrounds, and to help us compare results from different groups in our analysis.

Throughout the programme, we have used best practice methods to break down the barriers to engagement and ensure that everyone has a voice. We have recognised that, for many traditionally 'hard to reach' customers, engagement exclusion has a range of drivers – be they low knowledge, vulnerability or emotional - that need a range of solutions. We have tailored our research approaches to remove these barriers wherever we can, for example by creating tailored educational materials, offering in-home engagement or translation services and creating safe-space engagement opportunities that give people time to listen and build confidence to engage. For our wider stakeholders, a refresh and gap analysis of our stakeholder database allowed us to identify and create improved and bespoke engagement opportunities with those stakeholders who are seldom heard or time-poor.

The impact of this has been an engagement programme that has reached over 26,000 people from across our whole community of stakeholders, and in so doing, a RIIO-2 business plan that represents a broader spread of insight than ever before.

Iterative

Every contact counts

We have brought together an extensive body of evidence to build a robust and meaningful platform upon which we can base strategic decisions. We have triangulated all sources of feedback available to us, making sure that every contact we have with our stakeholders counts.

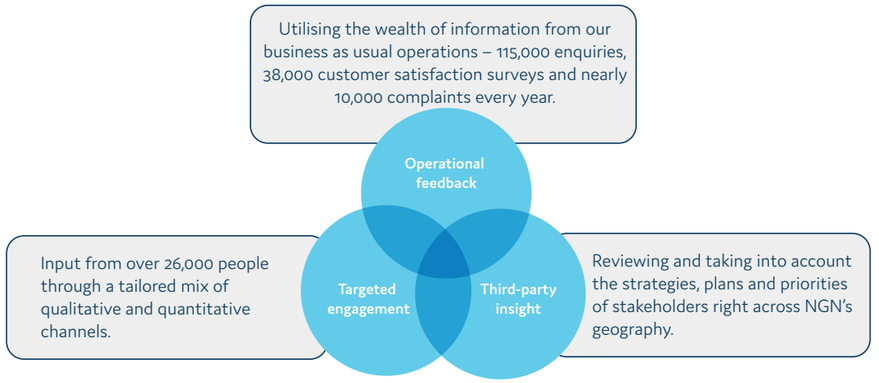

Figure 3.2: Insight data triangulation approach

The foundation of this approach has been to build on what we have learnt throughout the RIIO-1 period, and then focus engagement and activity to fill gaps in our knowledge and understanding. In this way, we have avoided the need to ask stakeholders to repeat what they have previously told us.

This gap analysis approach has also proactively sought out the vast experience, analysis and detailed insights of a wide range of third-party organisations. It recognises them as independent experts who can often provide a consumer, sector or industry voice, or a route into diverse communities that we might otherwise struggle to reach. An example of this is working with interest groups and specialists to test and inform key elements of our planning, such as with the Joseph Rowntree Foundation on inclusion and poverty, and with the Committee on Climate Change regarding the future role of gas. We have also conducted an extensive analysis of place-based economic and energy priorities by reviewing the plans and strategies of local and sub-regional bodies such as local authorities, local enterprise partnerships and combined authorities.

High-quality engagement and participation

Engaging about our services is often not straightforward. It involves issues that stakeholders are often not aware of or have not experienced, or decisions whose impact runs across decades and affects future generations. It also risks being one-way, rather than a genuine discussion or an opportunity to solve challenges and create new plans together. Successful engagement requires a dynamic, multifaceted approach, which seeks continual feedback across different pathways and levels which we can assimilate and act upon quickly. Recognising this, we have applied **four different levels of engagement to combine extensive breadth of input with genuine depth and collaboration**, including on particular topics and with specific stakeholder groups:

- **Inform:** Informing stakeholders of our intentions and updating them along the journey.
- **Consult:** Providing an understanding of stakeholders' high-level priorities.
- **Involve:** Linking to priorities, clarifying preferences relating to our outputs.
- **Collaborate:** Co-creating and refining the most material options in our plan.

From this, we have:

Developed a range of engagement mechanisms and materials tailored by topic of interest, the complexity of subject matter, the time stakeholders had available to participate and their preferred level of engagement. This approach enabled us to carefully determine the most appropriate use and weighting of engagement methods such as in-depth face-to-face methods for more complex 'knotty' issues and digital engagement for consulting on stakeholders' priorities. We provided 10 different core ways for people to engage, which, alongside other bespoke and ongoing channels, have created iterative opportunities for individuals to provide feedback.

Used these mechanisms to make the programme accessible to a diverse range of stakeholders, particularly those who are seldom heard or hard to reach. This includes, for example, using in-home interviews for customers in vulnerable circumstances to give more insight into potentially sensitive individual circumstances and allowing us to observe needs first-hand, in the comfort of familiar surroundings, rather than rely on reported evidence.

Used clear sequencing and timing of engagement for maximum impact and to ensure that our approach has been iterative. Our cumulative programme of research and dialogue has been planned so that each phase builds on knowledge gained in previous phases, including through RIIO-1. Our initial large-scale online Centrepiece Survey provided people with the opportunity to quickly give their views across a wide range of topics. It allowed us to segment stakeholders by interest topics for subsequent targeting and deeper exploration of specific business plan topics to understand priorities and support co-creation of options.

Figure 3.3 summarises the components of our approach, how they combine to reach all engagement needs and audiences, and how they have been sequenced to build iterative knowledge and impart maximum influence on the business plan from its conception to completion. Appendix A4 – NGN RIIO-2 Stakeholder Engagement Insights further details how this mix of mechanisms has enabled input and how this feedback has been triangulated with multiple sources of evidence to produce clear insights as a result.

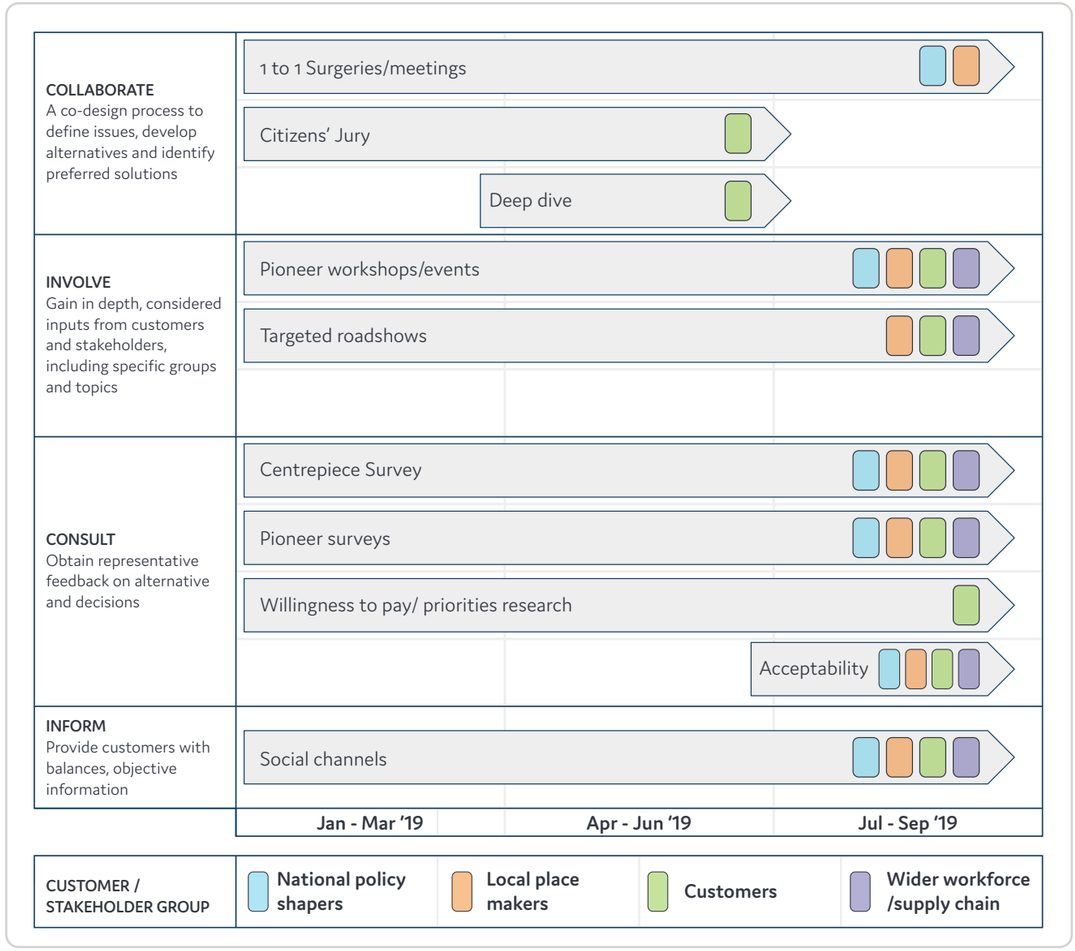

Figure 3.3: RIIO-2 Business Planning Engagement Activity

The impact of this has been a flexible engagement process that has continually evolved in response to insights gained, allowing us to iteratively test and calibrate proposals and, in so doing, build a RIIO-2 business plan that reflects the expectations of our stakeholder community.

3.1.3. Shared local ambitions for our region

Our business plan comes at an exciting time for the North of England. We have worked closely with local place-makers and service providers, who have set out an ambitious roadmap that seeks to rebalance the national economy and create inclusive, sustainable growth. Whilst each area is unique, there are many common themes that our local policy makers expect from us as a key anchor institution in the North. They each strive to:

Develop the infrastructure for growth: Our partners have plans for major transport, housing, digital and commercial developments. They expect us to continue to invest, in a coordinated way, in infrastructure that supports the productivity of industry and business in the region.

Meet stretching ambitions on climate change: They seek major reductions in carbon emissions linked to energy generation and distribution, and expect us to invest in an innovative, integrated approach to achieve that. In particular, they want to see positive steps taken to capitalise on the potential for hydrogen and other green gases being used within our network.

Boost innovation across industry: They wish to see more investment into research and development – particularly in energy and decarbonisation – alongside enhanced partnership between and across industry and academia.
Read more in section 5.4

Improve environmental resilience: They expect us, as partners, to proactively support them in their ambitions to improve green infrastructure connectivity, improve the resilience of critical infrastructure and reduce harmful transport emissions. Read more in section 4.4.3

Create inclusive communities with high-quality jobs: Our partners expect us to provide good jobs – a healthy workplace, training and progression, payment of the living wage and more good-quality apprenticeships. More broadly, they wish to see improved support for local communities and reduced inequalities across the board, through targeted action on issues like fuel poverty and building social capacity through community group links. Read more in section 4.3

3.1.4. Our stakeholders' priorities for the future

Whilst expectations of the service we provide is different for many of our stakeholders, our dialogue with them has shown that they are united by five core priorities, which in turn, underpin our plan.

Safety first: Providing a safe gas supply is most stakeholders' top priority and an absolute requirement. Customers' core expectations are that we will deliver a responsive emergency and repair service, and keep safety as the central driver of all investment decisions. Read more in section 4.3

Gas there when its needed: They place great value on providing reliable and uninterrupted supplies and want our focus to be on minimising disruption to their normal daily activities. They expect us to ensure that our services are resilient to the rapidly changing landscape in which we operate. Read more in section 4.1

Value for money: They want bills that are no higher than necessary and the provision of services that are affordable for all. Although the majority have no issues being able to access or afford our services, it is recognised that this is not the case for everyone, and they expect us to help those for whom this is not the case, so that no one gets left behind.
Read more in section 6

Protecting the environment: In the face of long-term issues, such as climate change, and day-to-day problems, such as gas leakage from our network, reducing the environmental impact of our operations is of significant and increasing importance. They wish to see greater urgency and ambition in reducing our business carbon footprint, now and in the future. This is particularly the case for our future customers - the group most likely to view this as their highest priority (over safety and reliability). Read more in section 4.4.3

Preparing for the future: Our customers rely on gas to power their day, every day, and want us to make sure it stays that way for future generations. They expect us to prepare our network for affordable, renewable energy solutions and play an active part in the delivery of the UK's commitment to a low-carbon energy future. Read more in section 5.3

3.2. Collaboration and challenge

3.2.1. NGN Customer Engagement Group

Along each step of our journey to develop this plan, we have been challenged and supported by an independent critical friend, our Customer Engagement Group (CEG). With membership drawn from across our stakeholder community, the CEG's role is to ensure that we have truly understood the priorities of our stakeholders, and reflected these in ambitious, stretching proposals that offer value for money.

The CEG's independent Chair, Jenny Saunders CBE, led an open call for recruitment to the group and selected 10 members with a broad range of experience covering utilities, engineering, consumer rights, environment, economic growth and social inclusion. Forming for the first time in the autumn of 2018, the group designed a robust governance framework. This included effectiveness criteria and an ongoing monitoring framework by which the group measured its ability to challenge and retain its independence. A target operating model set out the Group's code of conduct, its requirements of NGN and the processes by which the group would raise and manage challenges or feedback provided to the company. Finally, the group set out their assessment criteria for the business plan itself based upon Ofgem's guidance, ensuring a clear line of sight throughout the process. From the outset, we provided the group with resources and support to carry out this role, including the nomination of the business's Director for Governance and Assurance as the CEG's senior liaison, alongside dedicated secretariat support.

Meeting on a monthly basis, the group has investigated the business's performance track record and proposals across all aspects of the plan with the exception of the business's financial strategy. Throughout the year, the group has received presentations from members of the strategic and operational management teams, had direct access to NGN Board members, visited sites across the network and gone 'behind the scenes' to see operational activities. Alongside meetings of the full group, deep dive subgroups have been established to allow members to look in greater detail at critical aspects of the plan, reflecting their areas of specialism and expertise.

The CEG – informing our engagement approach

The CEG, in particular each of the Engagement Deep Dive Groups, has provided rigour and challenge to the business's dialogue with stakeholders. Initially, the Group considered the overarching engagement strategy and, building on their feedback, our detailed engagement plan. Their feedback in respect of this directly changed and improved our engagement programme.

CEG feedback ...	So we ...
Customers and wider stakeholders' views should be sought on the areas that are most material to their bill and which they have real opportunity to influence.	Undertook a materiality analysis of our 'longlist' of engagement opportunities, resulting in a more targeted, meaningful approach, and presented this analysis to the CEG in our detailed plan.
You should consider hard-to-reach and in particular vulnerable customers, in the broadest sense – recognising that vulnerability can often be a transient issue.	Tested our definitions of vulnerability, based upon the Priority Services Register with our CEG deep dive group and integrated these into our research where appropriate. We used multiple mechanisms for ensuring that we could access the broadest group of hard to reach customers, as set out above.

Figure 3.4: CEG influence on engagement approach

Throughout our engagement, CEG members have attended workshops, observed market testing events and commented on the draft approach and analysis of key research such as business plan acceptability. The benefits of the intensive consideration that the CEG has given to our stakeholder engagement programme are threefold:

- Opportunity to assure themselves that the business's approach to engagement has been open, honest and transparent – that stakeholders have had ample opportunity to put forward their views without being 'led' by the business.
- Front seat view of our engagement as it happens, giving opportunity for the CEG to assess if the business's interpretation of stakeholders' sentiments is fair and true.
- Continual improvement: the CEG's feedback was reported back to the business through monthly tactical 'lessons learnt' and used to inform forthcoming engagement opportunities.

Providing challenge to the business plan

Across stakeholder engagement and all aspects of our plan, the CEG have carefully considered our proposals, raised challenges and provided detailed feedback on our draft plans. We have acted on each challenge from the CEG and consider that these have been instrumental in influencing the development of our business plan to deliver greater benefits to customers and wider society.

	CEG asked...	So we...
Challenge	The business plan should demonstrate that the suggested activities delivered within the social outputs do not duplicate the work of other agencies and how any advice provided will be designed to meet recognised standards.	Provided examples to demonstrate NGN's past performance in establishing effective referral routes with a range of organisations, to whom we can refer people for support and advice, together with accredited training courses run for, or by, our community partners. To ensure that we were adding value to the activities our partners already undertake, we engaged with stakeholders to understand which social challenges they felt we should address. With their feedback, we directly addressed this challenge within our Vulnerability Strategy, committing to accredited training courses, investment in our Community Partnership Fund and key initiatives such as energy efficiency referrals and hardship funds being delivered in partnership with appropriate partner agencies.
Feedback to V1 business plan	We would like to see evidence that stakeholders help direct decision-making and co-create points of focus, rather than it just being about validation of existing choices.	Engaged with our stakeholders through a second innovation workshop to understand their appetite for being more closely involved in decision-making on our innovation programme. Following this, in further iterations of our plan, we set out a firm commitment to invite stakeholders 'behind the scenes' to take part in key internal decision-making groups, such as our Innovation Think Tank.
Feedback on V2 business plan	Given NGN's role in the community, it should do more to support those most in need and, specifically, the levels of investment in the proposed Hardship Fund should be reconsidered.	Recognising how important socially responsible efforts are to our customers and wider stakeholders we have tripled our hardship fund to £150,000 per year, which will support customers in desperate need of direct financial help.

Figure 3.5: Example of CEG Challenges

The full list of the challenges raised and our responses are contained in the Customer Engagement Group's Independent Report.

3.2.2. Ofgem RIIO-2 Challenge Group

Complementing the work of our CEG, Ofgem's independent RIIO-2 Challenge Group has provided a further challenge that has helped give us confidence to deliver our most ambitious plan. This expert group has had the benefit of oversight of the gas distribution and transmission companies plans across the UK, allowing them to benchmark our proposals and ensure a fair and equitable deal for customers across the country.

Whilst developing our business plan, our senior management team met with the Challenge Group three times, discussing our track record and our proposals for RIIO-2 . Additionally, the group has reviewed and commented on each iteration of our business plan. As with the CEG, our plans have evolved as a result of their feedback – Appendix A31 –NGN RIIO-2 Challenge Group You Said, We Did Responses, provides a full list of the challenges and how we have responded to them or changed our approach.

An overview of our plan | Giving customers confidence that we will deliver | **Giving customers a stronger voice** | Delivering better outcomes for our customers | A sustainable plan for the future | Delivering value for money | Financing our plan

3.3. Together, we have created a plan for the future

3.3.1. How we have responded to stakeholders' priorities

We have set out below 44 key insights from our stakeholders that have shaped our plan. You can find out more about what our stakeholders' told us and how views changed between different groups in Appendix A4 – NGN RIIO-2 Stakeholder Engagement Insights.

We have indicated if the commitments we are making in our plan meet or exceed Ofgem's RIIO-2 minimum standards and our stakeholders' expectations by using icons:

We've met or exceeded our stakeholders' expectations

Compromise area – we've not fully met our stakeholders' expectations

We've exceeded the minimum standards set out in OFGEM's regulatory framework

Whilst we have heard a call for ambition and frontier levels of customer service in our plan, stakeholders also prioritise value for money – second only to safety. We have worked hard to get this balance right and deliver a plan that delivers value for money improvements on the outputs which are material to our stakeholders – at a reduced price.

In our 2019 Priorities Research, Business Plan Acceptability testing and Citizens' Jury – all material components of our overarching engagement programme – we heard that customers value our strong track record in providing excellent service and want us to at least maintain our current performance. Our proposals respond by setting out continuous improvement, such as improved outputs on complaint handling, at no extra cost to our customers.

Investment in the network and minimising disruption caused by supply interruptions and roadworks featured prominently in our stakeholders' priorities for the future. We believe that their preferences have been reflected in our commitments set out in this business plan.

In some areas of our plan, we have been challenged to think bigger, notably the duration of unplanned interruptions and outputs that protect the environment. This input has given us the confidence to commit to things that we may not otherwise included or emphasised in our plans, such as an enhanced programme of non-mandatory pipe replacement to achieve improved safety and reliability, and greater reduction in our environmental impacts. In some areas, we have had to balance conflicting views and reached decisions that do not fulfil our stakeholders' expectations in full. These represent compromises within our plan and where we have been open and honest with our stakeholders' on why we have taken these decisions.

Stakeholder-driven changes to our plan – highlights

By testing our proposals with stakeholders iteratively, each with varying degrees of ambition and investment implications, we have made changes to our business plan. Some of the key changes are:

- Smarter coordination between utilities. During many of our discussions with stakeholders, frustration with repeated roadworks by multiple agencies was cited as a key area for improvement. In our initial plan, we set out some broad principles for coordination but realised we needed to go further to address these concerns. We have now established a broader scope for our Whole Systems Framework that covers heat, power, transport and business solutions. Within our framework, we have established action plans to implement with partner organisations, such as water and power utilities, to coordinate our approach and reduce the impact on consumers and future customers.
- More ambitious targets for decarbonising our fleet. Our starting point was a target that all of our vans would meet Euro 6 emissions standards, but our stakeholders were clear that they expected us to go further. Now, we have committed to 100% of our company cars and at least 50% of our commercial vehicle fleet being ultra-low emission or hybrid by the end of RIIO-2. This means 50% of our total fleet will be ultra low emission by the end of RIIO-2.

- New measures for reducing plastic wastage, including from our pipe replacement programme. Our initial plans did not include any measures for plastic wastage, but our stakeholders told us it was important to them. So, we have committed to eliminating single-use plastics from our offices and depots, and reducing the amount of plastic pipe that we waste and the amount of plastic that we use in our supply chain.
- Investment in green infrastructure. Our stakeholders told us that they want us to improve air quality and expect us to support regional programmes to improve green infrastructure, over and above our initial plans. So, we have committed to funding the planting of 40,000 trees in our region during RIIO-2, predominantly in urban areas, and adopting tools to measure the impacts on biodiversity from our works and infrastructure sites.

Balancing trade-offs

Throughout our engagement programme we found significant consensus across our stakeholder community on key priorities. Nevertheless, there were nuances in our stakeholders' views and, indeed, issues on which we have made business decisions that represent trade-offs for our stakeholders.

For example, whilst concern about our impact on the environment has grown across our community in recent years, within our acceptability testing we found that our future customers (aged 18–25) tended to view this as a highest priority (compared to safety for other stakeholders). Across the board, whilst acceptance of our environmental commitments was high (ranging between 80% and 91%) stakeholders' were most likely (1%–14%) to find our environmental commitments unacceptable than in any other part of our plan. Those stakeholders felt deep concern for the environment, particularly in terms of carbon emissions and climate change. And in our Citizens' Jury, we heard our customers' concern that a desire to keep bills low may be storing up environmental problems for the future.

Whilst we are encouraged that stakeholders are broadly supportive of our environmental commitments, we recognise that these represent a trade-off for others who would like to see swifter progress in our pipe and fleet replacement programmes. In the case of fleet, our decision has been made on the basis of the current availability of appropriate vehicles on the market and our consequent need to trade off environmental impacts with the delivery of a safe and reliable service. In the case of our pipe replacement programme, we have considered the needs of all of our customers and come to the view that we can only justify investment of customers' money where there is a clear cost benefit case for doing so. In both cases, in the light of changes in the availability of vehicles or certainty of government policy on decarbonised heat, we will reconsider our strategy in light of our stakeholders' views.

Our responsibilities to communities and our most vulnerable customers was also a point of divergence between different stakeholder groups. Whilst our CEG, alongside local service providers with experience of supporting those at the highest point of need, asked us to do more, only 8%–13% of stakeholders taking part in our Centrepeice Survey felt this was a key priority. In more deliberative settings, including those with high proportions of vulnerable customers such as our Citizens' Jury, there was a stronger consensus that we did have a strong role to play but concern to ensure we do not go 'beyond our role'. Nevertheless, there was strong support for free or low-cost connections to people in fuel poverty. Indeed, our Willingness-To-Pay research suggested that, for a target of 1,000 free connections, they would expect to pay less than they currently do (compared to targets of 1,500+, for which they were willing to pay more).

As with environment, we have had to carefully calibrate both conflicting stakeholder views and the changing delivery landscape when making social commitments in our plan. Whilst we recognise that many of our stakeholders question our role in some of these activities, we have also drawn on the experiences of our front-line staff and our local service partners, who see on a daily basis the needs of our most vulnerable customers. With this in mind we have increased our investment in these areas, whilst committing to work through partners and only act when there is a clear role for us to do so. We have also heard and fully recognised the importance of fuel poor connections to our stakeholders and balanced this with a need to set realistic and deliverable targets. Our baseline target of 1,000 reflects the changed national eligibility requirements for this service, whilst our aspirational target of 2,000 reflects our ambition to more effectively address our stakeholders' expectations.

The results of our business plan acceptability study have given us confidence that we have arrived at a fair and acceptable outcome for our stakeholders and customers.

An overview of our plan | Giving customers confidence that we will deliver | **Giving customers a stronger voice** | Delivering better outcomes for our customers | A sustainable plan for the future | Delivering value for money | Financing our plan

3.3.2. An affordable and acceptable plan

We have worked hard to get the balance right between ambition and affordability in order to deliver a plan that delivers more for less. Our business plan acceptability testing research engaged with over 1,300 domestic, future and business customers on every aspect of the plan. Through that research, 92% of all customers told us that they found the plan acceptable. Our future customers were most likely to find the plan acceptable, at 96%. And across our key performance promises, 92% of customers felt these were acceptable – the following section outlines acceptability of each of our promise areas. For more information on our acceptability testing and the methods used, please see Appendix A3 – NGN RIIO-2 Stakeholder Engagement Strategy.

You said	So we have	Read more at
Bills should be no higher than absolutely necessary; our services should be affordable for all.	We will reduce the average domestic customer bill from £139 during RIIO-1 to £127 in RIIO-2. An 8.6% reduction over the period. This represents a c.£150m saving over RIIO-2 compared to RIIO-1.	7.5 Customer bills
Overall business plan affordability approval rating: 87% % of customers saying our proposed bill level is affordable or very affordable.		

Figure 3.6: Affordability insights and response

3.3.3. Meeting the needs of customers and network users

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Customer experience – our supply interruptions proposition

Our extensive engagement with stakeholders and triangulation of this evidence with insights collected from operational data and third-party insights has indicated that, based on our RIIO-1 performance levels, stakeholders are very satisfied with the overall service we provide. They understand that a supply interruption is a relatively rare occurrence on our network, with the likelihood of experiencing a planned interruption as only 1 in 40 years and the chance of an unplanned interruption as just 1 in 200 years. However, our engagement has reminded us that our focus must be on restoring their supply safely, quickly and efficiently whilst minimising disruption to our customers' normal daily activities. On the rare occasion that we fail to hit our high standards, not all customers expect to be compensated; however, we heard that there is an opportunity to improve confidence and satisfaction in our service by going above and beyond the minimum requirements. See table 4.7

You said	So we have	Read more at
Our focus should be on minimising disruption to our customers' normal daily activities by reducing the average duration of supply interruptions.	Committed to monitoring our performance in responding to all unplanned interruptions through RIIO-2 and have implemented a bespoke target of <11hrs for the average time it takes for us to re-connect customers to the ECV. Recognising the importance to our customers, we have additionally committed to a voluntary compensation payment if we fail to reconnect within the same day.	4.2.2 Gas there when you need it
Seven days' notice of a planned interruption typically meets stakeholders' needs; however, customers in vulnerable circumstances should receive extended notice, and a 48-hour reminder prior to work starting.	We will provide notification: • at least 7 working days prior to work commencement; and • notify all identified vulnerable customers 15 working days prior to work commencement. • We will provide a reminder 48 hours in advance of the planned interruption.	4.2.2 Gas there when you need it A7 – NGN RIIO-2 Vulnerability Strategy
When their gas supply is interrupted unexpectedly, customers want to be reconnected and able to use their appliances as soon as possible.	Introduced a bespoke target to restore gas to appliances within 2 hours of either gas being restored to the ECV or the time convenient for our customers. We will investigate means of avoiding interruptions or providing temporary supplies, to customers in vulnerable situations using NIA funding.	4.2.2 Gas there when you need it 5.4.8 NIA funded innovation

Figure 3.7: Supply interuption insights and response

You said	So we have	Read more at
Nobody likes having to wait at home for a tradesman or a delivery to arrive, but when it is inevitable, customers told us they expect us to offer an appointment service.	We will offer 2-hour appointment slots for engineers to attend jobs and a tracking service.	4.2.2 Gas there when you need it
We should make every contact with customers count by raising awareness of our services and providing additional support during the same customer journey.	When undertaking our normal activities, in addition to carbon monoxide awareness, our front-line staff will provide energy efficiency advice or referrals.	4.2.3 Help for those who need it most
Reinstating our excavations after engineering works more quickly than during RIIO-1 is important, but not at the expense of quality.	We have gone beyond the minimum requirement of 5 working days and committed to reinstating customers premises within 3 calendar days (excluding bank holidays) – and doubling the RIIO-1 regulatory compensation payments if we do not deliver.	4.2.2 Gas there when you need it
If we do not meet our service standards, customers expect us to go beyond minimum requirements and compensate them appropriately.	We have committed to doubling the RIIO-1 regulatory compensation payments when we do not meet our obligations and introduced compensation even where we do not have to, for the things that stakeholders have said are important to them.	4.1 Our RIIO-2 outputs
We should continue to provide industry-leading support when a large-scale unplanned incident occurs.	We will deliver an enhanced Major Incident Support Framework during 'gas-off' incidents impacting over 250 customers. This will also be provided on a case-by-case base for smaller incidents, based on expected length of interruption and weather conditions.	4.2.2 Gas there when you need it
Overall acceptability of our reliability promises: 93% % of customers saying our promise is acceptable or very acceptable.		

Figure 3.8: Supply interuption insights and response

Our customer satisfaction and complaints proposition

A key aspect of our stakeholder engagement process is listening, learning and acting on this feedback. We are reliant on this feedback to indicate if we are delivering consistently with what we set out to achieve. Where we get it wrong, we want to learn from this and ensure that we embed the necessary actions to improve our service going forward. Customers recognise our strong customer service and complaints-handling performance throughout RIIO-1 and want to ensure that existing levels of performance are at least maintained in RIIO-2. We have listened to our stakeholders and will strive for continuous improvement across the board, with specific commitments to improving the customer journey for our connections and market services customers.

You said	So we have	Read more at
We should strive for continuous improvement on customer complaints by a) setting targets based on calendar days and b) working towards an agreed solution within 60 minutes.	We will measure our performance against an enhanced metric – based on calendar days – and we have committed to agreeing a resolution of a complaint within an hour, even on weekends. We will deliver this at no extra cost to customers.	4.2.1 A truly great customer experience for everyone
Customers want to see improved communication throughout the connections process and enhanced outputs on the time taken to deliver.	For standard quotations, we will go beyond minimum requirements to provide quotes within three working days and start dates within 10 working days, together with an online booking service and a key customer contact throughout the journey.	4.2.2 An enhanced connection service
Our market service customers such as gas shippers and independent transporters could be better served through account management and enhanced responsiveness.	We will introduce new standards for our market services customers which set time commitments for resolving queries and see us deliver a more consistently good service.	4.2 Meeting the needs of consumers and network users
Overall acceptability of our customer service promises: 92% % of customers saying our promise is acceptable or very acceptable.		

Figure 3.9: Customer satisfaction insights and response

Socially responsible and saving lives

More than any other priority in our plan, social responsibilities have polarised opinion amongst our stakeholders. Although it is very challenging to find consensus on which vulnerable customers have the greatest need, stakeholders have reiterated that we have an important and practical role to play in supporting the wider social agenda. We heard that we should continue with our core outputs but stop short of duplicating the efforts of social services or the NHS.

Our stakeholder engagement has clarified the need for a flexible approach to defining vulnerable circumstances and fuel poverty so that each individual's situation can be taken into account and bespoke support be provided. We have used stakeholder feedback to refine our portfolio of tailored initiatives to better serve our customers and deliver more successful outcomes than ever before.

You said	So we have	Read more at
Stakeholders want us to support all individuals in vulnerable situations, including residents who are 'off grid'.	We will actively promote and seek out members of our communities who are eligible for the Priorities Services Register, targeting an additional 5,000 registrations per year. We will also deliver enhanced services such as offering a dedicated hotline for any customer registered on the PSR, or anyone who might identify themselves as vulnerable.	4.2.3 Help for those who need it most
Stakeholders want us to meet or exceed the number of fuel-poor gas connections provided during RIIO-1.	We will commit to a minimum 1,000, and have an ambition to deliver 2,000, off-grid, fuel-poor customers per annum over the RIIO-2 period by connecting them to the gas network, saving them £350 per year on their energy bills. This is a compromise area in our plan. We have set ourselves what we believe is a realistic target based upon the narrowing definition of who can qualify for the scheme.	4.2.3 Help for those who need it most
Stakeholders want us to ensure that, when we deliver a fuel poor gas connection, this results in benefits to those customers in the form of cheaper bills.	We will offer a suite of additional support to households receiving free gas connections during the same visit. We have committed to only claiming the full allowance should the desired customer benefit be achieved.	4.2.3 Help for those who need it most
Stakeholders want to see a continued focus on raising relatively low levels of awareness of carbon monoxide to save lives.	We will continue our important CO safety and awareness programme. This service will be available to all customers and not just those identified as vulnerable. We have promised to deliver 10,000 CO surveys per year.	4.2.3 Help for those who need it most
Stakeholders want to see NGN staff providing advice or referrals on energy efficiency in addition to carbon monoxide awareness when undertaking our normal activities.	Our first-call engineers will make every contact with customers count by delivering bespoke energy efficiency advice and referrals to 5,000 customers per year.	4.2.3 Help for those who need it most
Stakeholders want NGN to deliver support and key messages through effective and trusted collaboration with other partners, taking care to avoid duplication with other utilities or social services.	We will continue to support our unique Community Partnering scheme. Launched in 2015, we initially made £50,000 available for charities to bid for, that would both meet our core strategic objectives and also respond to the needs of the specific charity. We will also train 100 community partners per year in CO, PSR and energy efficiency in order to reach a wider range of customers.	4.2.3 Help for those who need it most
Stakeholders want to see provision of bespoke relevant support that is driven by individual circumstances, such as relief from financial hardship.	We occasionally serve customers who are in desperate need of direct financial help. For these customers, we will set up a hardship fund of £150,000 per year, in partnership with similar schemes. Access to this fund will have a strict set of criteria, to ensure that we are not duplicating any other available funding streams.	4.2.3 Help for those who need it most

You said	So we have	Read more at
Stakeholders want to see us offering bespoke support to vulnerable customers during supply interruptions.	We have enhanced the service offerings that we have available during supply interruption incidents, including a Major Incident Support Framework, and set timescales for the provision of each of these services. We will investigate solutions to reduce the day-to-day impacts.	4.2.3 Help for those who need it most 5.4.8 Innovation to support customers in vulnerable situations
Stakeholders want to see vulnerability training given equal importance to the safety and technical competency training provided to our first-call engineers.	We will create a Customer and Social Competency Framework, to mirror the existing framework for safety and technical competencies. We will develop this in collaboration with National Energy Action and the Institute of Customer Service.	4.2.3 Help for those who need it most
Stakeholders support our staff taking up to 2 days paid leave to volunteer in the community to support a range of relevant causes.	We will continue our policy which enables our staff to take two days' paid leave each year to undertake volunteering activities in the local community. At least 1 day will be dedicated to supporting our social priorities, e.g. carbon monoxide awareness and tackling fuel poverty.	4.2.3 Help for those who need it most
Overall acceptability of our social and vulnerability promises: 89% % of customers saying our promise is acceptable or very acceptable.		

Figure 3.10: Social and vulnerability insights and response

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3.3.4. Maintaining a safe and resilient network

Safety first

We are proud that our record indicates that we are one of the safest networks in the sector. When we shared our overarching strategy for minimising safety risk with our stakeholders, they unanimously said that safety was their highest priority. They also indicated that this is an area with little room for compromise – safety is an absolute – which clearly aligns with our own priorities.

Stakeholders expect safety to be a key driver that underpins our proposals for investment in RIIO-2 and informs our asset intervention strategy. Their advocacy influenced our plans for an enhanced programme of pipe replacement which, in addition to reducing safety risk, will also reduce the risk of a loss of supply or service failings to our customers, decrease the cost of operating or maintaining our network over the long term and reduce the amount of carbon we release into the atmosphere.

An overview of our plan | Giving customers confidence that we will deliver | **Giving customers a stronger voice** | Delivering better outcomes for our customers | A sustainable plan for the future | Delivering value for money | Financing our plan

You said	So we have	Read more at
Attending gas escapes within one hour is the most important safety response and stakeholders want us to set targets for 1 and 2 hour response that are higher than our performance in RIIO-1.	During RIIO-1, we led the industry with an average of 99.8% and over 99.9% of gas escapes attended within the 1- and 2-hour standards respectively. In RIIO-2, we will exceed the minimum standard of 97%.	4.2.2 Gas there when you need it
Stakeholders want to see improved performance on repairing controlled gas leaks (where the flow of gas to the property has been stopped and the smell of gas has disappeared) within 12 hours of an escape being reported.	During RIIO-2, we will continue to improve by repairing more than 64% of controlled gas leaks within 12 hours. We will also reduce leakage from our network and the carbon impact associated with this by improving our performance on 7- and 28-day repairs.	4.2.2 Gas there when you need it
Stakeholders want to see improved performance in restoring supply to customers within 24 hours following an interruption.	We have committed to restoring gas to the emergency control valve on the same day for unplanned interuptions. Where we fail, we will pay £25 after 8 hours, in addition to double the RIIO-1 compensation payment if reconnection is not made within 24 hours.	4.2.2 Gas there when you need it
Customers showed, in principle, support for an accelerated programme of pipe replacement, in order to achieve improved safety and reliability, and reduced environmental impacts.	We will replace 2,144km of Tier 1 iron mains in line with the Health and Safety Executive's expectations, whilst also increasing the volume of work related to steel pipes and larger diameter bands of iron main where there is a clear cost-benefit to do so.	4.3.1 A safe and sound service
We should manage our assets to ensure that they are future-proofed, and make decisions with the longer-term end goal in mind.	We will adopt Ofgem's Network Asset Risk Metric (NARMS) to help justify, evidence and track the investments we make in our network, ensuring that we maximise customer benefit whilst minimising safety risk.	4.3.1 A safe and sound service
National, local and wider stakeholders advocated a proactive approach to educating customers on gas safety.	We have committed to training 100 community partners per year to deliver CO awareness in our region. We will also provide free carbon monoxide detectors to all customers who have a new connection to the gas network.	4.2.3 Help for those that need it most
Category 2 responders would like to see us going above and beyond the minimum standards and being more proactive with resilience planning.	We will take a more active role in Resilience Forums and working groups across our region, thereby improving community contingency planning and response to emergency situations.	3.4 Moving forward, together
Overall acceptability of our safety promises: 92% % of customers saying our promise is acceptable or very acceptable.		

Figure 3.11: Safety insights and response

3.3.5. Delivering an environmentally sustainable network

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Taking a leading role in promoting the environment

Stakeholders have told us that as the provider of an essential service to nearly 2.7 million homes and businesses across the North East, Cumbria and much of Yorkshire, we should take a leading role in developing and implementing the policies, technologies, systems and workforce required to achieve the Government's decarbonisation targets by 2050.

Throughout RIIO-1, we have observed stakeholders showing increasing support for and urgency about protecting the environment. Linked to its materiality stakeholders want to see us proactively reducing gas shrinkage, our biggest direct environmental carbon emission and environmental impact which includes natural gas leaking from our network. Therefore, stakeholders support an optimised mains replacement programme which targets the leakiest metallic pipes within our network and investments in system pressure management and gas conditioning to reduce shrinkage.

We have reflected stakeholders' concerns and preferences in our RIIO-2 outputs and will continue to listen as we deliver the objectives of our strategy via our Environmental Action Plan (EAP), with a key focus on initiatives to 'Reduce our business carbon emissions', 'Protect the Environment' and 'Supporting a move to "net-zero" Carbon Emissions'. In our early engagement with future customers we heard that, despite the EAP being forward thinking, transparent and realistic, there is a desire for quicker action and greater ambition in reducing the impact of our vehicle fleet.

You said	So we have	Read more at
Stakeholders consider that it is imperative that we act against climate change, by reducing both shrinkage and non-shrinkage emissions to reduce carbon emissions.	During RIIO-2 we have committed to: · Reduce gas shrinkage by 23% and gas leakage by 24% through an optimised mains replacement programme; investment in system pressure management; gas conditioning and improved gas escape repair performance; · Reduce our non-shrinkage business carbon footprint by 23%; a science-based target achieved by reducing the impact of our vehicle fleet, on-site renewable energy, reduced material wastage and using our resources responsibly. These commitments will support a net zero carbon future and protect our environment.	4.4.1 Reducing our business carbon emissions 4.4.2 Supporting a "net-zero" Carbon Future
There is a significant appetite amongst stakeholders for us to reduce our vehicle carbon footprint, and go above and beyond by phasing out diesel vehicles sooner.	We have committed to: · 100% of our company cars will be ultra-low emission or hybrid by the end of RIIO-2, with electric vehicle charging infrastructure installed across all of our offices and depots at a cost of approximately £0.9m; · Renewal of our commercial vehicle fleet with newer, more efficient vans that can meet our operational requirements, with at least 25% of our commercial fleet being ultra-low emission by end RIIO-2; · Altogether at least 50% of our total vehicle fleet will be ultra low emission or hybrid by the end of RIIO-2, removing 250 diesel vehicles from our fleet. · Continuing to install remote pressure management on our network to reduce the number of journeys that our engineers make to site. Our investment will reduce our business carbon emissions and improve air quality.	4.4.1 Reducing our business carbon emissions
When gas land is remediated, stakeholders expect us to actively improve habitats for wildlife at NGN's permanent sites.	We will enhance life on hand by creating >200 homes for nature and our land remediation programme. We have also committed to investing, from shareholders' returns, in the planting of 40,000 trees in urban areas which will deliver improved air quality and aesthetic value to the communities that we serve.	4.4.3 Protecting the environment
Stakeholders want us to reduce roadworks caused by our approximately 180,000 excavations per year.	Our whole systems strategy commits us to working closely with other utilities, particularly in the area of joint planning of works. We've also committed to ongoing innovation to reduce the duration of our excavations. These include specialist cameras to target blockages, mains and water extraction and allowing excavations to be carried out in a side street and not in high impact locations.	5.1 Enabling whole systems solutions 5.4.8 Planned outcomes for innovation in RIIO-2
Overall acceptability of our environment promises: 90% % of customers saying our promise is acceptable or very acceptable.		

Figure 3.12: Environment insights and response

3.3.6. Enabling whole systems solutions

Proactively facilitating the energy transition

A diverse range of stakeholders have called for a national conversation about the future of gas and have asserted that the gas networks have a role in promoting the topic through the public agenda, as well as providing an evidence base to inform policy decisions. We heard a strong appetite for greater urgency in creating stepping stones to future decarbonisation targets, by trialling innovative alternative gas options such as hydrogen. However, not all of our stakeholders agreed with

these majority views. Some challenged the assertion that it is our role as a network operator to provide solutions to national policy decision makers, or to risk investment that may not return value to customers. The Core Energy Scenario developed jointly across the energy industry identifies gas as playing a significant role in providing reliable, flexible energy supplies in RIIO-2 and beyond. Stakeholders have shaped our approach to risk and uncertainty by supporting 'low regrets' investments. Our RIIO-2 business plan reflects their appetite for a range of investigative research and development projects to ready the network for changes beyond 2026.

You said	So we have	Read more at
Our stakeholders consider that gas should remain part of the UK energy mix provided it can be decarbonised	Our plans reflect the need for gas as an ongoing energy source and our ambitions for a decarbonised gas sector to meet the UK's net zero emissions targets. We will continue to develop the evidence base required to inform a policy decision on the decarbonisation of heat, through our H21 project and ongoing collaboration with other gas distribution businesses through projects such as HyDeploy.	4.4.2 Supporting a "net-zero" Carbon Future 5.1 Enabling whole systems solutions 5.4.8 Innovation outcomes in RIIO-2
Our investment strategy in RIIO-2 should be 'Business as usual 'plus' investments that prepare the network for a positive future policy decision.	We are continuing to work collaboratively with the government and other gas distribution and transmission businesses to identify remaining research requirements to help inform a policy decision on how to achieve the UK's net zero targets. We have committed to a number of innovation projects in our business plan, but will remain flexible with the work that we look to undertake across RIIO-2, so that we are ready to respond to policy changes. Our whole systems strategy outlines the pragmatic approach we will take to coordinating our approach to reducing and outlines the pathway to meeting the net zero carbon targets.	5.1 Enabling whole systems solutions 5.4.8 Innovation outcomes in RIIO-2 4.4.2 Supporting a "net-zero" Carbon Future
The government cannot make informed decisions without evidence that future gas options are feasible. We should be running live trials of hydrogen, and stakeholders want to see more research conducted to build an evidence base.	During RIIO-2, our next steps will be to move to real-world trials across our portfolio of projects. To achieve this, we will collaborate with Gas Distribution Networks and other utilities to explore the commercial applications of the technology and the most effective delivery models.	5.1 Enabling whole systems solutions 5.4.8 Innovation outcomes in RIIO-2 4.4.2 Supporting a "net-zero" Carbon Future

Figure 3.13: Whole systems insights and response

3.3.7. Driving efficiency through innovation and competition

Stakeholders told us that they believed that we could use innovation to improve our customers' experiences and deliver our services more efficiently. They considered that we should focus on projects which:

- are within our area of expertise;
- are financially viable without reliance on external support;
- better understand and use data to deliver improved customer service;
- improve collaboration with supply chain partners;
- are rapidly deployable;
- tackle challenges specific to NGN, as no one else will be developing these solutions;
- are scalable and have tangible customer benefits.

Stakeholders stated that the benefits of such projects could include: improved safety; reduced customer disruption and complaints; increased security of supply and sustainability; more accurate asset location and specification data; increased reliability; environmental benefits; and de-carbonisation.

Collaboration is key when funding is uncertain

Many of the stakeholders with whom we engaged had extensive experience in the gas industry and praised the impact that the Network Innovation Allowance (NIA) and Network Innovation Competition (NIC) funding has had in incubating innovation throughout the gas and electricity networks and the innovation supply chain. They told us that they want NGN and the other gas networks to be 'easy to work with' in order to get the most from the innovation supply chain, which is important now but will become critical if NIA/NIC funding is reduced or withdrawn.

You said	So we have	Read more at
Stakeholders praised our engineer-led innovation approach and the introduction of a Think Tank to develop and foster a culture of 'value-based' innovation across the network.	In RIIO-2, we will continue to develop our people to empower them to innovate. We will expand on our existing training and streamline our internal processes to further embed our culture of innovation. We will build upon the success of the established NGN Innovation Think Tank by expanding it to include selected third parties, to enable us to obtain robust challenge and external input on our innovation portfolio.	5.4.4 Continuing to develop our NGN culture 5.4.5 NGN deeper collaboration across A wider set of stakeholders
Stakeholders believed that our own business requirements should dictate the focus of our innovation efforts. The innovation portfolio should include a balance of small/short-term projects and large/long-term projects.	We have committed to better monitoring of our innovation portfolio, which must focus on both transformational and incremental innovation. We have an absolute need to deliver solutions that drive efficiencies and improvement today; we must, however, also undertake projects that assist the energy industry in meeting the decarbonisation challenge.	5.4.9 Monitoring benefits from our innovation portfolio
Stakeholders are concerned about the impact of changes to NIA funding and want to see continued commitment to investment in innovation.	We want to reduce the cost of innovation to our customers. To do this, we will reform our innovation funding model. We will increase our investment in innovation, leverage other funding mechanisms and ask our innovation partners for greater financial contributions towards specific projects.	5.4.8 Innovation outcomes in RIIO-2
Stakeholders would like to see deeper enduring collaboration across a broader cross-section of stakeholder groups.	We will set up a new continuous forum for innovation to develop new relationships and allow suppliers to showcase their ideas. We have committed to making our data more accessible to third parties, to better allow suppliers to innovate and further understand our needs.	5.4.5 NGN deeper collaboration across A wider set of stakeholders
Innovation should be used to meet the needs of consumers and network users who find themselves in vulnerable circumstances.	We have committed to developing a research and development programme to mitigate risks introduced to vulnerable customers by our 'everyday operations' and create and deploy solutions that safeguard and support our customers. This activity will build upon the NIA funded Making Every Contact Count (MECC) innovation project to expand the reach beyond traditional Gas Distribution Network (GDN) focus areas.	5.4.8 Innovation outcomes in RIIO-2
We should innovate further on combined heat and cooling to facilitate an energy system that utilises waste energy.	We have committed to collaboration with academia, in particular universities in the North East, to ensure that the essential evidence required to support long term policy decisions in this area is generated. This is a complex area and the need for research is paramount to enable the integration of gas and electricity networks alongside alternative solutions for heating and power to create the pathways towards a whole systems decarbonised future.	5.1.2 Whole energy system strategy
Dedicate resources to developing methods of energy storage to maintain a safe and resilient network.	The GDN already provides significant energy storage capabilities. We will look to work with the wider industry to see how these storage capabilities can be utilised to support the wider energy system.	5.1.2 Whole energy system strategy

Figure 3.14: Innovation and competition insights and response

3.3.8. Giving consumers a stronger voice

Stakeholders who have had contact with us are significantly more likely to say they are familiar with our services, satisfied overall and feel that their bill represents good value for money. However, our extensive engagement programme reached a great mass of stakeholders who had never interacted with us before and we heard that action is required to demonstrate enhanced value for money to customers, with just 52% currently appraising their bill charges positively. In RIIO-2, we will improve value for money perceptions by reducing customers' bills and improving outputs across the board. However, we will concurrently give consumers a stronger voice by educating and engaging them on how they can shape the delivery of our services in a way that meets their preferences and creates value for them, by focussing our activity on engagement that promotes longstanding, trusted relationships.

You said	So we have	Read more at
During RIIO-2, stakeholders want us to continue to offer meaningful, fair and equal opportunities to shape our business decisions.	We have committed to several enduring engagement mechanisms: · A Citizen's Jury meeting three times a year; · Key account management to local place makers, at a frequency that suits them; and · Hot topic workshops tailored to stakeholders' interest and expertise.	3.4 Moving forward, together

Figure 3.15: Future engagement insights and response

3.4. Moving forward, together
– Our approach to stakeholder engagement for 2021–2026

As a gas distribution company, our core purpose is to build and care for networks. Our most valuable networks are those between people – it is these that drive our values, our decisions and the improvement of our services. The world will continue to change for our stakeholders throughout RIIO-2. In turn, our business and the services we provide will need to continue to evolve in anticipation of these changing needs.

3.4.1. Our commitments

Our commitments for RIIO-2 are outlined in figure 3.16, and are discussed further in part 3.4.2

Ofgem Requirement	Key commitments	See part 3.4.2
Strategic and proportionate	· A holistic, tried and tested engagement strategy	Our strategic approach
Inclusive	· Commitment to engage across entire stakeholder community · Hard to reach engagement framework	Engage
Responsive	· Monthly stakeholder satisfaction surveying · Annual engagement plan, co-created with stakeholders	Identify and understand
Ambitious and transparent	· Online Engagement Hub · Annual Stakeholder Report · Annual Stakeholder Conference · Customer Engagement Group independent annual assessment	Measure and improve
Valued outcomes	· Annual Stakeholder Report	Measure and improve
Embedded culture	· Senior management led involvement in all aspects of our strategy	Identify and understand Engage Act and feedback Measure and improve
Best practice and benchmarking	· Co-created engagement planning · Enduring role for our CEG and Citizens' Jury · Key account management · Hot topic workshops · National Customer Engagement Group Chairs' Summit	Identify and understand Engage Measure and improve

Figure 3.16: RIIO-2 Engagement Strategy summary against OFGEM requirements

Together, these commitments represent a £3m investment commitment to stakeholder engagement over the course of RIIO-2. This represents all costs, including a central engagement team (supporting and supported by all colleagues across the business), those associated with our CEG and enduring engagement mechanisms and an ongoing research and events budget. Through our extensive engagement with stakeholders throughout this programme, together with specific testing with our Citizens' Jury and Customer Engagement Group, we are confident that this level of investment supports the scale and quality of engagement our stakeholders expect to see. For more on what we've heard, see Appendix A4 – NGN RIIO-2 Stakeholder Engagement Insights (Insight 5).

Our track record

Enduring and meaningful engagement with our stakeholders throughout RIIO-1 has been a hallmark of our approach and has influenced many of the insights presented within our plan. Our strategy has matured significantly over that period. Our approach has become more sophisticated, as we have moved from informative engagement to truly collaborative discussion.

	<2015	2015	2016	2017	2018	2019
Collaborate			Engaged customer panels	Annual stakeholder event	Customer Engagement Group	Roadshows and key account management
			Community Promises workshops			Citizens' Jury
Involve	Persona research programme	Depot days	Stakeholder Panel		Hot topic workshops	
Consult	Stakeholder Satisfaction Survey		Test-it research	Priorities research	Social media surveying	Willingness to Pay research
				Online presentation consultations		Online engagement portal
Inform	Dedicated web pages	Customer Interface Centre set up				
	'Knock Introduce Communicate Knock again'	Patch flyers				

Figure 3.17: RIIO-1 Engagement Mechanisms

Evolution of our engagement approach has been guided both through continuous feedback from our stakeholder community, together with annual, independent external audit against the AA1000 standard for Stakeholder Engagement. Since 2015, our external audit has repeatedly found a strong foundation of stakeholder engagement embedded across the business:

> *'NGN continues to demonstrate best practice in building a company with the customer and the stakeholder at its centre. The strengths of the company's approach are the commitment of the leadership team, the culture of collaboration and responsiveness, a focus on gathering deep insights into stakeholder needs in order to inform strategy and decision making, and the commitment of financial and human resources to deliver engagement and respond to stakeholder inputs.'*
> *- AA1000SES Audit report, Feb 2019*

An overview of our plan | Giving customers confidence that we will deliver | **Giving customers a stronger voice** | Delivering better outcomes for our customers | A sustainable plan for the future | Delivering value for money | Financing our plan

3.4.2. Our strategic approach

Our engagement strategy has been tried and tested throughout RIIO-1 and is founded upon the AA1000 standard for Stakeholder Engagement. Our overarching objective will continue to be that insight into our stakeholders' values, preferences and ideas consistently and resolutely drives business planning and change. In support of this, we will utilise our engagement framework.

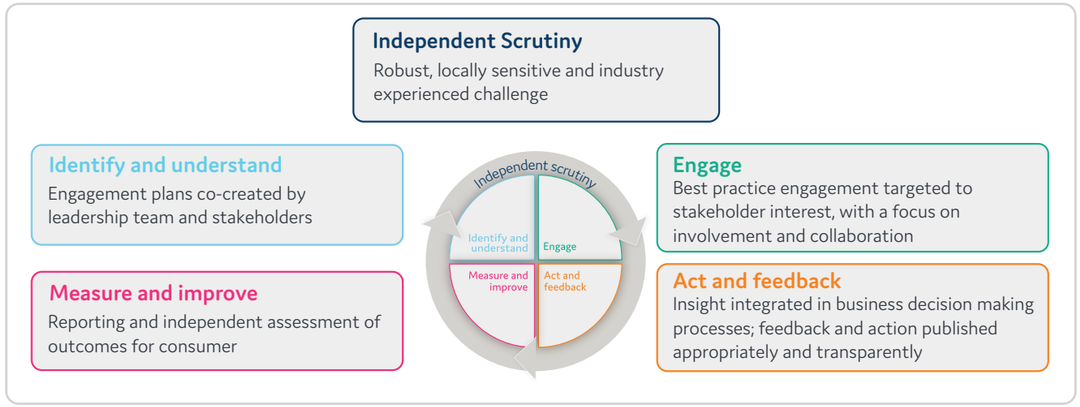


Figure 3.18: Stakeholder Engagement Framework

As well as building on the lessons learnt during RIIO-1, we have conducted a benchmarking review of best practice to inform our proposals for our engagement with our stakeholder community in RIIO-2, (see Appendix A5 – NGN RIIO-2 Stakeholder Engagement Benchmarking). We will continue to carry out such reviews on a regular basis through the regulatory period, ensuring we continually broaden and deepen opportunities for stakeholder-led change. This overarching engagement strategy is complemented by more detailed engagement plans that identify some of the key issues, on a thematic basis, on which we will engage; for example, our Whole Systems Strategy (Appendix A14 – NGN RIIO-2 Our Whole Systems Strategy), which identifies remove core areas for engagement with a wide variety of partners, and our Innovation Strategy (Appendix A18 – NGN RIIO-2 Innovation Strategy), which sets out a range of commitments for bringing stakeholders into our decision-making process.

Enduring independent challenge: the Customer Engagement Group (CEG)

Our independent CEG has played a fundamental role in the development of our business plan, bringing new perspectives and providing robust, constructive challenge to our decision-making. During RIIO-2, we will create an enduring role for the CEG as a central part of our decision-making governance, whose role will be to challenge us on our performance against the promises set out in our plan and our responsiveness to changing consumer needs.

The establishment of the CEG as an enduring body represents a step change from our approach in RIIO-1 that will, ultimately, drive better outcomes for our stakeholder community. Its enduring role will provide value ...

... for our stakeholder community with

- greater relevance: recommendations that are sensitive to local needs, from stakeholders vested in our region
- enhanced influence over business decisions, with CEG feedback built into our decision-making framework (see, Act and Feedback)
- greater transparency, with the publication of the CEG's annual independent review and opportunity for stakeholders to meet with and discuss progress at the Annual Stakeholder Conference (see 'Measure and Improve')

... for our business with

- stronger challenge, in turn, helping us to deliver our ambition to be a pioneering business; the CEG's review will replace our external audit, providing more rigorous challenge from a group who have built significant knowledge of the industry
- real-time feedback and challenge, allowing us to adapt and respond quickly

- clearer, smarter processes underpinning our business decisions.

Trusted relationships, between our community, the CEG and the business, for the CEG is to act as an effective critical friend and advocate for our stakeholders and customers.

To develop trust between our community and the CEG we will:

- Create opportunities for members of our CEG to join engagement events.
- Bring our stakeholders together with the CEG to discuss our annual performance, through our **Annual Stakeholder Conference**.
- Provide an independent website for the CEG to communicate its own on going work and observations.

To develop trust between the CEG and the business we will:

- Provide access to levels of the business through site visits, regular access to both strategic and operational management, and timely provision of information.
- Assign a member of our **Senior Management Team** and secretariat to act as liaison between the CEG and the business
- Provide the CEG with resources to undertake independent analysis.

Identify and understand

Our engagement planning for the RIIO-2 Engagement Plan ensured that we engaged on the issues that were material to our stakeholders.

Each year, our senior management team will develop an **Engagement Plan** identifying the issues we will engage on, with whom and how. Our plans will be based on the insight we have gained from our engagement in the previous year and look ahead to the emerging business challenge or decisions that will affect our stakeholder community.

Our draft engagement plan will be launched at our **Annual Stakeholder Conference**, allowing our stakeholders to shape the way we work with them over the next year. Throughout the year, we will ensure that we remain responsive to stakeholders' emerging issues, through our monthly **Stakeholder Satisfaction Survey**.

Engage

An inclusive approach: engaging with the right people

During RIIO-2, we will continue to engage with each level of our stakeholder community, including:

- National Policy Place Shapers: stakeholders who have a broader geographical reach than our operations and who wish to influence the industry as a whole;
- Local Place Makers: stakeholders who develop the local place and communities, either by providing services or through policy and strategy activities;
- Customers: including domestic, commercial, vulnerable and future customers as well as our shippers and suppliers;
- Workforce and wider supply chain: our colleagues, our direct service providers and the range of businesses that make up our supply chain.

Engaging hard to reach groups
To make the right decisions for our stakeholders, we need to ensure that everyone is heard. We consider customers 'hard to reach' who, for whatever reason, experience isolation and whose voice is less likely to be heard without us going the extra mile. Our **Hard to Reach Engagement Framework**, opposite, addresses the key drivers of engagement isolation and our commitments to help overcome them.

An overview of our plan | Giving customers confidence that we will deliver | **Giving customers a stronger voice** | Delivering better outcomes for our customers | A sustainable plan for the future | Delivering value for money | Financing our plan

Drivers	Our commitment
Technology	We will always offer alternatives to online engagement for customers, such as 1 to 1 at home or telephone interviews.
Language	We will always provide translation services for our engagement.
Health	In line with our vulnerability strategy, we will collaborate with partner organisations to identify and engage with customers whose health acts as a barrier to engagement.
Lack of information	We will proactively use all our contact points with customers, from social media, our relationships with community groups and our front-line engagement, to educate customers about the business and raise awareness of opportunities to engage.
Transport	Wherever possible, we will host engagement events at familiar venues within local communities. Where we cannot, we will pay for or arrange transport.
Emotional	Working with trusted intermediaries, we will create engagement routes, such as our Citizens' Jury, that allow for trusted relationships to develop over time, celebrate diversity of views and clearly demonstrate the business's commitment to act in response.

Figure 3.19: Hard to Reach Engagement Framework

Engaging biomethane stakeholders

We recognise that our stakeholders in the biomethane supply chain have a significant role to play in the decarbonisation of our network and that engagement with this group will be a key priority for us during RIIO-2. At the same time, our experience during RIIO-1 has taught us that biomethane stakeholders often have differing engagement needs and that we must be prepared to take a personalised approach. We will use the core mechanisms outlined in Quality Engagement (key account management, hot topic workshops) to engage with this group. In addition, we have had significant interest in our series of Biomethane Open Days during the autumn of 2019 and will continue to run these sessions at key points over the RIIO-2 period. Read more on page 85

Quality engagement

During RIIO-2, we will continue to tailor our engagement approach according to the preferences of our stakeholders, and to ensure that we offer meaningful, fair and equal opportunities to shape our business decisions. In particular, we commit to a number of enduring engagement mechanisms that will ensure the continuity of our approach from year to year.

NGN Citizens' Jury CVP
In 2019, we became the first energy distribution company to establish a Citizens' Jury – a 50-strong, demographically representative group of customers who deliberated on key decisions on our business plan. Our Citizens' Jury sessions gave us a deeper understanding of our customers than ever before. In particular, it has created the space to engage meaningfully on issues that could otherwise be considered 'too complex'. Moreover, we have seen first-hand how much this quality engagement has meant to members of our community, with 90% wishing to continue to participate in this way.

During RIIO2, we will create an enduring role for our Citizens' Jury. Meeting three times a year, the group will be tasked to deliberate on the difficult and important challenges the business has to face.

Key account management
We know that for many of our key stakeholders, nothing beats a named contact and regular, face-to-face contact. In our engagement preferences research, 55% of our stakeholders told us they most valued face-to-face meetings. And during our bilaterals and roadshows, many of our stakeholders, particularly local authorities, tell us they want regular meetings with us ranging from quarterly to annually. We will offer key account management to local stakeholders, at a frequency that suits them; and, where they prefer, we will take an active role in existing partnership arrangements they have in place, such as resilience forums, local enterprise partnerships and topical committees. Through mechanisms such as these, we will play an active role in supporting key initiatives such as local energy action plans.

Hot topic workshops
We recognise that our communities of interest want to focus on those areas that are most material to them, rather than engage on a broad agenda. Following feedback from our stakeholders, in 2018 we dissolved our Stakeholder Panel and instead launched a programme of thematic workshops allowing attendees to give us a deep insight into their areas of expertise. Throughout RIIO-2, we will further develop this programme, responding directly to our stakeholders' priorities.

Act and feedback

For insight to drive change, it is critical to embed customer insight into our decision-making processes. During RIIO-1, we have established effective mechanisms for integrated decision-making, including regular reviews by the **NGN Leadership Team** and our long running Stakeholder Engagement Management Group, tasked with making and driving decisions across the business.

In RIIO-2, we will build on this foundation by:

- undertaking an annual review of our business plan, driven by stakeholder feedback;
- opening up Leadership Team meetings to the CEG at key points in the year.

We will continue to feedback both what we have heard and what we have done, on a real-time basis, to our stakeholder community through our Online Engagement Hub, publishing the outcomes of our engagement as it happens.

Measure and improve

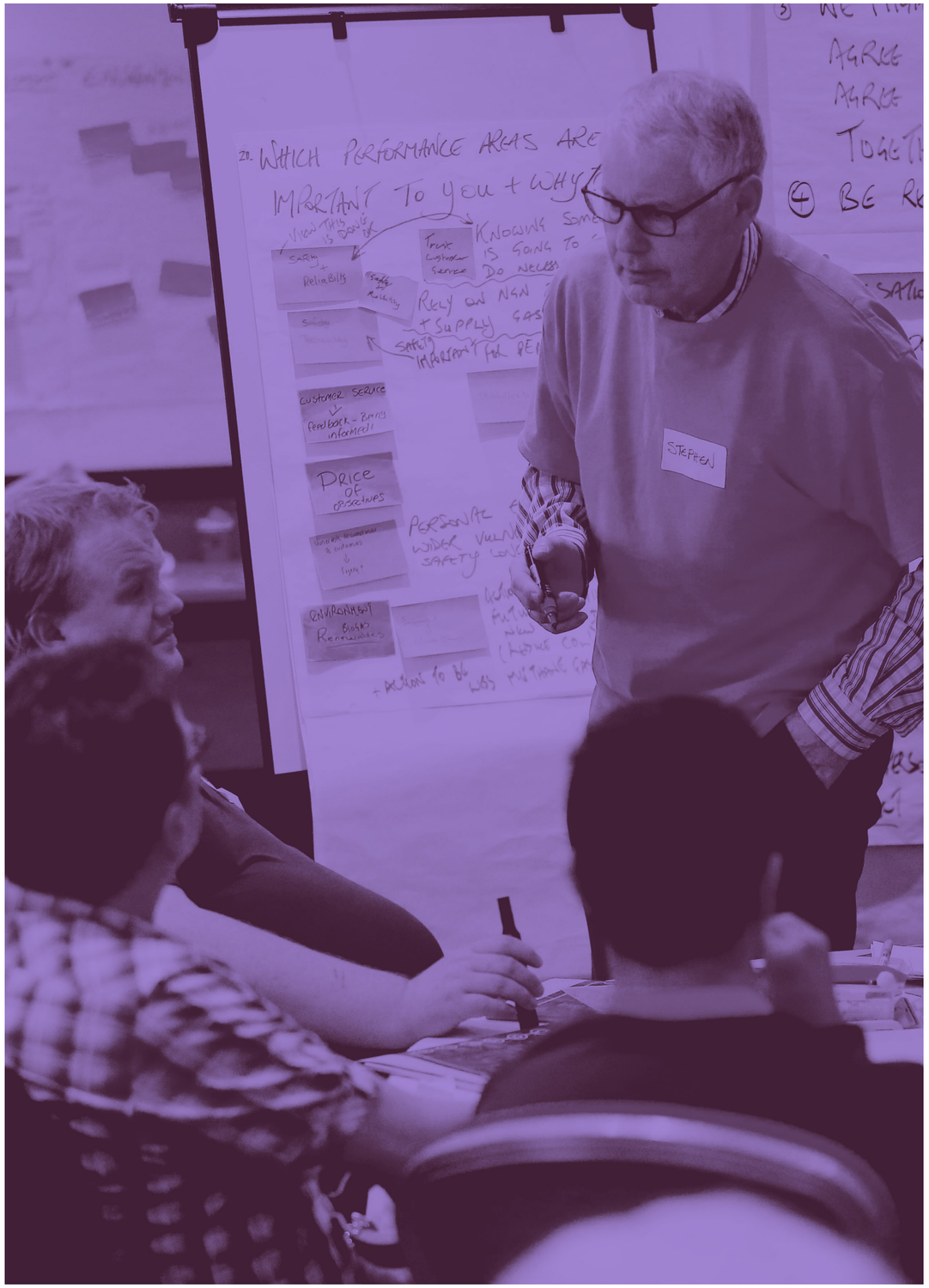
During RIIO-2, we will undertake enhanced reporting to deliver the greatest levels of transparency for our stakeholder community. Building on the processes we have developed for our business plan, we will continue to commit to dual reporting, publishing both our own report into our performance and that of our independent CEG. The table below outlines the scope of our dual reporting:

NGN Annual Report	CEG Independent Assessment
· Performance against key commitments in the plan · How we have engaged with stakeholders throughout the year · What we have learnt about the needs of customers · How we have responded · The financial, economic, social and environmental outcomes of the changes we have made, and · Key metrics of customers' and wider stakeholders' satisfaction.	· Performance against key commitments in the plan · The quality and inclusiveness of our engagement · How effectively we embedded engagement into our business decisions and culture, and · Our performance in delivering strategic and operational changes in response to, and in partnership with, our stakeholders.

Figure 3.20: Engagement Reporting Framework

As part of the CEG's assessment, it will be important to have oversight of the activities of other networks, by which to effectively benchmark. To support this, we propose the establishment of an annual **CEG Chair's Best Practice Summit**, hosted in cycles by each energy distribution and transmission network.

Annual Stakeholder Conference
It is important that our stakeholders can both scrutinise the business and understand why and how the CEG has come to its conclusions. So, each year our Annual Report and Independent Assessment will be launched at our **Annual Stakeholder Conference**, hosted by our **Leadership Team**, providing further opportunity for challenge and feedback, and to shape our activities for the coming year.



PART 4: DELIVERING BETTER OUTCOMES FOR CUSTOMERS

IN THIS SECTION

In this section, we set out all the outputs that will enable us to meet stakeholder and customer expectations.

There are a total of 64 outputs. Collectively, they comprise an ambitious and imaginative programme of service improvement.

4.1. Our RIIO-2 outputs: highlights

Our RIIO-2 business plan contains a total of 64 outputs, all with associated performance targets.

These outputs cover three core themes:

- Meeting the needs of customers and network users.
- Maintaining a safe and resilient network.
- Delivering an environmentally sustainable network.

All 64 outputs have been influenced by our extensive stakeholder and customer engagement programme, which is described in Part 3.

26 of these outputs go beyond our licence obligations. They are ambitious, bespoke outputs, and are aimed at improving service delivery and setting new benchmarks for our industry, at no additional cost to our customers.

Through these outputs, we will deliver c.£90 million of additional value to our customers over the next five years.

Several bespoke outputs are focused on improving customer convenience and removing commonly-cited frustrations. For example, we will reduce reinstatement times from five working days to three calendar days, so that excavations are filled in more quickly. We will also commit to restoring gas supplies to customers appliances (not just their gas meter) within set timeframes.

Where we fail to meet guaranteed industry levels of service, we will pay customers double the GD1 amount of statutory compensation – reflecting our determination to treat our customers fairly at all times.

10 outputs are specifically focused on improving services for vulnerable customers , in line with our strong social ethos. For example, we will introduce a new £150,000 per annum hardship fund, paid for through a direct contribution from our owners, and launch a 24 hour hotline for customers on the Priority Services Register.

We will reduce our business carbon footprint by 47% by the end of RIIO-2. From reducing vehicle emissions to planting 40,000 trees, we will implement a far-reaching environmental programme, with the aim of having net-zero business carbon emissions by 2031.

Crucially, our full suite of outputs will be delivered at no additional cost to the customer. Bills will fall by 8.6%, compared to RIIO-1 levels.

64
Individual outputs covering all aspects of business

26
bespoke outputs reflecting customer priorities

Enhanced £ payments for all GSOP failures

Dedicated vulnerability strategy with measurable outputs
helping those who need it most

£150,000 pa
Hardship Fund to help individual customers in most need

Faster supply restoration following interruptions

Exceeding minimum standard for emergency response to gas escapes

Faster, cheaper, more efficient connections process

47%
reduction in BCF Scope 1 & 2 by 2026

Net-zero Business Carbon Emissions by 2031 (scope 1 & 2)

Pathway to net-zero gas network by 2050

£0 Incremental cost to deliver enhanced service offering

Customer Value Proposition of c£90m additional benefit delivered in RIIO-2

4.1.1. Our RIIO-2 customer outputs

Throughout this section, we have placed each output into one of four categories, in accordance with Ofgem definitions. These categories range from meeting minimum standards of our licence obligation to bespoke outputs which go beyond regulatory requirements to enhance the customer experience.

We have also highlighted where an output is common for all Gas Distribution Networks (GDNs) or is a bespoke NGN commitment, whether the associated incentive is financial or reputational, and where innovation has allowed us to set stretching performance targets.

Licence Obligations (LO) Minimum standards. Breaching a minimum standard results in regulatory enforcement action and financial penalties.

Price Control Deliverables (PCDs) Inputs, outputs or deliverables which we need to deliver on time, or it will result in financial penalties.

Output Delivery Incentives (ODIs) Where we are required to improve quality above the minimum standard to improve the customers' experience. These will have incentives/penalties to encourage our delivery of the required improvements. These incentives and penalties can be reputational or financial.

NGN Bespoke Outputs We have proposed bespoke outputs where we consider we can enhance our performance and deliver greater value to customers. These outputs have been informed by our customer research. In Appendix A-5, we provide an assessment of each bespoke output and how we consider these proposals meet Ofgem's business plan guidance. A summary is provided in this section to highlight the bespoke outputs, RIIO-2 targets, value delivered and the stakeholder evidence that supports our outputs. For each output we have explicitly referenced the specific stakeholder insight that supports each output. Further information on stakeholder insights is included as Appendix A-3.

4.1.2. Delivering our outputs in RIIO-2

We have developed an ambitious and comprehensive suite of outputs that we will deliver in RIIO-2. Outputs have been supported by our customers and reflect the services that our current and future customers require. In this section we outline each of our outputs and the supporting evidence we have gained from customers, in addition to a summary of the resource, activity and customer benefit that we will deliver.

We have set stretching targets in RIIO-2 to exceed customer expectations and minimum regulatory requirements. Our ambition is reflected both in the targets that we have set, the additional compensation we propose for customers in the event that we do not deliver on our outputs and importantly our commitment that our enhanced suite of outputs will be delivered at no extra cost to customers.

In order to deliver our ambitious service improvements without adversely impacting bills, we will continue to capitalise on the investment and service improvements we have introduced in RIIO-1. These improvements include:

- A new online portal, work scheduling tool and work execution application, developed as part of our Future Ways of Working (FWoW) programme which will allow seamless data transfer between delivery teams.
- A cross-flex team of colleagues who can both lay services (connection to the Emergency Control Valve (ECV)) and carry out purge and relight jobs (connection to the appliance). In RIIO-1, our workforce planning strategy saw the creation of these multi-skilled teams, which avoids the need for two separate teams to visit the customer and speeds up gas restoration.
- Operation of a revised extreme weather resilience plan which replaced our winter resilience plan, in recognition of the fact that weather patterns are changing and that flooding and water ingress can occur at any time.
- Increased use of the wider NGN workforce to support front line colleagues during busy times on the network – reducing our reliance on expensive third-party contractors, who can be difficult to mobilise at short notice. We will continue to train our wider workforce in RIIO-2, so that we have this flexibility.
- Modern terms and conditions for existing and new employees, ensuring that we have our standard workforce available on flexible shift patterns between 7am and 10pm seven days a week, making resources available when we need them most.

4.2. Meeting the needs of customers and network users

4.2.1. A truly great customer experience for everyone

To deliver a truly great customer experience, we need to listen to our customers and act on their feedback. Customers recognise our strong customer satisfaction and complaints handling performance throughout RIIO-1 and want to ensure that existing levels of performance are maintained in RIIO-2.

We have undertaken a cost and benefits assessment of the customer service outputs that we will deliver in RIIO-2. To deliver our service outputs we will invest c£197m and deliver monetised benefit of c.£125m in RIIO-2 and £518m over the 15 year assessment period, further details are included in tables 4.1 to 4.7 and Appendix A6.

A new, non-regulated customer survey

We carry out Customer Satisfaction Surveys (CSS) on three of our core activities – Emergency and Repair, Planned work, and Connections. The results of these surveys feed into a financial incentive, aiming to drive improvements in performance. Our RIIO-2 outputs for customer satisfaction are outlined in Table 4.1. Our customer engagement activities identified that customers recognise our strong customer service throughout RIIO-1 and want to ensure that existing levels of performance are at least maintained in RIIO-2. This is reflected in customer insight 18 in our customer insight appendix. Understanding the satisfaction levels of both regulated and non-regulated customers will provide information to continually improve our service.

	RIIO customer satisfaction outputs						
No	**Output**	**Type**	**Ofgem target**	**NGN target**	**Resources and expenditure**	**Customer benefit**	**Stakeholder evidence**
	Ofgem common outputs						
C1	CSS (regulated)	ODI (F)	Customer scores emergency & repair planned works connections	Customer scores emergency & repair planned works connections	· No incremental increase in Totex. · Expenditure covered in emergency and repair, connections and Repex costs but not separately identifiable · No increase in resource levels or activity to deliver this output	Drive improvements in performance to meet expectations of customers	· Customer and Reinstatement Pioneer Survey 2019 • **Customer insight 18 in customer insight appendix**
C2	GSOP 12 - timely payment of GSOP customer payments	LO (F)	10 working days	10 working days £40 payment			• **Customer Insight 18 in customer insight appendix**
	NGN bespoke output						
C3	CSS (non-regulated)	ODI (R)	N/A	· Stakeholder: · Gas producer · Large loads and UIPs · Developers · Shippers & supplier · Vulnerable · Land owners · Paid for disconnections · Live-dead checks	· No incremental increase in Totex · Expenditure covered in emergency and repair, connections and Repex costs but not separately identifiable · No increase in resource levels or activity to deliver this output	Feedback from our customers that aren't captured within our regulated surveys. To drive improvements in performance	· Customer and Reinstatement Pioneer Survey 2019 • **Customer Insight 18 in Customer Insight Appendix**

Table 4.1: RIIO-2 customer satisfaction outputs

In RIIO-2, we will implement our own, non-regulated customer satisfaction survey, to supplement the regulated survey, and provide additional insights to guide service improvement. The results of this survey will form part of our annual, regulatory reporting, and provide learning for the whole industry, as we will report and share our findings annually, highlighting areas where we have improved because of this bespoke output.

Implementing an enhanced complaints metric

Our complaints performance is currently assessed by Ofgem using a metric covering four key complaints targets. We are penalised if we fall below a set standard.

During RIIO-1, we set ourselves stretching internal targets, by measuring our complaints performance in calendar days rather than working days and agreeing a resolution to a complaint in 60 minutes. These measures saw us outperform the minimum standard set by Ofgem and the industry average. We now regularly agree resolutions to 80% of complaints within the hour. Our customers have told us that we should strive for continuous improvement on complaints by setting targets based on calendar days and working towards an agreed solution within 60 minutes. We have reflected this feedback in our RIIO-2 complaints output.

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RIIO complaints metric outputs							
No	**Output**	**Type**	**Ofgem target**	**NGN target**	**Resource and expenditure**	**Customer benefit**	**Stakeholder evidence**
Ofgem common outputs							
C4	Complaints metric CVP	ODI (F) (enhanced)	· % of complaints unresolved after one calendar day · % of complaints unresolved after 31 calendar days · % of repeat complaints · No of Energy Ombudsman against NGN as % of total complaints received	· % of complaints unresolved after one calendar day · % complaints unresolved after 31 calendar days · % repeat complaints · No of Energy Ombudsman against NGN as % of total complaints received · % of complaints resolution agreed within 60 minutes	· No incremental increase in Totex · Costs are not separately identifiable · No increase in resource levels or activity to deliver these outputs	· Increased customer satisfaction · Customer time saving · Monetised benefit of £6m in RIIO-2 and £24m over 15 years from 2021/22	· Willingness to Pay (WTP) Research · Citizens' Jury · Future Customers Priorities Research · Unplanned interruptions · Pioneer Survey 2019 • **Customer insight 19 in customer insight appendix**
C5	GSOP 14 - timely response to customer complaints	LO	% working days; 10 working days if site visit required.	meet Ofgem Target - enhanced £40 payment on failure.			

Table 4.2: RIIO-2 complaints metric output

In RIIO-2, we will assess our performance against an enhanced complaints metric, measured in calendar days, and include the percentage of complaints measured resolved within 60 minutes as a target.

We propose that the weighting applied to the revised complaints metric calculation reflects the proposal in Table 4.3. We will consult further on whether these weightings are appropriate with Ofgem.

RIIO-2 complaints metric	Weighting
% complaints unresolved after one calendar day	10%
% complaints unresolved after 31 calendar days	30%
% of repeat complaints	40%
No. of Energy Ombudsman decisions against NGN as % of total complaints received	10%
% of resolutions agreed within 60 minutes	10%

Table 4.3: RIIO-2 proposed weighting for revised complaints metric

We are also committed to reducing the number of complaints that we receive. On an annual basis, we will report the number of complaints received per 100,000 customers and will target a year-on-year reduction.

Improving Market Service Standards

Market service customers such as gas shippers, gas suppliers and gas transporters contact us with specific, often complex queries relating to industry codes, customer switching, supplier customer issues, capacity management and operational issues at supply points. Resolving these queries can require the involvement of multiple departments and coordination with external parties.

By working in a more integrated way with these customers, and resolving pressure points, we can improve the service we deliver to our end customers.

Our customer engagement has indicated that our market service customers such as gas shippers and independent transporters could be better served through account management and enhanced responsiveness. This feedback is evidenced through insight 19 in our customer insight appendix and has informed the development of a suite of service standards for gas shippers, transporters and suppliers, which set time commitments for each step of the query resolution process.

These standards are specific to each of the three customer types and are similar to enquiry standards elsewhere in the industry. We will work with these customer groups to develop a standard way of capturing queries and providing our responses. Our RIIO-2 market services standards are outlined in Table 4.4.

RIIO-2 market services standards outputs							
No	**Output**	**Type**	**Ofgem target**	**NGN target**	**Resource and expenditure**	**Customer benefit**	**Stakeholder evidence**
	NGN Bespoke Outputs						
C6	Key account service standards for shippers	ODI (R)	N/A	· Acknowledgement of query (other than those which are part of a standard Xoserve interface) – 1 working day · Agreement of a resolution date (following internal assessment) – 1 working day · Completion to agreed resolution date – on agreed date · Industry code services through Xoserve interfaces – as per industry standard	· No incremental increase in Totex · Expenditure covered in audit, regulation and finance costs but not separately identifiable · No increase in resource levels or activity to deliver these outputs	· Faster, more efficient service · Reduced complaints · Increased customer satisfaction	NGN persona research 2016 • **Customer insight 19 in customer insight appendix**
C7	Key account service standards for suppliers	ODI (R)	N/A	· Agreement of a resolution date (following internal assessment) – 1 day · Completion to agreed resolution date – 2 day · Completion to agreed resolution date – on agreed date			
C8	Key account service standards for gas transporters	ODI (R)	N/A	· Agreement of a resolution date (following internal assessment) – 1 day · Completion to agreed resolution date – 2 day · Completion to agreed resolution date – on agreed date			

Table 4.4: RIIO-2 market services standards outputs

4.2.2. Gas there when you need it

An enhanced connections service

Our connections service provides exit connections, service alterations and disconnections for domestic customers, business customers, developers and large load customers such as power stations and industrial customers. We also provide entry connections for producers of natural gas, biomethane, shale and synthetic gas who want to feed their gas into our network.

During RIIO-1, we have consistently outperformed the existing Guaranteed Standards of Performance for all of our exit connections activities, averaging over 99% in most cases - well over the 90% minimum standards. We also established a set of voluntary standards and processes to manage and monitor our performance in supporting entry connections.

We have engaged extensively with stakeholders to develop our connections outputs. The outputs of the engagement are reflected in section 3 and our stakeholder insights appendix. Customers have told us that they want to see improved communication throughout the connections process and a commitment for enhanced outputs on the time taken to deliver a connection. We have reflected this insight in the development of our connections outputs to meet the expectations of our customers.

In RIIO-2, we will spend c.£69m to deliver our connections outputs this will deliver a discounted benefit of £65m in RIIO-2 and £290m over 15 years from 2021/22. We will make the following improvements to our end-to-end connections service:

- An online quotation and job booking service for standard connections and alterations customers;
- Streamlined offline service for jobs that don't meet the criteria for our online service or for customers who simply prefer to be attended by a member of our dedicated Connections Team;
- Quotation delivery standards and a standard for the provision of a start and completion date for disconnections and service alteration jobs;
- A key contact who guides the customer through the delivery process until the job is done;
- A commitment to deliver the job at the time the customer wants with a guarantee to complete the job within 20 days from acceptance for standard domestic customers who want the job done as soon as possible;
- One-week turnaround of initial capacity studies for entry connection customers (e.g. biomethane producers) so that they know quickly if the selected location is suitable for their project; and
- Enhanced compensation payments if we fail to deliver against our bespoke standards, in order to reinforce our commitment to high levels of service.

Where appropriate, we have also included service standards for service alterations and disconnections. For example, the provision of quotations under guaranteed standards 4, 5 and 6 (see table below) will apply to exit connections and alterations and we will introduce quotation standards for disconnections and domestic diversions. Both will be issued within three working days or the customer will receive £20 per working day compensation capped at the lower of £297 or the quotation value.

In addition, the application of guaranteed standards 9 & 10 (see table below) will apply to exit connections and alterations and we will introduce standards for disconnections and domestic diversions. Both will be provided within five working days or the customer will receive £40 per working day compensation capped at the lower of £297 or the quotation value.

Our RIIO-2 connections service outputs are outlined in Table 4.5.

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Connections services							
No	**Output**	**Type**	**Ofgem target**	**NGN target**	**Resource and expenditure**	**Customer benefit**	**Stakeholder evidence**
Ofgem common outputs							
C9	GSOP 4 – Standard connection/alteration quotation – <275kWh	LO	4 working days: £12 per working day late, capped at lowest of £297 or quotation sum	3 working days: £20 per working day late, capped at lowest of £297 or quotation sum	There are no additional costs for the delivery of output targets that are above and beyond the minimum targets set by Ofgem's own targets. All GSOP payments are borne by our shareholders and do not form part of total expenditure. Expenditure of c.£69m (gross) for connections but not separately identifiable for each output.	· Increased customer satisfaction · Increased workforce efficiency · Reduction in complaints · Customer time saved through appointments · Reduced business disruption · Enhanced payment on failure · Monetised benefit of £65m in RIIO-2 and £290m over 15 years from 2021/22	· Citizens' Jury · Customer feedback analysis · Y13Q4M3 report · Customer complaints data • **Customer insight 22 in customer insight appendix**
C10	GSOP 5 – Non-standard connection quotation below 275kWh	LO	11 working days: £12 per working day late, up to quotation sum or £297 whichever is lowest	11 working days: £20 per working day, up to quotation sum or £297 whichever is lowest			
C11	GSOP 6 – Non-standard connection quotation above 275kWh	LO	21 working days: £24 per working day late, up to quotation sum or £595 whichever is lowest	21 working days: £40 per working day late, capped at lowest of £595 or quotation sum			
C12	GSOP 7 – Accuracy of quotations	LO	Accurate quotation issued	Accurate quotation issued			
C13	GSOP 8 – Response to land enquiries	LO	5 working days: £48 per working day late up to £297 (< 275kWh) or £595 (>275kWh)	Within 5 working days: £80 per working day late up to £297 (<275kWh) or £595 (>275kWh)			
C14	GSOP 9 – Provision of start and completion date below 275kWh	LO	17 working days: £24 per working day late, capped at lowest of £297 or quotation sum	10 working days: £40 per working day late, capped at lowest of £297 or quotation sum			
C15	GSOP 10 – Provision of start and completion date above 275kWh	LO	20 working days: £48 per working day late, capped at lowest of £595 or quotation sum	20 working days: £80 per working day late, capped at lowest of £595 or quotation sum			· Citizens' Jury · Customer feedback analysis · Y13Q4M3 Report · Customer complaints data • **Customer insight 22 in customer insight appendix**
C16	GSOP 11 (i) – Completion of work on the agreed date ≤£1k	LO	On agreed date: £24 per working day late	On agreed date: £40 per working day late			
C17	GSOP 11 (ii) – Completion of work on the agreed date ≤£4k	LO	On agreed date: Lesser of £119 per working day late or 2.5% of contract sum	On agreed date: Lesser of £200 per working day late or 2.5% of contract sum			
C18	GSOP 11 (iii) – Completion of work on the agreed date ≤£20k	LO	On agreed date: £119 per working day late	On agreed date: £200 per working day late			
C19	GSOP 11 (iv) – Completion of work on the agreed date ≤£50k	LO	On agreed date: £119 per working day late	On agreed date: £200 per working day late			
C20	GSOP 11 (v) – Completion of work on the agreed date ≤£100k	LO	On agreed date: £178 per working day late	On agreed date: £200 per working day late			

No	Output	Type	Ofgem target	NGN target	Resource and expenditure	Customer benefit	Stakeholder evidence
	NGN bespoke outputs						
C21	Disconnection and diversion quotations	ODI (F)	N/A	3 working days: £40 per working day late, capped at lowest of £297 or quotation sum			· Citizens' Jury · Customer feedback analysis · Y13Q4M3 report · Customer complaints data • **Customer insight 22 in customer insight appendix**
C22	Initial capacity studies for entry	ODI (R)	N/A	<5 days			
C23	Initial capacity studies for large load connections	ODI (R)	N/A	<30 days			
C24	Job completion lead time including re-instatement	ODI (R)	N/A	Offer a date to complete works once payment has been made within 20 working days			

Table 4.5: RIIO-2 connections services outputs

Efficient and effective response for emergencies and repair

In RIIO-1, we have a licence requirement to attend 97% of uncontrolled gas escapes within one hour and 97% of controlled gas escapes in two hours to ensure that our network and our customers are safe.

We have led the industry with our best in class emergency response and repair service, averaging nearly 99.8% and over 99.9% for the one and two hour standards respectively. We have also repaired an average of 63% of leaks within 12 hours.

The mild winter temperatures we have seen so far in RIIO-1 have undoubtedly contributed to our performance as the volume of leaks and the average time taken to repair them can be adversely affected by weather in a similar way to our emergency response service.

Our customer engagement identified that attending gas escapes within the one and two hour standards are the most important safety response and they expect us to exceed the minimum targets set by Ofgem. This is evidenced through customer insight 35 in our customer insight appendix. Insight 43 also indicated stakeholders consider that it is imperative we act against climate change by reducing both shrinkage and non-shrinkage emissions to reduce carbon emissions.

Our RIIO-2 commitments, outlined in the Table 4.6, retain the licence obligations of attending 97% of uncontrolled and controlled gas escapes within one and two hours respectively, as well as setting out a commitment to a speedier completion of outstanding repairs. In response to the feedback that we have received from our stakeholders, these challenging targets will be met through the existing baseline totex allowances for emergency and repair.

RIIO-2 emergency and repair outputs							
No	**Output**	**Type**	**Ofgem target**	**NGN target**	**Resource & expenditure**	**Customer benefit**	**Stakeholder evidence**
Ofgem common outputs							
C25	% of uncontrolled gas escapes attended within 1 hour	LO	97%	>97%	· There is no incremental increase in expenditure · We will spend c£52m to attend gas escapes within 1&2 hours in RIIO-2 · Winter resilience plan and flexible workforce embedded to respond to any fluctuation in activity	· Reduction in safety risk · Reduction in complaints · Improved customer satisfaction · Fulfil licence condition and avoid penalty · Unquantified benefit as current level of service	· Citizens' Jury · Environment pioneer workshop 2019 · Futures and environment pioneer survey 2019 • **Customer insight 35 in customer insight appendix**
C26	% of controlled gas escape attended within 2 hours	LO	97%	>97%			

No	Output	Type	Ofgem target	NGN target	Resource & expenditure	Customer benefit	Stakeholder evidence
	NGN bespoke outputs						
C27	% of repairs completed within 12 hours (CVP)	ODI (R)	N/A	>64%	· There is no incremental increase in expenditure · We will spend c£74m to repair gas escapes faster in RIIO-2. · Totex planning approach and flexible workforce embedded to respond to any fluctuation in activity · This expenditure also covers our response to unplanned interuptions	· Reduction in carbon emissions c53000T carbon savings over RIIO-2 · Avoided cost to customers · Reduction in lost gas · Monetised benefit of £8m over RIIO-2 and £81m over 15 years from 2021/22	· Priorities research 2018 · Safety pioneer survey 2019 • **Customer insight 36 in customer insight appendix**
	Outstanding repairs completed in 7 days (CVP)	ODI (R)	N/A	>89% by end RIIO-2			· Priorities research 2018 · Safety pioneer Survey 2019 • **Customer insight 43 in customer insight appendix**
C29	Outstanding repairs completed in 28 days (CVP)	ODI (R)	N/A	>98% by end RIIO-2			· Citizens' Jury · Environment pioneer workshop 2019 · Futures and environment pioneer survey 2019 • **Customer insight 43 in customer insight appendix**

Table 4.6: RIIO-2 emergency and repair outputs

We have proposed three reputational ODIs to improve our service in RIIO-2. These outputs relate to the completion of outstanding repairs for escapes. Our customer research has indicated that in addition to meeting the response time for gas escapes, we should also focus on repairing these escapes to reduce the carbon impact associated with outstanding repairs, even where they have been classed as safe using the existing risk assessment methodology.

We have proposed challenging repair targets that are tiered throughout RIIO-2, completing 64% of repairs in 12 hours of a gas escape, 89% within seven days and 98% in 28 days by the end of RIIO-2. We will achieve these targets with no additional expenditure above base Totex and consider they reflect the long-term services expected by our customers and are measurable and reportable so that we can track progress.

Minimising customer inconvenience when gas is interrupted

There are two main instances where we might cause an interruption to a customer's gas supply. Planned interruptions can occur for a service alteration or mains diversion, or as a result of our pipe replacement programme (which accounts for over 95% of our planned interruptions). Unplanned interruptions usually occur following a gas escape due to a fault or failure on our network and result in customers losing their gas supply, often with little or no warning. These types of escape are rare, and we see on average 13,600 each year across our 2.7m customers. However, we recognise that any interruption can severely inconvenience our customers. The causes are many and varied and not easily forecastable, many are not within our control e.g. third party damage.

Ofgem has defined common outputs for performance in responding to interruptions, specifically around restoring gas supply to the ECV, reinstatement of a customer's premises and the provision of heating and cooking facilities for priority customers without gas.

We have made specific reference to the customer insights that have informed the development of our outputs for supply interruptions in Table 4.7. This feedback has led to the commitment to deliver the following enhanced outputs in RIIO-2. These are:

- **Advanced notice to customers:** enhanced compensation (double the RIIO-1 regulatory penalty) will be paid if we fail to notify a customer in writing of a planned interruption at least seven days in advance.
- **Restoration of supplies to the ECV following an unplanned interruption:** enhanced compensation will be paid if we fail to restore supply to the ECV within 24 hours of an unplanned interruption. £60 will be automatically paid to domestic customers, and £100 to non-domestic (commercial) customers for every 24 hours they are off gas.
- **A payment of £25:** if we fail to restore service on the same day for unplanned interruptions (within eight hours), a payment of £20 if we fail to restore gas to the ECV and appliance in under 12 hours for a planned interruption.
- **Quicker average restoration times:** we will target an 11-hour average restoration time, over the RIIO-2 period, for unplanned interruptions. This is a stretching new target based on an analysis of our previous performance, and an examination of the influence of external factors, especially severe weather, on restoration times. (See figure 4.2). Failure to meet the 11-hour target will result in a penalty. The details of this penalty are proposed to be based on annual revenue and capped at 0.5%.

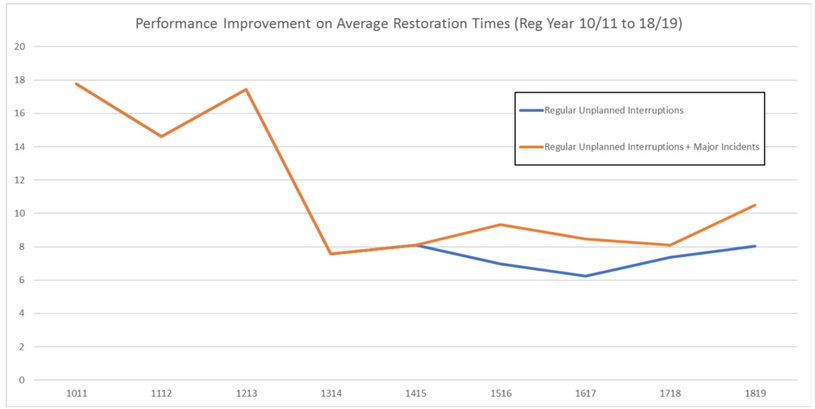


Figure 4.1: Summary of performance of average duration of planned interruption since 2010/11.

- **Restoring supplies to a customer's appliances:** we will commit to restoring gas supply to the customer's appliance within two hours of re-connecting gas to the ECV - provided we have access to the appliance/property to carry out a 'purge and relight'. If the customer is not at home, we will offer a two hour appointment slot for the engineer to attend, plus an engineer tracking option. If we fail, we will pay £20 compensation.
  This output underlines our commitment to getting life back to normal for our customers as quickly as possible, by restoring gas to appliances, not just the ECV. We currently achieve this level of performance 60% of the time but intend to go further in RIIO-2.
  The new standard will be delivered at no extra cost to the customer, as we will be able to offset the extra training costs required against reduced time on site, as well as reduced travel and fuel costs. Any compensation payments are fully funded by our shareholders.
- **Speedier reinstatement:** we will reinstate a customer's premises within three calendar days (excluding bank holidays) ahead of the statutory five working day target. We will pay compensation if we fail to complete the reinstatement within three calendar days. These payments are an enhancement to the minimum payments proposed by Ofgem to reflect our ambition to improve service to customers.

An overview of our plan | Giving customers confidence that we will deliver | Giving customers a stronger voice | **Delivering better outcomes for our customers** | A sustainable plan for the future | Delivering value for money | Financing our plan

RIIO-2 supply interruptions outputs

No	Output	Type	Ofgem target	NGN target	Resource and expenditure	Customer benefit	Stakeholder evidence
Ofgem common outputs							
C30	Unplanned interruptions average restoration time	LO	N/A	<11hrs (over RIIO-2) Penalty - Base revenue % increase dependant on level of failure. Max 0.5% (TBC)	· There is no incremental expenditure associated with delivering our supply interruptions outputs · Expenditure to deliver these outputs is within the same line as Repairs with c.£74m in RIIO-2 for unplanned interruptions and c.£105m for planned interruptions · Totex planning approach and flexible workforce embedded to respond to any fluctuation in activity	· Reduction in complaints · Reduction in business disruption · Customer time saving · Improved workforce efficiency · Improved customer satisfaction · Carbon and air quality improvements associated with workforce efficiency · Enhanced compensation payment. · Additional compensation payment after 8 hours · Improved workforce resilience/skills · £8m monetised benefit in RIIO-2 and £30m over 15 years from 2021/22	WTP research (1st & 2nd phase) Unplanned interruptions pioneer survey 2019 Priorities research 2018 **Customer insights 7 and 37 in customer insight appendix**
C31	GSOP 1 – Supply restoration to ECV – (Enhanced)	LO/ ODI	Within 24 hours: £41 domestic – no cap £69 non-domestic – no cap	Same day - £25 payment after 8hrs Within 24 hours: £60 domestic – no cap £100 Non-domestic – no cap			Unplanned interruptions pioneer survey 2019 Planned interruptions pioneer survey 2019 Customer and reinstatement pioneer survey 2019 GDN GSOP **Customer insight 9 in customer insight appendix**
C32	GSOP 2 – Reinstatement of a customer's premises for both planned and unplanned interruptions CVP	LO/ ODI (F)	Within 5 working days: £69 domestic £138 non-domestic	3 calendar days (excluding bank holidays) £100 domestic – no cap £200 non-domestic – no cap		· Reduced disruption to customers · Reduced complaints · Improved customer satisfaction · Monetised GD2 benefit of £6m informed by customer WTP and c.£16m over 15 years from 2021/22	Customer and reinstatement pioneer survey 2019 Planned interruptions pioneer survey 2019 Citizens' Jury (3rd meeting) Operational data: customer complaints **Customer insight 9 and 14 in customer insight appendix**
C33	GSOP 3 - Alternative heating and cooking facilities for priority. customers	LO (F)	4hrs	4hrs £48 payment		· Enhanced co-operation · Improved social well being · Improved satisfaction · Reduced complaints · Current level of service	**Customer insight 15 in customer insight appendix**
C34	GSOP 13 – Notification in advance of a planned interruption	LO	7 working days: £24 domestic £59 non-domestic	7 working days: £40 domestic £100 non-domestic		· Enhanced compensation payment on failure · Reduced complaints · Improved satisfaction · Current level of service	Pioneer survey 2019 **Customer insight 9 and 12 in customer insight appendix**
C35	Supply restoration to ECV and appliance following planned interruption.	ODI (F)	N/A	<12 hours – £20 Penalty		· Reduction in complaints · Increased workforce efficiency · Cost and time savings through efficient workforce · Improved satisfaction · Improved workforce resilience · Customer time saving · < £1m benefit in RIIO-2 and £1m over 15 years from 2021/22	Pioneer survey WTP **Customer insight 8 in customer insight appendix**

No	Output	Type	Ofgem target	NGN target	Resource and expenditure	Customer benefit	Stakeholder evidence
NGN bespoke outputs							
C36	Supply restoration to appliance – unplanned interruption CVP	ODI (F)	N/A	<2hrs of restoration to ECV or at a time agreed with customers £20 penalty		· Reduction in complaints · Increased workforce efficiency · Cost and time savings through efficient workforce · Improved satisfaction · Improved workforce resilience · Customer time saving · Reduced business disruption · Monetised benefit of £5m in RIIO-2 informed by customer WTP and £13m over 15 years from 2021/22	Pioneer survey WTP **Customer insight 8 in customer insight appendix**
C37	Major Incident Standards	ODI (R)	N/A	8 Individual targets to provide on site support including: customer care officers, support centre, alternative cooking and heating facilities, resilience support, catering on site, Hardship Fund available on site	· c.£2m in RIIO-2 based on RIIO-1	· Reduction in complaints · Improved satisfaction · c£25m benefit in RIIO-2 and £64m over 15 years from 2021/22	Pioneer survey WTP **Customer insight 15 in customer insight appendix**

Table 4.7: RIIO-2 supply interruptions outputs

4.2.3. Help for those who need it most

We have a strong social ethos and are committed to supporting struggling customers and communities wherever we can. During RIIO-1 we have developed and implemented practices that ensure we support the most vulnerable customers, ensuring we assess their individual needs, and put in place support mechanisms during our activities. This work has included helping to establish hubs in rural areas where socially isolated customers can go for warmth and company. We train our customer care colleagues to spot signs of vulnerability and provide appropriate support; work with experts to deliver energy audits and money-saving advice in customers' homes; and have launched a community grants programme for grass-roots schemes which make a difference.

During RIIO-1 we have really stretched ourselves to embed this support within our business as usual activities.

Our dedicated vulnerable customer strategy is reviewed regularly and in February 2019 we received the BSI 18477 Accreditation for Inclusive Service Provision which will be maintained in RIIO-2. Our strategy is included as an appendix to this plan and provides additional detail on our initiatives and delivery strategy for helping those who need it most.

Our strategy has three broad priorities:

- Collaborate with others to deliver more for customers who are hard to reach or seldom heard;
- Make sure colleagues are trained to recognise signs of vulnerability and are competent enough to deliver appropriate training to our partner organisations; and
- Be innovative in how we support our off-grid and fuel-poor customers.

In RIIO-2, we will continue to work with expert partners to deliver a wide range of support to customers in vulnerable circumstances. Stakeholders have reaffirmed our belief that we have an important and practical role to play in supporting the wider social agenda. However, stakeholders have given conflicting views about the extent to which we should deliver support beyond our core obligations. We have worked hard to develop outputs that respect these divergent views, whilst making sure that we can provide essential support to those in most need.

It is a guiding principle of the outputs detailed below that we are striving for ambition, and willing to take risk, both financial and reputational, in the delivery of these outputs. Our customers and stakeholders expect us to really stretch ourselves in this area, and we are fully committing to deliver much more in RIIO-2 as business as usual, as well as setting ourselves stretching outputs beyond business as usual activities. Importantly, we will not be using the 'use it or lose it' allowance to achieve any of the outputs detailed below. We see this fund as enabling us to scale up and grow project and research ideas that have already been tested either through the Community Partnering Fund (as a local level) or through the NIA for vulnerability.

Stakeholder input has been central to the development of all our commitments. We have heard and counterbalanced different views, and pledged to invest our resources wisely, to ensure that outputs derive the greatest possible social benefit. Our commitments for RIIO-2 have been set within our 'AAA' framework – Awareness, Accessibility, Action, which is described in more detail in our strategy document.

In RIIO-2 we will invest c.£3.5m to deliver our vulnerability initiatives. This will deliver a benefit of £39m in RIIO-2 and £142m over 15 years from 2021/22.

Facilitating fuel poor connections

We will continue to commit to stretching targets to help tackle fuel poverty by assisting off-grid, fuel-poor customers to connect to the gas network. Our commitments for RIIO-2 are outlined in Table 4.8.

We will target 1,000 customers per annum over the RIIO-2 period. For those completed as part of community schemes, we will undertake an assessment to understand how much more energy efficient these homes are once connected to gas. We will use the SAP[1] rating as the base for this assessment, and propose that we should demonstrate a three point or greater improvement to the SAP rating. If we are unable to reach this SAP rating improvement, we will make a self-imposed penalty payment based on the average savings delivered by reaching a three point SAP improvement, compared to the savings delivered when this isn't reached. Calculations to support this approach are provided in the vulnerability appendix. The penalty payment will either be made directly to fund further energy efficiency improvements or to supplement the existing Hardship Fund. The approach will make sure that we deliver maximum benefits to customers receiving a connection under FPNES.

In 2019 we commissioned external research to map social indicators across our network. This information will help us target those areas of our network that have the highest rates of fuel poverty, and highest incidents of cold-related illness and mortality. We will also continue to work with fuel-poor partners to maximise opportunities available.

RIIO-2 fuel poor connections outputs							
No	**Output**	**Type**	**Ofgem target**	**NGN target**	**Resource and expenditure**	**Customer benefit**	**Stakeholder evidence**
Ofgem common outputs							
C38	Fuel-poor connections CVP	PCD/ODI (F)	N/A	1,000 fuel-poor connections per year (SAP assessment of community schemes) as a minimum, with a stretch target of 2,000	· No incremental increase in expenditure · c£2m per annum to deliver obligations · No additional resource beyond RIIO-1	· Improved health · Safer heating systems · Cleaner source of fuel · Energy bills savings · Monetised benefit of £22m over RIIO-2 and £84m over 15 years from 2021/22	WTP research Social pioneer survey 2019 Citizens' Jury **Customer insight 27 and 28 in customer insight appendix**

Table 4.8: RIIO-2 fuel-poor connections outputs

Improving vulnerable customer support

We recognise that for RIIO-2 there will be a minimum set of performance standards that will provide the foundation for how we look after our customers in most need. These are:

- Licence Condition 'o' – currently in development, but likely to mirror the existing supplier licence condition.
- Licence Condition 17/Special Condition D13 – GDNs have a specific obligation to promote the PSR and refer eligible customers through to their respective DNO PSR registration process.

1 The Standard Assessment Procedure (SAP) is the methodology used by the Government to assess and compare the energy and environmental performance of dwellings. Its purpose is to provide accurate and reliable assessments of dwelling energy performances that are needed to underpin energy and environmental policy initiatives

- Guaranteed Standards of Performance – currently under review, but likely to lead to change to existing GSOPs based on collaborative research conducted by the GDNs.
- Annual showcase event – to share best practice and report on key performance areas.

We are fully supportive of the introduction of these minimum standards and will use the BSI 18477 standard to demonstrate compliance with the relevant licence condition.

Going further than the minimum standards, formalising key achievements from RIIO-1 into business as usual, and setting ambitious bespoke targets that go beyond our business as usual activities, the following set of outputs reflect stakeholder needs and feedback. Our commitments for RIIO-2 outputs related to vulnerable customers are outlined in Table 4.9.

RIIO-2 vulnerable customer outputs							
No	**Output**	**Type**	**Ofgem target**	**NGN target**	**Resource and expenditure**	**Customer benefit**	**Stakeholder evidence**
C39	Annual showcase event and publication of annual report	ODI (R)	· Report annually on common vulnerability metrics · Host annual showcase even	Meet criteria	· c.£10k per annum	Report on performance, share best practice, and engage with stakeholders on strategic direction.	Social pioneer survey 2019 Citizens' Jury **Customer insights 16, 17, 23, 24, 25, 26, 29, 30, 31, and 38 in customer insight appendix**
C40	Priority Services Register (PSR) promotion/ registrations	LO	N/A	5,000 registrations per year	£22,500pa to deliver 5,000 registrations per year	· Customer awareness · Improved well being and support · Improved satisfaction	
C41	Carbon monoxide (CO) awareness sessions and provision of free CO alarms to all new connections customers.	LO/ PCD/ ODI (R)	N/A	10,000 per year	£45,000pa to deliver 10,000 awareness sessions per year	· Improved safety awareness · Reduced risk of fatality and hospitalisation	
C42	Energy efficiency advice CVP	PCD/ ODI (R)	N/A	1,000 visits/ referrals per year	£34,000pa to deliver 1,000 visits/ referrals per year	· Reduced energy cost · Improved well being · Carbon savings · £2m delivered in RIIO-2 and £6m over 15 years from 2021/22	
C43	Hardship Fund CVP	ODI (R)	N/A	Meet criteria	£150,000pa	· Energy bill savings · Improved safety and efficiency for customers from newer appliances · Reduced fuel poverty · Improved customer wellbeing · Monestised benefit of £14m in RIIO-2 and £49m over 15 years from 2021/22	
C44	Community Partnering Fund CVP	ODI (R)	N/A	Meet criteria	£50,000pa	· Local economic multiplier · < £1m benefit in RIIO-2 and £1m over 15 years from 2021/22	
C45	Social and Customer Competency Framework	ODI (R)	N/A	Meet criteria	£140,000 over RIIO-2	· Negligable benefit in RIIO-2, c£15m over 15 years from 2021/22 once staff are fully trained	Social pioneer survey 2019 Citizens' Jury **Customer insights 16, 17, 23, 24, 25, 26, 29, 30, 31, and 38 in customer insight appendix**
C46	Dedicated 24/7 PSR/ extra support hotline	ODI (R)	N/A	Meet criteria	£70k over RIIO-2		
C47	100 community partners trained each year to deliver support with carbon monoxide safety; priority services registrations/ awareness; energy efficiency advice/referrals	ODI (R)	N/A	Meet criteria	£8,650pa		

Table 4.9: RIIO-2 vulnerable customer outputs

PSR Referrals: Under Standard Condition 17/Standard Special Condition D13 of the Gas Transporters Licence, GDNs have specific obligations to promote the PSR and refer eligible customers through to their respective DNO PSR registration process. We will continue to comply with this licence condition. Since the introduction of Special Condition D13, we have been referring 3,000-4,000 customers per year through our day-to-day activities. We have set a stretching target of 5,000 referrals per year.

Carbon monoxide awareness: We will deliver 10,000 carbon monoxide awareness sessions to our customers. This is building on the capability that we have embedded into our business as usual activities. We currently deliver 7-8,000 awareness sessions per year through our day-to-day activities – we have set a stretching target compared to our current performance. Effectiveness will be measured through metrics relating to increased in awareness, and also behaviour change.

Energy efficiency advice: We have set an ambitious target for providing energy efficiency advice to 1,000 customers through our day-to-day activities. Training will be included as a key part of the Customer and Social Competency Framework (see below), and effectiveness assessed through practice, support provided and successful referrals made to our partner organisations.

Hardship Fund: We occasionally serve customers who are in desperate of need of direct financial help and have been unable to identify help through existing funding routes. For these customers, we will be setting up a Hardship Fund of £150,000 per annum. Access to this fund will have a strict set of criteria, to ensure that we are not duplicating any other available funding streams. A full description of how this fund will be administered can be found in the Vulnerability Strategy.

Community Partnering Fund: We are committed to continuing support for our Community Partnering Fund. Launched in 2015 as the Community Promises Fund, we initially made £50,000 available for charities to bid for, that would meet our core strategic objectives (e.g promotion of the PSR; raising awareness of carbon monoxide and promoting energy efficiency) and respond to the needs of the specific charity. In 2018 we joined forces with Northern Powergrid. Together we make £100,000 available on an annual basis and administer this fund in two waves throughout the year. This has received strong customer and stakeholder support, and in RIIO-2 we are looking to expand this partnership approach even further by inviting both Yorkshire Water and Northumbrian Water to join.

Customer and Social Competency Framework: To demonstrate our commitment to providing comprehensive training to all our colleagues, we are building a Customer and Social Competency Framework. This will mirror the Safety and Technical Competency Framework that supports our existing operational training. It is being built in partnership with the Institute for Customer Service and National Energy Action. Effectiveness will be measured through key metrics, including:

- Number of PSR referrals
- Number of CO awareness sessions, and associated impact
- Number of energy efficiency referrals and associated outcomes

A full description of how the customer and social competency framework will work can be found in the vulnerability strategy.

Dedicated PSR telephone hotline: In 2014 we established a 24/7 approach to all customer contact handling, ensuring customers will receive a response, regardless of the time they contact us, or the channel they use. For RIIO-2 we are looking to enhance this service further by offering a dedicated hotline for any customer registered on the PSR, or who might identify themselves as needing additional support. This is in direct response to feedback received through our customer persona research and demonstrates our on-going commitment to deliver a bespoke service to all our customers.

Training partner organisations: We are committed to increase our reach and impact through trusted partner organisations. NGN will deliver training to a minimum of 100 community partners per year, in line with the standards and criteria set within our Customer and Social Competency Framework. This will include training on the PSR, energy efficiency advice and carbon monoxide awareness. All the services and training that we are offering will be scrutinised through our continued commitment to the BS1 18477 Standard, which we have held since January 2019.

Major Incident Standard: During a major incident we offer additional support, above and beyond the facilities that we are regulated to provide, with special consideration to ensuring that we protect our most vulnerable customers. These are detailed in full under Supply Interruptions Outputs outlined in Table 4.7.

Our delivery plan to make best use of the 'use it or lose it' allowance

We will use the 'use it or lose it' allowance to ensure that we maximise positive outcomes for customers in vulnerable situations.

As a general principle, we will use the allowance to scale up and roll out projects that have been researched and tested through the Network Innovation Allowance (NIA) Vulnerability Allowance or our Community Partnering Fund.

- **The Community Partnering Fund** is chaired independently, with membership including external subject matter experts. The fund is used to support grass-roots community projects.
- **The NIA Vulnerability Allowance** will be used to fund new projects aimed at trialling and testing on a small scale and that have an element of research, usually conducted through independent agencies. Projects eligible for NIA Vulnerability funding will be focused on keeping the gas flowing for those most in need; solutions to make life easier for customers in vulnerable situations (both on and off grid) and exploring a whole systems and smart grids approach to reducing fuel poverty. Read more about the NIA Vulnerability Allowance on page 122.

We are confident that by following this framework, we will make sure that we make best use of the 'use it or lose it' allowance, to maximise positive outcomes for customers in most need.

How we will identify areas of improvement/further support: Initiatives that are to be considered for funding under the 'use it or lose it' allowance would be activities or projects that would bring additional benefits to customers in vulnerable circumstances. We will unlock incremental benefits by identifying significant current and future challenges based on data established using independent research, and specific to our region. Applying this intelligence to our communities will allow us to support funding opportunities targeted at local issues with community groups.

How we will ensure that the allowance is used effectively and efficiently: Opportunities will be reviewed within the context of our Community Partnering Fund (jointly funded by NGN and NPG) and the NIA Vulnerability Allowance. The Community Partnering Fund is chaired independently, with membership including external subject matter experts, engaged to review opportunities presented prior to further support. Customer groups would include but are not restricted to: national and local charities/third sector organisations; local community groups; schools/educational establishments. The fund is used to support grass-roots community projects, and seeks to help with the specific needs of a particular area.

Case study – Community Partnering Fund to 'use it or lose it' allowance

Green Doctors

Over the last three years we have partnered with Green Doctors, who visit the most vulnerable customers in our region to provide advice and support that tackles fuel poverty, improves health and well being, and reduces incidence of cold homes. This project has been co-funded with Northern Powergrid through the Community Partnering Fund, and so far has delivered lifetime savings of £550k to over 2,300 customers most in need.

We are now looking to grow the reach of Green Doctors as this is one of our most impactful projects, in terms of positive outcomes for the customers that it reaches. This is an example of the type of project that we would scale up through the 'use it or lose it' allowance. The NIA Vulnerability Allowance will be used to fund projects that are entirely new/have not been tried before and that have an element of research, usually conducted through an academic/independent research body. Opportunities will be considered for the NIA Vulnerability funding under the three broad categories that stakeholders have told us we should focus on:

- Keeping the gas flowing for those most in need;
- Creating better solutions to help make life easier for customers in vulnerable situations, both on and off grid; and
- Exploring a whole systems and smart grids approach to reducing poverty.

How we will engage and collaborate with stakeholders to develop these initiatives: We have a range of engagement mechanisms in place to ensure that we regularly review current and emerging risks and challenges. These include: Infrastructure North; Citizen's Jury; pioneer workshops; academic research to support specific knowledge gaps and internal colleague engagement. We triangulate learning from direct engagement with stakeholders on an on-going basis with operational data such as customer complaints, enquiries, social media channels and third party insights which capture different dimensions and points of view.

An overview of our plan | Giving customers confidence that we will deliver | Giving customers a stronger voice | **Delivering better outcomes for our customers** | A sustainable plan for the future | Delivering value for money | Financing our plan

Case study – NIA to 'use it or lose it' allowance

Connecting homes for health – impacts on health of living in a cold home

An NIA funded project in two parts:

- **Part 1** – literature review to collate all available evidence/research to support the fact that health is impacted by living in a cold home.
- **Part 2** – working with suppliers and health services to install gas supply and central heating to around 100 homes with known cold related ill health, supported by research/consultation to determine actual impact by moving people into warmer, healthier homes, with forecasts of possible positive benefits to individuals and the health service.

  Further work – based on the results of this research, we would expand the reach of this project with the 'use it or lose it' allowance.

Case study – NIA to 'use it or lose it' allowance

'Making Every Contact Count' – looking to determine protocol/support when we disconnect unsafe appliances, with specific focus on vulnerable customers

An NIA funded project in three parts:

1. Establishing scale and current protocol/support mechanisms
2. Developing and testing protocols to determine wider benefits (local NGN)
3. Report and suggestions for national roll-out

Further work – based on the results of this research, we would look to scale up nationally using the collaborative element of the 'use it of lose it' allowance.

How we will assess the success of any initiatives: All funding opportunities are and will be subject to a series of evaluations and approvals prior to commissioning, with a number of tests to be met before any progress to approval cycles; these include consideration of the following:

- Is the initiative a matter that we should be funding, matching needs to be in line with our CSR strategy "Community Promises", our Vulnerability Strategy, and reflect the views of our stakeholders?
- Is it likely that the initiative is able to be replicated, i.e. will it work/be of benefit to others, in different areas, with different needs?
- Is the initiative scalable, can it be grown to bring benefits of being shared with others to use beyond NGN?

If the above challenges are met, assessment against costs, benefits, outputs and outcomes are then developed using the NGN Value Framework, with the outcomes reviewed by an independent panel prior to any funding. Critical success factors will be clearly defined and agreed for each initiative and are subject to interim reviews against criteria allowing support/evaluation during the life of the initiative, and in general are based on expected outcomes and outputs. Evaluations pre and post completion would be undertaken using the NGN Value Framework, ensuring that activities are measured against expected outcomes.

How we will split the allowance proportionately between vulnerability and CO safety initiatives: We would envisage that any funding the allowances made available through the 'use it or lose it' allowance would be proportional between vulnerability and CO safety initiatives; with our portfolio being informed by stakeholder engagement. Using historic spend patterns a split in the order of circa 50% CO and 50% wider vulnerability would be anticipated at this stage, based on activities beyond business as usual. Our assessment of costs is based on our activity in RIIO GD1, as shown in the Table 4.10.

	CO	Vulnerability	Total cost approx
2014	£257,845	£213,745	£471,590
2015	£243,050	£198,950	£442,000
2016	£243,600	£211,500	£455,100
2017	£237,300	£190,000	£427,300
2018	£254,800	£197,500	£452,300
2019	£226,100	£234,000	£460,100

Table 4.10: Proportional split of RIIO expenditure for CO & Vulnerability

How we will work in partnership to develop and deliver collaborative projects. We will continue to work in partnership with other GDNs to develop and deliver collaborative projects and intend to use and extend current sharing mechanisms with other GDNs and other utilities. These include:

- GDN Collaboration forums on CO, fuel poverty, customers and safeguarding
- Infrastructure North

Using these GDN partnership opportunities, NGN would seek to extend collaborative activities, for example a joint GDN collaborative fund is already in place to support CO activities – this is based on the framework successfully established through the NGN Community Promises Fund. This could easily be replicated and as appropriate extended into other areas.

4.3. Maintaining a safe and resilient network

4.3.1. A safe and sound service

Stakeholders consistently tell us that above all else, they expect a safe and reliable gas supply.

Safety and reliability will remain overriding priorities in RIIO-2, and will account for the largest portion of our forecast expenditure. We will measure the impact of this investment across five key service areas which are discussed further in this section. We also outline our strategy for workforce resilience and record keeping for multi occupancy buildings. While not discrete outputs our approach to these two areas will be important in ensuring we are safe and resilient in RIIO-2.

Network Asset Risk Metric

The Network Asset Risk Metric (NARM) provides a monetised risk metric that assesses the overall health and performance of our network assets. It was developed in collaboration with the other GDNs and Ofgem.

It provides a consistent approach across networks to assess asset risk and uses the principles of FMECA (Failure Modes, Effects and Criticality Analysis) by identifying the failure models of an asset, the probability and consequences of such a failure and their financial impact, as shown in Figure 4.2.

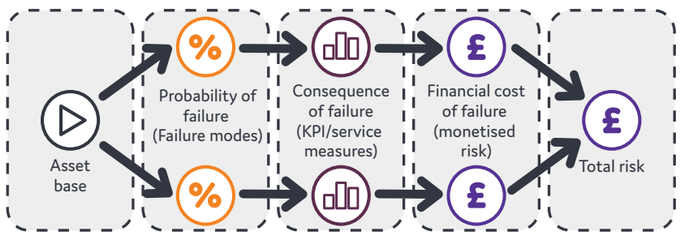


Figure 4.2: Assessment of NARM

As an output measure, monetised risk helps overcome the limitations of using physical quantities of assets in priority bands, by defining asset risk in accordance with a common currency for all network assets. This enables a meaningful comparison and prioritisation across the full asset base.

We engaged with our stakeholders on our asset risk objectives and shared our overarching strategy for managing safety and asset risk, they confirmed that safety and reliability were their highest priorities. They also indicated that this is an area with little room for compromise – safety is an absolute – which clearly aligns with our own priorities for managing our assets. This evidence is reflected in stakeholder insight 33 in our stakeholder insight appendix, Appendix A4.

Our NARMs output for RIIO-2 is outlined in Table 4.11. In RIIO-2 we facilitate a long term risk benefit of £128m as a result of our asset interventions. We will report on progress and any deviations annually.

RIIO-2 NARMs outputs							
No	**Output**	**Type**	**Ofgem target**	**NGN target**	**Resource and expenditure**	**Customer benefit**	**Stakeholder evidence**
Ofgem common outputs							
SR1	Lifetime risk benefit	PCD/ODI (F)	N/A	£198m long term benefit	c.£280m non mandtory Repex and Capex investment in RIIO-2. £313 mandetory mains and services Repex.	£113m benefit in RIIO-2 and £660m over 15 years from 2021/22	**Customer insight 33 in customer insight appendix**

Table 4.11: RIIO-2 NARMs output

Our proposed risk targets have been developed through consideration of the whole life cost and benefit of our asset interventions, in addition to stakeholder feedback. This ensures that our network is resilient over the long term.

Without any investment, our forecast risk position would increase from £107m at 2021 to c£123m at 2026. Based upon the interventions included within our RIIO-2 business plan, the total network risk position will reduce to c£99m at 2026.

The long term risk benefit that will be delivered from interventions in RIIO-2 is c£198m.

NARMs risk analysis is undertaken over multiple time periods, ensuring that the proposed interventions account for the optimal intervention for current and future customers. NARMs has been used as evidence to support the development of our engineering justification papers and capex and repex intervention plans in RIIO-2. Further information and evidence can be found in Part 6 of this plan and also in Appendix A-23.

The monetised risk positions resulting from our investment proposals are shown in the Figure 4.3.

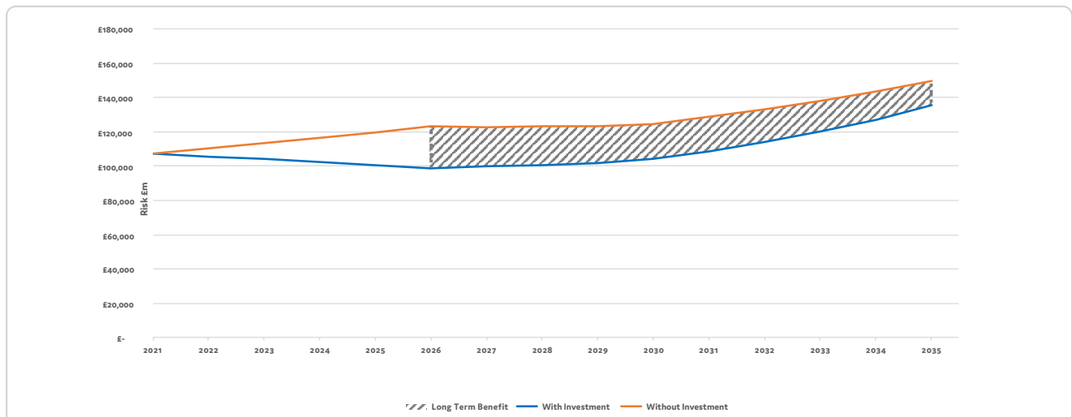


Figure 4.3: Long term NARMs risk benefit delivered through RIIO-2 interventions

Case study – PE asset health

We have used our innovation processes and invested out Totex allowance to test and deploy industry best practice solutions to deliver improved performance. One such example is our PE Asset Health program working with ControlPoint Ltd. The development in digital technology has enabled data capture of essential information from field engineers as part of PE pipe construction. The data is transferred and subject to near real time, independent inspection to support the quality assurance program in NGN. The data provides essential management information to enable and support immediate operational asset management decisions to reduce risk and future impact on the PE network. The solution had not been deployed by any GDN in the UK and field trial and formal network wide implementation was an industry first.

Proactive and remote identification and removal of risk ensure a "right first time" approach to network construction. This proactive intervention removes the potential for unnecessary re-work, customer and stakeholder impact, and environmental issues, and also delivers c.£1m of future avoided risk per annum and has contributed to an increase in overall quality. RIIO-1 Use and benefit – 300,000 inspections throughout RIIO-1 with a c.£4m of future cost avoidance

Delivering our iron mains replacement commitments

The Health & Safety Executive (HSE) initiated an Enforcement Policy in 2002 for the decommissioning of all iron gas mains within 30 metres of buildings. It prescribes a 30 year programme to reduce the risk of injury to people arising from fire or explosion as a consequence of the sudden failure by fracture or corrosion of iron gas pipes.

In 2013, a series of changes were made to this policy:

- The minimum requirement is that all iron pipes of 8 inches and below that are within 30 metres of a property should be abandoned at a rate that will deliver completion of this part of the programme by 2032.
- Iron mains with a diameter of greater than 8 inches and less than 18 inches that exceed an agreed risk threshold must also be abandoned.
- Whenever NGN is replacing an iron main, attends a gas escape, or undertakes a service alteration, if we discover a metallic service at a property then we must replace it.

The three separate commitments that will deliver this outcome for mandatory Repex are set out in Table 4.12 below. All other mains replacement is justified using NARMS and will be included within that output. We will abandon 2,144km of tier 1 iron mains and all tier 2a pipes above the Risk Action Threshold during RIIO-2, in line with our mandated responsibilities.

We have also consulted with our stakeholder who showed, in principle, support for an accelerated programme of pipe replacement, in order to achieve improved safety and reliability, and reduced environmental impacts. Further information is provided in Appendix A4 stakeholder engagement insights.

RIIO-2 repex outputs							
No	**Output**	**Type**	**Ofgem target**	**NGN target**	**Resource and expenditure**	**Customer benefit**	**Stakeholder evidence**
Ofgem common outputs							
SR2	Tier 1 mains	PCD	N/A	2144.3	· Expenditure to deliver the RIIO-2 target workload is £313m · Activity will be delivered through existing workforce and direct service provider model that has been delivered in RIIO-1 and is discussed in Part 2 of this document	· Improved safety · Carbon reductions · Cost benefit detailed in appendix A-23.m mandatory Repex · Benefit of £25m delivered in RIIO-2 and £148m over 15 years from 2021/22	Citizens' Jury Environment pioneer workshop Futures and environment pioneer survey 2019 WTP research **Customer insight 34 in customer insight appendix**
SR3	Tier 2a	PCD	N/A	10.1			
SR4	Steel services	PCD	N/A	208,939			

Table 4.12: RIIO-2 repex outputs

At the start of the RIIO-2 period NGN will have 4718km of iron mains of eight inches and below that are within 30 metres of a property (Tier 1 iron mains). This volume grows dynamically over time as properties are altered and new properties built that bring them within 30 metres of an iron main. Based on historic rates we are forecasting this volume to grow by 0.2% per annum over the period.

Our strategy for the RIIO-2 period is to maintain a 'flat' profile of work over the period to the end of the programme in 2032. This represents an appropriate balance between cost and the safety risk associated with these assets and was supported by our stakeholders.

NGN has delivered a higher workload than was required in RIIO-1 and consequently the remaining annual workloads will be lower in the next period. The costs and supporting analysis for our repex activities are outlined in Part 6 of this plan.

Booking NTS offtake capacity efficiently

We have a statutory and licence obligation to maintain enough capacity to meet our forecast one in 20 peak day demand. To deliver this, we book capacity for each of our offtakes from the National Transmission System (NTS), owned by National Grid. Over the course of RIIO-1 we have reduced our bookings from 611 GWh/day to 514 GWh/day, bringing our bookings more in line with our expected peak demand as shown in Table 4.13.

Target volumes per licence												
	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26
Baselines	611.80	618.10	624.10	624.10	624.10	624.10	624.10	624.10	TBC	TBC	TBC	TBC	TBC
Bookings	611.25	595.73	545.72	540.85	526.87	513.83	513.57	513.57	514.00	514.00	514.00	514.00	514.00

Table 4.13: Historic and forecast volume of offtake bookings

NTS charge for capacity on an offtake by offtake basis, to reflect the costs they incur in providing the capacity. As we have significantly reduced our bookings, we have reduced the costs passed through to the shippers and, in turn, our customers. Furthermore, the unused capacity we have freed up has enabled substitution for large quantities of flexible generation on the national system, supporting progress in decarbonisation.

Our stakeholder engagement evidence, specifically, customer insight 1 indicates that customers expect bills to be no higher than absolutely necessary. As NTS capacity is a pass through cost, booking this efficiently will ensure savings are passed onto customers.

We are engaged with NTS and the wider industry in the Capacity Access Review, which is showing there is clear appetite to review the current entry and exit capacity arrangements. This review includes looking at several key topics which currently impact our booking strategy, such as substitution, Planning and Advanced Reservation of Capacity Agreement (PARCA), capacity products and the user commitment methodology. Whilst it is recognised that many topics will be lengthier areas of review, there may be some 'quick wins' which will impact capacity during RIIO-2. As a result, and as outlined in Ofgem's RIIO-2 methodology decision document, we are not yet able to forecast RIIO-2 baseline levels and the exact form of output is still to be determined.

As our capacity requirements are closely aligned with our peak day demand forecasts, which we anticipate will slightly decline over the RIIO-2 period, we are not expecting significant changes to our bookings over the next five years. Localised growth and decline are likely to alter the requirements at the offtake level, but not significantly impact the network level. We consider the main risk to our requirements is linked to the growth of large load customers and flexible generation. Our proposed output of NTS offtake capacity booking is outlined in Table 4.14. We note that final baselines and targets will be confirmed with ofgem following consultation through draft determinations and a decision UNC678.

RIIO-2 NTS offtake capacity outputs							
No	Output	Type	Ofgem target	NGN target	Resource and expenditure	Customer benefit	Stakeholder evidence
Ofgem common outputs							
SR5	Offtake bookings	TBD	TBC following UNC678 outcome	514 GWh/day TBC following consultation with Ofgem	Costs are included within our asset management activities in BPDT 2.10, however are not separately identifiable	Cost reduction to customers through efficient booking of gas	Customers have indicated they expect service at lowest cost **Customer insight 1 in customer insight appendix**

Table 4.14: RIIO-2 NTS Offtake capacity outputs

We will efficiently book offtake capacity to deliver on our capacity obligations and manage the whole system's impact of our demand requirements. We will actively engage with industry to ensure the capacity arrangements are fit for purpose and consider the ability of the regime to support the future. We employ sophisticated modelling techniques to forecast this capacity requirement. We also engage in regular dialogue with National Grid Transmission through our whole system strategy to ensure investments before and after the offtakes represent the most efficient overall solution.

Removal of remaining gas holders on our network

In RIIO-1 we established a clear cost benefit analysis case to remove all the remaining 46 gas holders on our network. These assets are extremely old and are no longer required to operate the network. They cost a lot to repair and maintain and represent a potentially increasing safety risk. By the end of RIIO-1 we will have completed our programme to demolish 23 of these holders on a risk-ranked basis.

The removal of these assets means that we will remove the safety risk that they pose and also the added cost associated with maintaining them which aligns with our stakeholders' expectations that we keep costs low and do not compromise on safety.

As shown in Table 4.15, by the end of RIIO-2, we will complete the entirety of our gas holder decommissioning programme, ensuring that the benefits of removing the remaining holders are realised as soon as possible.

Our detailed cost benefit proposal for gas holders is outlined in our investment decision packs attached as Appendix A.23.L and costs are discussed further in Part 6 of this plan.

RIIO-2 gas holder demolition outputs GWh/day							
No	Output	Type	Ofgem target	NGN target	Resource and activity	Customer benefit	Stakeholder evidence
Ofgem common outputs							
SR6	Gas holder demolition	PCD	N/A	24	£16m included in controllable opex tables	· Cost saving · Improved public safety · Carbon saving and improved environmental outcomes · Cost benefit detailed in apendix A-23.L Gas Holder Demolition · Benefit of £12m in RIIO-2 and £64m over 15 years from 2021/22	Citizens' Jury Environment pioneer workshop Futures and environment pioneer survey 2019 WTP research **Customer insights 1 and 33 in customer insight appendix**

Table 4.15: RIIO-2 gas holder demolition output

Improving cyber resilience and IT business security

Our networks are becoming smarter, more automated and more digitised at a time where there is increased risk from cyber-attacks. Consequently, cyber resilience and IT security in general are an ever-increasing risk area that we need to manage. In RIIO-2 we will deliver against the objectives of our cyber resilience and IT business security plans to mitigate cyber and IT threats and ensure delivery of excellent service to our customers.

In addition, our customers and stakeholders have told us that they expect to see improvements in our approach to the overall cyber security and cyber resilience of the network. This is reflected in customer insight 41 in the customer insight appendix. In RIIO-2 we will deliver a cyber resilience plan and a business IT security plan, delivered by an expanded internal team, as shown in Table 4.16. Further detail on these plans and our strategy for IT and cyber security is included in Appendix A11 and Appendix A23J.

RIIO-2 cyber resilience outputs							
No	Output	Type	Ofgem target	NGN target	Resource and expenditure	Customer benefit	Stakeholder evidence
Ofgem common outputs							
SR7	Cyber resilience	PCD	· Publish and deliver Business IT security plan · Publish and deliver cyber resilience plan	· Publish and deliver business IT security plan · Publish and deliver cyber resilience plan	Proposed totex to deliver cyber resilience and business IT security is £13m	Increase to the overall cyber security and cyber resilience of the network Benefit of £17m in RIIO-2 and £59m over 15 years from 2021.22	Citizens' Jury Environment pioneer workshop futures and environment pioneer survey 2019 WTP research **Customer insight 41 in customer insight appendix**

Table 4.16: RIIO-2 business IT security and cyber resilience outputs

Cyber resilience

NGN is an Operator of Essential Services (OES) within the UK. As an OES, we play a vital role in society by ensuring the distribution of gas in the North East, Northern Cumbria and much of Yorkshire, where the reliability and security of these services are essential to everyday activities. As we have seen from numerous cyber security incidents, the network and information systems that uphold these services can be an attractive target for malicious actors, with the magnitude, frequency and impact of cyber-attacks increasing.

NGN relies on some legacy information and operational technology to operate its GDN. Some of this technology, especially in the operational space, will have been in place for tens of years, and at the point of implementation, cyber security wouldn't have been a consideration. The older the technology, the less chance there is that it is up to dealing with the sophisticated threats, externally and internally as they often rely on older unpatched versions. The threats now facing these legacy technologies leaves NGN vulnerable to cyber-attack.

Our vision is to ensure that we are resilient to even the most sophisticated attacks, enabling a safe and secure environment that minimises risk of unavailability of gas distribution against an ever-changing threat landscape.

In RIIO-2

- We will deliver enhanced protective, detective and impact minimisation capabilities to our essential services at a total cost of £3.8m. This comprises additional investment in Operational Technology (OT), and to meet the requirements of the Network and Information Systems Directive (NIS Directive).
- Our cyber security team will be an operating model of direct employees, providing core functions and delivery capabilities, supplemented by partner expertise.
- We will commit to an evolving OT cyber risk strategy, that continually identifies and assesses risk, addresses changing internal and external factors and develop proportionate security counter measures to meet the needs of our business, the industry and laws & regulations.

In RIIO-2 we will deliver several key improvements to improve our resilience to growing cyber threats, these include:

- **Cyber security conscious and aware employees:** Continue to develop and pursue a positive cyber culture, training an aware employee base, using innovative techniques and omni channel approaches.
- **Security operations:** Proactive detection and monitoring of all our services to gain visibility of threats and act upon them, complemented with Security Operations Centre (SOC) and anomaly detection services.
- **Threat and vulnerability management:** Contextual threat intelligence feeds and capabilities to manage service vulnerabilities, whilst improving cyber hygiene practices.
- **System security and resilience:** Building cyber security protection and resilience into the OT network, Internet of Things (IoT) and information systems, including securing telemetry data and enhancements/upgrades to field specific technologies.
- **Asset management:** Holistic visibility and management of all network, information systems and supporting services required to support the delivery of our essential service including the use of technology to aid with these processes.
- **Response and recovery:** Continually improving plans and practices so that we are able to respond and recover from incidents, complimented with Computer Security Incident Reponse Team (CSIRT) capabilities.
- **Governance, risk and compliance:** Build a unified Information Security Management System to ensure we manage our risks and compliance obligations effectively, whilst gaining the assurances we need.
- **Supply chain:** We govern, understand and manage security risks to network and information systems supporting the delivery of our services that arise as a result of dependencies on external suppliers. This includes ensuring that appropriate measures are employed where third party services are used.

IT security

We recognise that information is a critical asset and how networks and information systems are managed, controlled and protected has a significant impact on the delivery of services to our customers. A growing worldwide cyber threat, which has exponentially increased in recent years, compounds the need for further investments and strategic planning to minimise the risk to our assets and increase NGN's resiliency to all threats. Information assets must be protected from unauthorised use, disclosure, modification, damage and loss and additionally, they must be available when needed, particularly during emergencies and times of crisis.

The scale of technological change throughout GD1 has evolved significantly. The trends and opportunities described then have since accelerated. New technologies and applications have come to the fore and we have seen a greater uptake and demand for internet-based solutions to deliver business benefits. However, as our reliance on networks and information systems grows, so do the opportunities to compromise our systems and data. Malicious cyber activity knows no boundaries. We face increasingly growing threats from several avenues at home and abroad with a shift in the geopolitical landscape.

In RIIO-2 our vision is to ensure that resilient security is integrated as seamlessly as possible and built into everyday operations, enabling a safe and secure environment that nurtures innovation and protects against an ever-changing threat landscape. In RIIO-2:

- We will deliver enhanced protective, detective and impact minimisation capabilities to our business and customers at a total cost of £9.2m. This comprises our business as usual IT security requirements.
- Our cyber security team will be an operating model of direct employees, providing core functions and delivery capabilities, supplemented by partner expertise.
- We will commit to an evolving IT cyber risk strategy, that continually identifies and assesses risk, addresses changing internal and external factors and develop proportionate security counter measures to meet the needs of our business, the industry and laws & regulations.
- We will preserve and protect our employees' and customers' privacy.

We will also deliver several key improvements to mitigate the growing IT security threats. These include:

- **Cyber security conscious and aware employees:** Continue to develop and pursue a positive cyber culture, training an aware employee base, using innovative techniques and omni channel approaches.
- **Identity and access management:** Holistic management of users' (end and privileged) identity and access control across our technologies including looking at processes and Identity and Access Management (IAM), Privileged Access Management (PAM) and Multi Factor Authentication (MFA) technologies.
- **Security operations:** Proactive detection and monitoring of all our services to gain visibility of threats and act upon them, complemented with SOC and User and Entity Behaviour Analytics (UEBA) services.
- **Threat and vulnerability management:** Contextual threat intelligence feeds and capabilities to manage service vulnerabilities.
- **System security and resilience:** Building cyber security protection and resilience into all our services across Cloud, IoT, End Point Devices, and the Networks, including tools such as Cloud Access Security broker (CASB), Network Access Control (NAC) and enhanced backup and next-gen end point security services.
- **Response and recovery:** Continually improving plans and practices so that we are able to respond and recover from incidents, complimented with CSIRT and Security Orchestration Automation Response (SOAR) capabilities.

Workforce resilience

During RIIO-1 we have developed a workforce with the skills and culture to take us forward into the next decade.

Key initiatives such as our workforce renewal and change programme, which has lowered the average age of our workforce by 10 years; the implementation of revised terms and conditions for our operational colleagues, and our direct service provider model for mains replacement work, have had a far-reaching impact (see Part 2 for further details). We have also increased focus on equality, inclusion and diversity and are working towards benchmarking our performance against a recognised standard so that we can implement continuous improvement.

Our progress in RIIO-1 is part of a carefully developed business strategy to understand future business needs and ensure resilience. It provides the foundation for our ongoing strategy in RIIO-2. We are also gearing our workforce to address future challenges such as the skills requirement for a hydrogen economy. We will look to the market to help meet these challenges. We have also included programmes of work in our H21 project to understand mitigate workforce resilient risk around this change.

The objective of our workforce resilience strategy is to operate a safe, skilled and resilient workforce that consistently delivers high quality and efficient services to our customers. Our strategy and priorities are reflected in our strategic framework for workforce resilience, shown in Figure 4.4.

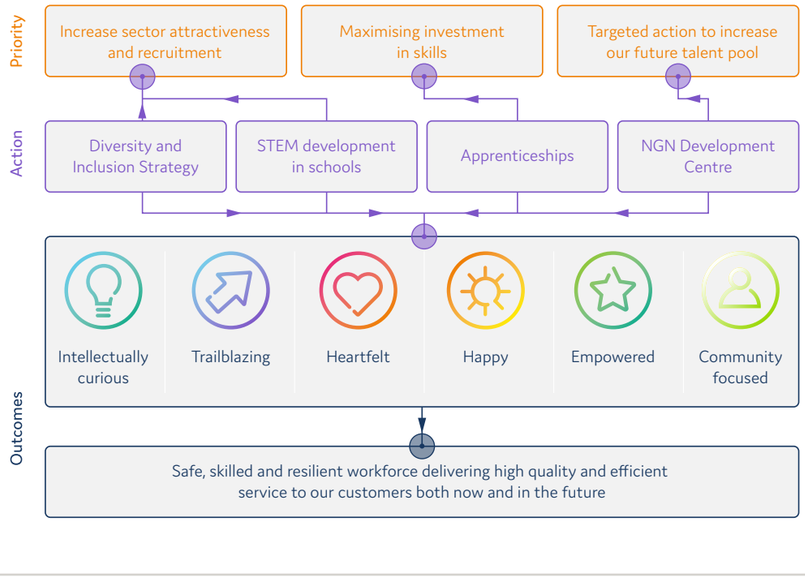


Figure 4.4: NGN workforce resilience strategic framework

We are mindful that similar workforce challenges exist across the sector. However as a result of our progress in RIIO-1 we consider that we are ahead of the industry in preparing our workforce to be resilient to future risks. Through the Energy and Utilities Skills Partnership, we are working with the wider energy and utility sector to develop the first ever shared workforce renewal and skills strategy for the sector.

This strategy is aligned closely to our own aspirations and the collaborative nature of the approach ensures that best practice is shared across all businesses. It will continue to evolve as input is gathered from a wide range of stakeholders.

Three priorities for workforce resilience that have been developed as part of this shared strategy, which we have integrated into our own workforce resilience strategy, are as follows:

- Sector attractiveness and recruitment – to increase our future talent pool
- Maximising investment in skills – to invest in our people
- Targeted action – to address anticipated skill gaps and shortages

To deliver against this strategy in RIIO-2 we will continue to focus on:

- Developing and implementing our Diversity and Inclusion Strategy;
- Working with schools to promote STEM careers and the utility sector as a future employer;
- Continue to offer apprenticeships and development of NGN employees through our in-house Development Centre, focusing on both technical and soft skill development.

Our workforce resilience strategy, which outlines the initiatives we have implemented in RIIO-1 and our plans for RIIO-2 is attached in Appendix A10.

Maintaining effective records of our multi-occupancy buildings

We have robust processes in place to manage risk within multi-occupancy buildings (MOBs) of six storeys or above which contain a gas supply which we own all or part of.

Our procedures cover inspection, maintenance and monitoring of gas risers (vertical mains) and our above ground services, up to the customer's emergency control valve.

Our approach to managing risk in these buildings is governed by two key internal procedures which have been benchmarked against IGEM standards, and against similar procedures of other GDNs.

We prioritise our work program according to the level of risk, with higher buildings (i.e. with longer risers) generally receiving a higher risk score and having greater control measures implemented than shorter buildings with lower risers.

We hold regular refresher briefings with key personnel (including surveyors) to ensure they are kept up to date on any new industry developments and compliance requirements, and we routinely share information with other stakeholders such as emergency responders and building owners. Information is shared with other GDNs through the Replacement Forum.

Over the course of RIIO-1 we have invested in the following improvements in MOB record-keeping, as shown in Table 4.17:

Improvement	Description
One central database	Historically, assets located within buildings (risers and above ground services) were not recorded in our main asset repository and instead were split across two internal systems. Over the course of RIIO-1, we have shifted all MOB data, for above 6 storeys, to a central database which has enabled us to link asset data to our routine survey information. This has improved our ability to monitor the condition of MOB assets and record findings in a robust manor. It has also allowed us to improve the efficiency of asset surveys.
Improved internal systems	We are currently implementing improved internal systems to enable MPRNs to be linked directly to address information. This will ensure we are able to identify buildings with multiple MPRNs thereby easily identifying MOBs on our network (including new MOBs). As a result of these improvements, we will be able to access a range of information on each MOB enabling us to further mitigate risk on our network (e.g. number of risers, above ground services associated with each riser, escape history and survey information).
MOB surveys	Our ongoing, risk-based programme of MOB surveys and inspections has resulted in an improved baseline of data relating to risers and laterals. As a result of this survey programme, we have assessed that our Core Asset Data relating to risers and laterals is of sufficient quantity and/or quality to enable consistent application of the NOMs methodology. [2]

Table 4.17: Improvements made to MOB record keeping during RIIO-1

In RIIO-2, we will continue to ensure our approach to multi-occupancy buildings is consistent with best practice and will exploit the new analytical capabilities of SAP Hana that we have implemented through our Future WoW programme of work. We do not expect any significant developments or issues to occur in RIIO-2 that would impact our record keeping related to MOB assets, however we understand there is always room for improvement in our approach and we will monitor and adapt as we gain new learning.

Physical Security Upgrade Programme

The Physical Security Upgrade Programme (PSUP), requires distribution companies to implement processes and procedures, to enhance the physical security at sites on their network that are designated to be Critical National Infrastructure (CNI) sites.

The process for a site to become part of the PSUP begins with the initial designation and categorisation of a site based on guidance released by BEIS and Ofgem. Operators of gas or electricity transmission or distribution sites should consider if a site falls within the CNI criticality scale as published. This is applicable to any new build site or an existing site that may have increased (or decreased) in importance as the network changes over time.

We have reviewed the current guidance and assessed that none of our sites currently fall within the criticality scale that would warrant upgrade through the PSUP. As such, we have not included a specific programme of work in RIIO-2 for the upgrade of our sites under the PSUP.

2 For further information relating to this assessment, please refer to our "Information Gathering Plan" submitted to Ofgem 1 April 2019.

4.4. Delivering an environmentally sustainable network

Our stakeholders have asked us to be more ambitious in RIIO-2 in reducing the impact of our business activities on the environment, and it is a challenge we have readily accepted. We have developed an ambitious and challenging Environmental Action Plan (EAP) that will lay the foundations to deliver:

- Net-zero carbon emissions from our business operations by 2030/31
- Net-zero carbon emissions from our network gas by 2050
- Significant environmental improvements across our business throughout RIIO-2.

Our Environment Strategy[3], supported by our dedicated EAP, extends to 2050 and aims to reduce the environmental impact of our business activities across five key areas - carbon impact and climate change resilience, improving air quality, using resources responsibly, enhancing life on earth and supporting net-zero carbon emissions through a whole systems approach.

During RIIO-1, we have achieved a lot to make our business cleaner and greener, including a 99% reduction in excavated spoil disposed to landfill a 78% reduction in virgin aggregate use in reinstatement, whilst also using sustainable techniques to remediate 12 former town gas sites to a compliant environmental condition.

In 2018, we became the first GDN to map our entire business objectives against the UN's Sustainable Development Goals (see Table 4.18), and introduced other GDNs to these UN objectives, with the aim of aligning our approach to the goals most relevant to our business and where we could measure progress against them.

Our activities in RIIO-2 are set to be even more far-reaching, reducing the environmental impact of our day-to-day activities while continuing to develop energy sources and systems for the future.

Environment strategy focus area	Long term objectives by 2050	UN SDG
Take action against climate change	Help the UK to achieve net-zero greenhouse gas emissions by 2050 and ensure our assets are resilient to the environmental challenges of the future.	
Improve air quality	Reduce our impact on air quality in the communities where we live and work.	
Use resources responsibly	Develop a sustainable approach to procurement and resource consumption to reduce the environmental impact of what we buy, how we use it and how we dispose of it.	
Enhance life on land	We will have an enhancing impact on the landscapes and communities we work in.	
Enable lasting energy solutions	Enable decarbonised heat, power and transport with a whole of systems approach to support the achievement of net-zero emissions by 2050.	

Table 4.18: NGN Environment Strategy long-term objectives and alignment to UN Sustainable Development Goals

An ambitious EAP for RIIO-2

We will implement our well evidenced EAP in RIIO-2, outlining the initiatives and associated expenditure to deliver against our three explicit areas of focus:

- **Decarbonising our business**
- **Supporting a Net-zero carbon future**
- **Protecting the environment**

3 https://www.northerngasnetworks.co.uk/wp-content/uploads/2019/04/ENVIRONMENT-STRATEGY-JUNE-2018-COMPRESSED.pdf

Our RIIO-2 EAP outputs are shown in Table 4.19.

RIIO-2 EAP							
No	**Output**	**Type**	**Ofgem target**	**NGN target**	**Resource and expenditure**	**Customer benefit**	**Stakeholder evidence**
Ofgem common outputs							
E1	EAP	PCD	Develop and Implement an EAP	Develop and Implement our EAP to delivering key Environmental Initiatives focussed on · Decarbonising our business · Supporting a net-zero carbon future · Protecting the environment	No incremental increase in expenditure to deliver this. Costs associated with initiatives under the EAP are detailed in Tables 4.20 – 4.22. No additional resource is required to deliver the initiatives under the EAP or AER.	· Carbon Reduction · Blodiversity improvements · Air quality improvements · Reduced waste · Social amenity · Reduce natural resource consumption	Business plan acceptability **Customer insights 43 and 50 in customer insight appendix**
E2	Annual Environmental Report	LO/ODI (R)	Produce and report annually on key environmental aspects of business	Report annually on initiatives in EAP.		Clear understanding of environmental improvements, customer and areas for further improvement.	

Table 4.19: RIIO-2 EAP outputs

Our detailed EAP is attached as Appendix A8 to this plan and outlines the key initiatives and outputs that we will deliver in RIIO-2 under each of these categories.

An Annual Environment Report (AER), published annually throughout RIIO-2, will outline our performance against each of the metrics and targets that we propose in the EAP, including revising our EAP targets where necessary to drive continuous improvement and in response to technological developments..

We have engaged with stakeholders extensively in the development of our environment commitments for RIIO2 and gained clear insight into what their priorities are. Key insights gained from our engagement that have shaped our EAP and RIIO-2 outputs include:

- **Leadership:** Our stakeholders want us to be an environmental leader by driving behavioural change and adopting stretch targets, and targets for a longer period into the future to reduce our BCP (insight 42). We have adopted science-based targets and demonstrated alignment to the UN Sustainable Development Goals to evidence to stakeholders that we are accounting for this. Our ambition is to have net-zero business carbon emissions by 2030/31.
- **Emissions:** Stakeholders consider that it is imperative that we act against climate change by reducing both shrinkage and non-shrinkage emissions to reduce carbon emissions (insight 43). We have set challenging targets to reduce shrinkage and leakage in RIIO-2, in addition to establishing a pathway to net-zero business carbon emissions by 2030/31 and 2050 for our network.
- **Clean and tidy:** Customers want us to use our resources responsibly and work considerately by leaving the local environment clean and tidy (insight 44). We will deliver against challenging outputs on resource use and sustainable procurement as outlined in Table 4.22.
- **Air quality:** Air pollution is a key issue and should influence investment decisions – stakeholders expect us to be proactive in this area for both moral and reputational reasons (insight 45). We have committed to improving our vehicle fleet and also investing in mitigations such as tree planting to improve air quality.
- **Vehicles:** There is significant appetite for us to reduce our vehicle carbon footprint and go above and beyond by phasing out diesel vehicles sooner (insight 46). Our revised fleet strategy represents a significant step forward and is in direct response to customer feedback. We have set a challenging target in RIIO-2 to improve carbon emissions from our fleet without compromising our safety or customer service objectives.
- **Roadworks:** Customers and stakeholders want us to reduce roadworks caused by our approximately 180,000 excavations per year (insight 48). We propose to work closer with anchor institutions and local councils to improve planning and the impact of road works.

- **Biodiversity:** When gas land is remediated, customers and stakeholders expect us to actively improve habitats for wildlife at NGN's permanent sites (insight 49). We have committed to improving biodiversity and introducing valuation techniques, so we can measure the value delivered.
- **Knowledge sharing:** Future customers welcome the EAP as a starting point that demonstrates what can and should be done within other organisations in the region (insight 50). Our EAP is a key element of our whole systems strategic framework, discussed in Part 5.1. Through the EAP we commit to reporting against this framework and disseminating the improvement and benefits that we realise to other organisations.
- **Biomethane:** Biomethane production is still an emerging sector and discussions on how NGN can best collaborate with stakeholders should be ongoing as it develops (insight 59). We have committed to ongoing engagement with biomethane stakeholders including targeted annual workshops.

The initiatives that we will report on in RIIO-2 are outlined below in (Tables 4.20, 4.21 and 4.22) with further detail included in the EAP, attached as Appendix 8 to this document.

4.4.1. Reducing Our Business Carbon Emissions

Our ambition is to have a net-zero scope 1 & 2 BCF by 2030/31

We have set ambitious decarbonisation targets for RIIO-2 as part of our long-term Environment Strategy which go beyond our existing science-based targets for a well below 2 degree warming scenario in 2050. These targets, underpinned by our EAP initiatives and coupled with anticipated developments in technology, mean we are targeting the achievement of net-zero non-shrinkage Scope 1 and 2 business carbon emissions by the end of the 2030/31. These targets directly support the achievement of net-zero emissions in our network regions and the UK. A summary of how we are forecasting reducing our carbon emissions to support net-zero is provided in 'Our contribution to net-zero' discussed further in this section.

RIIO-2 initiatives – reducing Oour business carbon emissions							
No	**Output**	**Type**	**Ofgem target**	**NGN target**	**Resource and expenditure**	**Customer benefits**	**Stakeholder evidence**
NGN bespoke outputs							
E3	Reduction of BCF (excl shrinkage) CVP	ODI (R)	N/A	Science-based carbon targets: · Scope 1 & 2 – 47% in RIIO-2 · Scope 3 (key) – 11% in RIIO-2 · Scope 1, 2 & 3 – 23% in RIIO-2 Key initiatives: · Vehicle fleet improvements; · Renewable energy installation at offices and depots · Purchasing only renewable electricity and gas · Tree planting in our region (40,000 over 5 years)	Vehicle fleet investment: c.£19.5m Renewable energy: c£0.6m Tree planting: £400k shareholder funded Renewable electricity and gas has no additional cost on RIIO-1	· Carbon reduction · Air quality improvements · Renewable electricity	· Business plan acceptability · **Insights 43 and 46 in customer insights appendix**

Table 4.20: EAP outputs to reduce business carbon emissions

Working with the Carbon Trust in 2018/19, we were the first UK gas network to establish science-based carbon reduction targets. As part of our contribution to the UK achieving net-zero greenhouse gas emissions in 2050, we will go beyond this trajectory to reduce our Scope 1 and 2 non-shrinkage business carbon emissions by 52% from 2017/18 levels by the end of RIIO-2, with our ambition being to achieve net-zero Scope 1 and 2 non-shrinkage carbon emissions by 2030/31. In addition, we are targeting reducing our key Scope 3 emissions by 16% by the end of RIIO-2 compared to our 2017/18 baseline. Our carbon reduction targets equate to 47% reductions in Scope 1 and 2 emissions, and 11% reductions in Scope 3 emissions, during RIIO-2. Key RIIO-2 activities will include:

Vehicle fleet: Approximately 50% of our total vehicle fleet will be ultra-low emission or hybrid by the end of RIIO-2, comprising 100% of our company cars and approximately 25% of our commercial vehicles. To enable this electric vehicle charging infrastructure will be installed across all of our offices and depots at a cost of approximately £0.9m. We will also renew our remaining larger diesel vans with newer, more efficient models that can meet our operational requirements whilst reducing our carbon and air pollutant emissions. The net impact of our improvement will remove 250 diesel vehicles from our fleet, replaced by ultra-low emission or hybrid alternatives.

Offices and depots: We will invest over £2m in our offices and depots to provide modern energy efficient facilities. Previous office refurbishments during RIIO-1 have delivered building energy efficiency improvements of 28%.

Renewable energy generation: Building on the 310KW peak (KWp) of renewable energy generation that we will install at our sites during RIIO-1, during RIIO-2 we will invest approximately £0.6m on installing on-site renewable energy generation across all of our offices and depots (a further 370 KWp), which aims to deliver an overall 10% reduction in our total electricity consumption.

Embodied carbon: We will also utilise our investment in new systems and innovations to reduce our wastage of PE pipe; monitor, report and reduce embodied carbon on our key new RIIO-2 projects; and self-fund the planting of 40,000 trees in our network area as part of the Northern Forest to tackle urban air pollution and capture approximately 2,450 tCO_2e.

4.4.2. Supporting a net-zero carbon future

We have an essential role to play in helping the UK transition to a net-zero greenhouse gas emissions future by 2050.

We are doing this by working with partner organisations to develop sustainable, green forms of gas, such as hydrogen; making it easier for biomethane producers to connect to our network, reducing gas shrinkage/leakage from our network and pursuing a wide range of measures to reduce carbon emissions form the gas in our network.

RIIO-2 initiatives – supporting a net-zero carbon future							
No	**Output**	**Type**	**Ofgem target**	**NGN target**	**Resource and expenditure**	**Customer benefit**	**Stakeholder evidence**
NGN bespoke outputs							
E4	Reduction in gas leakage (GWh)	ODI (F) & (R)	N/A	24% in RIIO-2 Key initiatives: · Optimised mains replacement programme; · Investment in system pressure management; · Gas conditioning; · Improved gas escape repair performance	Primarily delivered by Repex programme of >c£500m over RIIO-2 and targeted investment of £8m for pressure management and £0.6m gas conditioning	Cost reduction Carbon reduction	Business plan acceptability **Insights 43, in customer insight appendix**
E5	Reduction in gas shrinkage (GWh)	ODI (F) & (R)	N/A	23% in RIIO-2		Cost reduction Carbon benefit Social benefit	Business plan acceptability **Insights 43, in customer insight appendix**
E6	Biomethane process improvements	ODI (R)	N/A	Key commitments: · Produce initial capacity studies for gas producer connections in five working days compared to 15 working days in RIIO-1; · Produce detailed capacity studies in 20 working days compared to 30 working days in RIIO-1 · Respond to operational faults on gas producer sites within four hours to agree a resolution · Stakeholder engagement, including annual stakeholder workshop	· Dedicated business development manager to manage stakeholders	Customer satisfaction Carbon reduction	Business plan acceptability Biomethane stakeholder survey **Insights 59, in customer insight appendix**
E7	EAP – Initiatives to facilitate a low carbon future	ODI (R)	N/A	Report progress on delivering workstreams and projects to deliver net-zero by 2050 as outlined in NGN whole system and innovation strategies	Costs for projects focused on facilitating a low carbon future are included in Innovation Strategy c£7.89m in total which included partner funding that will be leveraged through joint working and the enablers in our whole system strategy	· Carbon reduction · Reduced safety risk · Improved customer satisfaction · Improved workforce resilience · Improved workforce skill base	Business plan acceptability **Insights 48 and 58 in customer insight appendix**

Table 4.21: EAP outputs focusing on supporting a move to a net-zero carbon future

Reducing our gas shrinkage

Methane, the primary constituent of natural gas, contributes to the build-up of harmful greenhouse gases when it enters the atmosphere. Our biggest direct greenhouse gas emission, and the environmental impact, is gas shrinkage from our network which includes natural gas leaking from our network (c.95%), gas stolen from the network (c.3%), and gas used during distribution (c.2%), e.g. to preheat gas. Reducing our gas shrinkage is a key part of our contribution to the UK's journey to net-zero greenhouse gas emissions by 2050.

We are committed to reducing gas shrinkage by 23% and leakage by 24% during RIIO-2 (based on estimates derived from the cross-GDN Shrinkage and Leakage Model) which will reduce our direct carbon emissions by over 287,000 tCO_2-e over the period.

The largest contribution to these ambitious reductions will come from our mains replacement programme, which targets the leakiest metallic pipes within our network. Significant additional gas shrinkage reductions will also continue to be delivered by our investments in system pressure management and gas conditioning. We have committed to further optimising this technology in RIIO-2.

Gas escapes associated with third party damage, joint failure and pipe corrosion also result in emissions of natural gas to atmosphere. As detailed in Section 4.2, we have committed to repairing emergency gas escapes more quickly during RIIO-2, with continuous improvement in repair times throughout the period. These commitments could deliver an estimated additional real-world carbon emission savings of c.30000 tCO_2-e over RIIO-2.

Enabling green gas

We are committed to enabling the injection of green gas to our network to support the transition to a low carbon energy system and enable net-zero greenhouse gas emissions by 2050. Building on our work done in RIIO-1, we have engaged with our stakeholders to identify areas where we can improve our customer service to assist the connection and operation of green gas production sites.

In RIIO-2 we will improve our customer service offering for new and existing biomethane customers, talk to our stakeholders to understand how we can improve further to help them, and work to standardise the connection process. As detailed in Appendix 8, during RIIO-2 we commit to enhanced customer service levels for capacity studies, improved response times to system faults compared to RIIO-1 and commit to liaising with our green gas stakeholders at least annually throughout RIIO-2 to gather feedback and identify areas to improve our customer performance. We will report our biomethane connection performance in our AER via a set of reporting outputs influenced by what information our stakeholders find useful.

Our biomethane story

Over RIIO-1 we have worked with government and biomethane stakeholders to grow the biomethane industry. By early 2020, we will have connected 17 biomethane plants, with a combined capacity of just over 17,000scm/hour. We have reviewed our priorities for biomethane and focussed on the customer journey, ensuring that we provide the right support, information and timely service where a producer wants to connect to our network.

We have heard from our biomethane stakeholders that they would value an improvement to our customer service and as a result, we are introducing strengthened outputs in this area to deliver initial and detailed capacity analysis reports to stakeholders in a timelier manner. Our engagement with biomethane producers over RIIO-1 has also demonstrated that views amongst this stakeholder group vary and the level of engagement that we receive has been inconsistent. This has prompted us to rethink our approach and look to identify new methods to reach out to and engage with these stakeholders. We are proposing to hold an annual workshop to further unpack these views and ensure that we're directing our efforts toward areas that they value the most. We are also identifying potential areas where we can support market stimulation of biomethane injection projects by working collaboratively with waste generation streams to maximise the potential of this resource. We have included a number of innovation projects focusing on extending the potential of biomethane on our network, including research into the establishment of a biomethane hub to streamline injection into our network.

Our biomethane commitments are detailed in our EAP and we will report progress annually through our AER. This will include progress against innovation and business as usual activities. We are committed to improving the service we provide to our biomethane stakeholders and facilitating an improved green gas connection service. We are also committed to advocating for changes to be made to our regulatory framework to ensure that it remains fit for purpose and is flexible enough to facilitate further injection of low emission gases such as biomethane.

Our pathway to net-zero carbon

We are committed to reducing carbon in our network and will implement a range of initiatives in RIIO-2 to deliver against our obligations.

We have divided our approach to carbon reductions into two areas to demonstrate our pathway to deliver the 2050 targets.

We have discussed our ambition to decarbonise our business by 2030/31 in Part 4.4.1 as we consider we have control over the uptake and deployment of low carbon technologies in these areas. However, our biggest area of carbon impact is through the gas that flows through our network.

In addition, to reducing our leakage and shrinkage and targeting an improved process for injecting green gas into our network, we have mapped out our pathway to achieve net-zero by 2050. Our approach is based on cross-industry work delivered through the ENA to map pathways for the gas sector to 2050. We consider our H21 and HyDeploy projects provide the foundation of achieving the reality of 100% hydrogen gas through the network. In RIIO-2 we will focus on delivering the final phases of these projects and reporting progress to enable the hydrogen transition.

We are committed to delivering net-zero as soon as possible and will push for a decision on heat in the early 2020s so that we can continue to implement the outputs of our programme of work to demonstrate a hydrogen economy. This area of research is well advanced through our pioneering work on H21 and we intend to continue this in RIIO-2. We also see great value in collaboration and will work with other GDNs to maximise value delivered from the wider innovation portfolio and contribute expertise to compliment these projects.

Our pathway initially focusses on increased biomethane and hydrogen injection, following the successful completion of HyDeploy, to reduce the carbon intensity of gas in our network leading to a network that will be characterised by the following in 2050:

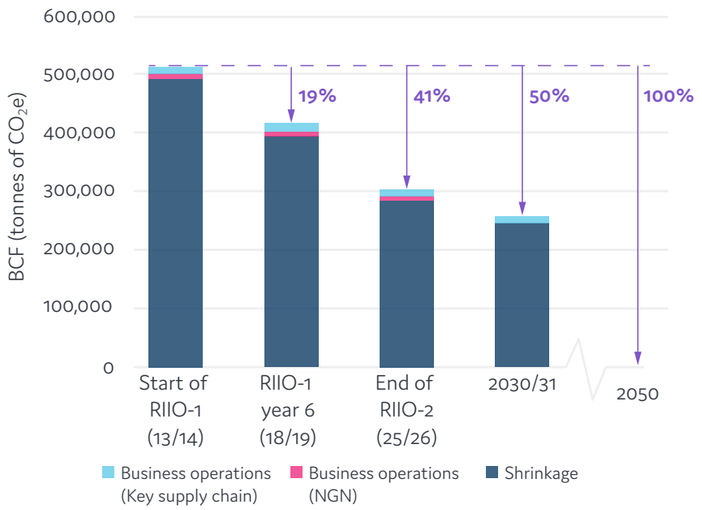
- **Significant reduction in gas throughput –** a 46% reduction in total gas delivered through our network (although we are still relied upon to deliver peak heating demand in winter), largely driven by increasing energy efficiency of homes and businesses, the uptake of alternative technologies such as heat pumps and identification of areas of our network that are better suited to full electrification.
- **Biomethane –** biomethane will either solely supply segmented areas of our network, or be displaced by hydrogen and instead used for other applications such as transport.
- **Hydrogen conversion –** most (if not all) of our network will be converted over to hydrogen and is predominantly supplied by blue hydrogen (coupled with carbon capture and underground storage), with further transition to green hydrogen required. H21 will enable hydrogen conversion.
- **Zero emission –** our network supplies zero emission gas to customers, as carbon capture technologies have improved to ensure 100% carbon capture and electricity generation has transitioned over to renewable sources with storage to support the growth in production of green hydrogen.

Our Whole System Strategy and Innovation Strategy to enable, research and evidence to facilitate the net-zero change. We consider the EAP as the regulatory reporting mechanism where we will report progress on our net-zero ambitions with the Innovation and Whole Systems Strategies providing the enabling work and partnerships to facilitate the change. More information on our Innovation Strategy is within Part 5.4 and Appendix A18, and the Whole System Strategy is within Part 5.1 and Appendix A14.

An overview of our plan | Giving customers confidence that we will deliver | Giving customers a stronger voice | **Delivering better outcomes for our customers** | A sustainable plan for the future | Delivering value for money | Financing our plan

Our contribution to net zero

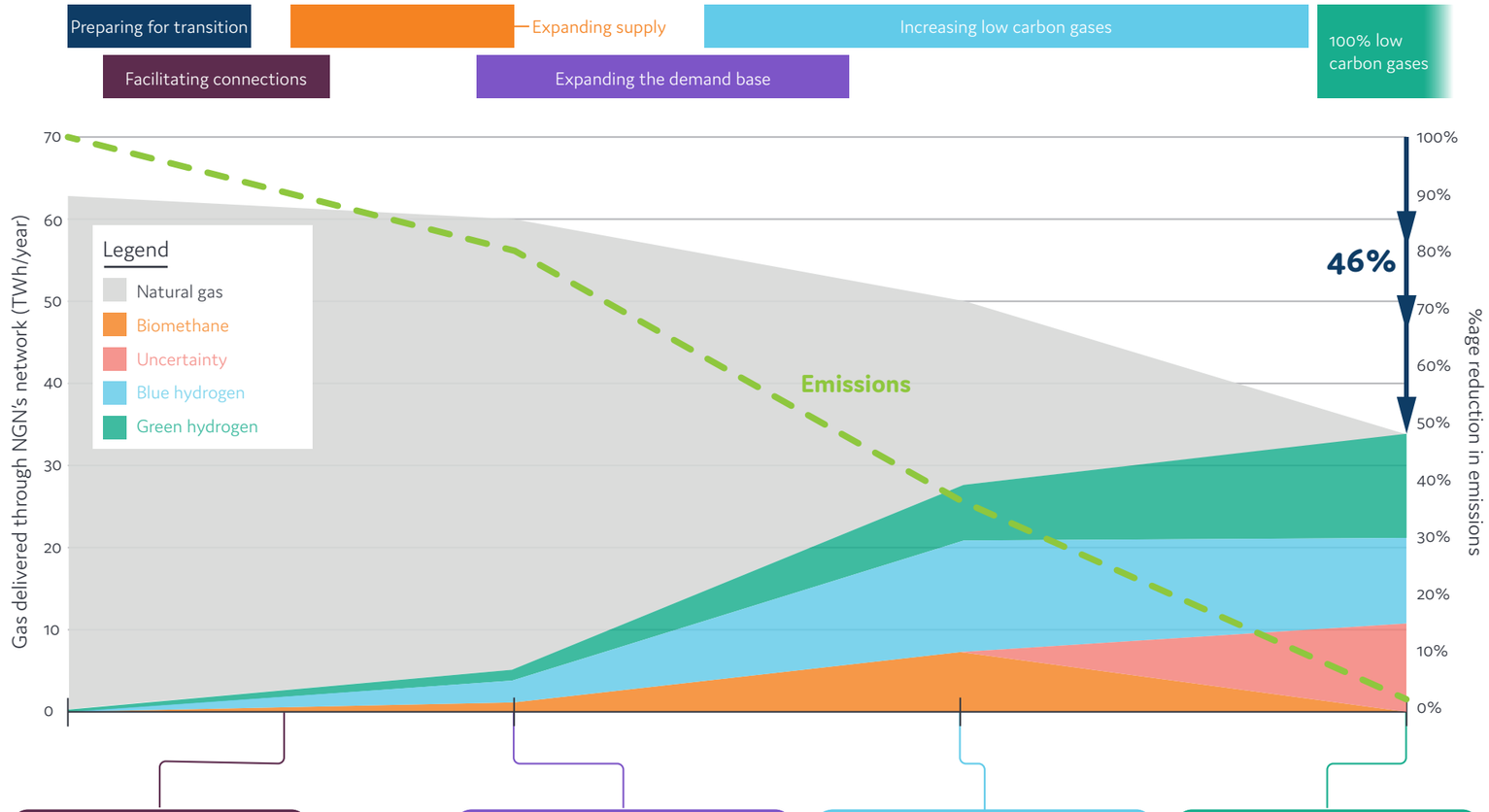
NGN is committed to supporting the achievement of the UK's 2050 net zero emission target



Our ambition is to achieve net zero scope 1 & 2 BCF by 2031/31

The importance of innovation and R&D

Based on current assumptions around efficiency of carbon capture and storage technologies, we would not be able to reach our net zero target (gas flowing through our network would still contribute around 300,000 tonnes of carbon per year in 2050). We have assumed that there will be technological breakthroughs in the industry to support the achievement of net zero, which highlights the importance of our innovation investments now.



By 2025

- Research and development into feasibility and safety case for introducing alternative gases into NGN's network
- Continued facilitation of biomethane injection
- Demonstration of safety case for 100% hydrogen for heat
- Increasing volumes of hydrogen blends through delivery of HyDeploy
- First 100% hydrogen community trial delivered
- **Emissions impact of our network is c12 million tonnes of CO2e p.a. A reduction of 12% on 2020 levels**

By 2030

- Increasing injection of low carbon gases into our network, through biomethane and hydrogen
- Biomethane supply increases to c3%
- Hydrogen supply increases to 10% (on an energy basis), as blended hydrogen is maximised and larger 100% hydrogen community trials are delivered
- Blue hydrogen anticipated to be more prevalent than green hydrogen (c72% of hydrogen production)
- **Emissions impact of our network is c11 million tonnes of CO2e p.a. A reduction of c18% on 2020 levels**

By 2040

- Conversion to 100% hydrogen is established with large scale roll-out of hydrogen conversion commencing
- Hydrogen supply chain has developed to service customers
- Increased blends of biomethane up to 15%
- **Emissions impact of our network is c5 million tonnes of CO2e p.a. A reduction of c62% on 2020 levels**

By 2050

- Hydrogen clusters are widespread, with our network no longer supplying conventional natural gas to customers
- Our network supplies solely hydrogen, or biomethane through a segmented network
- Blue hydrogen production continues, with a longer-term trajectory for to produce hydrogen from renewable electrolysis
- Innovative carbon capture technologies have been embedded such that the emissions impact of **our network achieves net zero by 2050**

Figure 4.5: Our Contribution to Net-zero

4.4.3. Protecting the environment

A summary of our EAP commitments which aim to reduce the environmental impacts of our business operations, as guided by our Environment Strategy, is provided in Table 4.22.

RIIO-2 initiatives for protecting the environment							
No	**Output**	**Type**	**Ofgem target**	**NGN target**	**Resource and expenditure**	**Customer benefit**	**Stakeholder evidence**
NGN bespoke outputs							
E8	EAP – initiatives to improve air quality (CVP)	ODI (R)	N/A	· Vehicle fleet improvements · Tree planting in our region (40,000 over 5 years) · Gas preheating infrastructure improvements	Transport and plant c£19.5m £0.9m for EV charging £400k for tree planting funded by owners Note the costs are the same as fleet improvements outlined in BCF	Improved air quality Carbon reductions Social amenity Improvements £17m benefit in RIIO-2 and £197m over 15 years from 2021/22 Note these include benefit of carbon reduction	Business plan acceptability **Customer insights 42, 44, 45 and 49 in customer insight appendix**
E9	EAP – initiatives to use resources responsibly	ODI (R)	N/A	· Embed NGN Sustainable Procurement Policy via Supplier Code · Less than 2.5% virgin aggregate use · Reduce office and depot waste by 20% (vs 2017/18) · 0% office and depot waste to landfill · Reduce paper use by 50% (vs 2017/18) · Less than 0.1% of excavation spoil to landfill · Eliminate single use plastic items from offices and depots	Not identifiable - impacts all operations	Reduced waste Reduced carbon Improved efficiency Promote circular economy Reduce resource use	
E10	EAP –initiatives to enhance life on land	ODI (R)	N/A	· Targeted biodiversity improvements at >200 NGN sites · Embed tools to measure net change in ecosystem services at our 50 largest sites and natural capital on new large projects · Continue land remediation programme, including up to 8 site remediations	c£3.4m to deliver land remediation programme. No additional resource is required to deliver these outputs	Social and environmental amenity improvements. Benefit of £0.95 in RIIO-2 and £21m over 15 years from 2021/22	

Table 4.22: EAP outputs focusing on protecting the environment

An overview of our plan | Giving customers confidence that we will deliver | Giving customers a stronger voice | **Delivering better outcomes for our customers** | A sustainable plan for the future | Delivering value for money | Financing our plan

Improving air quality

Poor air quality is recognised as the largest environmental risk to public health in the UK, with long-term exposure to human-made air pollution having an annual equivalent effect of 28,000 to 36,000 deaths in the UK[4] . Air pollution is important to our stakeholders, in particular in Leeds which is one of five cities in the UK with a mandatory requirement to significantly improve air quality. As a part of our EAP in RIIO-2 we will invest in initiatives to improve air quality including:

- improving our vehicle fleet which includes the removal of 250 diesel vehicles that will be replaced by ultra-low emission or hybrid vehicles (see Part 4.4.1 for further details),
- planting 40,000 trees, and,
- improving gas pre heating systems.

We will report progress on this separately to the carbon reductions associated with the same initiatives (outlined in Table 4.20) due to customer feedback on ensuring we can report progress against air quality improvements.

Using resources responsibly

We recognise the need to develop a sustainable approach to procurement and resource consumption to reduce the environmental impact of our business operations and c.£200m of goods and services that we buy each year from our supply chain. Building on our improvements on excavation spoil to landfill and virgin aggregate consumption during RIIO-1, our targets for RIIO-2 will ensure that we improve resource use, minimise waste and embed the principles of sustainability into our supply chain. We will report our performance against each of these initiatives within our AER.

Enhancing life on land

We will enhance the landscapes and communities in which we work by proactively improving our landholding and implementing the valuation of biodiversity improvements into our decision making. Our stakeholders are actively interested in the extent to which we can positively manage our above-ground asset sites to deliver environmental betterment and considered this to be important to report against in RIIO-2.

Case study –
Sustainable land remediation, Redheugh gas holder station

We installed an innovative solar-powered land remediation system to recover historical hazardous coal tar from below the ground surface at our former gas holder station in Redheugh.

During 2017/18 and 2018/19, the system recovered over 6,000 litres of toxic coal tar and over 17,000 litres of contaminated water for safe disposal, using only renewable solar energy. This approach saved approximately 66 tonnes of CO_2-e and £28,000 compared to the use of traditional generators.

The project won the 'Best in situ treatment' category at the 2018 Brownfield Briefing Awards and the 'Sustainability Award' at the 2019 Ground Engineering Awards, with the judges commenting that it was "a good example of permanent, sustainable environmental betterment".

bb AWARDS 2018 WINNER

GROUND ENGINEERING AWARDS 2019 WINNER Sustainability Award

4 https://www.gov.uk/government/publications/health-matters-air-pollution/health-matters-air-pollution (accessed 26 July 2019).

4.5. Our customer value proposition

We have developed a challenging and ambitious business plan that delivers the priorities and outcomes that our customers and stakeholders have told us are important to them. Our plan balances the delivery of outstanding levels of services, with cost efficiency and ensuring that we prepare our network for the transition to an environmentally sustainable low carbon energy system.

We have undertaken a thorough assessment of the value that our plan delivers, specifically those areas where customers have told us to be more ambitious and which go beyond the normal activities of a GDN. These areas deliver additional value beyond what customers expect and we have valued this benefit to include in our Customer Value Proposition (CVP). Our CVP proposals have been clearly signposted throughout this plan and are summarised in Table 4.21 below. An overview of the valuation process and outcomes of our CVP are also presented below. A full assessment of our CVP is included as Appendix A13.

We have valued 13 areas of our plan on a consistent basis which we consider will deliver added value to customers. 12 of our CVP proposals will deliver benefit as a direct result of our RIIO-2 plan and we propose them for inclusion in our CVP. We do not propose inclusion of CVP13 as the benefits will not fully be realised by customers in RIIO-2. However we consider our work on H21 and HyDeploy which underpin our net-zero pathway and energy system transition will deliver ongoing value for customers. As such we have valued the benefits that this enabling work will deliver in the future.

	Ref	CVP proposal names	Notional additional benefit delivered
Vulnerability	CVP1	Fuel poor connections	The minimum standard for fuel poor connections is 1,000 per year. Our proposal for RIIO-2 is to stretch this to deliver 2,000 per year against challenging revised guidelines.
	CVP2	Hardship Fund	We will establish a Hardship fund to support those who cannot afford repairs/replacement to gas appliances post disconnection in RIIO-2.
	CVP3	Community Partnering Fund	Our Community Partnering Fund will be delivered in partnership with Northern Powergrid. NGN will contribute £50k to a £100k pot which is accessible to community groups and charities to progress projects in their areas.
	CVP4	Customer Vulnerability Competency Framework	Implementation of a Customer Vulnerability Competency Framework to train NGN staff to recognise vulnerability and manage vulnerable customers.
Environmental	CVP5	Company cars	Implementation of a revised company car policy to include only full electric or hybrid vehicles.
	CVP6	Tree planting	Voluntary planting of 40,000 trees across our network.
	CVP7	Enhanced Repair for Gas Escapes	Improved repair time for gas escapes through the implementation of 7- and 28- day targets.
Customer service	CVP8	Appointments for restoration of gas to appliance	Provision of an appointments system for restoration of gas to appliance.
	CVP9	Complaint Resolution	60-min standard for complaint resolution
	CVP10	Gas Restorations to appliance	Restoration of gas to appliances within 2hrs of restoring gas to ECV.
	CVP11	Reinstatement	Reinstatement of a customer's premises (private) within 3 calendar days for planned and unplanned interruptions, excluding Bank Holidays.
	CVP12	Citizens' Jury	Commitment to an enduring customer engagement mechanism with our Citizen's Jury meeting three times a year.
Energy transition (Not included in RIIO-2 CVP)	CVP13	Hydrogen transition	Delivery of Phase 1-3 of the H21 Programme, and successful completion of HyDeploy will evidence the safety case and pathway for the use of upto 100% hydrogen in the GDN.

Table 4.23: Summary of areas included in our CVP

Our CVP values the key outcomes and insight from our stakeholder engagement activities to identify high priority areas and service levels that customers value. We shortlisted the outputs that deliver these service levels and priorities and assessed our proposals against the criteria outlined in Ofgem's RIIO-2 Business Plan Guidance. We also discussed our proposals with our CEG to determine whether these projects are within CVP scope. We have ensured that we have mapped and valued the benefits that are expected to be realised through our CVP outputs.

We have used a logic model approach to establish the impact pathways for each CVP activity and produce the benefit impact pathway mapping to articulate the flow from our activities to the outcomes experienced by a range of different beneficiaries. Figure 4.6 provides an indicative macro view of the benefit mapping and the beneficiaries identified to whom our CVP is delivering added value. In Appendix A13, we have mapped every CVP proposal to indicate where benefits are realised and who the beneficiaries are.

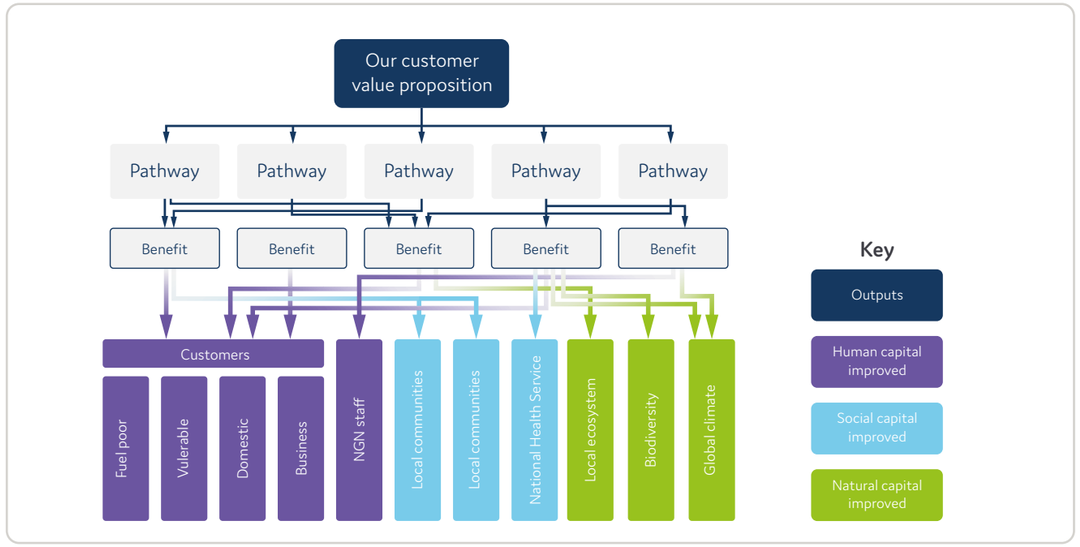


Figure 4.6: Benefit pathway mapping for our CVP

A summary of the process we have followed to determine what to include in our CVP is outlined in Figure 4.7. We have focused our CVP on the three service areas of vulnerability, environment and customer service and have identified twelve projects we will deliver, which provide exceptional customer value in these areas.

Figure 4.7: Process to assess our CVP

Once the benefits have been qualified, we have established the quantum of change for each benefit using a mixture of our past performance data, industry data and information from other reputable sources.

We have used our WTP research where possible, for the valuation of benefits and other industry recognised sources of values such as NARMs[5] and the Ofgem Cost Benefit Analysis template. Where WTP and industry standard sources of value do not exist, other reputable sources have been used, such as HM Treasury, Defra , the Department for Business, Energy and Industrial Strategy (BEIS) and Woodland Trust.

A summary of the benefit values for each CVP area is presented in Table 4.24 below. A more detailed narrative of each CVP and its benefit value is included in Appendix A-13.

Ref	CVP proposal names	RIIO-2 value (£m)	Total value[6] (£m)
1	Fuel poor connections	21.76	83.56
2	Hardship Fund	13.70	49.35
3	Community Partnering Fund	0.47	0.47
4	Customer Vulnerability Competency Framework	0.13	1.90
5	Company cars	1.43	2.44
6	Tree planting	0.95	22.69
7	Enhanced repair for gas escapes	8.42	81.02
8	Appointments for purge & relight	25.44	25.44
9	Complaint Rresolution	6.43	6.43
10	Gas restorations to appliance	2.60	2.60
11	Reinstatement	6.16	6.16
12	Citizens' Jury	1.87	1.87
Total	**RIIO-2 customer value proposition**	**89.37**	**283.95**
13	Hydrogen transition	722	76,329

Table 4.24: Monetised benefit of CVP proposals

A summary of the cumulative benefit values at the end of GD-2 and the end of assessment timeframe by beneficiaries is presented in Figure 4.7.

Our business plan delivers real benefit for customers beyond the normal activities that we are expected to deliver, all at no additional cost to our customers. Our proposals are ambitious, and delivery is dependent on the implementation and execution of our target business model and enabling technology to deliver our ambitious targets. We are extremely confident that we can deliver our ambition in RIIO-2. In the event that we are successful in receiving reward for any of our CVP proposals and are not able to deliver on our promises, any reward will be returned in full to customers, however, we will still endeavour to make up the ground to deliver on our ambitious targets.

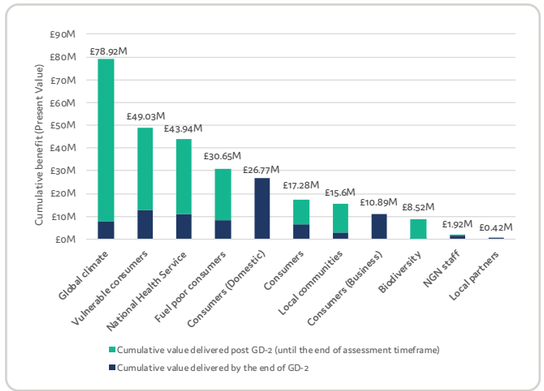


Figure 4.8: Cumulative benefit values of CVP proposals

5 NARMs also draw on values from HM Treasury and BEIS

6 Both are discounted values. Total value is the cumulative value at the end of the assessment time frame, which varies depending on the CVP area. For CVP1-5 and 7, the assessment period is 15 years. For CVP8-12, the assessment period is 5 years. For CVP6, the assessment period is 50 years. The rationale for these is set out in Section 3.2.3 of this report.

4.6. Modernising data

As a part of our ongoing commitment to network stewardship we have invested throughout RIIO GD1 to modernise energy data through the digitalisation of our IT infrastructure and energy systems. This has included investment of c.£3m NIA funding in RIIO-1. We have developed and are implementing a digital strategy to ensure that we can deliver on our RIIO-2 objectives and provide increased value for current and future customers.

We first outlined our digital strategy in 2014 and this has evolved since then drawing in new technologies, new ways of thinking, and new learning from hard-won experience. Throughout our evolution, one guiding principle has always been front and centre: Integrated Information Management; the understanding that data flows through everything that we do.

There is an absolute understanding in NGN that we can deliver the excellent levels of performance and service that our customers expect and deserve, but in a different way; through a Smarter NGN.

Our customers expect increasingly higher standards of service, our colleagues expect technology at work to be as good if not better than at home and we continually strive to be as safe, reliable and efficient as possible with our technology and its use in our organisation.

4.6.1. Cost savings through digitalisation

We have already started to realise the cost savings associated with digitalisation. At the start of RIIO1 we operated an on-premise IT infrastructure model, with NGN owned servers operating from seven data centres and supported by a number of outsourced partners. This meant that we operated a high cost of ownership estate, with a limited ability to flex the use of technology to meet the growing demand for change in Technology. We also operated two Wide Area Networks, with an associated high cost of ownership and an inconsistent colleague experience.

This combination of on-premise hardware, outsourced support and a complex number of IT service contracts meant that the overall cost to operate IT services in NGN was high and resulted in low levels of innovation and colleague satisfaction with the services that were being received

During RIIO GD1, we have delivered many projects to improve these areas, including:

- Establishing an in-house IT 24/ 7service desk, supporting all colleagues, this is NGN's Colleague Care Team
- Migrating IT systems to public cloud, including the first deployment of a Gas SCADA system to public cloud in the UK
- Delivering a data-led transformation programme through S4 HANA
- Simplifying and rationalising contracts to have a single application support contract, a single infrastructure as a service contract and a system control support contract

We also started our journey to digitise our data through FWoW, a digital transformation programme that introduces consistent, standardised processes based on industry best-practice, fully integrated information management and data captured and validated at source. FWoW uses the latest technology to provide real-time reporting, accurate data capture and reduces overheads through the facilitation of increased self-service. FWoW provides a common platform for all processes, meaning cross flexing between teams is much easier, and it builds on NGN's cultural and organisational development and terms and condition changes to deliver IT-enabled transformation.

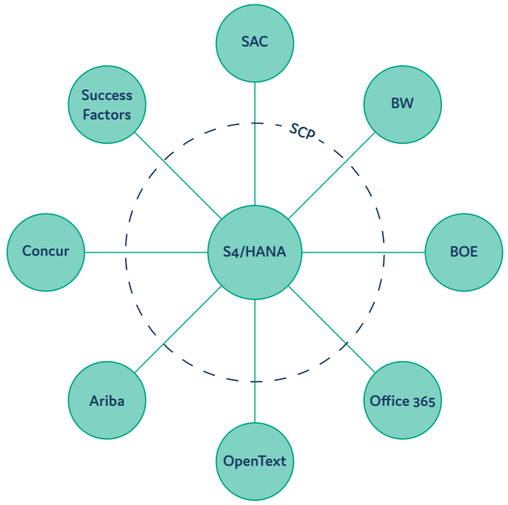
Through NGN's digitalisation work in GD1, significant cost savings have been made through a reduction in IT OPEX costs and through significant business efficiencies driven by digitalisation and these will continue in RIIO-2 to ensure delivery of our plan.

4.6.2. Ongoing efficiency improvements

As a result of FWoW we have also identified the opportunity for on-going efficiency improvements by implementing:

- Standard and simple processes -S4 Hana as standard
- In-house design and build of work apps by the teams who will be using them
- New technology – SCADA in the cloud, digital operation room
- Not using a system integrator – working with specialist suppliers and developing in-house capability.

Our digital enterprise and associated applications are shown in Figure 4.8 below. Further detail on our approach and action to embed the outputs and recommendation of the Energy Data Task Force (EDTF) report are detailed in Appendix A12.



S4/HANA	Our Enterprise Resource Planning tool, running on the state-of-the-art HANA Darabase
SuccessFactors	Our Human Capital Management application, for all Employee and Manager Self-Service HR activities
Concur	Our Expense and Travel Management application
Ariba	Our procurement and Supplier Management application
SAC (SAP Analytics Cloud)	Our Information Management amalgamation visualisation and exploration application
BW (Business Warehouse)	Our Analytical staging, planning, consolidation and transformation application
BOE (Business Objects Enterprise)	Our Data Integrity and Assurance application
OpenText	Our Enterprise Content Management solution for unstructured data
Office 365	MS Office applications and solutions in the cloud
SCP (SAP Cloud Platform)	Our Digital Platform, runing on the HANA Database, for app creation, integration and innovation

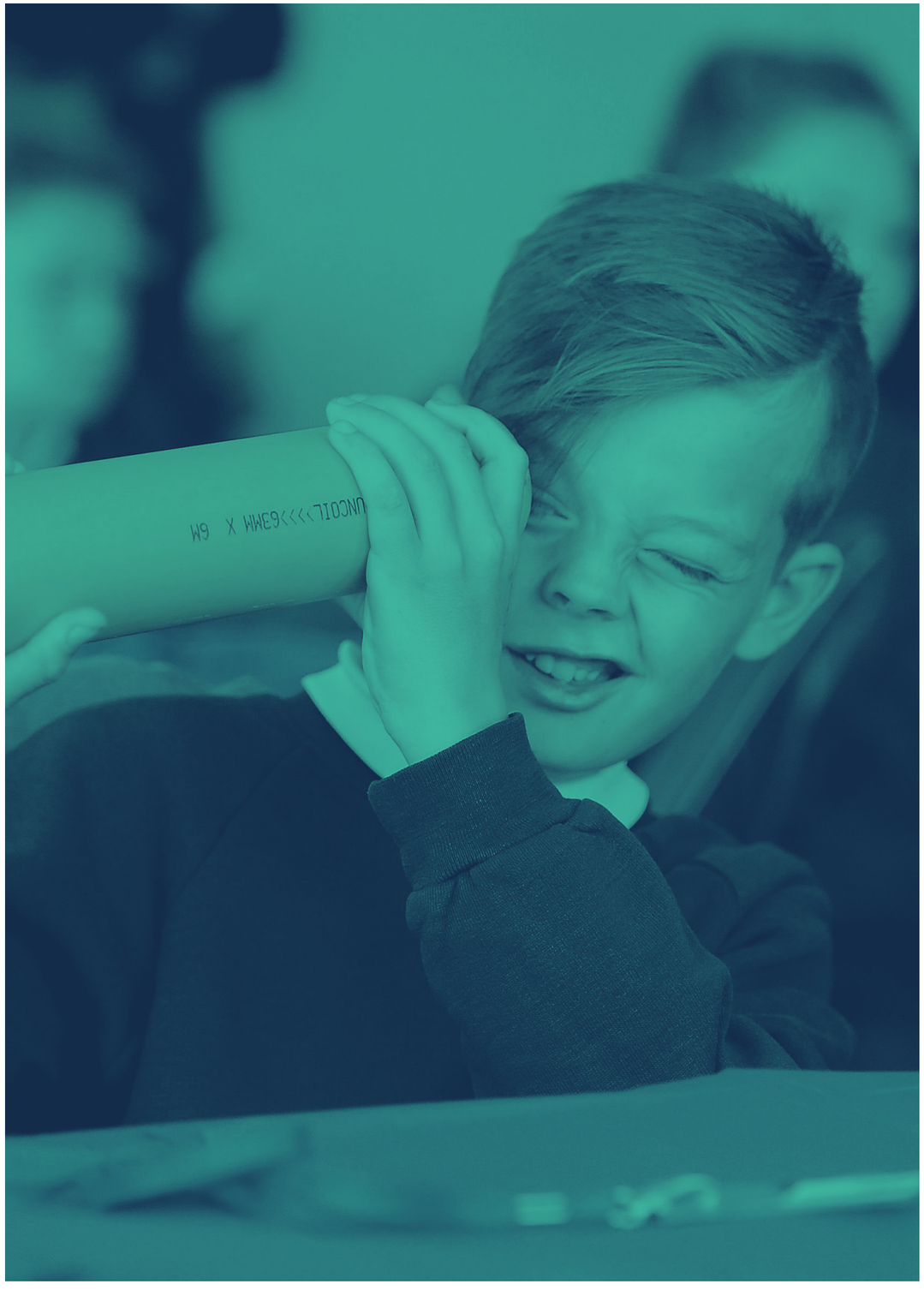
Figure 4.9: NGN digital enterprise and associated applications

We have implemented a significant transformation at NGN through our digitalisation journey and will continue to push the bar in this field. In addition to working collaboratively through our whole system strategy, outlined in section 5, to allow open access to data and data sharing. Key aspects of our approach detailed in Appendix A12 include:

- Recognising and embedding the outcomes of the EDTF report
- A commitment to continuous review and improvement of our approach and sharing learning with wider industry and local partners
- Collaboration with local anchor institutions and public bodies through the Leeds Open Data institute to learn, review and continuously improve
- Established process to make the most of metadata and extension of our open data standards to include metadata
- Consideration of the workforce planning and capability needs that come with a digitalised company
- Ongoing engagement, review and feedback from our users on the digitalisation strategy
- Clear delivery plans to meet the needs of users supported by relevant analysis.

Our digitalisation strategy will be made publicly available through our website and outline our plan for the ongoing continuous improvement. We also support and will work with the ENA and wider industry to facilitate a collaborative event in early 2020 and see this milestone as a key opportunity to share our progress and learning to facilitate the continuous improvement.

An overview of our plan | Giving customers confidence that we will deliver | Giving customers a stronger voice | **Delivering better outcomes for our customers** | A sustainable plan for the future | Delivering value for money | Financing our plan



PART 5: A SUSTAINABLE PLAN FOR THE FUTURE

IN THIS SECTION

In this section, we describe how we will respond to a changing energy landscape, in order to continue to deliver a reliable, good-value service to our customers.

This section examines the need to take a whole systems approach to our business planning, looks at future energy scenarios to predict likely customer demand and sets out the mechanisms by which we will manage uncertainty.

We outline the role innovation and competition has to play in a sustainable future, by adopting new technologies and ways of working to drive efficiency and improve customer service.

5.1. Enabling whole systems energy solutions

NGN is committed to a whole systems approach, in order to deliver sustainable energy solutions that will benefit our customers and contribute to meeting the UK's net zero emissions target.

A whole systems approach is one that facilitates strong collaboration and integration across utilities, operations, markets and supporting processes.

As the UK energy landscape becomes increasingly complex, it is vital that investment decisions are made with full consideration of whole systems benefits and costs, so that we can deliver truly sustainable, value-for-money solutions for our customers. We take the broadest possible definition of a whole systems approach, covering gas, electricity and transport. As well as enhanced integration of technology and processes, a whole systems approach is also dependent on better communication and knowledge sharing amongst utilities (including water and telecommunications) and other organisations.

As a distribution company, we understand that we can have different roles in supporting whole systems solutions. In addition to projects where we are driving the delivery of scope and outcomes, we actively support third-party organisations in researching and delivering whole systems energy solutions.

5.1.1. RIIO-1: embedding a whole systems approach

Throughout RIIO-1, we took many steps to promote greater collaboration across the energy sector. Notable projects and ways of working include the following:

Proving the case for hydrogen: The foundation of our pathway to net zero is based on increasing injection of hydrogen into our networks, through to conversion to 100% hydrogen. This will be facilitated through two key projects, HyDeploy and H21.

- **HyDeploy** - We are working with project partners to deliver HyDeploy 1 and 2 which will demonstrate the potential of hydrogen blending in gas distribution networks. These trials will blend up to 20% hydrogen (by value) into the gas supplied to around 800 homes and businesses on our network. HyDeploy will demonstrate the potential of hydrogen blending in gas distribution networks in the UK, supporting our ambition to achieve 20% hydrogen injection (by volume) across our network by 2030.[1]
- **H21** - H21 is our hydrogen research project and has already proven that conversion of the existing gas grid to carry 100% hydrogen is technically possible and economically viable. We are close to completing Phase 1 of our H21 work programme and are due to commence Phase 2 in early 2020. H21 is the cornerstone project of our whole systems approach and pathway to achieving our net zero carbon commitment by 2050. We have already developed comprehensive plans for the roll out of 100% hydrogen through the H21 Leeds City Gate and H21 North of England reports. In RIIO-2, we will continue to deliver the enabling research and evidence for the conversion of gas networks to 100% hydrogen through our innovation strategy (presented in Part 5.4).[2] We have quantified the consumer value proposition associated with delivery of our hydrogen pathway as well as the wider benefits that will be enabled across the UK through delivery of this project. Further detail on this is outlined in Part 4.5 and Appendix A13 NGN RIIO-2 Consumer Value Proposition.

Importantly, we are also working collaboratively through the Hydrogen Programme Development Group (with BEIS and other GDNs) to develop a broader programme of work relating to gas network safety testing, distribution network operations and impact testing and system optimisation. We expect a policy decision on heat in the early 2020s, and at that time, we will trigger a reopener to flex our Business Plan to fund the network augmentations required to convert our network to 100% hydrogen as conceptualised in our H21 feasibility studies.

InTEGReL: In 2017, we established the Integrated Transport Electric and Gas Research Laboratory (InTEGReL) – the UK's first multi-vector, integrated energy systems research and demonstration facility in Gateshead. Led by us, and in partnership with Northern Powergrid and Newcastle University, InTEGReL is helping to tackle the UK's energy challenges head on. Teams of academics and engineers are working to deliver breakthroughs in the decarbonisation of heat, energy storage and transport, to identify the most affordable and practical solutions for low-carbon, least-cost energy. The first projects are now underway on site, with Northumbrian Water, Three and Siemens also joining as partners.

1 For further information on HyDeploy, please visit https://hydeploy.co.uk/
2 For further information on our H21 work programme please visit our website at https://www.h21.green/

Local area energy plans (LAEPs): We have continued to monitor and contribute to the development of regional energy strategies in our network area. In particular, we have directly contributed to the North East Local Enterprise Partnership's (NELEP's) "Energy for Growth" strategy[3] as well as the Leeds City Region's Energy Strategy and Delivery Plan[4]. This has resulted in an enhanced understanding of the challenges associated with meeting the UK's net zero emissions target and has demonstrated the value of continuing collaboration in this area. As evidence of this continued collaboration, we have recently been appointed a board member of the North East Energy Catalyst (led by the NELEP), which was established as an outcome of its "Energy for Growth" strategy. We have also proactively offered support to other organisations in assisting the development of their energy plans, as we consider strengthened collaboration in this area is consistent with our whole systems strategy.

Data sharing: We have established processes for sharing data with third parties in relation to the location of our assets, health and safety, customers in vulnerable situations and upcoming streetworks. We are also a member of the open data institute, allowing open exchange of information across multiple member organisations.

Collaborative projects to support vulnerable customers: We have continued to work with other infrastructure providers (Northern Powergrid, Yorkshire Water, Northumbrian Water and various housing associations) through Infrastructure North to deliver initiatives to support customers in vulnerable situations.

Energy Networks Association: We are continuing to actively participate in the Energy Networks Association's Open Networks project, which is focused on developing whole energy system collaboration opportunities between gas and electricity networks.

5.1.2. Our whole systems strategy

Our approach implements a broad focus on "whole systems thinking" across our business, based on three key components:

- **Whole systems outcomes** – these are customer-driven and set out what our enablers and objectives will be delivering for customers over the longer term, taking account of the needs of both current and future stakeholders.
- **Whole systems objectives** – these are action-driven and outline what we intend to deliver to ensure that we are undertaking the right activities at a programme level to facilitate whole systems benefits.
- **Whole systems enablers** – these are process-driven and are focused on laying the right foundations to ensure that we have the right approach during our day-to-day activities.

Figure 5.1 opposite outlines our Whole Systems Strategic Framework, which is explained in further detail in Appendix A14.

Our strategic approach focuses on short-term enablers, which we will deliver as a part of business-as-usual processes and which contribute to the achievement of our whole systems objectives. These objectives target sustainable, integrated solutions for heat, transport, power and our business. The delivery of our strategic approach will ensure that we, and our partner organisations such as the local anchor institutions we have already engaged with through our strategy, will realise the long-term outcomes of decarbonisation, resilience and enduring value for customers.

We recognise that our strategy cannot be delivered in isolation so we have developed partnerships and action plans informed by a range of stakeholders to ensure that we work towards common objectives. These action plans are discussed briefly below and expanded on in Appendix A14.

We have commenced engagement in RIIO-1 with anchor institutions in our area (Yorkshire Water, Northern Powergrid, NELEP and Northumbrian Water) to share our strategy and agree a common approach for the mutual benefit of all customers. Included within Appendix A14 are letters of support from these institutions, as evidence of their commitment to a common and holistic approach to embedding whole systems thinking and action.

3 This document can be accessed online here: www.nelep.co.uk/wp-content/uploads/2018/10/nel185b-energy-smart-spec-brochure-web.pdf.
4 This document can be accessed online here: www.westyorks-ca.gov.uk/media/2424/leeds-city-region-energy-strategy.pdf.

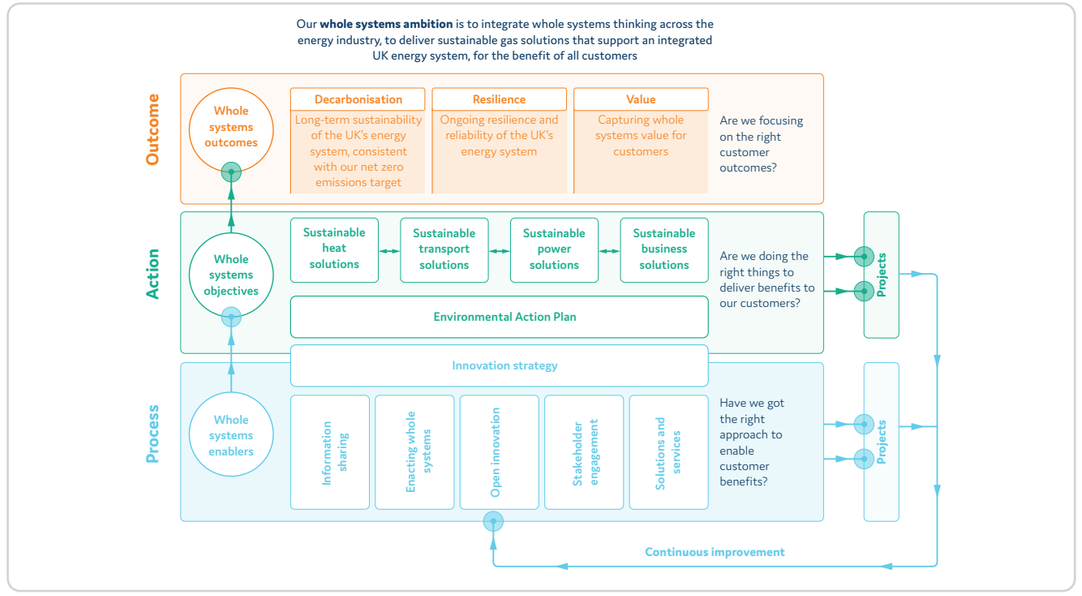


Figure 5.1: Our Whole Systems Strategic Framework

5.1.3. What stakeholders expect in RIIO-2

READ MORE ›

A whole systems approach is one that our stakeholders have welcomed. In both our RIIO-2 consultation programmes and specific engagement around our whole systems strategy, stakeholders have provided the following insights:

- Our stakeholders consider that gas should continue to be a part of the UK's energy mix.
- Our investment strategy in RIIO-2 should be business as usual 'plus' investments that prepare the network for a positive future policy decisions.
- The government cannot make decisions in favour of gas without evidence that future gas options are feasible. We should be running live trials of hydrogen and stakeholders want to see more research conducted to build an evidence base.[5]

We've also heard from our stakeholders that they expect us to focus on improving the way we collaborate in relation to our day-to-day operations. In particular, we've noted the following:

- Gas distribution companies are leading innovation in relation to streetworks, customer service and safety but there should be a short-term focus on collaborating in these areas.
- Network companies could benefit from sharing data on assets and vulnerable customers, as well as collaborating on resources, major project planning and delivery, emergency response and customer service.

This feedback has shaped our plans for further strengthening our whole systems approach in RIIO-2.

5.1.4. Our plan for RIIO-2

In RIIO-2, we will progress the implementation of our whole systems strategy through a variety of initiatives, which will be funded as follows:

- **Totex allowance –** where we have identified specific projects that will deliver tangible customer benefits, we will fund their projects in RIIO-2 through our totex allowance.
- **Network Innovation Allowance (NIA) –** where tangible benefits for our customers are less clear (or are more long-term in nature), we will use NIA funding to deliver whole systems initiatives that support the energy systems transition in RIIO-2. Read more about Innovation to support the energy transition.

5 Please see Appendix A4 for further information on these insights.

- **Third-party funding –** where projects are more prospective in nature (so customer benefits are unclear), funding will be sought through other means, such as wider government funding mechanisms (e.g. Innovate UK) or in partnership with academia.
- **Provision of technical expertise –** in some instances, we've identified projects where there is benefit of NGN involvement in progressing whole systems thinking in our region but acknowledge that the most effective means of our involvement is not through a financial contribution, but rather through the provision of technical expertise and guidance in support of our stakeholders.
- **Uncertainty mechanism –** we will continue our research and development efforts to support a policy decision about heat and, if the government introduces a new heat policy in RIIO-2, we will trigger a reopener to seek the funding required to support conversion of our gas network to 100% hydrogen.

We also recognise that it will be important for us to work collaboratively with other organisations to deliver the initiatives that we have set out for RIIO-2. To support delivery of these projects, we are working to establish a whole systems sub-group within Infrastructure North that will assist with peer-reviewing the initiatives we've identified and ensuring that our efforts are focused on delivering the greatest benefit to customers.

We consider our approach to both funding and delivering whole systems initiatives in RIIO-2 to be pragmatic, striking the balance of ensuring progression against our whole systems objectives whilst being responsive to changes in the market and having the capacity to support the achievement of government policy.

Our approach will also assist with managing the challenges associated with business plan submission dates, given that water utilities are very close to finalising their regulatory processes for PR19 and electricity distribution businesses are 12 months behind GDNs in their regulatory cycles.

Key activity: Laying the right foundations with our whole systems enablers

Table 5.1 shows how we are strengthening our whole systems capabilities in RIIO-2, with a series of whole systems enablers that are process driven and focused on laying the right foundations to ensure that we have the right approach within our day-to-day activities. These enablers are the foundation of our strategic approach and represent the pragmatic, business-as-usual adaptations we will implement to facilitate our whole systems approach. This has already commenced with action and engagement in RIIO-1. Further information on these initiatives and roles that we and other stakeholders plan is outlined is Appendix A14.

Enabler	Example initiatives and customer benefits	Funding stream	WS outcome (i.e. customer benefit)
Information sharing	Digitalisation to modernise our network – In RIIO-2, we will continue to collaborate with the Energy Networks Association (ENA) to consider and implement the recommendations from Energy Data Taskforce's "A Strategy for a Modern Digitalised Energy System".	Network Innovation Allowance (£1.25 million in NIA funding to investigate various opportunities associated with digitalisation)	Value & Resilience
Enacting whole systems	Joint works – In RIIO-2, we will continue to work collaboratively with MPs and local authorities/councils and other utilities to identify opportunities to deliver works in a coordinated way that minimises congestion and connectivity disruption.	Totex allowance (covered in baseline totex). No incremental increase in expenditure.	Value
Open innovation	**Control rooms of the future –** Together with NPG, we are working with Newcastle and Durham Universities to assess key barriers and opportunities for the integration of electricity and gas network control systems and to identify areas that require further in-depth research.	Third party funding.	Value, Decarbonisation & Resilience
Stakeholder engagement	Local area energy plans (LAEPs) – In RIIO-2, we will offer key account management to local stakeholders, at a frequency that suits them. We will also aim to take an active role in existing partnership arrangements such as resilience forums, Local Enterprise Partnerships and relevant committees, where our stakeholders believe that we can add value to the development of their energy plans.	Totex allowance (covered in baseline totex). No incremental increase in expenditure.	Value
Solutions and services	**Streamline connections process –** In RIIO-2, we will continue to work with NPG to streamline our connections processes with a view to offering an integrated service to customers, across both gas and electricity networks.	Totex allowance (covered in baseline totex). No incremental increase in expenditure.	Value

Table 5.1: Our whole systems enablers

Key activity: Delivering the right things through our whole systems objectives

Table 5.2 outlines initiatives that we are progressing to deliver our whole systems objectives. These initiatives are informed by the enabling work that we have commenced in RIIO-1 and forms the foundation of our pathway forward, as presented in Table 5.1. The full suite of whole systems objectives initiatives that we will implement in RIIO-2 is set out in Appendix A14.

Objective	Example initiatives and customer benefits	Funding stream	WS Outcome (i.e. customer benefit)
Sustainable heat solutions	H21 Phase 2 – We have received Network Innovation Competition (NIC) funding to complete Phase 2 of our H21 work programme. If successful, this project will build on Phase 1 to provide the next stage of quantified safety evidence to confirm that the gas distribution networks are suitable to transport 100% hydrogen.	NIC (to be delivered in RIIO-1 and RIIO-2).	Decarbonisation
	Improved service for biomethane producers - In RIIO-2, we are reducing the amount of time we take to provide capacity analysis reports as well as committing to responding quicker when something goes wrong. (see Part 4.4.2)	Totex allowance (covered in baseline totex). No incremental increase in expenditure.	Value & Decarbonisation
Sustainable transport solutions	**Optimisation mapping –** In RIIO-2, we will develop a map of optimised sustainable transport solutions across our network area, to inform our approach to supporting the roll-out of refuelling and charging infrastructure.	NIA	Value & Decarbonisation
Sustainable power solutions	**Net Zero Customer Energy Village –** Together with NPG and Northumbrian Water, we are working to support Newcastle University in delivering this project, which will enable comparison of outcomes across electric heat, hybrids and decarbonised gas.	Third-party funding.	Value & Decarbonisation
Sustainable business solutions	Decarbonising our fleet – In RIIO-2, we are committed to converting 50% of our total vehicle fleet to ultra low-emission or hybrid vehicles by the end of RIIO-2. (see Appendix A23K and A8–Environmental Action Plan)	Totex allowance.	Decarbonisation & Resilience
	Diversity and inclusion – In RIIO-2, we will gain accreditation to a national diversity and inclusion standard, improving the resilience of our workforce. as outlined in our Workforce Resilience Strategy attached as Appendix A10	Totex allowance (covered in baseline totex). No incremental increase in expenditure.	Decarbonisation & Value

Table 5.2: Our Whole systems objectives

Whole systems in action: our focus on digitalisation

Through our whole systems approach, we are investing in digital solutions across the organisation for the benefit of current and future customers. We believe that digitalisation can assist energy utilities such as NGN to maximise the value of data supporting the energy transition as well as facilitating clean growth across the UK.

We are already sharing operational data with the gas transmission network operator and data in relation to vulnerable customers via the Information Commissioner's Office, but believe there is more to be gained by further investing in digitalisation. We have included a suite of digitalisation projects in our innovation strategy for RIIO-2, at a cost totalling around £2.5 million over the regulatory period, this comprises £1.25 million through NIA funding and £1.25 million match funding through third parties. These projects will support the creation of data-driven decision-making that will assist us with managing risk and enabling the energy transition.

Consistent with Ofgem's guidance, we are working collaboratively through the ENA to consider and implement the recommendations outlined in the Energy Data Taskforce report. Additionally, we are already working collaboratively with NPG to investigate the potential for a direct feed from/to our respective control rooms to increase our operational staff's understanding of the links between managing supply and demand on the electricity network and how we manage gas flows in our own network.

For more information, please refer to Part 4.6 and our Digitalisation Strategy (Appendix A12 - NGN RIIO-2 Digitalisation Strategy).

Recognising the value of heat pumps

We recognise the role that heat pumps can play in meeting our net zero emission targets and the take-up of heat pumps is expected to grow significantly due to the renewable heat incentive schemes. Heat pumps can relieve the electricity grid in times of high demand and their ability to generate heat from gas adds resilience and redundancy to the energy system. Heat pumps will have a role to play in the energy transition along with other innovative technologies, given the scale of the challenge in meeting our net zero carbon target outlined in Appendix A16 - NGN RIIO-2 Economic Outlook. We have modelled the impact of heat pumps through our forward-demand planning and we project that the take up of heat pumps could be a significant factor in reducing gas demand in the future. A reduction in demand is a key component of our pathway to achieving net zero-carbon emissions by 2050. Although we are not including specific investment in heat pumps in our RIIO-2 plan, we are actively supporting the work being undertaken by Wales & West Utilities (WWU) on the Freedom Project and implementing its learning where applicable. We will continue to support fuel-poor customers who want to connect to our network making the most efficient choice by providing them with an assessment of the most efficient and reliable heating sources, which includes heat pumps.

5.2. Managing uncertainty

Price controls need to be flexible to adapt to changing circumstances in an increasingly complex world. Particular areas of our plan are clearly more uncertain than others. Even where work types are certain, volumes may alter over time. Networks should be rewarded for the outperformance they have delivered and not from changes driven by external factors. Uncertainty mechanisms allow network companies, revenues to change in line with changes in requirements, protecting both customers and companies from risk.

In our business plan, we have only included forecast costs where there is a clear audit trail of historic expenditure and a clear benefits case for future expenditure. If there is uncertainty over the future levels or timings of the expenditure, a reopener will provide an opportunity to recover or prevent any further costs on a justified basis, subject to a reopener threshold. We would expect to manage any variances below this threshold within our allowances.

Ofgem has recognised the need for uncertainty mechanisms and has included a number of them for RIIO-2. Whilst developing our plan, we have carefully reviewed our forecasts to determine whether any other mechanisms would be appropriate. We considered the following five types of uncertainty mechanism:

- **Reopeners** – where the needs case, timing or scope of a project is unclear.
- **Volume drivers** – where there is uncertainty about the future level of demand.
- **Price control deliverable** – where Ofgem wants to specify the volume and mix of work to be delivered.
- **Indexation** – where there is uncertainty over the evolution of prices.
- **Pass-through costs** – where expenditure is entirely outside the company's control.

As a result, we are proposing to expand the use of uncertainty mechanisms in six areas. These are considered further in Part 5.2. In addition, Appendix A15 provides a summary of Ofgem's proposed mechanisms, as well as further details of our proposed mechanisms and the key risks facing our network in RIIO-2.

Table 5.3 summarises our forecast cost base and the expanded uncertainty mechanisms that we think should be applied across the different activities.

Cost area	Value	Mechanism	Coverage
Repex	£108m per annum (p.a.)	Reopener – Streetworks excavation disposal	c.£0.4m – £2.5m p.a.
		Reopener – Streetworks	c.£0.6m p.a.
Capex	£59m p.a.	Reopener – Streetworks excavation disposal	c.£0.1m – £0.3m p.a.
		Reopener – Streetworks	c.£0.1m p.a.
		Reopener – Large load connections	c.£1m p.a. upwards
		Reopener – TransPennine rail electrification	c.£4m p.a.
		Reopener – High-speed Rail	Unknown costs and liability
		Volume driver – Fuel poor	£2m p.a.
Controllable Opex	£89m p.a.	Reopener – Streetworks excavation disposal	c.£0.1m – £0.6m p.a.
		Reopener – Streetworks	c.£1.3m p.a.
		Reopener – Smart metering	Unknown costs

Table 5.3: Summary of uncertainty mechanisms

An overview of our plan | Giving customers confidence that we will deliver | Giving customers a stronger voice | Delivering better outcomes for customers | **A sustainable plan for the future** | Delivering value for money | Financing our plan

5.2.1. NGN proposed additional uncertainty mechanisms

Streetworks (Opex, Capex, Repex) – Highways authorities in different parts of the country have introduced permit and lane rental schemes at different times and with different approaches. These schemes can impact our costs in three ways. We pay the permit and lane rental fees themselves because we manage the application and processing of the schemes, and the permits themselves impose conditions on how we operate in the street, which impacts our productivity.

At this time, seven authorities out of 27 in our network have introduced permit schemes. We have no lane rental schemes. Over the next two years, we expect many of the remaining authorities to introduce permit schemes, and potentially, lane rental schemes. Both types of schemes can be implemented to different levels and applied and managed in different ways, and so the exact nature and cost remains uncertain. We currently spend c.£2m on permit schemes per annum, and we estimate that costs could increase to between £4m and £5m per annum when all 27 authorities operate such schemes. Lane rental schemes have the potential to increase this cost significantly but, as none operate in our network at this time, we have limited ability to forecast the impact.

Our proposed mechanism is a reopener to allow NGN to claim for any efficiently incurred cost increases that result directly from a change in the application of the schemes. We would set the minimum threshold as 0.5% of additional Totex, c.£1.25m p.a. (above existing c.£2m). Beyond this threshold the total cost should be fully recoverable under the reopener.

Streetworks excavation disposal (Opex, Capex, Repex) – Streetworks legislation covers the safe disposal of hazardous waste encountered when the road is dug up. Regulatory Position Statement 211 gave utilities exemptions from this legislation until January 2019 – and a subsequent temporary extension now applies until April 2020. This extension has been put in place to give the utility industry time to formulate some alternative approaches to that laid out in the legislation that could satisfy the requirements with lower operational and cost impacts.

Trials have been carried out through Streetworks UK to understand the materiality of the issue. Early analysis shows costs could increase by between £0.5m and £4m p.a. for a network of our size, dependent on the approach adopted. The Environment Agency will ultimately make the decision on what is acceptable.

Our proposed mechanism is a reopener to allow the networks to claim for efficiently incurred costs as a result of the legislative change. Given the materiality of the scheme, and the likely costs which are not included in our plan, there should be no minimum threshold.

Large Load Connections (Capex) – We have seen significant increases in enquiries and actual projects in this area, which may or may not continue. Much of this is linked to the increase in peaking plant electricity generation. Our forecasts include c£1m p.a. associated with this, based on our current rate of enquiries, committed projects and costs. There is a risk that this could increase to levels seen in other gas networks, although the exact timing and impact are unknown. Our proposed mechanism is a reopener to allow the networks to claim for any efficiently incurred cost increases. We would set the minimum threshold as 0.5% of Totex, c.£1.25m p.a. (above existing c.£1m). Beyond this threshold the total costs should be fully recoverable under the reopener.

High-speed rail and TransPennine rail Electrification (Capex) – The impact, timing and funding of projects related to high speed rail and to the electrification of the TransPennine rail line is unknown at this point. We have major pipes and overcrossings which may need to be diverted, depending on the exact scope and timing of work.

We estimate the TransPennine electrification project will cost about £20m. The main issue is the timing of the project. We have included this in our forecast costs for RIIO-2 but expect any final allowance to be given on a 'use it or lose it' basis, with a reopener if the project changes – with more than a 10% cost impact.

There is much less certainty about the nature, scope and funding of high-speed rail, and so we believe a reopener would be more appropriate. Given the materiality of the scheme and that we have included no costs in our forecast – very early estimates suggesting it could be c.£30m – there should be no minimum threshold.

Smart metering (Opex) – RIIO-1 contains an existing reopener covering the potential impact of the smart meter roll out, which could lead to increases in calls to the emergency response line and more call outs to deal with problems with our equipment that have been discovered when a smart meter is being fitted. To date, there have been no material issues, mainly due to the slow roll out of the meters in RIIO-1. This in itself could cause a problem if large numbers of meters are installed over a short period to meet the deadline, which may move into RIIO-2. Read more on page 177.

We have included no costs for this eventuality in our plan. Our proposed mechanism is a reopener to allow for the networks to claim efficiently incurred costs as a result of any spikes in costs and workload. We would set the minimum threshold as 0.5% of Totex, c.£1.25m p.a. Above this threshold the total costs would be recoverable.

Fuel-poor Connections – Our ambition is to deliver at least 2,000 connections to fuel poor customers each year during RIIO-2, an increase from c.1,800 in RIIO-1. However, we recognise this is a stretching target given recent changes to the scheme which make it more difficult for customers to qualify for a free connection. Consequently, our plan includes a firm commitment to deliver 1,000 connections each year with associated costs. We then support the use of an uncapped volume driver to provide funding for any extra connections that we are able to deliver, which could increase costs by between £2m to £3m p.a.

5.3. A consistent view of the future

The operations of the future energy system are uncertain and we need to ensure that we are flexible and responsive to changes in the market. We have worked with the Energy Networks Association (ENA) and with other energy distribution and transmission organisations to develop the Common RIIO-2 Scenario referred to as the 'common scenario' which sets out a consistent and whole systems view of future demand on the UK's energy system. This was submitted to the Ofgem Consumer Challenge Group in March 2019.

In line with the findings of this work, we are expecting both annual demand and peak day demand to decline marginally over RIIO-2. Our forecasts reflect historic trends on our network and are largely driven by the penetration of renewables and improvements in energy efficiency.

5.3.1. Economic outlook and its likely impact on gas demand

We have undertaken an assessment to forecast the future economic outlook in our area of operations. The full report detailing our economic outlook can be seen in Appendix A16 - NGN RIIO-2 Economic Outlook . The key conclusion from this report is that economic growth in the UK is slowing, as this is having a dampening effect on the demand for gas. The report also sets out the significant uncertainty around managing the energy transition required to achieve the UK's emissions targets. The report also explains the key economic assumptions underlying our business plan, which are summarised in Table 5.4.

Indicator	Explanation
Gross value added	GVA is a good measure of the current state of the economy in the North of England and, as a result, of future gas demand. There are 12 regions in the UK, and in 2017 the ranking was 9th for Yorkshire and Humber and 11th for the North East, consistent with the results from 2016.
Gas prices	The most influential factor that determines gas demand annually, after weather, is the price of gas. Over the last six-year period (2013–18), gas prices have varied from £0.33 to £0.90 per therm. Prices are expected to remain volatile but to generally increase, dampening the demand for gas.
Sector growth	The commercial and services sector has seen substantial growth in our network over many years, only being halted by the recession but with sustained recovery since then. The general trend in both manufacturing and industrial sectors is toward a flattening of output and a reduction in gas demand.
Consumer Price Index	The Bank of England's forecast for CPI for the next three years is 2.4% (2018), 2.2% (2019) and 2.1% (2020). The long-term Bank of England target for CPI is 2%.

Table 5.4: The impact of key economic indicators on potential gas demand

5.3.2. A changing energy mix

The energy challenge that faces the UK is ensuring a secure supply of energy to meet consumer demand, meeting decarbonisation targets and ensuring that energy is affordable. Balancing these outcomes will be critical in meeting the net zero targets legislated by the UK government in July 2019.

Our business plan for RIIO-2 reflects the need for gas as an ongoing energy source for the following reasons:

- Continuing to use gas is essential in meeting the UK's net zero targets.
- Gas is a cost-effective measure to meet peak heat demand in the transition to a low-carbon economy.
- All potential pathways to a low-carbon future require significant investment in new technology, including enhancing green gas supply, carbon capture and storage, and dual fuel/district heating.
- Gas will provide the necessary flexibility at times of low renewable output and will enhance the diversity of the existing energy supply.

Throughout RIIO-1, we have led the focus on assessing how gas distribution networks could be 'repurposed' to deliver a low-carbon, low-cost source of energy to meet the heat demands of our customers. In particular, through collaboration with other businesses and our involvement in innovative projects such as H21, InTEGRel and HyDeploy, we are actively embedding change to decarbonise heat, using hydrogen as an energy source whilst adopting a whole systems approach.

5.3.3. Future energy scenarios

To further understand the role that gas networks can play to support the energy transition, we have worked through a number of potential future energy scenarios, as described below.

1. Pathways to net zero

The ENA's 'Pathways to Net-zero' report[6] considers the role that low carbon and renewable gases could play in a 2050 decarbonised (i.e. net zero emission) energy system, outlines a pathway to achieving this outcome and suggests the short-term, low-regret actions that GDNs can take now and in RIIO-2 to contribute to the UK's net zero targets. The report considers two key scenarios:

- A **balanced scenario** in which low-carbon and renewable gases are balanced in combination with low-carbon electricity
- An **electrified scenario** in which low-carbon and renewable gas use is limited to cases where no reasonable energy source alternative exists, such as in certain industrial processes and transport modes and for dispatchable power generation.

The electrified scenario is £13 billion per year more expensive than the balanced scenario, primarily due to costs associated with adoption of electric heating in buildings – this supports the cost-effectiveness of repurposing gas infrastructure to transport low-emission gases (such as hydrogen) in order to achieve our net zero targets.

However, another key finding from this report is that, in both scenarios, gas end-use demand volumes decrease significantly from current levels (a reduction of c.50% in the balanced scenario), whilst peak demand is only expected to decrease moderately. Consistent with the findings of other analyses, this continues to support the ongoing need for gas infrastructure to reliably supply peak energy demand in a net zero emission energy system.

We have considered these findings in our approach to forecasting demand in RIIO-2 and consider that our forecast of both annual demand and peak day demand are broadly in line.

The low-regret actions identified in the report to support our contribution to achieving the net zero targets are explained in Part 4.4 where we outline our pathway and contribution to achieving net zero-carbon by 2050.

6 This report Is available online here: www.energynetworks.org/assets/files/gas/Navigant%20Pathways%20to%20Net zero.pdf

Our pathway is largely dependent on the research and development activities to evidence the case for hydrogen. Our wider H21 strategy also outlines our proposed roll out of full-scale hydrogen at a regional and national level, and the associated expenditure to deliver this beyond RIIO-2. Our pathway to net zero, as presented, is based on the assumption that our H21 research will evidence the safety case for full-scale hydrogen deployment in our network. Following this, we will enact the heat reopener mechanism, if applicable, in RIIO-2 to facilitate investment for delivering this pathway once a policy decision on heat is made. We have not included any highly anticipatory investment in our Totex, nor any specific Totex related to hydrogen. We will utilise NIA funding and the Strategic Innovation Challenge Fund during RIIO-2 to gather further evidence on sustainability of hydrogen.

Our priority in RIIO-2 is evidencing the case for hydrogen, through our H21 and HyDeploy work programmes, and providing the UK government with the evidence to make a policy decision about heat.

2. Future energy scenarios

We have also worked with the system operator, National Grid, to develop the Future Energy Scenarios (FES) which integrate both gas and electricity networks (rather than considering them as discrete networks) to consider the needs of the UK's energy system from a whole systems perspective.

Consistent with the findings of the 'Pathways to Net zero' report, the FES supports the ongoing role for gas in the future and especially in achieving our net zero emissions targets. In particular:

- Three of the four core FES scenarios indicate that gas will continue to provide more energy to the UK than electricity
- The net zero sensitivity analysis indicates that the role of natural gas will fundamentally change, but that it will remain crucial to energy supply[7] (and the role of hydrogen in residential heating is significant).

A key message stemming from the FES analysis is that:

Gas will play a role in providing reliable, flexible energy supplies for the foreseeable future, and new technologies and sources of low-carbon gas can decarbonise the whole energy sector.

3. Common RIIO-2 scenario

In response to Ofgem guidance, we have worked collaboratively with other energy infrastructure providers to develop a consistent view of a whole systems approach to the future of energy in the UK. This work agreed a set of common factors and assumptions in developing a core view of the future for RIIO-2 ('the common scenario').

The common scenario was developed using existing analysis undertaken by the system operator. This facilitated a consistent basis on which we could develop a common view of the future. The work focused on specific key drivers (agreed collaboratively) which were identified as material by the licensees. Each driver was assessed individually, and therefore the common scenario cannot be viewed as homogeneous. Each key driver should be viewed as an individual, estimated change, informed by the majority view of the licensees.

7 This document Is available online here: http://fes.nationalgrid.com/media/1409/fes-2019.pdf.

The common scenario only considers the period to 2030, as the uncertainty beyond this point is too great. The common scenario also recognises that projections of gas network usage post-2030 are highly dependent on the success and type of decarbonisation pathway adopted for any region. In general terms, we anticipate that there may be more change between 2030 and 2050 than in the period up to 2030. Again, importantly, this work recognises the role of gas in a future energy scenario and its ability to play a key role up to and beyond 2030.

A further conclusion is that a common energy scenario involves the continued integration of the gas and power sectors. We understand that it is essential for networks to operate in a more flexible and dynamic way, and that ongoing cross-sector collaboration and understanding will be key enablers in facilitating an integrated energy system.

Investment drivers

The primary output of the common scenario was a set of key parameters that would impact on gas flows and the peak demand of gas distribution businesses through to 2030.

Consistent with Ofgem's guidance, the demand scenario underpinning our business plan is based on these parameters. Specifically, the parameters are, in general, no greater than the lowest point of the ranges provided in the ENA's 'Common RIIO-2 Scenario' report. Where they differ to the lowest point we have qualified the reason for the difference. A summary of these parameters and our chosen approach is set out in Table 5.5.

Parameter	Common RIIO-2 scenario for NGN (by 2030)	Approach in NGN's business plan
Decentralised gas generation	623MW–1085MW	We have based our forecast on historic trends, and as a result there is negligible allowance made for the impact of decentralised gas generation.
Decentralised combined heat and power (CHP)	262MW–274MW	We have based our forecast on historic trends, and as a result there is negligible allowance made for the impact of CHP.
Shale	2bcm–6bcm	We have based our forecast on historic trends, and as a result there is negligible allowance made for the impact of shale gas.
Low-carbon gases	0.1bcm–0.22bcm	We have based our forecast on historic trends, and as a result there is negligible allowance made for the increased injection of low-carbon gases into our network. As outlined in Chapter 5, we will consider the use of uncertainty mechanisms to account for any significant market or policy changes in relation to low-carbon gases over RIIO-2.
Low-carbon transport	6,000–13,000 gas/ hydrogen vehicles	We have based our forecast on historic trends, and as a result there is negligible allowance made for the increased uptake of low-carbon gas/hydrogen vehicles.
Gas 1-in-20 peak day	>457GWh	Our peak demand forecast is 484GWh (6% above the low end of the range provided in the common scenario). We consider this relatively minor difference from the common scenario (i.e. less than 10% deviation) to be appropriate, as it takes account of the impact another extreme event such as the 'Beast from the East' would have on our network.
Gas peak hour	27GW–29GW	Our gas peak hour forecast is 27.6GW (2% above the low end of the range provided in the common scenario). We consider this relatively minor difference from the common scenario (i.e. less than 10% deviation) to be appropriate, as we have derived this number using an industry-accepted methodology that is standard practice.

Table 5.5: Key parameters identified in Common RIIO-2 Scenario

5.3.4. Our demand and peak day forecasts

Annual demand

Our annual demand forecasts for RIIO-2 are based on how historic weather-corrected demand is influenced by non-weather factors (such as the economy and energy-efficiency initiatives) and how these factors are likely to change in the future.

Our analysis indicates that the most influential factor in determining annual gas demand, after weather, is the price of gas. Gas prices steadily increased throughout 2018 and this increase is predicted to continue into 2019; therefore, annual gas demand is forecast to decrease by 2.4% over the RIIO-2 period.

Figure 5.2 sets out our recent annual actual demand and forecast demand through to the end of RIIO-2.

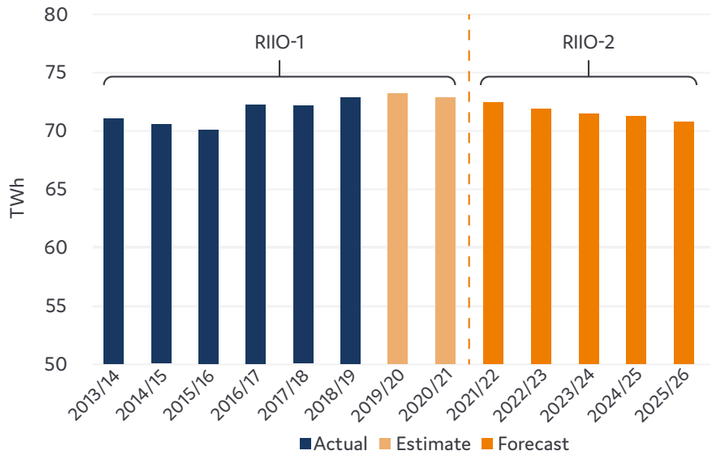


Figure 5.2: Annual demand actuals and forecasts

Further detail on our annual demand forecasting methodology is set out in Appendix A17 - NGN RIIO-2 Long Term Development Statement.

We have not identified any expenditure requirements in relation to our annual demand forecast in RIIO-2 and our shrinkage volume forecasts have been derived from a consistent basis.

Peak day demand

Peak day demand is a key factor in driving investment in the gas distribution network, and we are required to maintain and operate our network in line with our 1-in-20 peak day demand forecasts. Peak day demand is calculated using an established industry methodology[8] that determines the relationship between peak demand and the weather.

The 1-in-20 measure of peak demand has increased over RIIO-1, largely attributable to high-intensity winter events. A series of milder winters between 2011 and 2015 followed by short high-intensity cold weather, such as the 'Beast from the East' in 2018, demonstrate that the relationship between annual demand and peak demand is not linear and that periods of intense cold weather will see peak demand rise accordingly.

Our latest peak day demand forecasts incorporate the 'Beast from the East' crisis scenario and forecast a slight increase of 0.06% over the RIIO-2 period.

Figure 5.3 sets out our recent peak day demand actuals and forecasts through to the end of RIIO-2.

Further detail on our peak day demand forecasting methodology is set out in our long-term development statement attached as Appendix A17 - NGN RIIO-2 Long Term Development Statement.

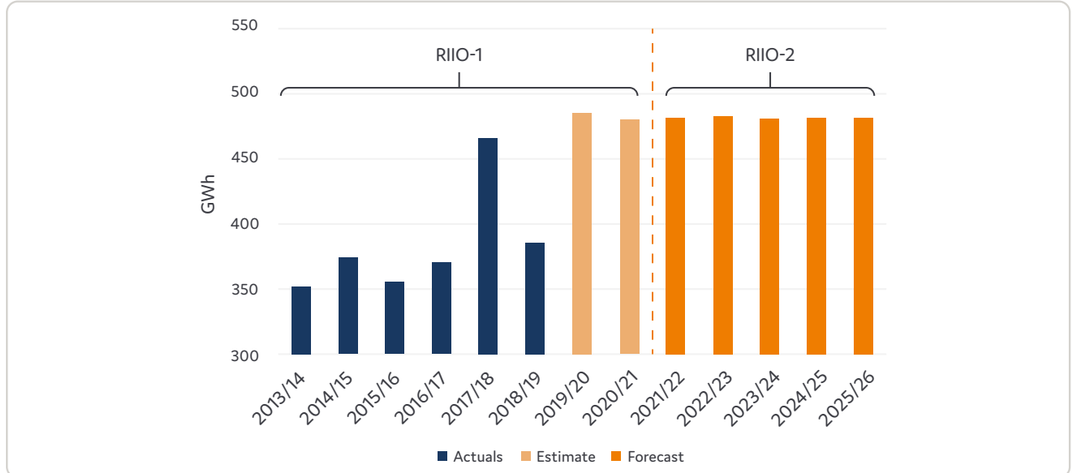


Figure 5.3: Peak day demand actuals and forecasts

8 For further information on this methodology, visit https://www.nationalgrid.com/sites/default/files/documents/8589937808-Gas%20Demand%20Forecasting%20Methodology.pdf

5.4. Driving efficiency through innovation

This section outlines how NGN will develop innovative products, techniques and research to deliver a more cost-effective, greener and less disruptive service to customers, whilst continuing to play an important role in the UK's transition to a net zero carbon economy.

5.4.1. Innovation in RIIO-2: our priorities

Building on our achievements in RIIO-1, our high-level priorities in RIIO-2, consistent with our Innovation, Vulnerability and Whole Systems strategies are:

- Keep bills affordable: by using innovative technologies and processes to reduce the costs associated with running our network.
- Improve the customer experience: by developing quicker, less intrusive and greener ways to deliver core network services, with particular focus on the needs ofcustomers in vulnerable situations.
- Inform policy decisions: on future decarbonisation of the energy sector, through projects which demonstrate the contribution that can be made by green forms of gas, such as hydrogen, in a whole systems energy landscape.
- Improve the way we manage our network: by creating modern, data-driven organisation that enables evidenced-based decision making that is predictive, automated and technology driven.

To achieve these priorities we will do the following:

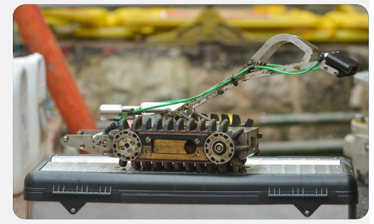
- **Increase engagement and collaboration with all stakeholders.**
- **Use Totex and external funding to deliver BAU innovation to achieve:**
  - future efficiency through modernisation of the processes, techniques and systems used to run our network
  - reduced impact of our activities on stakeholders
  - greater use of real time data, automation and robotics
  - better operational practices.
- **Use £11.5m of NIA funding to focus on six themes that address vulnerability and energy system transition, as shown in Table 5.6.**

	Innovation theme	Funding request
Customer vulnerability	Creating solutions to reduce impact of our day-to-day activities on vulnerable customers	£2,000,000
	Developing enduring solutions for customers with vulnerability beyond day-to-day activities	£1,250,000
	Using whole systems and smart grids to reduce fuel poverty	£360,000
Energy systems transition	Creating evidenced-based solutions to support the transition towards a hydrogen future	£1,140,000
	Creating data-driven networks to manage risk, enable transition and modernise delivery	£1,250,000
	Enabling decarbonisation through whole energy solutions	£5,500,000
		£11,500,000

Table 5.6: Summary of innovation themes

- **Continue to develop an innovation culture and improve our innovation processes.**
- **Develop projects under the Strategic Innovation Fund to support the energy system transition.**

Case study – Robotic Repair Technology



To improve performance on complex repair work, we teamed up with specialist suppliers Synthotech and ALH Systems to build a state-of-the-art robot that can travel down large-diameter pipes. Since early 2019, the resulting robot, STASS (System Two Access and Seal Solution), has been regularly deployed under the streets of Northern England. STASS is the first robot in the UK gas distribution industry to be owned and operated in-house by a direct labour team. The robot can be inserted vertically into a pipe, before travelling up to 130 metres along its length in either direction. The project merged three proven technologies to develop the STASS solution. The ALH Bond and Bolt and Flexspray solution, now developed to become luminescent to be visible on CCTV footage, to work in tandem with the Synthotech robotic platform to provide access, delivery and repair capabilities. This keyhole surgery approach to pipe inspection and repair enables multiple repairs to be completed through the smallest possible single excavation to target leaking pipe joints and capture in-pipe asset information.

The average duration of large-diameter repair jobs has reduced from three weeks to one week, with a cost benefit of around £2,000 per job. By completing the work more quickly and effectively the environmental performance of sites has also improved. Consequently in RIIO-2 we will dig fewer holes, displace less spoil and reduce our impact on stakeholders.

5.4.2. A collaborative innovation strategy

Collaborative approach

All UK gas networks faces similar challenges. We all need to deliver a safe, reliable service, at the best price, whilst preparing for decarbonisation and a net zero future. To enable greater coordination around innovation, the five UK gas networks jointly created and now maintain a national innovation strategy.

This helps the gas industry to share knowledge, avoid duplication and provide a clear steer to the supply chain, decision-makers and the public about the sector's priorities.

RIIO-1 strategy

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The existing RIIO-1 strategy is structured around seven innovation themes which set out the challenges we face as a business:

- Future of gas: The gas network plays a vital role in the current energy system. What role should it play in the future? How will technology, policy and customer demands evolve and what does that mean for network innovation?
- Safety and emergency: We always seek to minimise the risks of operating the gas network. How can we reduce the safety risks associated with essential activities, now and in the future?
- Reliability and maintenance: Our network has been serving customers since Victorian times. We must deal with the effects of ageing assets and examine the potential of new materials to transform the way we operate. As smart systems are increasingly adopted, how should our network management adapt to a digital future?
- Repair: Much of our metallic network is being replaced with polyethylene (PE) components, though a significant component will remain metallic after the current replacement programme finishes in 2032. We need repair technologies that can solve issues with legacy metallic pipes, alongside technologies that can repair plastic in an efficient and cost-effective way that causes as little disruption as possible to customers and road users.
- Distribution mains replacement: The iron mains risk reduction programme has accelerated work to replace old mains with polyethylene components. We look to innovation to improve efficiency, reduce disruption and lower costs.
- Environment and low carbon: The need to improve our environmental performance is more important than ever. How can we do this? There are many issues to consider, ranging from gas leakage and venting during field operations, to dealing with decontamination during decommissioning, and how we remediate legacy industry sites.
- Security: Cyber and information security have become crucial issues for businesses, and network operators are no exception. As we move to a more digital network with ever-increasing connectivity, the way we protect our network must change too. Innovation will be vital to preserve and enhance both our physical and cyber security.

RIIO-2 strategy

For RIIO-2, we believe that continuing the joint strategy is the correct approach, as we see the need for even closer collaboration on the key challenges facing gas networks and the wider energy industry.

With the other gas and electricity networks we are consulting stakeholders on formally updating this strategy by March 2020, consistent with our licence obligations. Based on the stakeholder engagement we have carried out for this business plan, we believe this strategy continues to be an appropriate foundation for RIIO-2, albeit with a few key changes:

- Replace the theme of the future of gas with a theme of delivering whole energy solutions that help move the UK towards net zero carbon emissions. Innovation will be critical for delivering such solutions.
- Add a new theme on addressing the needs of customers in vulnerable situations How can we do things differently to improve our service and treatment of customers in vulnerable situations, and contribute to reducing fuel poverty?
- Give more focus and priority to reducing the environmental impacts of gas distribution throughout the strategy. Currently this appears to be a stand-alone theme but it affects all aspects of our business.

Our innovation delivery strategy (see Appendix A18) explains in more detail how we will deliver innovation in RIIO-2.

5.4.3. Outcomes from innovation in RIIO-1

The Network Innovation Allowance (NIA) has been a crucial funding stream in RIIO-1, allowing us to take projects from initial concept right through to business-as-usual. Our RIIO-1 NIA portfolio spans 118 innovation projects – 97 of which have been completed, and 49 of which have involved collaboration with other gas networks. During RIIO-1 to date, we have invested £12.2m in an NIA portfolio, with NGN funding £1.2m from the 10-sharing factor, and with £11.0m coming from the NIA funding mechanism. Most (c.75%) of these projects began at low technology readiness levels (TRLs 2-4) and would not have progressed without NIA funding.

The results from the 97 completed NIA projects are shown in Figure 5.4:

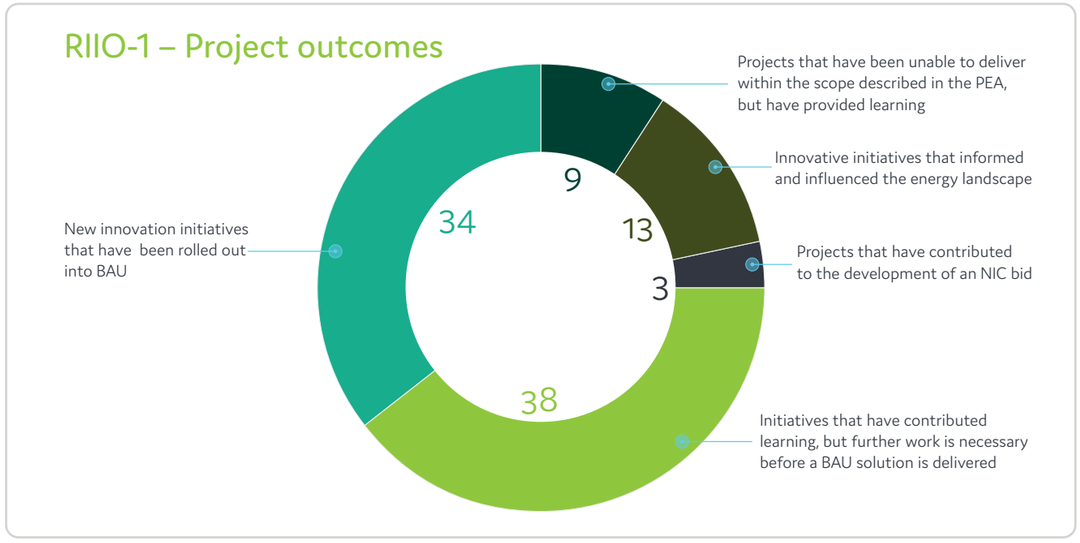


Figure 5.4: NIA project outcomes

Our NIA projects have been extremely diverse and have focused on delivering short or medium-term benefits to our customers through new techniques and processes, alongside energy decarbonisation and future of gas projects with longer-term outcomes. Table 5.7 shows the breakdown.

NIA project portfolio	Number of projects	Cost of projects (£m nominal)	Benefits delivered
Decarbonisation and future of gas	28	£3.8	The research projects completed here have informed and influenced the future energy landscape and provided essential evidence to contribute towards the development of NIC bids.
Network improvement	90	£8.4	Our network improvement projects have enabled a range of business improvements, including better leakage detection, the ability to undertake complex operations in a less invasive and more cost-effective manner, the use of predictive analytics to drive decision making for offtake booking, and the use of robotics and 'keyhole surgery' to maintain assets.
Total	118	£12.2	

Table 5.7: NIA project breakdown

We have invested £8.4 million of NIA funding into network improvements in RIIO-1 – unlocking £6m of financial savings to date.

Stand-out network improvement projects in RIIO-1 include:

- new leakage detection techniques, including acoustic cameras and specially trained gas-detection dogs (ex-police sniffer dogs)
- less invasive excavation technology, such as our 'core and vac' rigs which can take small, targeted slivers from a road
- remote gas main abandonment techniques that reduce stakeholder and environmental impacts and deliver significant cost savings
- a state-the-art STASS robot which transmits live footage of a pipe's condition, as well as treating joints by applying 'flex spray'
- use of predictive analytics in the management of NTS offtake capacity and asset risk management
- new equipment and techniques for extracting water from mains and services
- automation and digitalisation of streetwork plans

Case study – Total stub-end abandonment

Total stub-end abandonment is a technique to cap off small diameter iron gas pipes without leaving a short stub of live iron pipe. A foam bag inserted into the pipe prevents the need to dig up these stubs. The technique and associated kit were developed through an NIA-funded project.

The technique avoids the need for large excavations in major carriageways which would typically significantly impact stakeholders. There have been approximately 720 applications of the technique in RIIO-1, delivering a cost saving of over £4m, whilst reducing spoil waste and vehicle journeys. These savings are included in our RIIO-2 Repex cost forecasts.

In RIIO-1 we have also invested £3.8m of NIA funding in projects focused on decarbonisation and the future of gas, helping to inform government thinking about future energy solutions. This includes preliminary work to enable the industry-leading hydrogen projects, H21 and Hydeploy.

Stand-out decarbonisation and future of gas projects in RIIO-1 include:

- The **H21 Leeds Citygate** project had a significant impact at local, national and international level. The project indicated that an incremental conversion of the below 7 bar UK gas grid to 100% hydrogen is technically possible and economically viable and has led to subsequent collaborative H21 NIA and NIC projects.
- The research undertaken as part of **HyStart** was critical evidence to provide support and underpin the HyDeploy NIC project. It confirmed that although there were some knowledge gaps, it was apparent that there were no "show-stoppers" that would form a significant barrier to a "Hydrogen/natural gas" utilisation demonstration project for domestic customers.

- The **InTEGReL** project developed a research concept and facility that successfully launched a platform for wider industry to contribute to real world testing of whole energy systems concepts and support the transition to a low carbon economy.
- The collaborative **Pathways to Net Zero** project sets out a detailed plan to deliver a net zero gas grid, with clear technical, operational and regulatory actions that need to take place to achieve it.

Case Study – Hydrogen storage with Equinor

As part of our wider H21 programme, we worked with Equinor (previously Statoil), global leader in carbon capture, on an NIA-funded project examining the modelling of hydrogen production and storage. Equinor led this project, with strategic support from NGN. Equinor's element of the work was estimated at £800,000, with NGN using £240,000 of NIA funding.

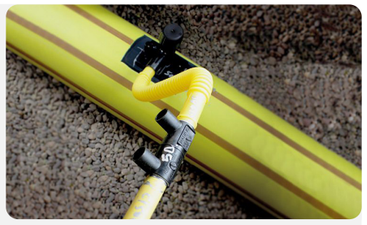
A detailed assessment of the requirements was made and presented, including more in-depth research into hydrogen production than had previously been planned and the identification and thorough investigation into the use of carbon capture and storage (CCS) technology. This report provides a detailed pathway to decarbonisation of the North of England via 100% hydrogen conversion of the gas grid. The vision for the conversion of the whole of the UK and how this could be achieved was also presented within the report.

More details on our NIA innovation portfolio can be found on the ENA's Smarter Networks innovation portal or in our annual innovation portfolio report, available via the Smarter Networks Portal[9] or on the NGN website.[10]

Stand-out BAU funded projects in RIIO-1 include:

- Our PE Asset health programme in partnership with ControlPoint Ltd, which has enabled real time quality assurance, identification and removal of risk to ensure a 'right first time' approach to PE gas network construction. This proactive intervention delivers c.£1m of future avoided risk per annum on the PE network per annum and has contributed to an increase in overall quality.
- We have deployed **water filter bags** across our operational workforce that enable the 'on site' management and disposal of excavation water that is contaminated with hydrocarbons rather than containment, transfer and disposal.
- We worked with the supply chain to further develop the **Soil pick/ jet wash** solution to enable our engineers to easily remove mud and mess from sites following excavation works and improve customer satisfaction.
- We have fully implemented the **Infinity trailer** across our entire network and our engineers use this for flexible bypass connections to maintain gas supply, reduce duration of work and significantly reduce PE pipe wastage as part of our network operations.
- The **Anaconda tee** is installed in c.6,000 locations each year and can accommodate different trench configurations avoiding multiple connections and reducing installation time. The Anaconda tee delivers a forecast of £100,000 per annum cost saving. In addition to NIA funded innovation we have also used Totex funding of c.£200,000 plus time and effort from our staff to trial, test and implement new innovations. These include innovations adopted from other GDNs or products/services developed by our supply chain. These have delivered savings of £1.8m since 2017.

Case Study – Anaconda tees



We worked with supplier Radius Systems to reduce the quantity of material required when making PE service connections at restricted-access locations. The solution, funded through our Totex budget, was implemented into business-as-usual operations across our network in 2017, saving time, removing complexity and having a positive environmental impact.

We forecast that 13,500 tees will be installed by the end of RIIO-1 – delivering a cost benefit of approximately £0.4m, with a forecast of £100,000 per annum positive cost impact savings built into our RIIO-2 forecasts.

9 https://www.smarternetworks.org/
10 https://www.northerngasnetworks.co.uk/ngn-you/the-future/recent-projects/

5.4.4. Continuing to develop our innovation culture

A culture of innovation is developing across our whole business. Throughout RIIO-1, all our employees have been empowered to behave in an innovative manner, and relevant professional development is offered to give them the tools and confidence to innovate in their day-to-day roles.

We have delivered the vast majority of our RIIO-1 innovation projects using NGN employees as project managers. This has provided tremendous development opportunities and has ensured projects are closely aligned to our business needs.

To support our colleagues, we have created a professional development programme (PDP). Three development levels are available to colleagues, from gaining awareness of our innovation portfolio to the direct management of an innovation project. To date, 38 colleagues have completed an element of the PDP.

We have also established the NGN Innovation Think Tank – an internal forum consisting of colleagues from across the business, with the authority to approve innovation projects. The Think Tank meets monthly and has the core aim to sanction innovation projects and review the outcomes from completed or ongoing projects.

Case study – From a garden shed prototype to an everyday tool

Water ingress in gas pipes can be extremely disruptive for our customers, potentially causing lengthy interruptions to the gas supply. One of our Hull-based engineers, Rob Arthur, had an idea to overcome the problem and, in his garden shed, developed a prototype suction pump to extract water without impacting gas flow. The prototype concept, which would suck the water out of the pipe, led to an NIA-funded project, with the final product now implemented across the business, delivering £250,000 of cost savings to date, with and enduring forecast of £100,000 per annum for RIIO-2.

In RIIO-2, we plan to complete the following:

- Further develop and embed our PDP by incorporating formal industry accreditation.
- Expand our network of 'innovation representatives' within NGN – a business-wide network of colleagues who promote interaction between our dedicated innovation team and the wider business.
- Expand the Innovation Think Tank to include selected external third parties, giving us a wider viewpoint and offering external expertise and challenge. The agenda will be expanded so that the implementation process will be routinely reported upon to ensure projects are delivering their intended benefits to customers. We will also rotate attendance from colleagues across the business, to ensure diversity of opinions and viewpoints.

In RIIO-2, we will continue to expand our culture of innovation, through a three-step process , as shown in Figure 5.5.

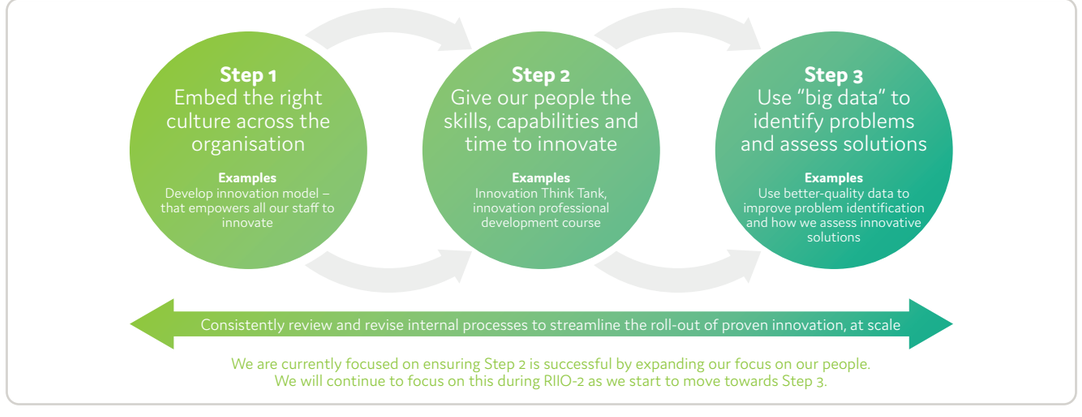


Figure 5.5: Developing our innovation culture

5.4.5. Deeper collaboration across a broader set of stakeholders

As part of our business plan development, we have engaged with stakeholders at external forums, partnership reviews and through challenge groups, specifically focusing on innovation to provide insight into current and future areas for development and to set out and test our priorities. Our stakeholders have told us that the areas shown in Table 5.8 are important in helping to underpin the priorities and themes for innovation in RIIO-2. Read more on page 44.

Systems and technology	· The energy systems transition · IOT sensors, preheating technology and robotics · Combined heating and cooling in an energy system that utilises waste energy · Methods of energy storage, creating further network reliability
Communication	· Consider the definition of vulnerability and whether the definition makes more customers vulnerable · Improve the quality of information given to customers and utilise digital technology to communicate works and strategies
Collaboration	· Improve how we collaborate on projects with other utility companies · Be more outward facing to wider industry groups such as the Research Council, the Engineering and Physical Sciences Research Council (EPSRC) and Innovate UK · Be more open to innovation sharing in the industry and engage more with LEPs on innovation, specifically that relating to energy transition strateies

Table 5.8: Stakeholder priorities for innovation in RIIO-2

Systems and technology

In RIIO-2, we will extend engagement with external stakeholders, the supply chain and our workforce. We will continue to develop our people and empower them to innovate by expanding our existing training and development programme.

Industry-recognised formal training will create a pool of skilled innovators across our business who are perfectly placed for engagement. For example, our technical experts can engage with their primary customers and stakeholders to help solve joint problems. This model has proven successful in RIIO-1 and will be expanded in RIIO-2.

We believe that this cross-organisational approach is crucial to making innovation a habit across the business. This will be supported by enhancements to our ways of working and our engagement with stakeholders, alongside investment in projects delivering new technologies to enable better outcomes for our customers and stakeholders.

Case study – Digital Catapult North East innovation challenge

The transition to a digital future is a broad challenge. We teamed up with the government-funded Digital Catapult North East, the UK's leading advanced digital technology innovation centre, to explore potential opportunities for NGN relating to the Internet of Things (IoT).

We engaged with over 30 SMEs, leading to a number of NIA projects, such as a printable pressure sensor that aims to create an intelligent, low-cost IoT connector for use in the gas network. The connector will create a platform that in time could be used to also collect other data sources from the network, creating an 'internet of pipes'.

RIIO-2 impact – We will use the connection with the Digital Catapult to further build links with the digital SME community to ensure that the digital technology developed is aligned to the recommendations from the Energy Data Taskforce's 'A Strategy for a Modern Digitalised Energy System'.

Communication

Sharing information on innovation successes (and failures) with other GDNs and the wider utilities sector has been a crucial feature of RIIO-1 – as it allows organisations to learn from one another and adopt or refine successful projects. In RIIO-2, we plan to act on feedback from stakeholders who have called for shorter, more regular engagement on innovation.

We have identified several areas for further improvement, including the following:

An overview of our plan | Giving customers confidence that we will deliver | Giving customers a stronger voice | Delivering better outcomes for customers | **A sustainable plan for the future** | Delivering value for money | Financing our plan

- Setting up an enduring forum for innovation conversations, to supplement traditional procurement exercises. This will allow suppliers to showcase their products to us and create opportunities for ongoing discussions and a deeper understanding of challenges and collaborative solutions.
- Developing relationships between suppliers and our colleagues to create partnerships with a greater understanding of each other's needs. Our colleagues are the end users of technology and perfectly placed to engage with our procurement partners.
- Expanding our list of innovation partners to those who offer 'innovation as a service'.
- Making our data accessible to third parties, to better allow suppliers to innovate and further understand NGN's needs.
- Sharing solutions with the wider industry, and adopting of successes from elsewhere, to avoid unnecessary duplication.
- Continuing to reach out beyond the traditional boundaries of gas networks and regulated utilities, to understand the culture, behaviours and processes of sector-leading innovators. Where we think we can learn lessons from such organisations, we will adopt them.

Figure 5.6 shows the four key groups that NGN has identified as critical partners on our innovation journey.

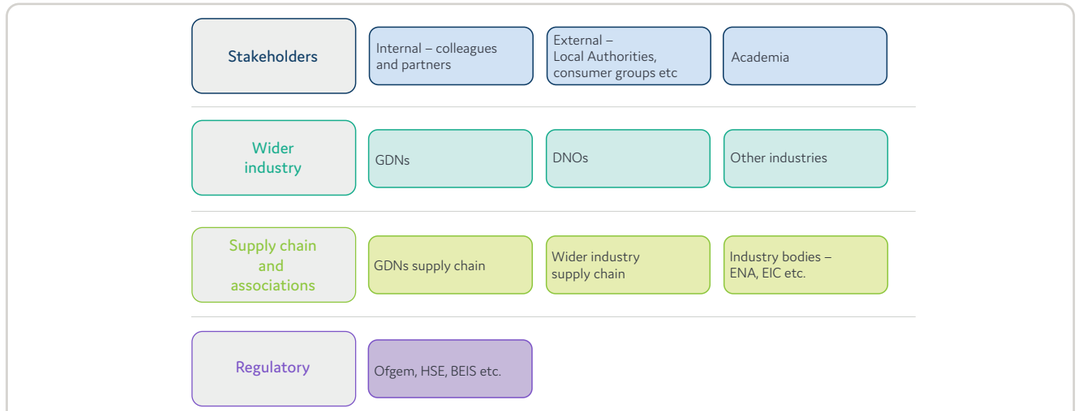


Figure 5.6: Key Innovation Stakeholders

Collaboration

Engaging with a broad range of external stakeholders ensures we can adopt the best emerging processes and products, as well as sharing the cost of innovation projects. During RIIO-1, we have formed partnerships and undertaken formal projects with 165 organisations. In RIIO-2, we will build upon this foundation to extend stakeholder engagement and bring it into the heart of our innovation process.

We have established several avenues for this engagement:

- Innovation tours attended by colleagues and suppliers. The most recent of these ran for 19 days, with over 500 people attending. The events enabled suppliers to better understand our business and work directly with our colleagues to generate ideas.
- Energy Innovation Centre (EIC), which acts as an industry-wide conduit for engaging 7,000 small and medium-sized innovation and technology companies.
- The Energy Networks Association (ENA) Gas Innovation Governance Group (GIGG) – an industry group which allows us to share learning and ideas with other gas networks.
- Collaboration with other CKI group companies across the world.
- Collaboration with other utility companies in our area through a regional cross-utility group, facilitated by the EIC and focusing on cross sector challenges.

We have an established process for launching 'innovation challenges', both internally and via the EIC. We have identified a series of joint challenges with Northumbrian Water, Northern Powergrid and Yorkshire Water and will continue to collaborate and look for joint solutions with a whole systems benefit.

5.4.6. De-risking and fast-tracking innovation projects

All innovation projects carry a level of risk. In RIIO-1, approximately 10% of our projects did not progress to a final implementation stage, due to factors such as technical difficulties or unsustainable costs.

We have learned from these experiences and are continually refining our approach to selecting and developing projects.

Lessons from RIIO-1 have highlighted the need to identify clarity of purpose from our colleagues (who are the target end users of any solution) understand workload to be clear of usage rates, expected uptake and associated benefits and ensure that all technical and operational requirements are clearly defined.

To increase the likelihood of project success in RIIO-2, we will implement projects at scale, more quickly, where cost-benefit analysis (CBA) demonstrates the benefits of doing so. We have enhanced our internal processes and systems to adopt a more flexible approach to enable this in several key areas. For example:

- We use more rigorous criteria when assessing potential innovation projects. An idea must meet a predetermined scoring threshold before it can be taken to the next stage.
- Before starting a project, we test ideas with internal and external stakeholders as part of our wider cost benefit analysis to ensure we understand its potential impact, and that it is appropriate and suitably ambitious.

Figure 5.7 shows how our innovation process aims to streamline the roll-out to implementation.

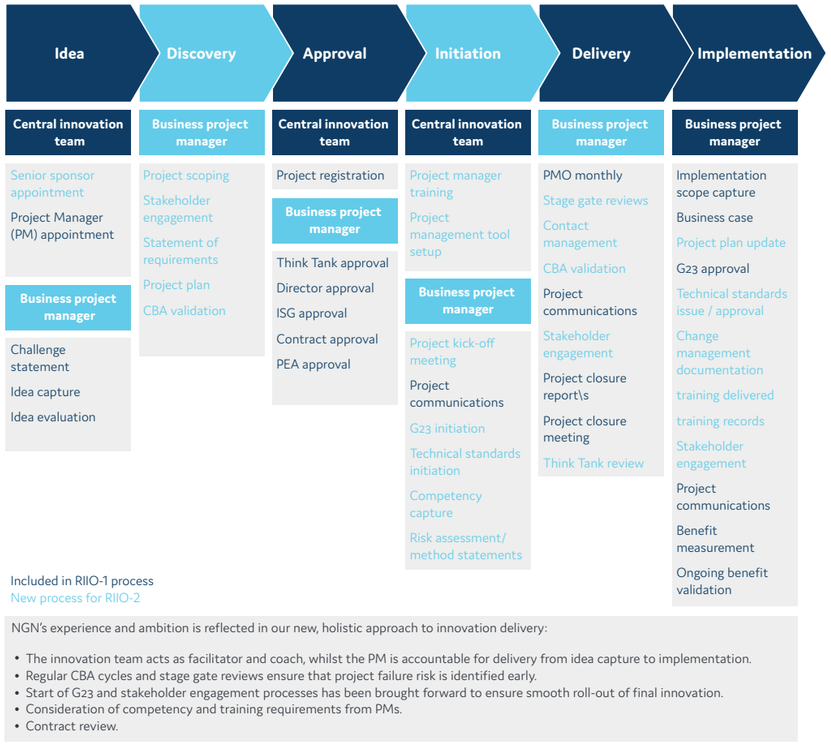


Figure 5.7: Developing our innovation process

5.4.7. Sharing knowledge and assessing the impact of projects

Sharing information on innovation successes (and failures) with other GDNs and the wider utilities sector has been a crucial feature of RIIO-1 – it has allowed organisations to learn from one another and adopt or refine successful projects.

In RIIO-2, we plan to act on feedback from our stakeholders who have called for shorter, more regular engagement on innovation.

We have identified several areas for further improvement, including the following:

- Setting up an enduring forum for innovation conversations, to supplement traditional procurement exercises. This will allow suppliers to showcase their products to us and create opportunities for ongoing discussions and a deeper understanding of challenges and collaborative solutions.
- Developing relationships between suppliers and our colleagues to create partnerships with a greater understanding of each other's needs. Our colleagues are the end users of technology and perfectly placed to engage with our procurement partners.
- Expanding our list of innovation partners to those who offer 'innovation as a service'.
- Making our data accessible to third parties, to better allow suppliers to innovate and further understand NGN's needs.
- Sharing solutions with the wider industry, and adopting successes from elsewhere, to avoid unnecessary duplication.
- Continuing to reach out beyond the traditional boundaries of gas networks and regulated utilities, to understand the culture, behaviours and processes of sector-leading innovators. Where we think we can learn lessons from such organisations, we will adopt them.

5.4.8. Planned outcomes from innovation in RIIO-2

Stakeholder insights

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We will innovate to deliver outcomes that have been identified as priority areas by stakeholders at external forums, partnership reviews and through challenge groups. This stakeholder engagement has provided insight into current and future areas for development and has enabled us to both set out and test our priorities. Our stakeholders have told us that our innovation programme in RIIO-2 should focus on the energy systems transition, customer vulnerability and digital communications.

NIA-funded innovation

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We estimate that we will need £11.5m of NIA funding in RIIO-2, supported with c.£6m from other sources, to achieve our ambitions around customer vulnerability and future energy systems.

The outcomes we are seeking to deliver with this funding are as follows:

- Reducing the impact of both planned and unplanned gas interruptions on customers in vulnerable situations, who will be affected more than other customers. We will look at innovative techniques to avoid interruption altogether or provide temporary or alternative provision, tailored to the specific requirements of these customers.
- Reducing the challenges and inconvenience we create for customers in vulnerable situations when we carry out physical works to maintain or repair our network. Such works can create harmful physical or mental barriers for certain characteristics of vulnerability.
- Providing solutions for customers in vulnerable situations beyond our day-to-day activities. To address the challenges arising from cold homes and fuel poverty, we will seek to develop innovative solutions with other specialist agencies.
- Developing the evidence base required to determine whether transition to full or blended hydrogen networks is a safe and cost-effective path towards achievement of our net zero target.
- Developing a network that is future focused, and will enable whole energy system solutions to be practically implemented. For example, creating a network that is more able to facilitate green gas solutions and is more integrated with electricity networks.

- Reducing our impact on the environment by developing innovative techniques for gas demand forecasting, network connections and operational activities that currently have a high impact on the environment, such as venting of gas operations, as referenced in Appendix A8 - NGN RIIO-2 Environmental Action Plan
- Ensuring that the energy systems transition incorporates whole systems that are fit for all. We have identified links between whole systems, decarbonisation and risks for customers in vulnerable situations. We will innovate to ensure that these customers are positively impacted as we transition to net zero.

The breakdown of our NIA funding request is shown in Table 5.9 and NGN will fund 10% of the requested amount, in line with the existing NIA arrangements.

This funding will only be utilised if it meets our criteria and delivers demonstrable value. Any funding not utilised will be automatically returned to customers.

Area	NGN NIA funding	Match/collaborative funding	Total investment
Customer vulnerability	£3,610,000	£410,000	£4,020,000
Energy systems transition	£7,890,000	£5,420,000	£13,310,000
Total funding	£11,500,000	£5,830,000	£17,330,000

Table 5.9: Breakdown of RIIO-2 NIA funding request

We will actively seek to reduce the level of NIA investment required through collaboration with other organisations – especially around projects that address issues common to all gas networks or the wider energy sector, such as decarbonisation or new operational techniques such as robotics. Similarly, we will utilise other funding mechanisms, such as Innovate UK, to support projects that enable wider transformational change across the industry.

Our innovation programme is ambitious, and we intend to build upon our successful solutions from RIIO-1. We will start RIIO-2 with an active programme to ensure that research and development is undertaken early in the regulatory period. This will create an early opportunity to deliver valuable benefits for our customers, and provide essential evidence, for future strategies.

The innovation focus areas that we have identified are low in technology readiness and require significant learning to be generated before they can become market ready. We will focus on low TRL across the first 3 years of RIIO-2 with the NIA research and development work. Without NIA funding the uncertainty of the outcome of such research would result in minimal work being undertaken. We plan to follow this research with additional investment using the other funding mechanisms and transition the innovation through the TRL stages as appropriate and prepare to transition this into BAU. This will enable that positive outcomes to be visible to customers and stakeholders.

	21/22	22/23	23/24	24/25	25/26	Total
NIA RIIO-2 funding	£3,075,000	£2,970,000	£2,597,500	£2,007,500	£850,000	£11,500,000

Table 5.10: RIIO-2 NIA funding phasing

Case study – Connecting homes for health

Connecting homes for health delivered free gas connections, new gas central heating and energy advice to our most in need people. Building upon the existing 'Fuel poor' mechanism, in which the networks are committed to providing free gas connections, the project sought to design and evaluate an alternative mechanism of eligibility, one that moves away from household income, to a criteria determined by the ill health of our people.

The project delivered 103 homes with gas central heating and continues to evaluate the merit of targeting ill health as an effective 'driver' to reducing fuel poverty. The project will conclude in 2020, but has already made a real term impact, with a participant of the initiative expressing; "It feels like a lottery win" after living in a cold home for several years.

Innovation to support customers in vulnerable situations

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Customer vulnerability can come in many forms, and usually has complex and deep-rooted causes.

In RIIO-2 we will use NIA funding to undertake research and development that has specific focus on exploring solutions that are targeted to ensure support for our vulnerable customers. The research undertaken in this area will provide essential evidence that will support the onwards development through the innovation processes utilising the various funding mechanisms.

In Part 4 we have stated that we will use both the NIA and the 'use it or lose it' allowances to be creative, initiate, scale up and embed impactful innovation. Our portfolio will commence with NIA research that will provide evidence and enable assessment of the potential for change. If deemed appropriate, subsequent progression through to demonstration phase projects will follow. Once the necessary evidence has been determined, we will progress through the innovation phases and fund developments via the dedicated 'use it or lose it' fund, our Community Partnership fund, Totex allowance or via leveraging other third party funding.

Table 5.11 shows how we plan to support customers in vulnerable situations. Of the three categories that underpin our focus on supporting vulnerable groups, two areas (enduring solutions for customers in vulnerable situations and whole systems and smart grids to reduce poverty) will be delivered by leveraging 39% collaborative funding.

Focus area	Description	Cost
Creating solutions to reduce any detrimental impacts on customers in vulnerable situations from our day-to-day works	This focus area will remove or reduce the impact of 'everyday operations' on customers in vulnerable situations. Through research, development and demonstration, we will create opportunities for the creation and deployment of appropriate solutions. · Minimising the impact of planned and unplanned gas interruptions and excavations, which typically impact customers in vulnerable situations to a greater degree than the majority of domestic customers. · Minimising impact from supply interruption or excavations which are more profound when presented to a customer with specific needs and can present a detrimental situation to that customer.	£2,000,000
Enduring solutions for customers in vulnerable situations beyond our day-to day-activities	We will build upon the learning from innovation projects in RIIO-1, where we identified that the impact of cold homes on wider health is a wide ranging and complex issue. Using the outputs from this work, we will further explore where our network operations create situations that are unmanageable for customers in vulnerable situations and undertake research and development to mitigate risk. · The research will develop practical solutions and explore technical advances that support customers in vulnerable situations. Particular challenges that have been identified are digital communications, streetworks and physical infrastructure. We will engage with local enterprise partnerships (LEPs) to ensure the areas are integrated into community-focused innovation projects. · Our innovation programme will incorporate field-based practical solutions, born from engagement with our customer-facing engineers. We will ensure cohesive working with wider industry to explore how energy networks can interact with the public sector and supply chain to transition to net zero without a negative impact on customers in vulnerable situations. · This complex area creates opportunities for development and deployment of solutions that enable life to continue as normal for our customers during essential works and change. The innovation programme will help to understand and explore the causes and impacts of poverty associated with energy. It will incorporate research and development to create collaborative, coordinated and customer facing enduring solutions that minimise impacts created from activity and how we maintain and repair our network.	£1,250,000
Whole systems and smart grids to reduce poverty	At recent engagement events, our stakeholders have reinforced the need to expand the reach from what a GDN would traditionally focus on and undertake research to define vulnerability, in the context of gas network activities, to clearly identify those requiring support as a direct result of network activities. · Our innovation programme will enable understanding of how vulnerability impacts our customers both directly and in relation to wider societal issues and provide direction and network access for supply chain to develop solutions that can provide valuable benefits. · With clear focus on network activities, we will examine the cost, societal and public health impacts relating to vulnerability from a multidimensional viewpoint. This will go beyond the current capabilities of GDNs and will allow us to explore opportunities for collaboration in similar industries to support both current customers and those who are off-grid.	£360,000

Table 5.11: RIIO-2 focus area

Innovation to support the energy system transition

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To help the UK meet its carbon reduction ambitions and comply with the net zero target, we will deliver a wide-ranging portfolio of projects, supplementing NIA funding with approximately 40% collaborative funding. For hydrogen-specific projects, joint funding will be around 60%.

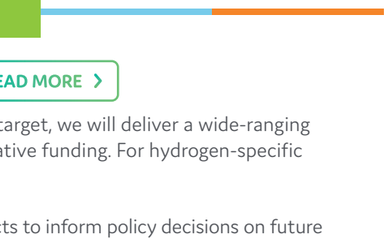
Our innovation programme will use research, development and demonstration projects to inform policy decisions on future decarbonisation of the energy sector, whilst enabling a positive environmental impact from network activities throughout RIIO-2. We are aware that the challenge of meeting the 2050 net zero target is significant and requires action from a broad range of players. We will work with gas and electricity partners, and also across industry beyond the existing regulatory boundaries. This will incorporate wider innovation areas, as we have done with supporting the Hy4Heat project run by BEIS.

We will work with stakeholders to facilitate sustainable whole energy solutions such as using gas as a transport fuel. Our clear strategy focuses on how we can support the roll-out of the required infrastructure to enable compressed natural gas (CNG), hydrogen and electric vehicles. These technologies have progressed significantly in recent years, across Europe and the wider world. It is essential that a commercial and customer focus is incorporated as the projects progress from research and development into demonstration and towards deployment. A challenge in this area relates to policy decisions, infrastructure and market forces; therefore, our innovation activity in this area will focus on the gas network challenges to support this whole system objective.

Data-driven systems will create an opportunity for proactive intervention that will have immediate positive impacts for our customers. Digital systems will automate decision making and create opportunities where solutions can deliver efficiency improvements, valuable benefits for customers throughout RIIO-2, and create evidence to support the energy systems transition. Proactive notification of potential issues or maintenance requirements enables them to be rectified in a number of ways such as, in advance of customer interruption, without the need to excavate or remotely, removing the need to deploy an engineer.

Working with academia, third parties and cross-sector organisations, we will explore technology and data capabilities. The transition to a future energy system requires modern networks that are capable of operating as cross-connected network systems. The solutions will use real-time data to enable automated, optimised decision making and create an active network that enables cross-sector connectivity. Table 5.12 provides more details.

Case study – OFGEM Approval for GasPTii (Calorific Value Measurement)



The increase in green gas within networks and providing technology to support the energy system transition were key factors in this collaborative project. The primary objective was to demonstrate that the GasPTii can be used as a directed Calorific Value Determination Device (CVDD). Following successful completion of testing, and with a significant drop in unit costs when compared to traditional methods, the GasPTii received approval for use by Ofgem on Directed offtakes. A collaborative knowledge dissemination session attended by all UK GDN's alongside Steve Brown from Ofgem fully endorsed the project outputs.

The device can now be considered for use on all sites where direction of the CV measurement is required. The largest potential impact of this project was the relaxation in the accuracy requirements for CV determination devices, the new limit of 2% is double that of the previous limit and now opens the door for more new devices increasing competition in the market and lowering costs.

We have identified that biomethane plants feeding into the medium pressure networks may be constrained off at periods of low demand. This results in insufficient capacity for the biomethane plants to feed in their full production capacity and means that the biomethane plants then have to flare any excess biomethane that cannot be injected into the network. This leads to lost income and efficiency, negative environmental impact as a result and potentially sanctions from the environment agency who places limits on the amount of flaring for problem sites.

In order to maximise potential for injection of green gases into the network, we plan to explore digital solutions that enable remote manual pressure control and monitor pressures at the low points on the medium pressure network and alarm should pressures at the low points deviate from their expected range.

Focus area	Description	Cost
Creating evidence-based solutions to support the transition towards a hydrogen future	The energy systems transition will create significant change within our industry, with technology development, evidence gathering and policy change essential steps on the decarbonisation journey, beyond the timescales of RIIO-2. Our innovation portfolio will undertake targeted research and development that will support our sustainable heat solutions objective. · In these areas, we must undertake detailed research and assessment to ensure that the future options for decarbonisation are validated against robust evidence; and are both socially and economically acceptable. · Our innovation portfolio will support the creation of evidence required to move towards hydrogen networks through a programme focused on sustainability and full-scale conversion and blending via electrolysis, and other technologies, to produce hydrogen. · We will provide essential evidence created via this collaborative programme. Our programme will see collaboration with GDNs, district network operators (DNOs), academia and the wider industry. Through a diverse, co-funded programme we will enable government policy decisions built upon robust information.	£1,140,000
Creating data-driven networks to manage risk, enable transition and modernise delivery	Distribution assets remain predominantly mechanical with manual intervention required to undertake a vast array of tasks. The advancement of digital technology can enable a network with enough flexibility to operate at a whole systems level. The innovation in this area will support our sustainable business solutions policy. Technology development in this area is complex and low TRL digital expansion both presents opportunity and comes with risk. Advanced digital technology is proven in wider industry, yet in the context of connected energy systems, remains largely unused across the gas sector at scale. Our innovation programme will explore the following: · Cyber security and technological opportunities that can deliver change and modernise network operations. We will create a modern system that is future focused, enabling whole energy system solutions via practical application. Operational durability, cross-system compatibility and commercial factors are amongst many areas that need investigation and development. · Opportunities have been identified for advancement and improvement in this area and will deliver significant efficiencies as well as reduced environmental and safety risk for both colleagues and customers. Modernisation of legacy systems will deliver customer benefits through operational efficiency in RIIO-2. A digital audit trail integrated with other energy, infrastructure and regional and national systems will enable identification of wider opportunities for innovation and collaboration.	£1,250,000
Enabling decarbonisation through whole energy system solutions	The future decarbonisation of the energy networks will be made possible by creating evidence-based solutions. It is essential to provide a clear pathway for policy decisions to enable future decarbonisation of the energy sector, whilst ensuring an immediate focus on delivering a positive environmental impact throughout RIIO-2. · We will enable green gas solutions that streamline connections processes and optimise operating models in line with our sustainable heat solutions objective. This remains an essential requirement and integral element of the whole systems approach and we will increase the opportunity for green gases, such as biomethane or hydrogen, to flow through the network and provide simplified decarbonised gas connections for our stakeholders and customers. · We will deliver an innovation programme focused on developing gas demand forecasting, network connections and reducing the environmental impact of operational activities such as venting of gas operations, referenced in Appendix A8 - NGN RIIO-2 Environmental Action Plan. The transition to a decarbonised energy system is linked with these operations and, whilst we work to enable the transition, will also deliver efficiency improvements and returns for customers in RIIO-2. · A significant challenge relates to alternative fuel transport solutions and in particular policy decisions, infrastructure and market forces. We will undertake a collaborative programme of research to support the whole energy system focus area relating to sustainable transport solutions. · Our programme will ensure that the energy systems transition incorporates whole systems that are fit for all. We have identified links between whole systems, decarbonisation and risks for vulnerable customers. We will innovate to ensure that vulnerable customers are positively impacted as we transition to net zero.	£5,500,000

Table 5.12: RIIO-2 focus areas

The opportunities for innovation in the energy systems transition focus area include a specific focus on digitalisation. Our Whole Systems plan, covered earlier in this section and referenced in more detail in our Whole systems strategy (Appendix A14), illustrates where our digital innovation programme in RIIO-2 will continue to collaborate with other UK energy networks and wide industry.

In RIIO-1 we partnered with the Digital catapult to commence an innovation programme where we are actively exploring the capability of IoT for various applications in the gas industry. This is evident in projects such as our NIA funded 'Printable Pressure Sensor' project where the development and deployment of printed graphene IoT sensors will enable network digitalisation as scale, with reduced cost. We will continue with this programme in RIIO-2 and further consider and implement the recommendations from Energy Data Taskforce's "A Strategy for a Modern Digitalised Energy System".

For more information, please refer to our Digitalisation Strategy (Appendix A12).

Business as usual (BAU) funded innovation

Alongside the NIA funding, we will use Totex funding, along with other third-party funding, and continue to adopt innovations and learnings from other GDNs, energy businesses and our supply chain.

The outcomes we are seeking to deliver with this funding are as follows:

- Greater efficiencies. Our RIIO-2 plan includes £24m of future efficiency, and innovation will be key to its delivery, through modernisation of processes, techniques and systems that are utilised in running the gas network.
- Reduction in the impact of network activities on all stakeholders through development of solutions that reduce the time that our customers are exposed to disruption and inconvenience.
- Increased use of real-time data to create streamlined digitised delivery models and utilisation of artificial intelligence to transform the service we offer to our customers. Building on our SAP 4 HANA investment, we will create solutions to allow our colleagues and customers to easily request, complete and record tasks to make the experience of dealing with NGN easier.
- Operational practices that utilise cutting-edge safety and environmental practice. Our mains replacement programme and repair activities will be delivered with a reduced environmental footprint and will drive efficiencies in daily operations.

Our successful innovations during the last price control period allows us to continue to invest in innovation. We recognise that a commitment to innovation is fundamental to a sustainable business that can continue to deliver value for our customers. We plan to focus this Totex investment at the mature end of the innovation scale, which is likely to deliver benefits to our customers in the shorter term.

Case study – Ductile iron window cutters

Gaining access to PE pipe once it has been inserted inside ductile iron pipes has been a perennial challenge. We adopted a repurposed window-cutting tool to solve the problem.

This market-ready product had been previously developed by another GDN (Wales & West Utilities) with supplier Steve Vick International. We used evidence from the original project to implement the solution across our own network, improving safety, efficiency and reducing customer disruption. There have been 370 operations of the technique in RIIO-1 with a c.£0.3m of cost benefit.

In RIIO-2, we will seek to leverage funding from a broader range of sources to reduce our reliance on regulatory funding streams. We will publish details of funding opportunities, to allow suppliers and partners to collaborate and co-fund proposals.

We will continue to innovate to further develop industry best practice techniques and other solutions that can minimise the impact of network activities on local communities. In addition, we will build on previous successful development in areas such as geospatial data capture and digital automated rules engines, where the solutions require further development to commercialise and enable transition to BAU.

In RIIO-2, we believe that our supply chain and project partners are well placed to take more of the risk of innovation – either by committing time to projects or by providing additional funding. We are in a unique position to help them test and develop cutting-edge products and provide them with a clear route to market. As such, we would expect them to undertake more of the conceptual development of new products and technologies themselves.

As part of our engagement with stakeholders, specifically our supply chain partners, we undertake regular horizon scanning exercises to ensure that we keep informed of new and emerging technologies. We test the market for both new and existing technologies directly with our existing supply chain network but also with the EIC. We use the EIC 'Call for innovation' process to launch challenges with the 7000 strong global SME innovator community. We are the most active UK GDN utilising this community; and in RIIO-2 we will continue with our current approach.

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We understand that supply chain is often best placed to advise us of what challenges the industry is facing at a global scale. Typically, this type of challenge, with global affect would be such as climate change. However, we have identified challenges that are relevant overseas; that are consistent with the challenges faced by UK GDNs. One such challenge is the isolation of pipes with minimal impact to enable safety, customer and efficiency improvements to be realised. This issue is prevalent in the USA and whilst the objective of this market ready solution is not consistent with the challenge faced by NGN, we have identified potential for innovative development and plan to explore this further.

This opportunity creates potential for NGN and supply chain to actively engage and co-fund the innovative development and subsequent testing to ensure that risk is shared, and any final solution developed is suitable for use in the UK industry and therefore relevant for all UK GDNs.

Case study – Project Zero 'reducing customer gas supply interruptions'

The 'metallic servicecam' element of the NIA-funded Project Zero aimed to enable in-pipe camera technology. The development was planned to move from TRL 4 to TRL 7 but the agile management and rapid development of the project saw our project partner, Synthotech Ltd, invest directly and fund the accelerated development up to TRL 9. This resulted in the solution being ready for deployment significantly earlier than planned and without additional need for NIA funding.

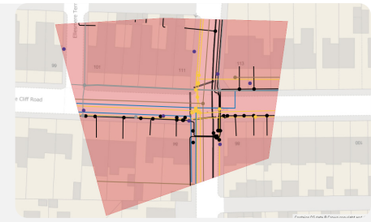
We believe that it is our role to provide a clear route to market for technology and to provide innovation providers with confidence of success, therefore we would expect them to undertake more of the conceptual development of new products and technologies themselves.

We have previously demonstrated our ability to convert ideas to successful innovative solutions that deliver immediate valuable benefits to customers, such as with the total stub-end abandonment project. These incremental, tactical solutions will deliver immediate value that allows the performance outputs of network tasks to increase, alongside the associated service that is delivered to customers.

Consequently, we plan to build upon existing stakeholder engagement and explore opportunities with wider stakeholders for aligning with existing models of innovation funding. We would expect this funding to be for academic research, such as the CESI work with Newcastle University. We will also concentrate on projects that are at a more mature stage of development, and see both the supply chain and Totex allowance used to support development across the whole process, from initial idea to the customer's front door.

In RIIO-2, we will seek to leverage greater innovation funding from other third party sources such as Innovate UK grants, academia and the supply chain.

Case study – Creating a collaborative infrastructure map



NGN is working alongside Ordnance Survey, local authorities, water, electricity and telecommunications networks to develop a collaborative infrastructure map of underground assets.

The consortium developed an initial concept which was promoted to the Geospatial Commission, allowing the concept to form part of a national underground asset register. The project is now being full funded by the Geospatial Commission at a cost of £3.9m.

5.4.9. Monitoring benefits from our innovation portfolio

Tracking of Innovation benefits in RIIO-1

In RIIO-1 we have been implementing solutions into BAU following the successful completion of innovation projects. We have developed a tracking solution and dashboard that enables clarity of the financial benefits that have been delivered because of use. The dashboard is cascaded across the business at periodic intervals to enable trend analysis and share successes with stakeholders.

Monitoring and reporting of benefits is an essential activity and we work to support the business to ensure consistent application to deliver change. The benefits dashboard creates a visible and comparable analysis to ensure that the forecasted benefits are realised and increase the likelihood of return on investment.

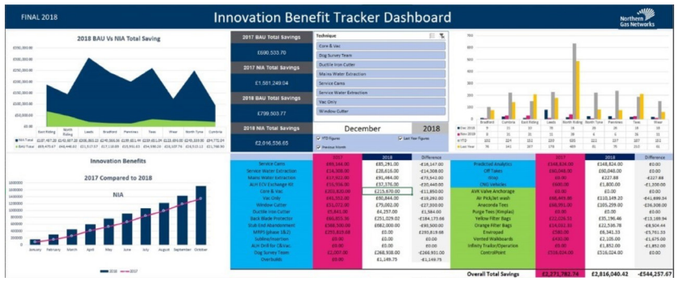


Figure 5.8: Innovation Benefit Tracker Dashboard

It is crucial to demonstrate that innovation investment is delivering value for money and throughout RIIO-1 we have been actively tracking and reporting on both the quantitative and qualitative benefits of completed projects, and the subsequent adoption of the solution. We will continue to track and report on benefits in RIIO-2 as part of a collaborative framework.

The challenge of accurately measuring the impact and value of an innovation project is complex, and in recent years we have worked with the EIC and other GDNs and DNOs to develop a collaborative, industry-wide framework to report on the outputs and outcomes of innovation.

The framework enables comparable review, and in RIIO-2 we understand that the clear, detailed reporting of return on investment is required. Additionally, where projects are proven successful and have been deployed into BAU, we will report on performance against the cost of investment.

Table 5.13 summarises what we, along with all the other UK energy networks, are proposing for RIIO-2 and beyond. In order to develop this proposal, we have analysed the existing industry framework, which combines decades of operational excellence experience with 'lean thinking', innovation and exceptional service design. We have also analysed industry regulatory reporting systems and industrial reports, such as the 'Pathways for the GB Electricity Sector to 2030',[11] and the 'Wholesale Market Report 2019'[12].

Proposed innovation benefits reporting (RIIO-2)	
Biannual reporting	**Annual reporting**
Electricity/Gas Network Innovation Strategies (ENA) · Review of priorities and progress against objectives	**Network Specific Annual Summary Reports** · Including ENA agreed Innovation Framework Dashboard · Including Implementation Log (BAU rollout) Summary **Consistent Innovation Benefits Tables with detail behind Dashboard** **Individual Project Completion Reports** · Individual Project Progress to be captured in Annual Summaries **Annual Innovation Conference** **Smarter Networks Portal** · With improved project templates and analytics

Table 5.13: Proposed innovation benefits reporting in RIIO-2

11 https://www.energy-uk.org.uk/publication.html?task=file.download&id=5722
12 https://www.energy-uk.org.uk/publication/294-research-and-reports/wholesalemarketreports.html

It is important that innovation outcomes from the entire portfolio are reported in an open and transparent manner. The summary dashboard for each network operator can be seen in Figure 5.9. This will be further refined after discussions between the network operators and other stakeholders.

In RIIO-2, every innovation project that has been successfully deployed into BAU will be reported on in terms of return on investment, to deliver a quantifiable NGN innovation portfolio report and a comparator. The various measures in this dashboard are explained in detail in the Innovation Delivery Strategy (Appendix A18). The definitions of the outcome measures and secondary deliverables have been captured separately.

Innovation Measurement Framework – Primary outputs and secondary indicators

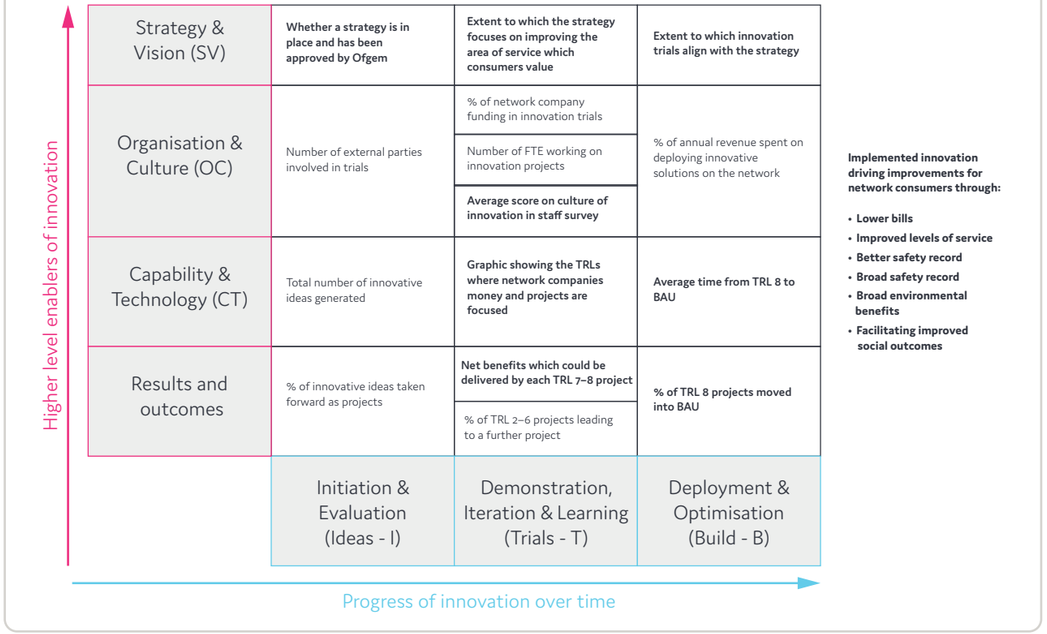


Figure 5.9: Innovation Measurement Framework

Once the template for the scorecard and underlying data tables have been agreed by all relevant ENA members, this will be trialled before being finalised. The completed dashboards will be made available by each network operator within their annual innovation summary reports. These can also be made available on the Smarter Networks Portal once they have been published.

To support the population of this dashboard, ENA gas and electricity companies have agreed to develop template innovation benefits tables, which capture data for each individual innovation project. The tables will be agreed at ENA and reviewed with all our stakeholders. A number of tools and best practice guides will be agreed at GIGG and EIM to support the population of these tables, including a common CBA and TRL calculator.

We will continue to report via an annual summary report, project completion reports, the Smarter Networks Portal and the annual industry conference.

5.4.10. Utilising the Strategic Network Innovation Challenge Fund

NGN has bid every year to the Network Innovation Competition. Our successful bids are leading the way in providing evidence to support a net zero ambition, in particular through the use of hydrogen.

Low Carbon Gas Preheating (LCGPH)

Exploring more sustainable and economical sources of preheating – a market traditionally dominated by suppliers of boiler packages and water bath heaters.

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HyDeploy

Working with Cadent to develop the safety case for blending up to 20% hydrogen with natural gas to deliver significant carbon savings. The first HyDeploy trial is taking place in 2019 on part of the Keele University campus and will be followed by **HyDeploy2** trials on two public networks in the North of England.

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City CNG

Working with an aim to overcome barriers to commercial development of CNG filling stations, through innovative commercial arrangements for connection.

READ MORE ›

H21

Led by NGN and supported by all the other gas networks, this project is delivering evidence for the safety, affordability and practicality of converting the natural gas network to 100% hydrogen.

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To deliver more transformational change, it is essential to be bold and explore opportunities that need significant investment over a number of years. NGN has a proven record of success in the Network Innovation Competition and plans to continue with this approach as the competition transforms into the Strategic Network Innovation Challenge Fund.

For RIIO-2, we intend to forward developments to facilitate net zero and whole energy system solutions. Utilising NIA (or equivalent) funding would support the development of ideas through to benefit-realising concepts, both in terms of financial return, and benefits related to safety, customer satisfaction, and stakeholders.

The need for research, development and demonstration of technologies and bold new solutions can revolutionise how networks operate. Examples are cross-vector "connected" energy networks, whole systems network storage and capacity management, and enabling strategic deployment of green gas across networks. In RIIO-2, in line with our whole systems strategy, we will look to develop projects suitable for the Strategic Network Innovation Challenge Fund and continue to work with wider industry on critical items such as hydrogen conversion and the integration between GDNs and electricity networks.

5.5. Driving efficiency through competition

5.5.1. Our approach to native competition

Our approach to native competition is based on the following principles:

- Demonstrating innovation and fresh thinking in approaching the market.
- Cycling insourcing and outsourcing to embed competition and add customer value.
- Delivering procurement efficiency through regular market testing and utilising CKI buying power where possible.
- Being effective contract managers and stimulating ongoing competition between our framework contractors.
- Using innovation funding to stimulate the market to bring new products and services for gas distribution and to assist the energy industry in meeting the decarbonisation challenge.

Demonstrating innovation

Since our inception in 2005, innovation has consistently permeated our approach to delivering services. In the early days of our business, the roles of asset ownership and asset services were legally separated, making it possible for the asset services activity to be outsourced whilst retaining in-house asset management and ownership. This resulted in sustained cost reductions and delivered a frontier efficiency assessment from Ofgem for the 2008 to 2013 (GDPCR1) price control.

During RIIO-1, we moved away from the traditional contracting and partnership models adopted by other utility businesses, in order to deliver our mains replacement programme (see case study). We also implemented a fully outsourced maintenance service – the first time this had been done in the utilities sector.

Case study – Our direct service provider model

The iron mains replacement programme is c.40% of our Totex budget. Prior to RIIO-1, we competitively tendered this work out to large national tier-one contractors (e.g. Carillion, Balfour Beatty). In 2011, we explored a new approach which would address the shortcomings of the existing arrangements and partnership models seen elsewhere in the sector, including multiple management costs and premiums, misaligned work prioritisation, opaque programme delivery and remote customer service.

Through a series of controlled steps over four years using regular market testing, we removed tier-one contractors, replacing them with Direct Service Providers (DSP) whilst augmenting our own in-house management capabilities. DSPs are small, locally based businesses that would have traditionally worked as subcontractors for tier-one contractors.

To make this happen, we ran a proactive engagement programme with SMEs and micro-businesses within our region, using meet-the-buyer events to explain the opportunity, and to understand their appetite for managing their own. From this, we aligned our procurement process to match the sophistication of the SMEs and developed contractual terms designed to make the work attractive to the market (e.g. seven-day payment terms). We helped these businesses to register on Achilles supply chain management database and comply with the EU procurement legislation.

The move to a DSP model delivered significant improvements in the unit cost of delivery, with a c.40% reduction over the period plus improvements in customer service and safety culture. It also gave NGN full control of the programme to ensure that challenging projects were not deferred. We are still the only GDN to have moved to this model.

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For RIIO-2, we will keep abreast of developments in the market and move quickly where we see opportunities to do things differently, in order to benefit our customers.

We will continue to look for innovative approaches for delivering emergency and repair activities, as we move towards a full PE network. We will also fully exploit the full potential of our SAP S4/HANA platform (e.g. artificial intelligence, automation, Internet of Things and predictive analytics) and consider different approaches to the delivery of our capital programmes.

Cycling insourcing and outsourcing

We cycle insourcing and outsourcing to get the best of both models, flexing our approach in response to specific challenges in different areas of our business.

Outsourcing exposes our people to the market and allows us to embed new commercial thinking. It allows us to align our business to best market practice in areas such as training, multi skilling, pay, contract conditions, cultures, behaviours, and methods for driving improved performance and productivity.

Case study – Outsourcing our maintenance activity

In 2015, we outsourced our maintenance activity to an external contractor.

Our aim was to make our workforce more agile and resilient, to modernise our workforce contract terms and conditions bringing them into line with current market rates, and to improve productivity and performance by exposing our team to the market. Alongside this, we aimed to ensure that the work was carried out in line with NGN and industry standards and prioritised in accordance with NGN procedures. The contract has successfully delivered on our aims.

We are the only GDN to have outsourced its maintenance activity.

Insourcing allows us full control of the end-to-end process, delivers efficiencies, avoids protracted contractual disputes, brings us closer to the customer, and ensures that full knowledge and expertise are retained in our business.

Case study – Insourcing our IT professional services

Before 2015, we used external contractors to deliver our IT consultancy and project management. This was expensive, and the controlling mind for our projects and the knowledge of our systems sat outside our business.
It was highly contractual, so IT project work and support took longer, costs escalated, and the focus on our customers and output targets were not always well prioritised.

In 2015, we brought this activity in-house and established a new team with new terms and conditions that reflected the needs of our business but were also in line with what was needed to recruit and retain people in a highly competitive arena. Across all our IT projects since 2015, this insourcing improved IT solution development responsiveness from 100 days to 25 days, reduced IT project cost overruns and improved internal support, business resilience and asset investment decision making.

For RIIO-2, we will periodically review all areas of our business to ensure that the correct blend of insourcing versus outsourcing is in place, based on business performance and market developments.

Delivering procurement efficiency

NGN has a high performing professional procurement team in place and follows best practice in market tendering as set out in our procurement policy. We follow the EU Treaty procurement principles for all procurements above and below threshold. The principles we follow are:

- proportionality
- mutual recognition
- transparency
- non-discrimination
- equal treatment.

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Specifications are written in an unbiased way, ensuring we do not specify any brands or outputs that would restrict competition. Our specifications ensure compliance with our procurement policy whilst embedding the concept of technological agnosticism for IT procurements. During procurement all information shared throughout the tender process is provided to all bidders so that we remain fair and transparent.

Our procurement policy applies across all activities and our procurement strategy applies to all requirements above £10,000. It involves key people from across all areas of the business and ensures we consider the interests of current and future customers, the environment, health and safety, data protection and cyber security. It also ensures that conflicts of interest are managed at the front end of all procurements. The strategy informs the route to market and ensures the complexity of the procurement process is proportionate to the value and time-sensitivity of the need.

Our team has a successful track record in delivering savings during RIIO-1, as shown in Table 5.14.

Year	£m programme value	Saving and cost avoidance achieved against programme plan	£m total saving
2016	£157m	6.5%	£10.3m
2017	£155m	9.2%	£14.2m
2018	£162m	6.2%	£10.1m
2019	£172m	5.2% est	£9.0m est

Table 5.14: RIIO-1 cost savings track record

During RIIO-2, we will continue to drive procurement efficiency through an annual programme of tender events. Around 80% of our purchases are covered by contracts or framework agreements. The annual procurement programme has an average of 400 procurement events. During RIIO-2 we will therefore undertake about 2,000 procurement events.

Our top 15 high-value contracts/frameworks and the planned market retenders are shown in Table 5.14:

Description	Contract value	Retender
Direct service provider Framework	£380m	Potentially 2020 if extensions provision not utilised
Purge & relight Framework	£11m	Potentially 2021 if extensions provision not utilised
Capex delivery framework	£63m	Potentially 2021 if extensions provision not utilised
Maintenance	£8m	2020
Reinstatement	£39m	2020
Shrinkage gas	£26m	Potentially 2023 if extensions provision not utilised
PE pipe & fittings	£40.5m	Potentially 2021 if extensions provision not utilised
Fleet management services	£7m	2019
AWS infrastructure & training	£7m	Potentially 2022 if extensions provision not utilised
Personal protective equipment	£5.4m	2020
Inspection services	£6m	2020
Facilities management	£5m	2019
Logistics provision	£5m	2021
Mechanical fittings	£5m	2021
Technical engineering services	£8m	2022

Table 5.15: Top 15 high-value contracts/frameworks

Where single-source arrangements are requested, these will continue to be challenged and approved at senior level. The implementation of SAP S4/HANA will also allow the procurement team to have more control over any uncontracted spend, ensuring we obtain best value for money and comply with our procurement policy.

Our major shareholders are part of the CKI Group and, wherever possible, we seek to leverage their buying power by working with other companies within the group. During RIIO-2, we will continue to work with other companies in the CKI Group to identify potential savings from joint buying.

Case study – CKI Group procurement of polyurethane pipe and fittings

In 2016, we issued a joint tender with Northumbrian Water and Wales & West Utilities for the supply of polyethylene pipe and fittings fully compliant with the OJEU 2016 regulations, inviting bidders for the supply of goods to the total potential contract value of £84m. The NGN proportion of this was c.£45m (with a potential spend of c.£5.5m p.a. over an eight-year period).

Response to the OJEU notice was good, with a total of 11 suppliers submitting the required registration; these came from within the UK and also India, China and Germany. The resulting NGN framework contracts awarded six suppliers, with a projected value of c.£35m over the total contract life, enabling savings to be made on current contractual costs of 9.7%.

5.5.2. Effective contract managers

If contracts are not managed effectively, then efficiencies delivered from the procurement process can soon be eroded, service standards diminished and/or outputs not fully delivered. It is vital, therefore, that managers across the business effectively monitor contract performance and have in place suitable arrangements on the larger contracts for stimulating ongoing competition, wherever possible.

Case study – Managing the DSP framework

We work very closely with our DSPs and monitor their performance on a daily basis. There are 26 DSPs delivering our mains replacement programme. We use a variety of performance metrics covering efficiency, customer service and safety. This focuses our DSPs on delivering our targets, outputs and commitments, and it ensures that we gain the right balance between safety, service and price. We create commercial tension by using benchmarking, performance league tables, stretch targets and savings targets. Work volumes are flexed between DSPs based on performance.

We hold awards events to recognise standout performance. Our project managers manage poor performance by co-developing and managing the implementation of performance improvement plans. We help our contractors to share innovation and best practice to continuously improve everyone's performance. Alongside this, we retender the DSP framework every four years to enable new entrants, retest the market, replace DSPs who are at the bottom of the performance tables and build in any significant changes.

For RIIO-2, we will develop more active real-time monitoring of our supply base and continually review performance in a structured manner.

Early-or late-stage competition models

We have carried out a review to determine whether any of the largest projects in this RIIO-2 business plan would be suitable for either the early-or late-stage competition models as defined by Ofgem in the December 2018 RIIO-2 sector-specific methodology. This review concluded that none of these projects met the criteria (new, separable, high value) which would deliver customer value.

For RIIO-2, we would review any developments that require very significant new investment (e.g. new hydrogen pipelines), to identify whether whether there could be benefit from these approaches.

5.5.3. Summary of Native Competition Plan for RIIO-2

For RIIO-2 we will:

- keep abreast of developments in the market and consider, in an agile way, how we can move quickly where we see opportunities to innovate and do things differently. Where appropriate, we will fund the development of new and innovative products and services where these are not market ready
- periodically review all areas of our business to ensure that the correct blend of insourcing versus outsourcing is in place, based on business performance and market developments.
- continue to drive procurement via a high-performing professional procurement team which follows best practice. We will follow an annual programme of tender events with a focus on high-spend areas operating in line with the best practice principles set out in our procurement policy. We will continue to challenge all single-source requests
- procure responsibly, with an updated procurement policy that has a greater focus on sustainability. This policy is currently being developed in line with our environment strategy and will be fully embedded for RIIO-2.
- work with other companies in the CKI group to identify potential savings from joint buying
- using our investment in SAP S4/HANA, to develop more active real-time monitoring of our supply base and continually review performance in a structured manner. We will also use the capability of SAP S4/HANA to monitor and challenge any uncontracted spend
- look for opportunities to deploy early-or late-stage competition models should a new high-value project emerge.

PART 6: DELIVERING VALUE FOR MONEY

IN THIS SECTION

Cost Information

This section describes how we will deliver the outputs we have committed to in our plan whilst ensuring value for money for our stakeholders. It includes our forecast expenditure plans for RIIO-2, including the main components of our expenditure and the assumptions that underpin our plan. We provide more in-depth detail of our expenditure plans and how they have been justified in the attached appendices.

Each table is cross-referenced to the appropriate Business Plan Data Table (BPDT) and Investment Decision Pack (IDP).

6.1. Total expenditure summary (Totex)

The table below compares our average and forecast Totex costs for RIIO-2 against our average costs for RIIO-1 to date. We will spend £1.26bn on our controllable Totex costs in RIIO-2.

£m 2018/19 prices	RIIO-1	RIIO-2						
	6-year average	21/22	22/23	23/24	24/25	25/26	Total	Average
Controllable Opex	84.8	90.9	89.7	89.1	87.9	87.7	445.3	89.0
Capex	57.0	51.0	58.9	59.4	54.8	49.8	274.0	54.8
Repex	96.5	107.3	106.7	106.0	105.4	104.8	530.2	106.0
Totex	**238.3**	**249.2**	**255.3**	**254.6**	**248.1**	**242.3**	**1249.5**	**249.9**

Table 6.1: Total expenditure

Reference: BPDT – Totex Summary

We will invest a total of £804m in the network in order to continue to operate an efficient, safe and reliable network. Safety, reliability and affordability continue to be our stakeholders' top two priorities. The balance of the expenditure (£445m) will be spent on operating and maintaining the network.

Of this investment, £530m is in the replacement programme, replacing nearly 2,900km of old metallic mains with modern plastic pipes. This improves both the safety and reliability of the network, and provides a significant environmental benefit by reducing the volume of natural gas leaking from our network.

Our average annual expenditure on the programme is increasing by nearly £10m p.a. from RIIO-1 to RIIO-2. Our stakeholders have shown increasing support for improving safety, reliability and protecting the environment and accelerating the replacement programme. We will complete lower volumes of Tier 1 mandated work during RIIO-2, as we have over-delivered compared to the target agreed with the Health and Safety Executive (HSE) during RIIO-1. However, we have identified that, due to a change in HSE policy, there is a population of short length Tier 1 stubs that need addressing, and we are implementing a plan to remove these by 2032. We will also increase the volumes of steel mains and higher diameter band iron mains workload where there is a clear cost–benefit case to do so.

The balance of the investment – just under £274m – is in capital investment. This is a 4% reduction compared to RIIO-1. We are seeing reductions in both network and non-network investments. Network investment is decreasing as we have already tackled many of our poorest-performing assets, and our risk analysis shows that we can now deliver the greatest lifetime benefit by increasingly maintaining rather than fully replacing some assets. Ofgem's Network Asset Risk Metrics (NARMs) have significantly influenced this approach and the scope of our investments. Consequently, our overall capital replacement costs are decreasing, with a partially offsetting increase in operational maintenance. The main driver for the decrease in non-network investment is the sizeable investment in new digital technology we have made in RIIO-1, which will not be replicated.

We will spend c.£89m each year on operating and maintaining the network, a 4% increase from RIIO-1. The main driver for the increase is the increased asset maintenance costs mentioned above and the completion of our gas holder demolition programme over the five-year period. These increases will be partially offset as we will see reducing leakage and gas escapes from the network as a result of our targeted replacement programme.

6.2. Background and key assumptions

This section includes background and key assumptions that provide the foundation of our plan.

Background

The environment that we operate our network in is changing rapidly and will continue to do so over the next decade. This change is driven by many factors – including the economic and social environment, technological change, consumer preferences and the evolving energy landscape. As a result, we will face many challenges and opportunities in RIIO-2. This level of change has driven several key features of our plan.

Five-year planning period – We have adopted a five-year period for our plan, consistent with Ofgem's Business Plan Guidance. Ofgem's logic references the current pace of change in the energy system and recognises that a five-year time horizon better protects consumers and reflects the share of risk and reward between networks and consumers. This is in effect another type of uncertainty mechanism.

Outputs focussed – Our expenditure plans fully reflect the outcomes and outputs our stakeholders have identified as key priorities for us to deliver in RIIO-2. We will deliver these commitments efficiently and deliver value for money for our customers, which is reflected in the customer bill reduction we expect to deliver over the plan period.
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Improving the resilience of our network – RIIO-1 has shown the environment in which we operate is changing and we need to adapt our investment plans to reflect this. We have seen an increase in extreme weather events and incidents that have tested our network and our emergency response capabilities to their limit. Major bridges supporting our pipes have been washed away, riverbanks and other supports have seen increased erosion and we have seen a year-round increase in water ingress to our network. Our current and future plans have adapted accordingly, with an increased focus on investing to improve the resilience of our network to these events.

Managing our ageing asset population – The average age of our network is increasing as we look to minimise the whole-life cost of our assets whilst ensuring that we still deliver a safe and reliable network. In RIIO-1, we have invested in our poorest-performing assets, which now enables us to refocus our strategy on the remaining asset population. We plan to intervene on more assets due to their increasing age by increasing maintenance and major overhauls, whilst reducing the number of new assets installed.

Changes to the mains replacement programme – Safety has again been identified as a key priority for our stakeholders. Our analysis shows that steel mains now pose an increasing risk to safety due to their poor condition, with a strong costs versus benefit case for replacement. Consequently, our mains replacement plan now includes a higher proportion of steel mains. This is partially offset by a reduction in the iron mains we plan to replace. In RIIO-1, we expect to get ahead of the delivery profile needed to deliver the overall programme by 2032, allowing us to marginally reduce workload in RIIO-2.

We will further enhance our innovative delivery model to offset cost pressures we expect to see as we near the end of the programme. The programme will continue to deliver the expected reductions in leakage, gas escapes and repairs as well as reducing the risk of incidents.

Completing the gas holder removal programme – We will accelerate our gas holder removal programme to ensure none of these assets remain on the network by the end of RIIO-2. These assets are no longer required as they became increasingly unreliable and expensive to operate and maintain.

Increased NTS offtake charges – RIIO-2 will see a significant increase in NTS offtake charges due to a change in how National Grid calculate the charges paid across the UK.

An overview of our plan | Giving customers confidence that we will deliver | Giving customers a stronger voice | Delivering better outcomes for customers | A sustainable plan for the future | **Delivering value for money** | Financing our plan

6.2.1. Key assumptions

The assumptions detailed below impact all areas of our expenditure and so are set out here to provide background for the detailed forecasts in the remainder of this section.

Pensions – The forecast ongoing pensions costs contained in our plan assume that, at the start of RIIO-2, there will be 190 active members in the Northern Gas Networks Defined Benefit Pension scheme, assuming members retire at 60; this will fall to c.100 members over the following five years. The current employer contributions towards future benefit accrual for these members will be 49.2%. Our latest estimate based on current market conditions is that this will rise to 60%, which has been used in our forecast costs for RIIO-2. This uses a consistent methodology to that used at the 31 March 2016 actuarial valuation.

Real price effects (RPEs) – As a gas distribution network, the basket of goods and services we procure in our normal activities is significantly different from those that make up the general measure of prices for the economy – the Consumer Price Index (CPI). In particular, our cost base includes significant proportions of specialist materials, labour and contractors. As a result, over time between 60–75% of our various activity costs are unlikely to move in line with CPI. RIIO-2 is likely to see significant cost pressures, due to competition for scarce resource from other UK major engineering projects such as HS2, and indeed from other utilities as a result of the changing energy landscape.

This cost differential has been recognised in previous price controls and managed through an upfront allowance. However, we recognise this differential is driven by many factors and is inherently uncertain and difficult to forecast. Setting the wrong upfront cost allowance could therefore unfairly penalise or reward the network. In order to protect the networks and consumers and provide the right incentive, we therefore support the indexation of RPEs. The annual cost allowances will then better reflect the actual market conditions experienced throughout the price control.

Consequently, the cost forecasts contained within this plan contain no specific costs for RPEs. Appendix A19 provides further evidence of the case for RPEs, the indices that could be used and how the indexation could work through Ofgem's Annual Iteration Process.

Productivity and efficiency – NGN has consistently benchmarked as the most efficient network in the sector. In RIIO-1, we have again led the way. Notably, we have increased productivity and efficiency with the introduction of our innovative Direct Service Provider model in Repex. We have also refreshed our workforce through the introduction of new terms and conditions, whilst significantly reducing our average age profile.

We expect to see ongoing improvements in the use of labour, new assets and new technologies across all business activities for the remainder of RIIO-1 and into RIIO-2. Historic benchmarking of comparator industries back to 1970 shows we could expect to deliver improvements of between 0.5% and 1% annually across our activities, at a weighted average of 0.7%. However, the Bank of England estimates for annual total productivity growth show rates were negative from 2008 through to 2014 and have recovered slowly since then. They forecast a rate of 0.3% for the period 2019 through to 2022. This is further supported by analysis carried out by Frontier Economics for Water UK, which shows water industry productivity has gradually declined over time and has averaged close to 0% p.a. since 2011. Further analysis of the expected productivity growth for gas networks can be found in Appendix A20.

Gas distribution networks are not immune from the trends affecting the wider economy, not least because they rely heavily on supply chain alliances and contractors. It is also not clear whether the factors causing this lower productivity are temporary or longer-lasting. Productivity may start to accelerate if central banks normalise interest rates. Alternatively, if there has been a slowdown in innate technological progress, low productivity may become more permanent. There is a clear link here to our own approach to innovation and its funding in the sector.

However, we retain our ambitions to remain at the efficiency frontier in order to deliver best-in-class value for money and lower bills for our customers. We have invested in RIIO-1 to ensure our business is ready and resilient to absorb the impact of and respond to future changes. Therefore, we expect to exceed the 0.3% productivity improvement forecast by the Bank of England. Our expenditure plans include an annual 0.5% cost reduction from improved productivity.

We estimate this 0.5% annual reduction will reduce our annual Totex costs by c.£6m over the RIIO-2 period and deliver a total cumulative saving of c.£19m over the five years. It is not possible to identify all activities and innovations that will drive this 0.5% annual productivity when talking about a time horizon out to 2026. However, we do have three key areas we know will contribute towards this ambitious target.

In RIIO-1, we have invested in new IT systems which will deliver a range of benefits across the network. We forecast this will increase productivity of our support activities and directly reduce costs by c.£2.5m per annum by the end of RIIO-1. These savings are embedded in every year of our RIIO-2 forecasts, importantly before the application of the annual 0.5% efficiency reduction. However, we expect to further leverage our new systems to help deliver this further reduction.

In RIIO-1, we introduced new, modern terms and conditions for both existing and new employees. The number of our colleagues on these new working arrangements increases annually as a result of staff turnover and retirement. We expect this to continue into RIIO-2.

Innovation in RIIO-1 has delivered several projects which have driven real efficiencies across the network. These projects are enduring, and we expect increased efficiencies in RIIO-2.

Regional factors – Costs need to be 'normalised' for any factors outside the network's control when they are benchmarked across any sector. Regional factors are an example of this as they can impact the operations of one gas network differently to another. We have taken no account for this in our cost forecasts, but would expect Ofgem to make appropriate 'normalising' adjustments during the benchmarking process. Further details of our suggested approach and analysis can be found in Appendix A21.

Our network has specific geographic and demographic extremes that impact our operational resources and costs adversely when compared to the other networks. These include the following:

- Five out of the UK's top 25 largest conurbations are within our region. They contain 54% of our network's population and 56% by supply point;
- These conurbations are all on the periphery of our region and partly coastal, and so are not best placed for hubs of operations;
- The remainder of our network has the lowest population density in the UK;
- However, our network covers much of this area, which is predominantly rural and includes four national parks with limited road networks;
- We have the lowest number of customers per kilometre of main which further supports the sparsity of much of our network.

These factors have an impact on our cost base. We have to provide coverage for a much greater area than the other networks relative to the number of customers, which impacts everything from logistics and depot coverage through to the resources needed to deliver key outputs, such as the emergency response one-and two-hour standards.

6.3. Investment approach

6.3.1. Summary

Our stakeholders have consistently told us they expect a safe and reliable gas service. Indeed, our extensive stakeholder engagement programme for RIIO-2 has reconfirmed this should be our number one priority, and it is this that underpins our ongoing investment strategy. Our network is already extremely safe and reliable – our overall network reliability stands at 99.998% for 2018/19 – measured as the percentage of minutes interrupted as a proportion of assumed availability. Our strategy is to at least maintain this level of performance through a targeted and efficient maintenance and investment programme. This allows us to minimise the whole life costs of our assets, whilst taking into account our role in the whole system solutions needed to support the future energy transition.

Our mains replacement programme invests in replacing old metal pipes with modern plastic equivalents. This investment programme will continue from 2021 with c.£500m investment. Our stakeholders support doing more, so we are increasing the volume of work on a targeted basis where there is a clear cost–benefit case to do so. As a result, we expect gas leakage to fall by a further 24.4% throughout RIIO-2 – reducing customer disruption and cutting our business carbon footprint.

It is a similar story for our capital investment programme which will see c.£300m of investment. Our previous investments have targeted our poorest-performing assets, which now allow us to place a greater emphasis on maintenance, rather than full replacement for some of our assets. But we will continue to invest where necessary – replacing assets as required and responding to localised areas of growth to ensure that our network is resilient and that we can keep our customers on gas. Away from the gas network, RIIO-2 will be a period of consolidation, allowing us to realise the benefits from our investments in digital technology and our office infrastructure made during RIIO-1. These investments directly supported the commitments we are making in our RIIO-2 plan. However, we will continue to invest where necessary – to tackle new and emerging risks such as those surrounding the security of our IT systems arising from cyber activities.

We have used a consistent and transparent approach to justify our asset investments in this business plan. The approach is based on common principles of good practice asset management, supported by the asset risk management process that has been developed with Ofgem and the industry throughout RIIO-1. Information collected through the development of the Network Output Measures (NOMs) methodology and latterly the development of the NARMs has significantly influenced our approach to assessing investments and hence the scope of our asset plans. We will use NARMs to set a target, monitor and report on our asset risk performance for RIIO-2. This will be a key measure for assessing the delivery and success of our asset plans.

Our investment plans reduce our asset risk – as measured by NARMs – from the level at the start of RIIO-1. Over time, assets deteriorate and the associated risk increases. Our plans will more than offset this increase and help us maintain the excellent network reliability our customers are benefiting from today. Further details of the breakdown of NARMs by asset class are provided later in the Capex and Repex sections.

6.3.2. Risk and asset strategy

Throughout RIIO-1, we have invested to improve our asset management capability and ensure we target our investments to manage the risk of our assets, whilst providing the highest value for our stakeholders. We use an economic approach to analyse risk, which considers the trade-off between different intervention options. We have systemised this decision-making process by partnering with Copperleaf Technologies to implement their C55 Decision Support Software system. This ensures investments across all assets (both network and non-network) and different intervention options (repair/replace/refurb) are considered consistently.

Our approach for justifying asset investment follows six core steps. We have applied this approach to each asset category.

Strategic analysis

Our strategic analysis focusses on demonstrating the importance of the asset, what it is, and why it exists, and how it will continue to deliver benefit for customers over the longer term. We consider the historic and current performance of the assets, what this has achieved and how it is aligned to the outcomes we have promised to deliver for our customers and stakeholders – such as customer service, asset reliability, environmental trends and costs.

Expenditure need

There are several key drivers which underpin our expenditure in RIIO-2. These drivers help to define the need for investment and form the basis of our 'Value Framework'. This framework has been developed during RIIO-1, and is used to determine and compare the relative value of any investment we make. These are:

- **Health and Safety** – we intervene on our assets to reduce the risk of a health and safety incident which may impact customers or stakeholders;
- **Customer** – we intervene on our assets to reduce the risk of a loss of supply or service failings to our customers;
- **Compliance** – we intervene on our assets to ensure we are compliant with various forms of legislation and policy;
- **Financial** – we intervene on our assets to reduce the cost of operating or maintaining our network; we do this when the benefit outweighs the costs; and

- **Carbon** – we intervene on our assets to reduce the amount of carbon we release into the atmosphere through leakage and other operational activities.

It is often the case that there is one primary driver for investment; however, often the intervention will drive benefits in more than one area. These drivers are the core nodes of the NARMs models and enable the monetisation of risk through our investment planning to understand where the risk is in our assets, in addition to the benefits our interventions will deliver for customers.

Assess asset information

This step ensures we have enough high-quality information to inform our analysis and allows us to evidence and justify the expenditure on our assets. We collect a range of asset information on a routine basis to inform our decision-making and to validate and inform our models. We also identify and address any shortfalls in the data. This data covers areas such as asset attributes, fault data, maintenance plans, unit costs and planned upgrades.

NARMs analysis

Our NARMs analysis involves understanding the baseline risk position for each asset class, that is, the risk held in our assets if we did not intervene to mitigate the risk. In establishing a baseline position, we are able to distinguish between the emerging and critical risks on our network and then understand the range of intervention options we might reasonably apply to manage this risk.

Once the baseline is established, the desired future risk position for each asset class is derived based on the assessment of the lifetime benefit of the intervention options and our business strategy. Our approach is to identify the least cost options to manage network risk without compromising the service objectives we have committed for our customers and stakeholders.

Identify and value intervention options

Once we have identified a need to intervene on our assets, we have several options. Under our Total Network Management approach, we consider these options to make a holistic decision, providing the greatest net benefit to our customers. This includes a full range of options from capital investments through to operational maintenance and options for deferral. Interventions are considered across the life of the asset and are targeted at least cost management options. The interventions we consider within our capital investment programme include:

- **Replacement** – this is where we install a new asset to replace an existing asset on a like-for-like basis, often because of poor condition. The new asset will probably be a newer model or design;
- **Refurbishment** – a proactive, planned intervention which includes inspection, and replacement or servicing of major components and soft parts, with the intention of extending the expected life of the asset;
- **Addition** – this is where we install a new asset on our network to provide extra capacity or increased service levels, usually in response to increased growth, customer requests or a Cost Benefit Analysis (CBA) assessment; and
- **Consequential intervention** – an intervention on a network asset that modifies the probability of failure or consequence of failure of another network asset.

The interventions we undertake within our operational programme include:

- **Maintenance and repair** – pre-planned inspections and reactive repair works to ensure performance is optimised and the asset reaches its expected life; and
- **Removal** – where we no longer require an asset, or we can manage our network in a more efficient manner, we decommission and dispose of the asset from our network.

We undertake our assessment using both net present value and payback using our Value Framework assumptions in a bespoke CBA model. This model incorporates the priorities of stakeholders, society and the environment into our decision-making, and quantifies the benefit and costs associated with our asset management decisions, in addition to the probability and timing of achieving such benefits. It assesses the costs and benefits over a 45-year period, therefore ensuring maximum value for our stakeholders over the long term.

Optimise and agree plans

This step is about trying to determine what is the best balance of activities to manage our risks and achieve our objectives across the network asset classes. To do this, we apply financial and performance targets and constraints in a range of expenditure scenarios. These scenarios are then assessed against stakeholder and business objectives to ensure we are delivering against our objectives. Finally, there is a consultation with both internal and external stakeholders to agree the preferred expenditure plan.

Case study – Replace vs. refurbish

Our water bath heaters are some of the oldest above-ground assets we own. Over half have been in operation for over 50 years and have seen little investment during that time as they are relatively simple in operation and generally robust. However, many are now showing signs of poor condition such as severe corrosion and cracking, and we are seeing increasing faults.

Historically, water bath heaters have been viewed as inefficient, redundant assets that are beyond their economic life. The strategy during RIIO-1 has been to replace our most problematic water bath heaters with more efficient heating systems, typically modular boiler systems. However, we have been considering alternative solutions and in 2018, we completed a part-refurbishment of a water bath heater, which included a strip-down and re-fabrication of key components such as the gas burner box assembly. The results are shown below and demonstrate what can be achieved.

We are continuing our refurbishment programme in 2019 and extending the scope to include more components, as well as trialling more efficient burners to comply with the Medium Combustion Plant Directive. We expect a full refurbishment to reinvigorate the asset for the next twenty years.

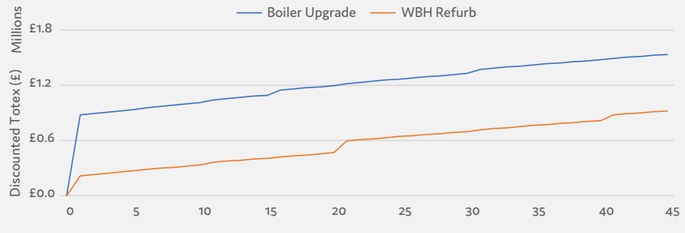

Figure 6.1: Water Bath Heater Whole Life Cost Analysis

We have modelled the whole life costs of the two intervention options – refurbish on a periodic basis or replacement – over a 45-year time horizon. The modelling takes into consideration important factors such as capital and maintenance costs, expected asset life, gas and electricity consumption and carbon emissions. The results are shown in the chart and demonstrate that refurbishment is the optimal long-term solution in most cases. It is the lowest-cost option, maximises the value of our existing assets and mitigates against any risk of asset stranding. For further details please see Appendix A23.A and A23.B.

Case study – District Governor

Our District Governor population is one of our largest above-ground asset classes with c.2,400 installed in our network. Without intervention, by the end of RIIO-2, c.45% will have been in operation for over 40 years, with little or no capital investment in that time. These assets are generally robust; indeed, surveys undertaken in 2018/19 have shown the mechanical elements to be in good condition considering their age. As a result we have seen low numbers of faults, and have managed this large asset class with minimal investment.

However, we are encountering an emerging issue with the governor paintwork and housing which are showing signs of worsening condition. If left unmanaged, this would lead to increased health and safety and loss of supply risks. Our strategy for this asset class is to manage these increasing risks through multiple refurbishments of the asset throughout its life. We will perform various grades of refurbishment, from minor works including painting, replacement of soft parts, and building and roof repairs, to more substantial interventions such as replacement of individual components such as the slam shut, filter or regulator.

The graph below shows the **Risk Profile** of a typical District Governor and the benefits delivered through a **Multiple Refurbishment Strategy** compared to a **Replacement Only Strategy**. By more regularly intervening on an asset, we can keep risk lower for longer and extend its life for a comparable discounted investment. This benefits our customers by maximising the value of our existing assets, delaying significant capital investment and mitigating against the risk of asset stranding. For further details please see Appendix A23.H.

Intervention	Discounted Investment (£k)	
	Refurb/ Replace	Replace Only
1	£2	£45
2	£7	–
3	£6	–
4	£30	–
Total	**£45**	**£45**

Figure 6.2: District Governor Strategy Risk Profiles

6.4. Capital expenditure summary (Capex)

We invest in our asset base each year to ensure we can continue to provide transportation, emergency and connections services to our customers. Capital expenditure can vary materially year on year depending on the types of assets invested in and the type of interventions applied.

Outcome and outputs from our Capex

Our stakeholder engagement programme has reinforced safety and reliability as our top priorities. In addition, stakeholders have told us environmental considerations are an increasing priority for them and we should be aiming to reduce the impact our activities and our network have on the environment. The activities within our Capex directly support these key areas:

- We will invest to protect our network from the ever-increasing threat of cyber and other technology-driven attacks to ensure we can operate a safe and reliable service;
- We will expand our investment in pressure control equipment to better manage system pressures and leakage performance;
- We will invest to install renewable technology to offset c.10% of our annual electricity consumption across the distribution network. This investment will pay for itself within the first 12 years of operation; and
- We will invest so at least 50% of our fleet will be ultra low emission or hybrid by the end of RIIO-2.

In addition, we are targeting improvement in how we deliver our capital programme, which will directly improve the customer experience and further reduce our impact on the environment. Our extensive stakeholder engagement has led to the following key updates:

- Our end-to-end connections service will see improvements at every stage. We are introducing an online quotation and job booking service where possible, and a streamlined offline service for customers who still want the human touch. We will shorten the time it takes to agree a start and completion date, and for standard works we will aim to get the job done within 20 days if the customer wants us to; and
- We will continue to target reducing our impact on the environment with a challenging set of targets around our Business Carbon Footprint, use of virgin aggregate and spoil to landfill.

We will use NARMs to monitor and report on our asset risk to ensure that we can provide a safe and resilient network. Overall, our capital investment plans reduces our asset risk – as measured by NARMs – by the end of RIIO-2. Over time, assets deteriorate and the associated risk increases. Our plans will more than offset this increase and help us maintain the excellent network reliability our customers are benefiting from today.

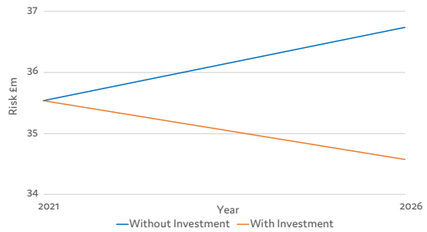

Figure 6.3: RIIO-2: Capex Monetised Risk

Our RIIO-2 expenditure and how it compares to RIIO-1

Table 6.2 below summarises our RIIO-2 Capex investments and compares the average planned expenditure to the 6-year average we have seen in RIIO-1 to date. Figure 6.4 below then shows the key movements that drive the decrease. Overall, we expect to decrease expenditure from £57.0m p.a. on average to £54.8m p.a.

This includes expenditure related with two of the **Uncertainty Mechanisms** we are proposing in Capex. Firstly, a Price Control Deliverable (PCD) on a 'use it or lose it' basis for the diversion of high-pressure overcrossings due to a lift and shift agreement which has been enforced by Network Rail. Secondly, a Reopener for specific reinforcement resulting from the connection of the emerging electricity peaking plant market. These are the main drivers for any potential cost increase between RIIO-1 to RIIO-2. Excluding these, we would expect our RIIO-2 average expenditure to decrease to £49.6m.

£m 2018/19 prices	RIIO-1	RIIO-2							
	Average	21/22	22/23	23/24	24/25	25/26	Total	Average	Variance
Local Transmission System (LTS) storage and entry	£15.3	£8.7	£12.9	£14.8	£12.8	£14.5	**£63.7**	£12.7	-17%
Governors	£1.9	£1.6	£1.6	£1.6	£1.6	£1.6	**£7.9**	£1.6	-19%
Reinforcement	£2.6	£4.3	£4.3	£4.4	£4.5	£4.4	**£21.9**	£4.4	68%
Connections	£9.3	£7.9	£8.1	£8.3	£8.5	£6.3	**£39.1**	£7.8	-16%
Other Capex	£27.9	£25.2	£25.3	£22.0	£22.1	£20.5	**£115.3**	£23.1	-17%
Subtotal	**£57.0**	**£47.7**	**£52.2**	**£51.1**	**£49.6**	**£47.2**	**£247.8**	**£49.6**	**-13%**
Uncertainty mechanisms	£0.0	£3.3	£6.7	£8.3	£5.3	£2.7	**£26.2**	£5.2	
Total	**£57.0**	**£51.0**	**£58.9**	**£59.4**	**£54.8**	**£49.8**	**£274.0**	**£54.8**	**-4%**

Table 6.2: Total Capital expenditure

Reference: BPDT 3.00

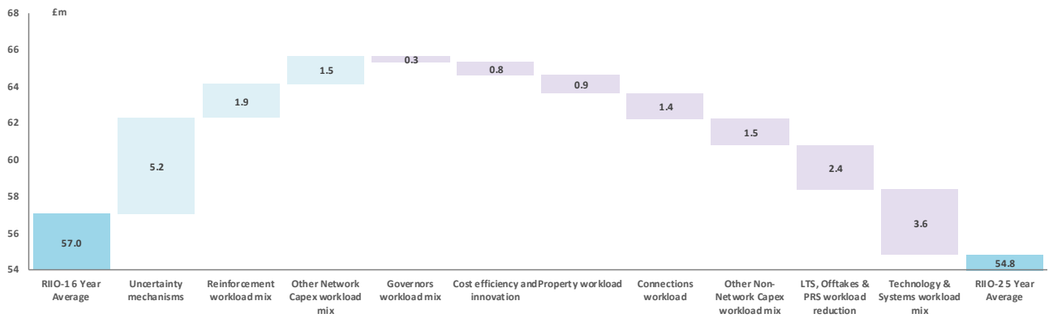

Figure 6.4: Capex changes from RIIO-1 to RIIO-2

We plan to increase investment in **Pressure Management** following our successful roll-out of the technology during RIIO-1. In RIIO-2, we plan to convert a further ten networks to operate on remote pressure management equipment. We are also increasing focus on our intermediate and medium-pressure **valves**, where we are seeing increasing operational risks. Both these sit within Other Capex. Our **Reinforcement** investment is increasing, as we plan to upsize some of our District Governors which are now showing as over capacity and need investment to ensure that we meet our 1:20 supply obligations.

We are forecasting a 16% reduction in **Connections,** which is primarily driven by a reduction in Fuel-Poor workloads; however, we are also expecting new domestic and non-domestic connection workloads to increase and existing domestic connection workloads to decrease. We have also included an uncertainty mechanism for Fuel-Poor as our ambition is to complete more connections, but this is not included in our base forecast.

We have reduced our **Governor** unit costs, delivering a 19% reduction in overall investment during RIIO-2 as we are expecting fewer large replacement projects, and we are increasing our maintenance activities to ensure we can continue managing these assets with efficient investment compared to the size of the population. We are also forecasting a 15% reduction in our investment on our **Offtakes and PRS** assets. Since we took ownership of the network in 2005, we have invested in replacing most of our riskiest and most problematic assets, enabling a change to our workload mix in RIIO-2, reducing asset replacements and increasing refurbishment and overhaul programmes of work. For Governors, Offtakes and PRSs, between both Capex and Maintenance activities, we will be increasing the numbers of planned interventions in RIIO-2.

Between RIIO-1 and RIIO-2, we have reduced our non-network activities by over 28%. This reduction is predominantly driven by **Technology & Systems** as we have replaced our core system, SAP, during RIIO-1 and will not need to invest in another major system replacement in the next period. However, there are pressures which are increasing costs, such as the heightened importance of cyber security and ensuring we benefit from innovation and the advances in technology that can be facilitated by our new systems. We also undertook a **Property** upgrade programme during RIIO-1 to provide the best possible working environment for our people. We will complete the final two upgrades in RIIO-2 and will not need to

undertake any further major works. We have also procured many items of **Tools and Equipment** during RIIO-1, which we are not expecting will need to be replaced during RIIO-2, so we have reduced investment accordingly. Finally, we have set ourselves a cost efficiency challenge of 0.5% which will save our customers c.£4m over RIIO-2. £0.8m per annum.

6.4.1. Local Transmission System (LTS)

Our network includes c.1,200km of high pressure LTS pipelines with a replacement value in the region of £3bn. These pipelines are some of the oldest on our network, with the highest impact should they fail. We regularly inspect, maintain and repair these pipelines in order to protect them from the effects of corrosion and the surrounding environment. As a result, we have experienced very few performance issues and we do not plan to undertake any large-scale LTS upgrades or replacements in RIIO-2.

£m 2018/19 prices	RIIO-1	RIIO-2						
	Average	21/22	22/23	23/24	24/25	25/26	Total	Average
OLI4 to OLI1 conversion	-	£0.3	£0.3	£0.5	£0.3	£0.3	**£1.8**	**£0.4**
Pipeline resilience	-	£0.0	£1.5	£1.5	£1.5	£3.4	**£8.0**	**£1.6**
Block valves	-	£0.2	£0.2	£0.2	£0.2	£0.1	**£0.8**	**£0.2**
Cathodic protection	-	£0.3	£0.3	£0.3	£0.3	£0.3	**£1.5**	**£0.3**
Third-party diversions	-	£0.0	£0.4	£0.4	£0.4	£0.8	**£2.1**	**£0.4**
Subtotal	**£3.7**	**£0.8**	**£2.7**	**£2.9**	**£2.7**	**£5.0**	**£14.2**	**£2.8**
PCDs	-	£2.4	£5.5	£6.9	£3.8	£0.9	**£19.5**	**£3.9**
Total	**£3.7**	**£3.2**	**£8.2**	**£9.8**	**£6.5**	**£5.9**	**£33.6**	**£6.7**

Table 6.3: Local Transmission System Expenditure

Reference: BPDT 3.01, IDP A23.C and A23.F

We plan to invest £14.2m in RIIO-2 on the LTS – an average of £2.8m per year. This is £0.8m lower than our average expenditure during the first six years of RIIO-1. With these targeted interventions, our asset risk from our LTS – as measured by NARMs – would increase marginally by the end of RIIO-2, driven entirely by the OLI4 to OLI1 pipeline conversion detailed below. The rest of our plans will offset this increase, helping us maintain the excellent network reliability our customers are benefiting from today.

The largest area of expenditure (£19.5m) in our LTS plan is to carry out diversions to remove several overcrossings following a formal instruction from Network Rail. Under the National Agreement in place covering rail lines, we are liable for the full cost of diversion. As we are not driving the work and the exact timing and final costs are uncertain, we propose that this be treated as a Price Control Deliverable (PCD) on a 'use it or lose it' basis. The project will remove risk from our network as overcrossings are vulnerable sections of pipelines; however, it will not form part of our risk targets as the project is ring-fenced and funded through the PCD. We believe this approach is in the best interests of our stakeholders.

The largest investment we plan to make is to improve LTS **Pipeline Resilience**. We make this type of investment to prevent the environment impacting our asset, preventing loss of supply and gas escapes. This includes managing riverbank and riverbed erosion which leaves our pipeline exposed, as well as areas of landslip which jeopardise the integrity of the pipes. Our strategy is to monitor and mitigate any environmental effects and, where mitigation proves ineffective, we will look to undertake a small localised diversion to mitigate the potential of a catastrophic asset failure.

We are forecasting to have to divert two high-pressure pipelines during RIIO-2 due to riverbed or bank erosion, at a total cost of £6.1m. Underwater surveys undertaken in 2018/19 have identified a further seven high-pressure pipelines which are exposed on the riverbed or bank. In addition to this, we are forecasting that we will need to remediate a further four pipelines at a total cost of £1.9m.

This forecast is in line with what we are experiencing in RIIO-1 to date and the costs proposed are based on similar projects undertaken in this period. During RIIO-1, we have completed a £3m project to divert a 700m single feed high-pressure pipeline feeding Penrith, by directionally drilling under the river, removing the risk totally. We also undertook a 200m

diversion of a single feed into the town of Whitby at a cost of over £2m, removing the immediate risk from slope instability. We have undertaken erosion protection measures and stabilisation works on three pipelines, with costs ranging from £0.1m to £2m.

The remaining investments cover four expenditure areas, summarised below.

Expenditure	Description
Pipeline conversion Total expenditure: £1.8m Average expenditure: £0.4m	New inspection technology means we can install pig trap launch and receiver equipment on five of our 4" pipelines to allow us to inspect the insides of these pipelines. This provides a much greater understanding of asset condition.
Block valves Total expenditure: £0.8m Average expenditure: £0.2m	Block valves allow us to safely shut down and isolate pipelines during an emergency event or for maintenance activities. We plan to overhaul the valves at 14 targeted sites to ensure we can isolate pipelines during an emergency.
Cathodic Protection (CP) Total expenditure: £1.5m Average expenditure: £0.3m	CP is used to mitigate against the effects of corrosion on below-ground pipework, prolonging the life of the asset and delaying potentially large investments. We plan to upgrade the CP at 40 locations on our high-pressure pipelines.
Third-party diversions Total expenditure: £2.1m Average expenditure: £0.4m	When a third party requests us to divert a section of our LTS, it may not be fully rechargeable for legal reasons. The forecast is based on RIIO-1 run rates and a view of our regional infrastructure forecasts.

Figure 6.5: Other Local Transmission System expenditure

6.4.2. Offtakes and Pressure Reduction System (PRS)

Since we took ownership of the network in 2005, we have replaced many of our riskier and more problematic assets. This has allowed us to transition towards a strategy whereby we invest less on replacing assets and focus more on extending the life of our existing assets to minimise whole life cost. By doing this, we can manage increasing risks over RIIO-2 by intervening on many more assets than we would be able to if we were to undertake an expensive asset replacement programme.

£m 2018/19 prices	RIIO-1	RIIO-2						
	Average	21/22	22/23	23/24	24/25	25/26	Total	Average
Filters	-	£0.2	£0.2	£0.8	£1.0	£0.4	**£2.6**	**£0.5**
Fiscal meters	-	£1.5	£1.5	£0.8	£1.5	£1.5	**£6.8**	**£1.4**
Preheating	-	£2.2	£4.6	£3.8	£2.8	£3.1	**£16.5**	**£3.3**
Regulators & slam shuts	-	£0.7	£1.0	£2.7	£1.8	£1.8	**£8.0**	**£1.6**
Odorant	-	£0.5	£0.4	£0.5	£0.5	£0.2	**£2.1**	**£0.4**
Calorimeters	-	£0.3	£0.2	£0.2	£0.2	£0.2	**£1.1**	**£0.2**
Electrical & instrumentation	-	£0.9	£0.9	£0.9	£0.9	£0.9	**£4.6**	**£0.9**
Civil structures	-	£1.4	£1.1	£1.1	£1.1	£1.1	**£5.8**	**£1.2**
Pipework	-	£0.0	£0.0	£0.8	£0.0	£0.0	**£0.8**	**£0.2**
Cathodic Protection	-	£0.2	£0.2	£0.2	£0.2	£0.2	**£1.2**	**£0.2**
Total	**£11.6**	**£7.9**	**£10.2**	**£11.8**	**£10.1**	**£9.5**	**£49.5**	**£9.9**

Table 6.4: Offtake and Pressure Reduction Station Expenditure

Reference: BPDT 3.01, IDP A23.A and A23.B

Overall, we plan to invest £49.5m in our Offtakes and Pressure Reduction Stations (PRSs) in RIIO-2 at an average of £9.9m per year, £1.7m lower than the average in RIIO-1. However, we will be intervening on two and a half times the number of assets through a combination of increased maintenance and refurbishment rather than full asset replacement. In addition, our investments will increase capacity at five of our sites to continue to meet our 1:20 supply obligations, and will upgrade our preheating systems at over 50 sites with more efficient and less polluting technology.

An overview of our plan | Giving customers confidence that we will deliver | Giving customers a stronger voice | Delivering better outcomes for customers | A sustainable plan for the future | **Delivering value for money** | Financing our plan

Our preferred solution results in a small NARMs risk decrease of 4.5% compared to the position at the start of RIIO-2. In absolute terms, risk reduces by 7.5% compared to a without-investment position. Our analysis has shown that to reduce risk further would cost customers a considerable amount more and would result in a far greater proportion of our assets having to be replaced, increasing the risk of future asset stranding due to the longevity of these types of assets. As an example, our modelling shows reducing risk by a further 8% would cost our customers c£200m during RIIO-2. In addition, our preferred option focusses on refurbishment rather than replacement, allowing us to intervene on many more assets at a lower unit cost.

Metering, Preheating and Pressure Control make up a significant proportion of the Offtake and PRS Capex in RIIO-2 (63%) and further engineering justification for this investment is discussed in detail below.

We use **Meters** to measure the amount of gas entering our network, allowing us to manage gas pressure and capacity, and to calculate Entry Charges for Shippers. Our stakeholder engagement process reinforced the fact that Shippers see this as a critical function.

Prior to RIIO-1, we had Turbine Meters installed on our Offtakes to record the gas flows. Turbine meters have moving parts, a rotor and bearings, which are subject to wear over time and can lead to accuracy degradation. These metering systems are obsolete, outside of their expected asset life and require increased maintenance, and our spares stock is depleting. During RIIO-1, we will have replaced these meters on 14 of our 23 Offtake sites with ultrasonic meters which are more modern technology. These meters are more accurate, create relatively little pressure drop and have no moving parts, so require less maintenance than other types of meters. During RIIO-2, we plan to invest £6.8m installing new ultrasonic meters at the remaining nine Offtakes.

We use **Preheating** to heat the gas on our sites prior to pressure reduction. As natural gas is reduced in pressure, it naturally reduces in temperature – which amongst many issues could cause critical downstream assets such as regulators and control systems to freeze. Preheating assets are some of our most critical, due to the risk of a major 'loss of supply' incident as each site supplies a significant numbers of customers.

Our preferred solution focusses on refurbishment where possible. We are planning to refurbish 38 of our water bath heaters, involving a full strip-down and re-fabrication of key components such as gas coils and fire tubes. In addition, our larger water bath heaters will have a low NOx burner retrofitted in place of their original burners to comply with the Medium Combustion Plant Directive, improving air quality in the local area. We are planning to replace three water bath heaters in RIIO-2, and will use the results from our RIIO-1 Network Innovation Competition (NIC) preheating project to determine the most appropriate preheat technology to install. We are also planning on refurbishing 16 boiler systems, replacing single boilers, but not the heat exchangers, pipework and let down unit. We will need to replace two entire boiler systems during RIIO-2.

Pressure control systems consist of regulators and slam shuts. These assets reduce the pressure of gas in the network (regulators) to supply the next pressure tier down, and to protect the network from any over-pressurisation that could occur (slam shuts). 50% of our regulators and slam shuts will be over 40 years old in RIIO-2 without investment, the maximum design life for this type of equipment. We are experiencing increasing faults on both assets; however, regular maintenance and repairs mean that these assets can continue in operation beyond this timeframe.

Over RIIO-2, without investment, asset failures would increase and could result in the slam shuts operating, stopping the gas supply, leading to a loss of supply. If the slam shut itself fails, there is a risk of high outlet pressure, leading to over-pressurisation of the downstream network, increasing the risk of an explosion.

We are planning to refurbish around 24 pressure control systems in RIIO-2, replacing soft parts within a regulator or replacing only one of the regulators or slam shut valves within a system. We plan to fully replace two pressure control systems due to condition and one due to capacity. In total, this work only covers c.25% of our assets which will be over 40 years old during in RIIO-2. We will increase maintenance on the other 75% of these assets through a major overhaul programme, replacing soft parts and worn components.

The remaining investments cover seven expenditure areas, summarised below.

Expenditure	Description
Filters Total expenditure: £2.6m Average expenditure: £0.5m	Filters remove debris from the gas stream to protect downstream assets from potential damage. We plan to replace filters on 13 sites in RIIO-2, c.6% of the total asset population, which is in line with historic trends.
Odorant systems Total expenditure: £2.1m Average expenditure: £0.4m	We are now experiencing increasing numbers of faults on some odorant systems and so we plan to invest in the systems on all 23 of our sites in RIIO-2. Only four are full system replacements, with the balance being replacement/refurbishment of specific components.
Calorimeters Total expenditure: £1.1m Average expenditure: £0.2m	Calorimeters are used to calculate the quality of the gas and the energy flow which is an important input to the Entry Charges calculation for Shippers. We plan to upgrade the calorimeters on 11 sites in RIIO-2, just under half the overall population.
Electrical/instruments Total expenditure: £4.6m Average expenditure: £0.9m	Electrical equipment powers our sites, and instrumentation equipment is used to monitor the performance of the assets on site. We plan to upgrade these systems at 50 sites during RIIO-2, 25% of the total. Only ten involve replacements, with the balance receiving refurbishment.
Civil structures Total expenditure: £5.8m Average expenditure: £1.2m	Civil infrastructure protects and supports our assets and enables safe access to and around our sites. Workload has been derived from survey information that informed our NARMs models, with c.80% of the work involving an overhaul, the balance involving full replacements.
Pipework Total expenditure: £0.8m Average expenditure: £0.2m	We plan to upgrade the inlet and outlet pipework on a few sites due to capacity constraints from localised growth. The workload has been derived from capacity utilisation calculations of all our Offtake and PRS sites.
CP Total expenditure: £1.2m Average expenditure: £0.2m	CP is used to mitigate against the effects of corrosion on below-ground pipes. We replace ground beds on failure, which requires £1.2m of investment during RIIO-2. The workload has been derived using historic run rates.

Figure 6.6: Other Offtakes and Pressure Reduction Stations expenditure

6.4.3. Governors

Governors are one of our largest asset groups – with over 5,600 assets – consisting of District Governors, Industrial and Commerical (I&C) Governors and Service Governors. The investments detailed here covers the refurbishment or replacement of existing assets due to condition or land issues. New governors installed as a result of network reinforcement or for new connections are covered in sections 6.4.4 and 6.4.5.

£m 2018/19 prices	RIIO-1	RIIO-2						
	Average	21/22	22/23	23/24	24/25	25/26	Total	Average
District Governors	-	£1.4	£1.4	£1.4	£1.4	£1.4	**£7.0**	**£1.4**
I&C Governors	-	£0.0	£0.0	£0.0	£0.0	£0.0	**£0.1**	**£0.0**
Service Governors	-	£0.1	£0.1	£0.1	£0.1	£0.1	**£0.7**	**£0.1**
Total	**£1.9**	**£1.6**	**£1.6**	**£1.6**	**£1.6**	**£1.6**	**£7.9**	**£1.6**

Table 6.5: Governors

Reference: BPDT 3.03, IDP A23.H

Overall, we plan to invest £7.9m on our Governor population at an average of £1.6m per year, £0.4m lower than the average in RIIO-1, which is primarily driven by a reduction in our unit costs. Without these targeted interventions, our asset risk from governors – as measured by NARMs – would increase by 7% by the end of RIIO-2. Our plans will offset this increase and reduce risk by 10% by the end of RIIO-2.

Almost 90% of our planned expenditure is on **District Governors.** These assets reduce pressures in order to supply the intermediate, medium or low-pressure networks. They balance pressures to ensure enough capacity to meet a 1:20 demand, whilst keeping pressures as low as possible to reduce leakage. District Governors can supply anywhere between ten and tens of thousands of customers. They represent a loss of supply risk within our network should they fail.

We expect to replace c.40 assets in RIIO-2, for legal land registration issues, in line with the run rate seen in RIIO-1. This equates to less than 2% of the total District Governor population. We also plan to refurbish 25 existing governors, replacing soft parts and individual components. We will manage the remainder of our District Governors through a maintenance programme, repairing governor paintwork and buildings to ensure that the assets are adequately protected to slow deterioration. This programme of works was commenced in RIIO-1 and will continue in to RIIO-2, the costs of which can be found within the maintenance section of this plan.

The remaining investments cover the other two types of Governor and are summarised below.

Expenditure	Description
I&C Governors Total expenditure: £0.1m Average expenditure: £0.0m	A pressure regulating system operating with an inlet below 7 bar, supplying large commercial or industrial customers. We plan to replace five I&C Governors in RIIO-2, c.2% of the total asset population, which is in line with historic trends.
Service Governors Total expenditure: £0.7m Average expenditure: £0.1m	A pressure regulating system operating with an inlet below 7 bar, supplying domestic or smaller commercial or industrial customers. They tend to be located in rural areas where there is no low-pressure network and they serve fewer than ten customers. We plan to replace 420 Service Governors in RIIO-2, c.14% of the total asset population which is in line with historic trends.

Figure 6.7: Other Governors expenditure

6.4.4. Reinforcement

Reinforcement is the increase in capacity of our existing pipeline system to meet our Gas Act and Gas Transporters licence obligations, to ensure that we can supply our customers in a winter of 1 in 20 severity. It may also involve the installation of a new governor. There are two types of reinforcement, each with a different driver:

- **General reinforcement** – investment to alleviate areas of pressure constraint on the network following our validation process, or when the annual Demand Refresh has been carried out. This type of reinforcement is driven by software models which identify general demand growth in an area; and
- **Specific reinforcement** – investment to maintain system pressures when a new connection is accepted and added to the network or where there is an increase in load through an existing connection. This type of reinforcement is driven by third-party connection requests. Specific reinforcements are subject to the Economic Test and may or may not require funding in part or in full by the third party.

£m 2018/19 prices	RIIO-1	RIIO-2						
	Average	21/22	22/23	23/24	24/25	25/26	Total	Average
General reinforcement	-	£2.3	£2.1	£2.1	£2.1	£1.8	**£10.3**	**£2.1**
Specific reinforcement	-	£2.0	£2.2	£2.3	£2.4	£2.6	**£11.6**	**£2.3**
Subtotal	**£2.6**	**£4.3**	**£4.3**	**£4.4**	**£4.5**	**£4.4**	**£21.9**	**£4.4**
Re-openers	-	£0.9	£1.2	£1.5	£1.5	£1.8	**£6.7**	**£1.3**
Total	**£2.6**	**£5.2**	**£5.5**	**£5.9**	**£6.0**	**£6.1**	**£28.6**	**£5.7**

Table 6.6: Reinforcement

Reference: BPDT 3.02, IDP A23.E

During RIIO-1, we have successfully mitigated the volume of reinforcement projects by implementing improved pressure management techniques and undertaking a CBA evaluation process. This compares the impact on leakage from pressure increases against the capital cost of reinforcing the network. We will continue these successes in RIIO-2, to ensure that the optimum solution is sought to deliver value for money and security of supply, whilst considering our impact on the environment.

We are forecasting an investment of £10.3m in RIIO-2 for **General reinforcement** which will involve laying c.23km of main and installing 75 District Governors. Our RIIO-2 mains reinforcement workload has been calculated from average RIIO-1 run rates. We have experienced relatively consistent workloads year on year in RIIO-1 and we are not expecting to see a significant change over the next few years.

The primary reason for the increase in general reinforcement is because we have recently identified 98 **District Governors** which are over capacity and require upsizing to ensure that we can meet our 1:20 supply obligations. Network analysis has identified that for 10 of these governors, even if they failed, we would not expect to lose customers as there are other governors in the vicinity which can meet the required demand. We will continue to monitor these governors but do not plan to intervene on them. We have commenced work on the remainder in RIIO-1, using a risk-based prioritisation approach, and will complete the programme of work in RIIO-2, intervening on 68 District Governors at a cost of £4m.

We are forecasting a net investment of £18.3m in RIIO-2 for **Specific reinforcement.** £11.6m of this investment will involve laying c.21km of mains and installing two District Governors. This is broadly consistent with where we expect our RIIO-1 run rate to be at the end of the price control. Workload to date has been lower but has picked up, and we will complete several large projects in the final years of RIIO-1. By the end of RIIO-1, average expenditure on general and specific reinforcement will be c.£3.9m.

The remaining £6.7m **Specific reinforcement** investment is linked to the connection of **electricity peaking plants.** During the latter years of RIIO-1, we have seen a large increase in this type of connection request. As a relatively emerging market in our region and one which is heavily dependent on collaboration between energy companies, regulators and the government, forecasting future investment with certainty is difficult. We have included a forecast based on current trends in our plan, and a Reopener uncertainty mechanism to protect customers and the network, should volumes vary materially.

6.4.5. Connections

Under the Gas Act, we are obliged comply with any reasonable request to connect to our system any premises or pipeline system operated by an authorised transporter. We expect to invest c.£39.1m over the five years of RIIO-2 providing this service. This is a 16% reduction from RIIO-1, mainly driven by a reduction in the number of Fuel-Poor customers we expect to connect.

£m 2018/19 prices	RIIO-1	RIIO-2						
	Average	21/22	22/23	23/24	24/25	25/26	Total	Average
Domestic connections (new)	-	£1.7	£1.9	£2.1	£2.3	£0.0	**£7.8**	**£1.6**
Domestic connections (existing)	-	£2.6	£2.6	£2.6	£2.5	£2.5	**£12.8**	**£2.6**
Non-domestic connections (new & existing)	-	£1.1	£1.1	£1.2	£1.2	£1.2	**£5.8**	**£1.2**
Fuel-Poor Network Extension Schemes (FPNES)	-	£2.5	£2.5	£2.5	£2.5	£2.6	**£12.6**	**£2.5**
System Entry connections	-	£0.0	£0.0	£0.0	£0.0	£0.0	**£0.0**	**£0.0**
Total	**£9.3**	**£7.9**	**£8.1**	**£8.3**	**£8.5**	**£6.3**	**£39.1**	**£7.8**

Table 6.7: Connections

Reference: BPDT 3.04, IDP A23.D

Domestic and non-domestic connections

Connections can range from single properties to large housing developments and non-domestic connections. For single connections, the work typically involves connecting to an existing main in public or private land and laying a single service, whereas larger developments are typically further away from an existing main and will normally require a length of main to be laid.

We have seen the numbers of **new domestic connections to new-build properties** increase steadily from 2013 as the housing market recovers following the 2008 financial crisis. This is the same reason we are seeing the length of mains laid per service increase over time as more expensive connections become viable. In discussions with our local authorities on their housing development plans, we expect this trend to continue into RIIO-2. Our plan then assumes that legislation changes in 2025/26 preventing the installation of gas boilers in new houses. We expect this to lead to an increase in new connections prior to this date. This drives the variations seen in the table above.

We also provide **new connections to existing domestic properties** that previously did not have gas. In general, these properties are close to existing gas mains and so only small main extensions are required, if at all. Over RIIO-1, we have seen a steady decline in this type of connection request as each year there are fewer existing properties without a gas connection. The number of existing domestic connections forecast for RIIO-2 follows this downward trend. However, the last four years have shown a consistent length of mains laid per service and we are not expecting this to change.

New connections to new and existing non-domestic properties cover a wide range of industrial and commercial properties from small commercial businesses such as a hairdresser who would not normally require a larger gas load than a typical domestic property, to large industrial businesses such as a factory where their load will be much larger, typically in excess of 275kW. With these types of connections, we are seeing a similar upward trend as with the new build domestic properties, again due to the strengthening economy in our region. The length of mains laid per service is also trending up. Our RIIO-2 forecasts follow these trends.

We are forecasting that our unit costs and recovery rates will remain comparable to RIIO-1, but we will be improving our customer service through providing quicker quotations, shorter lead times for delivery and overall improvements in our customer scores.

Fuel-Poor Network Extension Schemes (FPNES)

We expect to invest £12.6m in RIIO-2 to assist in connecting Fuel-Poor households to our gas network. We expect to connect 1,000 Fuel-Poor customers per annum in RIIO-2, a total of 5,000. This is a decrease from the annual rate in RIIO-1 of just over 2,000, which is driven by changes in Ofgem's definition of fuel poverty and the removal of area-based qualifications. Both make it more difficult for customers to meet the criteria for a Fuel-Poor connection. Our ambition is to deliver at least double this amount, but because of the uncertainty in successfully identifying and delivering this, we are proposing a volume-driven uncertainty mechanism to provide funding for this, rather than including it in our base allowance.

System entry connections

There is no capital investment required for entry connections as these connections are funded on the whole by the supplier. By early January 2020, we expect to have 17 biomethane plants connected to our network, with a maximum capacity of 16,140scm/hour. We expect this to double by 2025 and are also expecting increased hydrogen blending into our network, consistent with our pathway to net zero by 2050. For more information, see section 4.4.2.

6.4.6. Other network Capex

Other network Capex includes investment in network-related assets not covered above. We plan on investing £37.2m, an increase in expenditure from RIIO-1 of c.25%.

£m 2018/19 prices	RIIO-1	RIIO-2						
	Average	21/22	22/23	23/24	24/25	25/26	Total	Average
Physical security	-	£0.8	£0.9	£0.9	£0.9	£0.9	**£4.4**	**£0.9**
<>7bar overcrossings	-	£1.5	£1.6	£2.1	£2.5	£2.4	**£10.1**	**£2.0**
<>7bar sleeves	-	£0.1	£0.7	£0.6	£0.1	£0.1	**£1.5**	**£0.3**
<7bar cathodic protection	-	£0.5	£0.5	£0.5	£0.5	£0.5	**£2.7**	**£0.5**
<7bar valves	-	£0.8	£0.8	£0.8	£0.8	£0.8	**£4.0**	**£0.8**
Ball valves	-	£0.2	£0.2	£0.2	£0.2	£0.2	**£0.9**	**£0.2**
Pressure management	-	£2.6	£2.3	£1.2	£1.0	£0.9	**£7.9**	**£1.6**
Validation loggers	-	£0.2	£0.2	£0.2	£0.2	£0.2	**£0.9**	**£0.2**
DM & NDM loggers	-	£0.0	£0.0	£0.0	£0.0	£0.0	**£0.0**	**£0.0**
Telemetry	-	£0.3	£0.3	£0.3	£0.3	£0.3	**£1.7**	**£0.3**
Gas conditioning	-	£0.1	£0.1	£0.1	£0.1	£0.1	**£0.4**	**£0.1**
Renewables	-	£0.5	£0.5	£0.1	£0.1	£0.1	**£1.4**	**£0.3**
Total	**£5.8**	**£7.7**	**£8.1**	**£7.0**	**£6.7**	**£6.5**	**£36.0**	**£7.2**

Table 6.8: Other network Capex

Reference: BPDT 3.05, IDP A23.G and A23.I

Overcrossings account for £10.1m (28%) of this expenditure. An overcrossing occurs where our below-ground pipelines need to cross natural or man-made obstacles such as rivers, canals, roads and railways. We have a total population of 352 exposed overcrossings, split across all the pressure tiers. If an overcrossing fails, we risk an explosion, loss of supply and methane leaking into the atmosphere. There is also a security risk should a member of the public access the site and fall from the pipework – such an incident occurred in RIIO-1.

We prioritise overcrossing work based on risk and the results of visual surveys undertaken during routine maintenance. In RIIO-1, we will complete a programme of work upgrading our high pressure overcrossings. During RIIO-2, we will concentrate on the worst condition medium- and low-pressure overcrossings, upgrading nine overcrossings per year, a similar workload to RIIO-1. Security measures will be upgraded at c.18% of these sites based on condition.

We have also included a small capital investment to carry out work on overcrossings should a severe weather event occur. During RIIO-1, we had three such incidents; as a result, we commissioned a report to review the risk associated with flooding affecting our overcrossings. Without investing considerable amounts, we were unable to confidently identify where we should invest to mitigate these risks. Due to this uncertainty, our RIIO-2 strategy is a reactive rather than proactive approach.

We use **pressure management** within our network to ensure that we meet our 1 in 20 demand obligations whilst aiming to reduce leakage from our mains, reducing our business carbon footprint and preventing customers losing their gas supply. There are four types of pressure management techniques we use within our network:

- Fixed pressure – pressures are fixed all year round, typically used on all Polyethylene (PE) networks;
- Seasonal pressure settings – where pressures are reduced for summer and raised for winter months, typically used in networks where there is a mix of pipe materials with significant metallic mains remaining;
- Clock control – clocks are used to alternate the pressure between peak and off-peak settings within a day, typically only used for the winter months where there are significant differentials in demand during the day; and
- Remote pressure management – the most sophisticated pressure management technique that allows us to control the pressure at any time without the need to visit the sites, whilst providing online daily pressure data.

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Remote pressure management provides 24/7 visibility of the network as well as the ability to adjust system pressures to manage leakage and resulting carbon emissions without the expense of visiting sites. We can avoid expensive reinforcement through managing pressures daily, remotely control the network during incident events and identify issues early, allowing proactive resolutions. In addition, we install dataloggers at strategic points of our network downstream of our governors to provide an early indication of developing network issues, which if not acted upon could result in poor pressures or a loss of supply. Loggers are also fitted to District Governors as we require pressure data for our leakage calculations.

The clocks we have in the network are already well beyond their life expectancy and we are seeing them fail. To combat this, we are working on developing our own clock; we have a mechanically proven prototype and are now developing the software. The remote pressure management equipment is reliable for around five years and functional for about eight, over which time component parts will begin to fail and will need to be replaced. Without investment in RIIO-2, much of our pressure management equipment would fail.

Our preferred strategy for RIIO-2 is to apply the most appropriate method of pressure control to each of our 266 low-pressure networks and ensure that our whole system is being measured. To do this, we have undertaken a CBA on each network, accounting for the remaining lengths of metallic mains and the average system pressures. The results have shown it is beneficial to continue with remote pressure management on the current 26 networks as well as installing it on a further ten networks. We will also install clocks on 37 networks. We are rolling out a programme to install solar power at our remote pressure management sites to reduce the need for regular battery replacements.

The remaining investments cover eight expenditure areas, summarised below.

Expenditure	Description
Physical security Total expenditure: £4.4m Average expenditure: £0.9m	Security measures are installed to protect our sites, ensuring public safety and preventing theft or vandalism. Workload has been derived from our security risk model, developed in RIIO-1. We plan some form of security upgrades at c.25% of our sites.
< >7 bar sleeves Total expenditure: £1.5m Average expenditure: £0.3m	We plan to grout 22 sleeves on our LTS network, c.3% of the population. The workload is based on forecasts of pipeline condition from inspections (OLI1) and CP readings (OLI4). This investment is consistent with RIIO-1 intervention rates.
<7 bar CP Total expenditure: £2.7m Average expenditure: £0.5m	CP is used to mitigate against the effects of corrosion on the below-ground pipework. We plan to upgrade the cathodic protection at 438 locations on our network, workload driven by historic run rates.
<7 bar valves Total expenditure: £4.0m Average expenditure: £0.8m	Valves allow the safe shutdown and isolation of pipelines during an emergency event or for maintenance. This expenditure includes upgrades to Service Isolation Valves (SIVs) on multi-occupancy buildings (MOBs), and intermediate pressure and medium pressure valves.
Ball valves Total expenditure: £0.9m Average expenditure: £0.2m	We have a safety issue with a ball valve manufacturer and will upgrade these assets to mitigate the risk that this poses to the operation of these assets. This is a rolling programme of work that commenced in RIIO-1 and will be complete at the end of RIIO-2.
Validation loggers Total expenditure: £0.9m Average expenditure: £0.2m	Validation loggers record network pressures to update model data. Our plan is to reactively replace loggers upon failure.
Telemetry Total expenditure: £1.7m Average expenditure: £0.3m	Telemetry equipment is used to send site intelligence back to System Control, allowing us to react to faults and alarms, and remotely monitor and control gas flows. We plan to refurbish 15 sites, which equates to less than 10% of the population.
Gas conditioning Total expenditure: £0.4m Average expenditure: £0.1m	Gas conditioning units (Foggers) inject Monoethylene Glycol (MEG) into the network to moisten lead yarn joints to reduce leakage. We plan to decommission assets in areas where it is no longer effective and install new assets where it will prove more effective.
Renewables Total expenditure: £1.4m Average expenditure: £0.3m	We will invest to install renewable technology to offset c.10% of our annual electricity consumption across the distribution network. This investment will pay for itself within the first 12 years of operation. We are also installing electricity charging points at our offices and depots to facilitate our vehicle strategy carbon reductions.

Figure 6.8: Other network Capex expenditure

6.4.7. Other non-network Capex

Other non-network Capex includes investment in assets that are not directly associated with network assets; examples include IT and vehicles. We plan on investing £79.3m, a decrease in expenditure from RIIO-1 of c.28%.

£m 2018/19 prices	RIIO-1	RIIO-2						
	Average	21/22	22/23	23/24	24/25	25/26	Total	Average
Technology & Systems	-	£10.1	£10.9	£9.3	£10.2	£9.5	**£50.0**	**£10.0**
Tools & equipment	-	£0.6	£0.6	£0.6	£0.6	£0.6	**£3.1**	**£0.6**
Transport & wheeled plant	-	£4.4	£5.4	£4.4	£3.9	£2.2	**£20.3**	**£4.1**
Property & workspace	-	£2.2	£0.0	£0.5	£0.5	£1.6	**£4.8**	**£1.0**
Compensation	-	£0.2	£0.2	£0.2	£0.2	£0.2	**£1.1**	**£0.2**
Total	**£22.2**	**£17.5**	**£17.2**	**£15.0**	**£15.5**	**£14.1**	**£79.3**	**£15.9**

Table 6.9: Other non-network Capex

Reference: BPDT 3.05 and 3.06, IDP A23.J and A23.K

Technology and Systems

During RIIO-1, we have invested significantly in our IT landscape to simplify our infrastructure model, reduce our operating costs, increase colleague satisfaction, improve our lifecycle data management and open the door to innovation. We have migrated our back-office systems to a secure Private Cloud and migrated our System Control (SCADA) systems to public cloud hosting, reducing our datacentre footprint and reducing our IT operating costs.

We are the first UK utility to operate SCADA Systems from the public cloud. We have also replaced our Wide Area Networks with one Communications Network delivering high-speed Wi-Fi to our offices and depots. The most significant improvement has been our transition to the new SAP HANA platform, whilst reorganising many of our business processes under our Future Ways of Working (FWOW) programme. The benefits are significant: real-time access to business information, greater mobile working, predictive analytics and access to the Internet of Things (IoT).

These investments mean that we do not need to undertake another large-scale, large-cost SAP replacement during RIIO-2, and hence our annual investment is reducing by nearly 27% in RIIO-2. Our RIIO-2 investments will focus on four key areas:

- Hardware – we will continue to invest to replace end-of-life devices and hardware along with upgrading our operating systems and Public Cloud infrastructure. We plan to replace our unified communication networks to create a more cost-effective and modern IT network and replace our aged V-SAT telemetry network.
- Software – we will continually develop and improve our SAP HANA technologies, building more processes, reports and forms into our SAP landscape. Our SCADA system, which is used for the real-time process management of our gas network, will be coming to the end of its life, and will be replaced with technology and software to provide a wealth of new features, simplifying support, and driving business innovation and operational efficiencies.
- Emergent technology – we are committed to realising the benefits from an ever-evolving technology landscape and plan to invest in IoT technology and augmented reality to allow greater real-time monitoring and display of assets across the network. We want to improve our colleagues' safety through wearable technology and provide a more immersive learning and development environment through Virtual Reality and Digital Twin technology.
- Security – we are acutely aware of the threats facing organisations such as ourselves relating to cyber security and will invest in projects to make our systems, networks and data more secure. We will upgrade our Identity Access Management system to control user access to critical information, and develop an Information Security Risk Management programme and tiered Network and System Security Architecture to improve security and protect our business data and intellectual property. We will manage information and data from acquisition to disposal and have in place Operational Continuity and Disaster Recovery systems to ensure we are always operational and to minimise the effects of unplanned incidents.

The benefits of our investment will ensure that we operate all systems to a minimum availability level of 99.95% with a recovery time objective of 8 hours and a recovery point objective of 24 hours. Operation of applications as close as possible to the latest released version will ensure better security, and use of cloud technologies and modern hardware will reduce our carbon footprint and make us more cost-effective. Investment in emerging technology will allow us to put information at the heart of our decisions and utilise technology that drives business innovation and operational efficiencies. Finally, investments in managing cyber security will improve governance and compliance, proactively manage risk and improve controls.

Transport and wheeled plant

We operate a fleet of around 600 commercial vehicles which cover over ten million miles each year as our engineers attend gas escapes, undertake repair and maintenance tasks and connect new properties to our network. Our fleet is predominantly Ford-based vehicles, including a mixture of transit vans, smaller vans and HGVs, including water extraction tankers, grab wagons, and Core 'n' vac wagons.

Without investment to replace our fleet in RIIO-2, we would see a steep increase in the number and cost of repairs as major components start failing. Our vehicles would be likely to break down more often and spend longer off the road. This would put our customer outputs and one- and two-hour response times at risk, whilst less efficient vehicles would increase air pollution.

We have developed a Fleet Model to improve the way in which fleet investment decisions are made, using data-driven fault rates to drive CBA. This informs the optimal point to replace a vehicle based on mileage, fuel efficiency, maintenance and repair costs, emissions and depreciation. During RIIO-2, we are planning to replace 528 vehicles at a total cost of £20.3m which offers a payback for our customers of five years.

When we tested our business plan with our stakeholders, they told us that they expect more ambitious targets for decarbonising our fleet. As a result, we will commit to 100% of our vans meeting Euro 6 emissions standards, but we are now also committing to at least 50% of our total fleet being ultra-low emission or hybrid by the end of RIIO-2.

The remaining investments cover three expenditure areas, summarised below.

Expenditure	Description
Tools and equipment Total expenditure: £3.1m Average expenditure: £0.6m	We purchase small tools and equipment such as CAT and gennys, gas monitors, breathing apparatus and drills to support our operational activities. We reactively replace this equipment as it becomes worn or damaged. This investment is in line with historic run rates.
Property Total expenditure: £4.8m Average expenditure: £1.0m	We employ c.1,300 people and need to provide the right working environment to ensure that team morale, culture and productivity are optimised across our offices, depots and stores. We will operate a rolling plan of investments in order to ensure this continues.
Compensation Total expenditure: £1.1m Average expenditure: £0.2m	We expect to invest £1.1m to cover payment of compensation claims relating to mineral loss, loss of development and land drainage issues due to our pipelines' location. We have had three claims with quarries relating to mineral loss during RIIO-1, with a further five potential claims identified. We have had one loss of development claim in RIIO-1 but expect to see a small increase in claims driven by an increase in housing and wind farm development. We have typically seen five to six claims per year relating to land drainage issues and are expecting this to remain relatively constant through RIIO-2.

Figure 6.9: Other non-network Capex expenditure

6.5. Replacement expenditure summary (Repex)

Repex is generally associated with the replacement of old metallic pipes which can fail and allow gas to escape, potentially causing a safety risk and preventing gas reaching the end-customer. The assets we replace include:

- Distribution mains pipeline systems, including pipelines that cross roads, waterways and railways;
- Services which deliver gas to properties; and
- Riser and lateral pipelines which deliver gas to consumers within MOBs.

Investment in the above assets is either mandatory, based on risk, or non-mandatory where investment will be justified by CBA.

Outcomes and outputs from the replacement programme

Our stakeholder engagement programme has reinforced safety and reliability as our top priorities. In addition, stakeholders have told us environmental considerations are an increasing priority for them and we should be aiming to reduce the impact our activities and our network have on the environment. The replacement programme directly supports all of these key priorities:

- Safety is improved as there is less chance of a new PE pipe failing and leaking gas which could cause an explosion;
- Reliability is improved for the same reason – pipes will fail less and so fewer customers will suffer from an unplanned interruption to their gas supply;
- The environmental impact of our network is reduced as there is less methane gas leaking to the atmosphere – methane is a powerful greenhouse gas and a contributor to climate change; and
- The environmental impact and cost of running our activities will reduce – with fewer leaks, our Emergency and Repair activities and costs in Opex will trend downwards over time. We will also need to purchase less shrinkage gas to replace the gas escaping from our pipes.

In addition, we are targeting improvements in how we deliver the programme, which will directly improve the customer experience and further reduce our impact on the environment. Again, these improvements have been driven, reviewed and approved through our stakeholder engagement. They include:

- Our service levels, timescales and penalty payments for planned interruptions have improved across the replacement customer journey – from notifying the customer, through to getting gas back to the Emergency Control alve (ECV) and then the customer's appliance, and finally reinstating the site;
- We will measure our customer service using a new questionnaire via multiple channels of communication;
- We will continue to target reducing our impact on the environment with a challenging set of targets around our Business Carbon Footprint, use of virgin aggregate and spoil to landfill; and

We will use NARMs to monitor and report on our asset risk to ensure we can provide a safe and resilient network. Overall our replacement plans reduce our asset risk – as measured by NARMs – by the end of RIIO-2. Over time, assets deteriorate and the associated risk increases. Our plans will more than offset this increase and help us maintain the excellent network reliability our customers are benefiting from today.

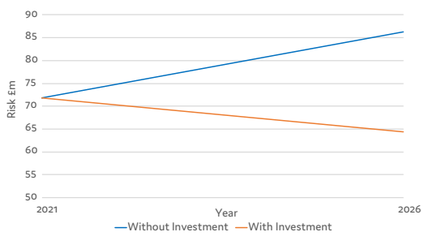

Figure 6.10: RIIO-2: Repex Monetised Risk

Our RIIO-2 expenditure and how it compares to RIIO-1

£m 2018/19 prices	RIIO-1	RIIO-2						
	6-year average	21/22	22/23	23/24	24/25	25/26	Total	Average
Tier 1 Mains and services and >2" steel	65.1	62.4	62.0	61.8	61.4	61.1	**308.7**	**61.6**
Tier 2a Mains and services	2.2	0.8	0.8	0.8	0.8	0.8	**3.8**	**0.8**
Tier 2b/3 Mains and services	9.0	14.2	14.1	14.0	14.0	13.9	**70.1**	**14.0**
Other mains and services	0.7	10.6	10.6	10.5	10.4	10.4	**52.5**	**10.5**
Zero-scoring mains and services	1.7	2.6	2.6	2.6	2.6	2.6	**13.0**	**2.6**
Diversions mains and services	2.0	2.3	2.3	2.3	2.3	2.3	**11.6**	**2.3**
Steel mains and services	2.2	5.2	5.2	5.2	5.1	5.1	**25.7**	**5.1**
Other services	9.1	8.7	8.5	8.4	8.2	8.1	**41.9**	**8.4**
MOBs	0.1	0.6	0.6	0.6	0.6	0.6	**2.8**	**0.6**
Total	**96.5**	**107.3**	**106.7**	**106.0**	**105.4**	**104.8**	**530.2**	**106.0**
Mains workload	578	563	563	563	563	563	**2,815**	**563**
Services workload	45,168	41,950	41,867	41,786	41,706	41,628	**208,939**	**41,788**

Table 6.10: Repex

Reference: BPDT 4.00

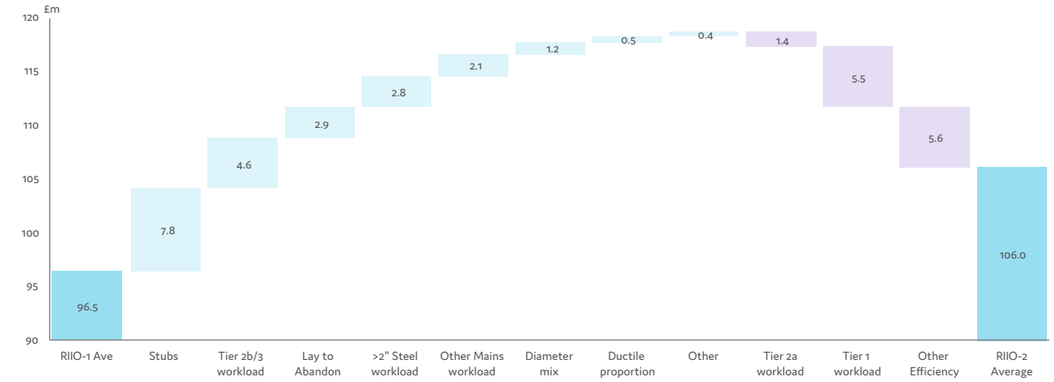

Figure 6.11: Repex trace

The table above summarises our RIIO-2 Replacement programme costs and workload, and compares both against the 6-year average equivalents we have seen in RIIO-1 to date. The diagram then shows the key movements that drive the increase. Overall, we expect to increase expenditure from £96.5m per annum to £106.0m.

The main driver for this is an increase of £7.8m p.a. for our Tier 1 **Stubs** workload. These short 'stubs' of Tier 1 pipe were an unintended consequence of the move to the Three-Tier Aapproach to Repex. Prior to this, we sometimes left a short 'stub' of Tier 1 main to a larger pipe, as it was more economic to replace the 'stub' when the larger pipe was replaced later in the programme. However, many of these larger pipes are no longer automatically replaced, as they are part of the Tier 2 and 3 workload which now only get replaced on a CBA basis. We have a programme in place to replace these mandatory Tier 1 stubs by 2032. As a result, we expect to abandon an average of 665 stubs per annum. These short length projects adjoining larger pipes are relatively expensive.

The failure rate for **Tier 3** pipes is comparatively high and has not stabilised during RIIO-1. As a result and using our CBA modelling, we plan to increase our Tier 3 replacement workload from 5km to 10km per year. This drives a £4.6m per annum increase in costs between the price controls. We are not seeing the same issues in our Tier 2b pipes and so workload is broadly in line with RIIO-1.

The **lay-to-abandon ratios** for Tier 1, Tier 2b/3, >2" steel and Zero scoring mains have been worsening over time due to the reduced availability of high ratio projects. We have successfully targeted these in the past under our CBA approach. This means we are having to lay relatively more pipe which costs more – we expect this to have a £2.9m impact on our annual costs in RIIO-2 when compared to RIIO-1.

In 2018, NGN and the other gas networks commissioned AESL Consulting and Newcastle University to assess the performance of **steel mains** across the UK networks. This report supported our analysis of the pipes within our own network, showing that steel mains are deteriorating at an increasing rate, and ahead of the rate at which they are being replaced. This clearly has a detrimental impact on the safety and reliability of our network. As a result, we plan to double the workload of >2" steel to 30.6km per annum, increasing costs by £2.8m per annum.

Our **Other Mains** workload is increasing during RIIO-2. Our risk analysis has shown that we need to make Repex investments to replace approximately 4km of overcrossings, driving a £1.4m increase in annual costs. In addition, we have approximately 9km of main fitted with Phoenix or Paltem liners that need replacing as we cannot work on them if they fail. These were generally fitted to larger diameter critical mains and so we consider this represents an unacceptable risk to security of supply. This workload will cost an extra £0.8m cost per annum.

Two other factors are increasing costs, primarily in Tier 1. We expect to abandon more pipes further up the **diameter mix** which have a higher unit cost. This is largely driven by our CBA approach. The proportion of **low pressure ductile iron** is also increasing. This material is more difficult and hence more expensive to work on. In RIIO-1, approximately 19% of the Tier 1 iron mains replaced have been ductile iron. We expect this to increase to c.28% during RIIO-2. These factors increase our costs by £1.2m and £0.5m per annum respectively.

Our **Tier 1 workload** has been forecast assuming we abandon the remaining population of Tier 1 pipes on a flat line basis to 2032. As a result, we will target abandoning 428.9km of Tier 1 mains each year during RIIO-2. During RIIO-1, we aimed and expect to abandon 463.4km of Tier 1 mains per annum on an equivalent basis. This over-delivery compared to the flat line target is the main reason our RIIO-2 target has decreased, and is the main reason we are seeing a £5.5m per annum reduction in mains and services costs between the price controls.

Section 2 of this plan details the significant **efficiency savings** we have seen in our replacement costs since we began to introduce the Direct Service Providers (DSP) delivery model in 2011. This has put us firmly at the efficiency frontier for Repex and has provided year-on-year cost savings so far. We expect this to increase in RIIO-2 and support our 0.5% year-on-year efficiency target, delivering £5.6m of annual cost savings.

Unit costs and workload mix in RIIO-2

Whereas the overall cost of our replacement programme is increasing, it's important to realise that our unit costs are in fact reducing due to the efficiency targets we have set. The only reason the overall cost is increasing is because of the workload volume and mix.

As an example, we will deliver our Tier 1 and >2" steel mains programme – the largest element of Repex – for £52.2m on average in RIIO-2, £3m less than the equivalent in RIIO-1. Importantly £2.5m of this reduction is driven by efficiency. Our RIIO-2 unit rates are based upon actual, recent historical costs. These are then subject to an ongoing efficiency challenge of 0.5% per annum.

On average, we will deliver 36km less work per year – an 8% reduction. However this reduction is then partially offset by changes in the mix of the workload. In RIIO-1 89% of the workload was in the 2 lowest diameter bands, this drops to 80% in RIIO-2. The proportion of ductile iron increases from 18% to 26%. Both of these changes increase the average unit cost of the overall programme. The net result is a £0.5m reduction in costs.

6.5.1. The mains replacement programme

When the gas distribution network was established, the pipes transporting gas around towns and districts were made from iron. Iron was considered to be a sound material for gas distribution at the time. However, following several high-profile fatal incidents, a national risk-based mains replacement programme to replace iron mains came into operation.

The Iron Mains Replacement Programme (IMRP) was introduced by the HSE in 2002 to address concern about the failure of iron mains, particularly cast-iron mains due to fracture. The Mains Risk Prioritisation System (MRPS) was also created at this time to provide an estimate of the risk of an incident presented by each individual section of main. This enabled the gas distribution networks to prioritise investment on iron main replacement, targeting investment towards replacing the riskiest pipes. The IMRP required the distribution companies to replace all 'at risk' iron mains (i.e. those within 30 metres of a property) within 30 years of 2002 and became known as the '30/30 programme'.

Following a ten-year review of the IMRP commissioned by the HSE, IMRP was revised in 2013 to become the current Iron Mains Risk Reduction Programme (IMRRP), also known as the 'Three-Tier Approach'. The key advances to the methodology were:

- For most iron pipes (those ≤ 8" diameter – Tier 1), the requirement remained unchanged – those pipes within 30m of property are still required to be decommissioned by 31st March 2032;
- For iron pipes >8" and <18" (Tier 2), a Risk Action Threshold (RAT) was established. All pipes above the RAT have to be decommissioned;
- Tier 2 pipes below the RAT and Tier 3 pipes (iron pipes ≥ 18") are subject to condition monitoring and management regimes (which may include decommissioning where the pipes have deteriorated beyond safe or effective repair) and may also be subject to decommissioning where this is justified by a CBA;
- A greater flexibility to prioritise replacement based on a wide range of customer and stakeholder benefits, including reductions in gas losses, operating costs and improvements in safety risk;
- Greater flexibility to consider other remediation techniques (where available and accepted) to continue the use or extend the life of larger diameter mains; and
- Replacement due to condition or risk is required to undergo CBA.

This more flexible approach allows us to better balance the removal of the highest-risk pipes whilst delivering an efficient, effective and safe programme of work, ultimately delivering value for money for stakeholders.

Repex is not limited to expenditure on iron mains replacement. Our network also has steel mains, steel services, pipes made from non-standard materials and above-ground riser pipes that we are also required to manage. The following details provide the definitions of each category of Repex investment and whether it is mandatory, non-mandatory or policy-driven.

Definitions		
Mains	A below-ground pipe that supplies more than 2 primary meter installations operating below 7 bar gauge pressure	
Tier 1	Iron pipes ≤ 8" in diameter	Mandatory
Tier 2a	Iron pipes 8" < diameter < 18" and MRPS score ≥ RAT (risk action threshold)	Mandatory
Tier 2b	Iron pipes 8" < diameter < 18" and MRPS score < RAT (risk action threshold)	Non-mandatory
Tier 3	Iron pipe diameter ≥ 18"	Non-mandatory
≤2" steel	Steel pipes ≤ 2" in diameter	Non-mandatory/policy
>2" steel	Steel pipes > 2" in diameter	Non-mandatory
Zero scoring	Mains of any Tier with MRPS score of zero	Non-mandatory
Other mains	Mains of non-standard material (e.g. asbestos)	Mandatory
Services	A pipe from a main up to the outlet of the ECV	Non-mandatory/policy
Riser	A vertical pipe that carries gas between floors within a MOB	Non-mandatory
Lateral	A horizontal pipe connected to a riser that conveys gas along one floor level within a MOB (largely steel or polyethylene – PE)	Non-mandatory
Diversions	Diversions of mains requested by third parties. These can be rechargeable or non-rechargeable.	Mix of mandatory/non-mandatory

Figure 6.12: Replacement definitions

6.5.2. Cost drivers

Replacement costs are largely driven by the following factors:

Definitions	
Diameter band mix	The larger the diameter of pipe, the higher the unit cost of the pipe and the size of hole/trench we dig.
Project length	Shorter projects cost more as there is an element of fixed cost to design and set up a project.
Lay-to-abandon ratio	On some projects, we may not lay new pipe to replace the abandoned pipe if it is no longer required. The opposite can be true – we may lay more pipe to change the location where buildings have encroached on the existing pipe. Typically, we have laid less than we have abandoned, but the ratio has been worsening i.e. we are laying more pipe.
Proportion of mains inserted	Rather than replace via open-cut, insertion costs less as you need to excavate less ground compared to open-cut, where you expose the whole length of the pipe.
Proportion of mains in the road versus verge or footpath	Digging in the road costs more, as it costs more to replace the road surface.
Location	More remote projects cost more as resources have to travel to projects each day.
Ground conditions	Different types of rock and soil can present different types of challenge.
Complexity	The mix of work on a project can increase cost e.g. back garden mains, steel rails, etc.
Streetworks	Nature of the street works, permits and traffic management required.
Service type	Domestic services are usually less expensive than non-domestic services, driven by size.
Service intervention length	The distance between services will affect the number of services on a mains replacement project and consequently the overall cost.
Re-lay/transfer ratio	Some services will have already been re-laid as PE following a service alteration or a gas escape. This service can simply be transferred to the new main, which is cheaper than re-laying the whole service.
Complexity of the service	Particularly if there is a need to reposition the meter.

Figure 6.13: Repex cost drivers

6.5.3. Our replacement strategy

Our replacement strategy is based on the investment principles outlined in section 6.3.2 above, utilising the flexibility within the Three-Tier Approach to maximise the benefits for stakeholders from mains replacement.

In RIIO-1, this strategy has delivered significant improvements in asset condition and safety performance beyond that expected. We have delivered significant additional value for stakeholders and exceeded a number of the key RIIO-1 outputs. We will continue to utilise and develop this approach in RIIO-2. The key features are summarised below:

- We use a cost–benefit methodology to determine which mains will be replaced and in what order. We use this for all categories of replacement;
- The greater flexibility in the Three-Tier Approach allows us to exploit greater economies of scale when building projects, which will allow us to mitigate as much as possible any cost pressures;
- We developed a risk threshold for Tier 2 iron pipes (approved by the HSE) which we believe delivers an appropriate level of risk management for these pipes;
- The volume of below-threshold Tier 2 and Tier 3 pipes includes only those which provide an overall net benefit;
- For the balance of large diameter iron mains pipes, where it is accepted by HSE, a programme of monitoring, maintenance and remediation is used to manage risks within acceptable levels;
- As a result, our total mandated and non-mandated workload volume in Tiers 2 and 3 has been reduced from almost 90km per year (based on a straight line profile of replacement of remaining live iron pipe out to 2032) to less than 33km per year – a reduction of over 60%; and
- We will quantify the relative level of risk removed from the network using NARMs consistent with other asset classes to demonstrate to stakeholders we are providing a safe and reliable service.

At the heart of our strategy is our cost–benefit methodology which we use to assess where the replacement programme will deliver maximum overall benefit. The methodology is a 'total network' approach which considers the characteristics of the network at each of 215 individual Network Analysis Polygons (NAPs) which make up our network. For each NAP within the network, we can analyse financial and non-financial data for a range of criteria detailed below.

NAP replacement criteria	
System pressure	Pipe diameters
Pipe material	MEG concentration levels
Risk profile	Impact on shrinkage
Leakage history	Impact on customer (interruptions)
Repair history	Impact on local community (road closures etc.)

Figure 6.14: NAP replacement criteria

This analysis allows us to identify those NAPs which present stakeholders with the highest levels of network risk and the highest network operating cost. We then identify which solution will deliver the most economic and sustainable improvement to performance. We consider a range of options which can be optimised to deliver the best result:

- Replacement (including the ability to develop efficient projects);
- Mains and governor reinforcement;
- Pressure management and (MEG) application; and
- Repair.

We have used the above process to determine those NAPs with the highest likelihood of leakage (escape) and mains repair, and consequently the highest operating expenditure. This has then been used to inform the size and shape of our replacement programme, specific geographic targeting for the mandated elements of the programme, and finally to identify the basket of non-mandatory mains replacement projects that can be justified on a true cost–benefit basis.

6.5.4. Tier 1 and associated <2"steel

£m 2018/19 prices	RIIO-1	RIIO-2						
	Average	21/22	22/23	23/24	24/25	25/26	Total	Average
Mains cost	55.2	52.7	52.4	52.2	51.9	51.6	260.8	52.2
Services cost	14.8	9.7	9.6	9.6	9.5	9.5	48	9.6
Mains workload	508.5	472.6	472.6	472.6	472.6	472.6	2,363.2	472.6
Services workload	34,556	32,081	32,081	32,081	32,081	32,081	160,405	32,081

Table 6.11: Tier 1 and <2" steel trace from RIIO-1 to RIIO-2
Reference: BPDT 4.01, IDP A23.M

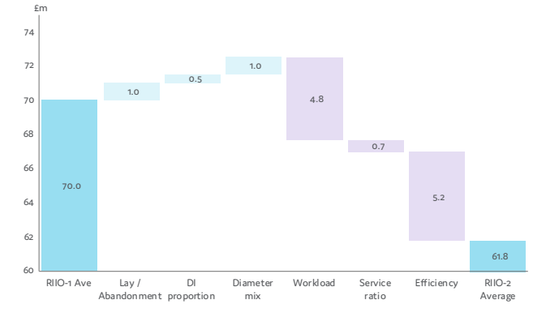

Figure 6.15: Tier 1 and <2" steel trace from RIIO-1 to RIIO-2

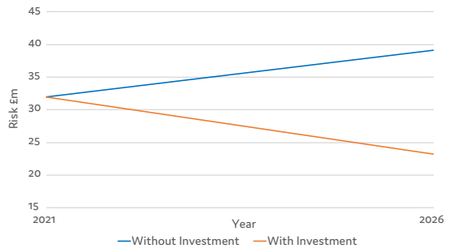

Figure 6.16: RIIO-2: Tier 1 and <=2" Steel Monetised Risk

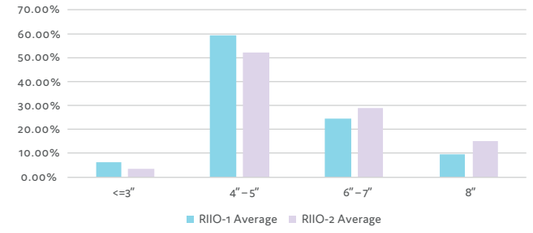

Figure 6.17: Tier 1 abandon diameter splits

Tier 1 is the largest element of the Repex programme, accounting for 76% of the total mains removed and 54% of the total costs. The HSE has mandated that all Tier 1 pipes are abandoned by 2032. Our Tier 1 workload has been forecast assuming we abandon the remaining population of Tier 1 pipes on a flat line basis to 2032. As a result, we will abandon 428.9km of Tier 1 mains each year during RIIO-1, a total of 2144.3km.

During RIIO-1, we expect to abandon 463.4km of Tier 1 mains per annum on an equivalent basis. This is made up of three distinct workloads:

- At the beginning of RIIO-1, we had 8,368km of Tier 1 mains to abandon by 2032, or 440km per annum;
- We had a target to abandon 122.9km of Tier 1 mains associated with customer-funded diversion work, or 15.4km per annum. This workload has not materialised and we expect stakeholders to fund only 17.1km over RIIO-1. We are obliged to make up the shortfall of 105.8km, 13.2km per annum; and
- We had a further target to abandon 64km of Tier 1 main, 8km per annum, which we originally understood to be zero scoring mains more than 30m from a domestic property.

At the end of 2018/19, we have actually abandoned 465km of Tier 1 per annum, slightly ahead of the 463.4km target. This is well ahead of the 440km per annum target we had at the beginning of RIIO-1 to abandon all Tier 1 mains on a straight line basis by 2032. This over-delivery is the main reason our RIIO-2 target has decreased to 428.9km. This reduction in workload in RIIO-2 drives a £4.8m per annum reduction in mains and services costs between the price controls.

We must replace the 20% highest scoring Tier 1 pipes from our risk model. These are known as seed pipes. The remaining 80% of the workload can be selected from anywhere in the remaining Tier 1 population. We use CBA to determine this mix, taking into account efficiency of delivery, impact of pipe failures (e.g. forecast leaks) and the impact on customers. We also take into account the overall deliverability of the programme of work up to 2032, in particular geographic constraints around the maximum annual workload we can deliver in any given location. The average payback of our remaining pipes is over 20 years, but our targeted CBA approach will deliver a workload with a payback period of nearer 16 during RIIO-2.

We are also expected to replace ≤2" steel when we find it, either associated with other mains replacement activities or following escape. This accounts for 8% of total mains removed and 4% of total costs. We expect the amount of small diameter steel we are required to replace to remain broadly constant in RIIO-2 compared with the levels seen in RIIO-1. At the end of 2018/19, we have actually abandoned 43.5km per annum through RIIO-1. During RIIO-2, this will change slightly to 43.8km per annum.

Without these targeted interventions, our asset risk from Tier 1 and ≤2" steel pipes – as measured by NARMs – would increase by 4.5m to 30.2m by the end of RIIO-2. Our plans will offset this increase and reduce risk to 20.2m by the end of RIIO-2, helping us maintain the excellent network reliability our customers are benefiting from today.

The annual workload targets detailed above are for the length of pipe we will abandon. There are several factors which will impact how much it will cost us to deliver this programme in RIIO-2 when compared to RIIO-1:

- Efficiency – as discussed in section 6.2.1, we are targeting a year-on-year efficiency-driven unit cost reduction of 0.5% per annum through RIIO-2. This is on top of the efficiency benefits we are already delivering through RIIO-1. Together, we expect these to have a £5.2m impact on our annual costs in RIIO-2 when compared to the first 6 years of RIIO-1.
- Lay-to-abandon ratio – this ratio has been worsening over time due to the reduced availability of high ratio projects, as we have successfully targeted these in the past under our CBA approach. This means we are having to lay relatively more pipe which costs more – we expect this to have an £1m impact on our annual costs in RIIO-2 when compared to RIIO-1.
- Diameter band mix – similarly, we expect to have to abandon more pipes further up the diameter mix as shown in the diagram above, which have a higher unit cost, again largely driven by our CBA approach – we expect this to have an £1m impact on our annual costs in RIIO-2 when compared to RIIO-1.
- Proportion of low-pressure ductile iron – this material type is more difficult and hence more expensive to work on. So far in RIIO-1, approximately 19% of the Tier 1 iron mains replaced have been ductile iron. The remaining population of Tier 1 pipe contains a higher proportion of this material type, and through RIIO-2 we expect that approximately 28% will be ductile. We expect this to have a £0.5m impact on our annual costs in RIIO-2 when compared to RIIO-1.

In terms of services workload, we expect to see an average service intervention length (i.e. separation between services on a main) of one every 14.7m of Tier 1 and <= 2" steel main abandoned – a slight increase in separation compared with the RIIO-1 average so far of 13.8m leading to 160,405 services being replaced. Of these services, we expect 60% to be re-lays and 40% to be transfers, no change from RIIO-1. We expect this change in service intervention length to have a £0.7m impact on our annual costs in RIIO-2 when compared to RIIO-1.

Test case – Total stub end abandonment

Total stub end abandonment enables remote abandonment of assets, removing the need for large excavations in major carriageways which would typically create significant stakeholder impact, thus reducing congestion and impact on traffic. This NIA-funded project has unlocked a range of both qualitative and quantitive benefits. With approximately 720 applications of the technique throughout RIIO-1 and delivering a financial cost saving of over £4m, these significant savings are included in our RIIO-2 Repex cost forecasts. In addition, reduced volumes of excavated spoil waste are sent to landfill with associated vehicle journeys.

6.5.5. Tier 2a

£m 2018/19 prices	RIIO-1	RIIO-2						
	Average	21/22	22/23	23/24	24/25	25/26	Total	Average
Mains cost	2.1	0.8	0.8	0.7	0.7	0.7	3.7	0.7
Services cost	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Mains workload	6.2	2.0	2.0	2.0	2.0	2.0	10.1	2.0
Services workload	160	41	41	41	41	41	206	41

Table 6.12: Tier 2a

Reference: BPDT 4.02, IDPA23.M

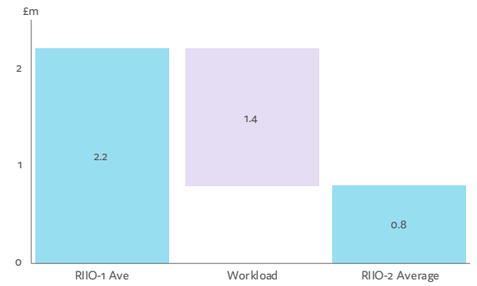

Figure 6.18: Tier 2a trace

We will have decommissioned all of the Tier 2a pipes we currently know about by the end of RIIO-1. However, as pipe risk scores change dynamically over time, we expect more Tier 2a pipe to be identified in RIIO-2 as pipes migrate above the Tier 2a RAT. The HSE has mandated these pipes need to be replaced within a reasonable period of time following their discovery. We will decommission all Tier 2a pipes identified during RIIO-2, removing all of their associated asset risk – as measured by NARMs.

Tier 2a accounts for 0.4% of the total mains removed and 0.7% of the total Repex costs in RIIO-2. We have forecast our RIIO-2 workload by analysing the length of the remaining Tier 2 pipe population (1,568 km), and then used historical trend analysis to forecast the length of main expected to score above the RAT during RIIO-2. As a result, we expect to abandon c.10km of Tier 2a main in RIIO-2 at an average of 2km per year, considerably below the average of 6.2km of main we have abandoned so far in RIIO-1. This annual reduction in workload in RIIO-2 drives a £1.4m per annum reduction in costs between the price controls.

The 2km annual workload target is for the length of pipe we will abandon. Our efficiency target to deliver year-on-year unit cost reduction within RIIO-2 of 0.5% per annum has a beneficial but small (<£0.1m) impact on our annual costs in RIIO-2.

In terms of services workload, we expect to see a service intervention length of one every 49m of Tier 1 main, compared with 39m seen in RIIO-1, leading to 206 services being replaced. Of these services, we expect 60% to be re-lays and 40% to be transfers. We expect this change in separation to have a minimal impact (<£0.1m) on our annual costs in RIIO-2.

6.5.6. Tier 2b and Tier 3

£m 2018/19 prices	RIIO-1	RIIO-2						
	Average	21/22	22/23	23/24	24/25	25/26	Total	Average
Mains cost	8.4	13.9	13.8	13.8	13.7	13.6	68.9	13.8
Services cost	0.3	0.3	0.3	0.3	0.3	0.3	1.3	0.3
Mains workload	24.1	30.6	30.6	30.6	30.6	30.6	153.0	30.6
Services workload	665	811	811	811	811	811	4,057	811

Table 6.13: Tier 2b and Tier 3 Reference: BPDT 4.03, IDP A23.N

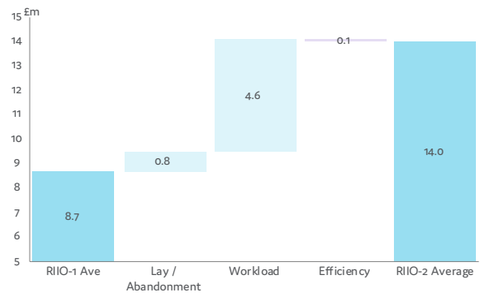

Figure 6.19: Tier 2b/3 trace

Tier 2b and Tier 3 account for 5% of the total mains removed and 13% of the total Repex costs in RIIO-2. The main driver for the workload is to provide value for money for the customer, which is assessed using CBA outlined in section 6.3.2. A small proportion of work will also be built into Tier 1 projects to deliver overall efficiency. Tier 2b and Tier 3 workload is non-mandatory.

So far during RIIO-1, we have abandoned an average of 19.4km and 4.7km per year of Tier 2b and Tier 3 mains respectively. By the end of RIIO-1, we expect these to have increased to 20.4km and 5km, in line with our allowed targets.

The main driver of RIIO-2 workload for both Tiers is the forecast failure rates of these assets and the resulting impact on our stakeholders. Our analysis shows the failure rate for Tier 2b pipes has stabilised during RIIO-1 at 0.498 leaks per km, and so we plan to continue replacing Tier 2b at 20km per year during RIIO-2, broadly in line with RIIO-1. However, the failure rates for Tier 3 pipes are significantly higher than those for Tier 2b at 1.016 leak per km, and have not stabilised. As a result, and using our CBA modelling, we plan to increase our Tier 3 replacement workload from 5km to 10km per year. This includes pipes where full replacement is the most efficient and beneficial action, and importantly pay back within 16 years. We will continue to use whatever asset management options are most appropriate, including the management of an escape as it occurs, and the utilisation of innovative techniques such as System Two Assess & Seal Solution (STASS) where we can internally treat multiple Tier 3 joints through a single operation. It should be noted that the cost of repairing Tier 3 pipes is variable but high, and depends in particular on location, traffic management requirements and the depth of main. Many of these pipes are located in key trunk roads in larger towns and cities, any failure causes significant customer and stakeholder issues, and there is often strong local support for full replacement. For both Tiers, the proposed workload has a discounted payback period of 16 years or less. This annual net increase in workload in RIIO-2 drives a £4.6m per annum increase in costs between the price controls

Without interventions, our asset risk from all non-mandatory pipes – as measured by NARMs – would increase by 4.7m to 35.4m by the end of RIIO-2. Our plans will mitigate this increase and reduce risk to 32.6m by the end of RIIO-2, helping us maintain the excellent network reliability our stakeholders are benefiting from today.

The 30km annual workload target is for the length of pipe we will abandon. There are several factors which will impact how much it will cost us to deliver this programme in RIIO-2 when compared to RIIO-1:

- Efficiency – our target to reduce unit costs by 0.5% per annum through RIIO-2 will deliver a £0.1m reduction in our annual costs in RIIO-2.
- Lay-to-abandon ratio – this ratio has been worsening over time due to the reduced availability of high ratio projects, as we have successfully targeted these in the past under our CBA approach. This means we are having to lay relatively more pipe which costs more – we expect this to have an £0.8m impact on our annual costs in RIIO-2.

In terms of services workload, we expect to see a service intervention length of one every 38m of Tier 2b and 36m of Tier 3 main in line with RIIO-1, leading to 2,655 and 1,402 services being replaced respectively. Of these services, we expect 60% to be re-lays and 40% to be transfers.

6.5.7. > 2" Steel

£m 2018/19 prices	RIIO-1	RIIO-2						
	Average	21/22	22/23	23/24	24/25	25/26	Total	Average
Mains cost	1.9	4.5	4.5	4.5	4.5	4.4	22.4	4.5
Services cost	0.3	0.7	0.7	0.7	0.7	0.7	3.3	0.7
Mains workload	14.2	30.0	30.0	30.0	30.0	30.0	150	30.0
Services workload	610	2071	2071	2071	2071	2071	10,353	2071

Table 6.14: Reference: BPDT 4.04, IDP A23.N

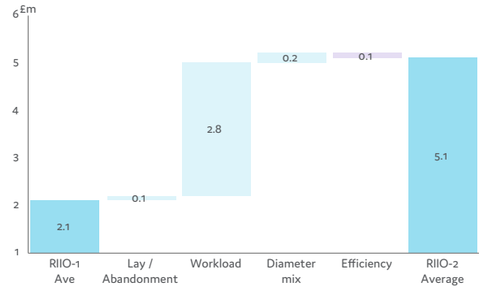

Figure 6.20: Tier 2a trace

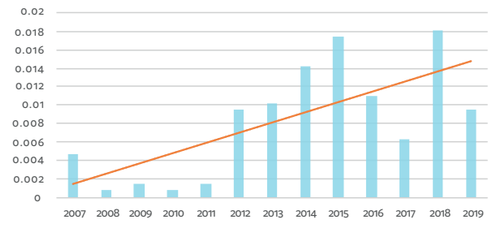

Figure 6.21: ST GIB/KM

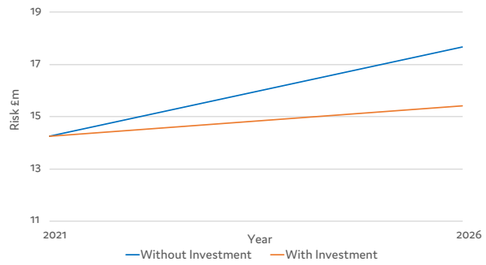

Figure 6.22: RIIO-2: >2" Steel Monetised Risk

In total, greater than 2" steel accounts for 5% of the total pipework abandoned and 5% of the total Repex costs in RIIO-2. The main driver for the workload is to provide value for money for the customer, which is assessed using CBA.

During RIIO-1, we expect to abandon an average of 15km of >2" steel mains. At the end of Year 6, we are slightly behind target, having abandoned on average 14.2km. By the start of RIIO-2, we will have 1,206km of >2" steel mains within our network. Within this population, there is a spread of asset performance that includes some very poor condition assets with a high rate of deterioration. Low pressure steel mains are thin-walled and highly-corrosive with no corrosion protection. Our options to manage and intervene on these pipes are either reactive – respond to and repair the local escape, or proactive – replace the pipe to prevent future escapes from happening.

Analysis of our own pipes has shown steel mains are deteriorating at an increasing rate overall and faster than they are being replaced. We have also identified there is an increasing level of steel mains failures resulting in gas entering properties. This is supported by further analysis carried out by AESL Consulting and Newcastle University on behalf of NGN and the other gas networks in 2018 to assess the performance of steel mains across the UK networks. This increasing failure rate clearly has a detrimental impact on the safety and reliability of our network.

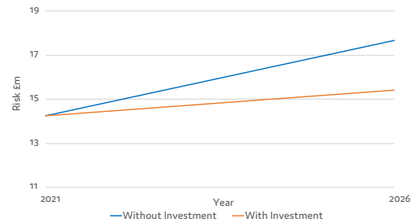

Figure 6.23: RIIO-2: >2" Steel Monetised Risk

As a result of this, and using our CBA modelling, we plan to increase the abandonment of >2" steel to 30km per annum in RIIO-2. The assets identified for replacement are those that are showing the highest rate of failures (joint and barrel), highest deterioration rates and associated repair costs. The remaining population will be managed through a range of reactive maintenance techniques.

We assessed the impact of increasing the proposed workload further by 5% and 10% using CBA, but this does not improve the payback period when compared to our proposed workload, but brings additional costs into RIIO-2 that would be passed on to the customer. The proposed workload has a discounted payback period of 16 years or less. This annual net increase in workload drives a £2.8m per annum increase in costs between the price controls.

The 30.6km annual workload target is for the length of pipe we will abandon. There are several factors which will impact how much it will cost us to deliver this programme in RIIO-2 when compared to RIIO-1:

- Efficiency – our target to reduce unit costs by 0.5% per annum through RIIO-2 will deliver a £0.1m reduction in our annual costs in RIIO-2;
- Lay-to-abandon ratio – this ratio has been worsening over time due to the reduced availability of high ratio projects, as we have successfully targeted these in the past under our CBA approach. This means we are having to lay relatively more pipe which costs more – we expect this to have an £0.1m impact on our annual costs in RIIO-2; and
- Diameter band mix – similarly, we expect to have to abandon more pipes further up the diameter mix which have a higher unit cost, again largely driven by our CBA approach – we expect this to have an £0.2m impact on our annual costs in RIIO-2.

In terms of services workload, we expect to see a service intervention length of one every 14.7m of steel main, in line with RIIO-1, leading to 10,353 services being replaced. Of these services, we expect 60% to be re-lays and 40% to be transfers.

6.5.8. Zero-scoring mains

£m 2018/19 prices	RIIO-1	RIIO-2						
	Average	21/22	22/23	23/24	24/25	25/26	Total	Average
Mains cost	1.7	2.63	2.62	2.60	2.59	2.58	13.02	2.60
Services cost	0	0	0	0	0	0	0	0
Mains workload	5.8	8.1	8.1	8.1	8.1	8.1	40.7	8.1
Services workload	0	0	0	0	0	0	0	0

Table 6.15: Zero-scoring mains Reference: BPDT 4.02, IDP A23.M

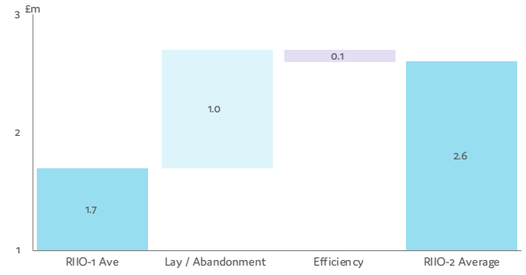

Figure 6.24: Zero Scoring mains trace

We plan to replace a small length of iron mains that have a score of zero on MRPS. This accounts for 1.5% of the total iron mains removed and 2.5% of the total costs in RIIO-2. There is no services workload associated with zero-scoring mains. There are two main drivers for replacing these pipes:

- c.60% of the work is driven by security of supply issues. We have several ageing single-leg, medium-pressure mains where security of supply issues have been identified. We plan to replace a proportion of these pipes in RIIO-2 on a risk basis; and
- c.40% of the work is driven by efficiency and delivering best value for our stakeholders. This can be driven by two factors. We add zero-scoring mains into mandatory replacement projects for efficiency where we expect the pipes to become scoring pipes in the future. We also complete some work using CBA analysis, taking into account poor condition and customer impact.

During RIIO-1, we expect to abandon c.64km of zero scoring main at an average of 8km per year. At the end of Year 6, we are slightly ahead of the phased target, having abandoned on average 8.4km of main. Our RIIO-2 workload has been derived by using these historic workload trends, and then reviewing key single feeds in our network and specific CBA-driven projects we expect to complete. As a result, we expect to abandon 8.3km of main per annum, just below current run rates.

The 8km annual workload target is for the length of pipe we will abandon. There are several factors which will impact how much it will cost us to deliver this programme in RIIO-2 when compared to RIIO-1:

- Efficiency – our target to reduce unit costs by 0.5% per annum through RIIO-2 will deliver a £0.1m reduction in our annual costs in RIIO-2; and
- Lay-to-abandon ratio and work type mix. The lay-to-abandon ratio has been significantly worsening through RIIO-1 and is now closer to 1:1 compared with the 6-year average of 0.86. We expect this higher ratio to continue through RIIO-2, meaning that we will have to lay relatively more pipe which costs more. We are also expecting to address more zero-scoring projects associated with single feed systems which will be more complex and in remoter areas. Together, we expect these to have a £1.0m impact on our annual costs in RIIO-2.

6.5.9. Other mains

£m 2018/19 prices	RIIO-1	RIIO-2						
	Average	21/22	22/23	23/24	24/25	25/26	Total	Average
Mains cost	0.7	2.73	2.72	2.70	2.69	2.68	13.52	2.70
Services cost	0.05	0.06	0.06	0.06	0.06	0.06	0.28	0.06
Mains workload	2.9	4.5	4.5	4.5	4.5	4.5	22.4	4.5
Services workload	107	186	186	186	186	186	929	186

Table 6.16: Other mains Reference: BPDT 4.04, IDP A23.N

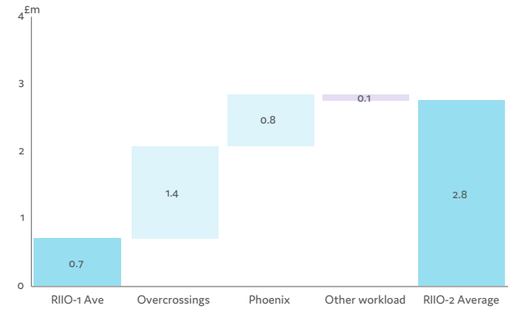

Figure 6.25: Other mains trace

Other mains accounts for 1.1% of the total mains removed and 2.6% of the total costs in RIIO-2.

We are specifically required by HSE to remove any asbestos mains we find due to health risks associated with the material. We decommission PE with a known and unacceptable increased risk of failure, or where it is effective to do so as part of a holistic replacement scheme. During RIIO-1, we expect to abandon c.39km of these and other mains at an average of 4.8km per year. At the end of Year 6, we are on target with this rate. Our forecast RIIO-2 workload for the materials discussed above will be slightly lower than those experienced in RIIO-1 to date, at 3.8km per year. This drives a cost reduction of £0.1m per annum during RIIO-2.

As part of our asset management programme, we have been assessing all of our distribution mains exposed crossings for their condition, suitability, vulnerability and resilience in terms of security of supply. These pipes may cross roads, rivers, canals railway lines, etc. Our risk analysis has shown we need to make Repex investments to replace approximately 4km of these, driving a £1.4m increase in annual costs.

In addition, we are intending to replace pipes which are fitted with Phoenix or Paltem liners (thin plastic sheaths installed as liners to a small number of iron pipes in the 1980s). We have approximately 9km of these pipes currently in service. Should these liners fail, then we have no method of working on these pipes. As these were generally fitted to larger diameter critical mains, we consider this represents an unacceptable risk to security of supply and so plan to replace these pipes in a planned way through to the end of RIIO-2. This increase in workload in RIIO-2 drives an £0.8m per annum increase in costs between the price controls.

We expect to intervene on c.929 services associated with the above types of main, with 60% re-lays and 40% transfers. Overall our investment here reduces risk measured by NARMs by 7.5% from the start of RIIO-1. In absolute terms, risk reduces by 13.2% compared to a without investment position.

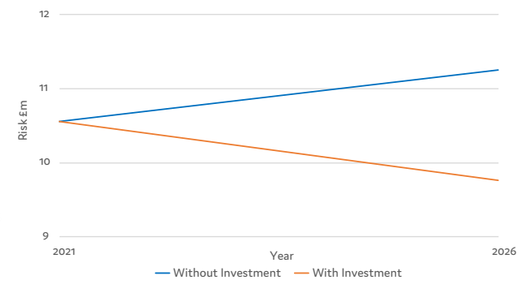

Figure 6.26: RIIO-2: Other Mains Monetised Risk

6.5.10. Stubs

£m 2018/19 prices	RIIO-2						
	21/22	22/23	23/24	24/25	25/26	Total	Average
Mains cost	7.8	7.8	7.7	7.7	7.7	38.8	7.8
Mains workload	30.6	30.6	30.6	30.6	30.6	153.0	30.6

Table 6.17: Stubs

Reference: BPDT 4.01, IDP A23.M

Legacy stubs did not feature as a category in RIIO-1 but account for 7.3% of the total Repex costs in RIIO-2.

Prior to the 10-year review of the Replacement Programme (see section 6.5.1), all iron mains pipes within 30m of a property were mandatory and required replacement by 2032. As a result, we sometimes left a short 'stub' of mandatory iron main from a smaller diameter pipe to a larger pipe, as it was more economic to replace the 'stub' when the larger pipe was replaced later in the programme.

However, many of these larger parent pipes are no longer automatically replaced as they are part of the Tier 2 and 3 workload which now only get replaced on a CBA basis. This has led to the stranding of short length stubs. We identified this unintended consequence in RIIO-1 and as a result modified our policies and work procedures to ensure that no additional Tier 1 stubs would be created in RIIO-1.

Legacy stubs of iron pipe <= 8" diameter and within 30m of a property are mandatory under the HSE Enforcement Policy and so need to be replaced by 2032. We have used Graphical Information System (GIS) tools to identify the number of legacy stranded stubs and short lengths we have across our network, and plan to replace them at a constant rate to achieve completion by 2032. As a result, we expect to abandon an average of 665 stubs per annum.

These short length projects adjoining larger pipes are relatively expensive. We have worked with an external organisation (Steve Vick International) to develop an innovative remote foam bagging system, which they now commercially market as E-SEAL. Where circumstances permit, this allows a Tier 1 stub to be remotely and permanently isolated and abandoned without having to cut out the parent main, resulting in smaller excavations, less disruption and reduced costs. Taking this into account, we expect to spend £7.8m per year replacing stubs. We are targeting a year-on-year efficiency-driven unit cost reduction of 0.5% per annum in line with our other activities – and so we expect to see year-on-year cost reductions.

Resolving the issue of legacy stubs does not represent an additional cost to the customer. To replace all of the Tier 2 and Tier 3 positive scoring iron up to 2032 (as required under the previous '30/30' policy) would have cost approximately £53.2m per year. Addressing just the Tier 1 legacy stubs reduces this cost by 85%. There are no forecast service re-lays or transfers against stubs abandonment workload.

Overall our investment here reduces risk measured by NARMs by 51.4% from the start of RIIO-1. In absolute terms, risk reduces by 60.9% compared to a without investment position.

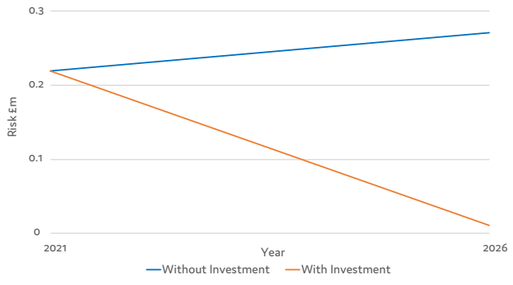

Figure 6.27: RIIO-2: Stubs Monetised Risk

Diversions

Diversions account for 2% of the total mains removed and 2% (net) of the total costs in RIIO-2. Diversions are driven by requests from third parties to move our main, or by other external factors such as landslip or river bank erosion. They can be rechargeable to the third party or non-rechargeable dependant on our legal rights covering the current position of our pipes. However, even for rechargeable pipes we may incur a net cost, for instance if we are required to apply a discount for betterment or under the provisions of the New Roads and Street Works Act (NRSWA).

£m 2018/19 prices	RIIO-1	RIIO-2						
	Average	21/22	22/23	23/24	24/25	25/26	Total	Average
Mains cost	5.3	5.81	5.78	5.75	5.73	5.70	28.77	5.75
Services cost	0.1	0.14	0.14	0.14	0.14	0.14	0.71	0.14
Revenue	(3.2)	(3.61)	(3.60)	(3.58)	(3.56)	(3.54)	(17.89)	(3.58)
Net cost	2.2	2.34	2.33	2.32	2.31	2.30	11.59	2.32
Mains workload	12.8	13.3	13.3	13.3	13.3	13.3	66.4	13.3
Services workload	226	266	266	266	266	266	1,329	266

Table 6.18: Diversions

Reference: BPDT 4.01, IDP A23.N

During RIIO-1, we expect to abandon c.9.6km of main per year as a result of a rechargeable diversion, and 3.2km as a result of a non-rechargeable diversion. Workload has been trending up slightly, mainly driven by economic factors, and analysing the number of quotes we have been responding to, we expect the average workload in RIIO-2 to be slightly higher at 9.8km and 3.5km per year respectively. We expect workload mix and unit costs will be consistent with those experienced in RIIO-1 to date, but subject to the same 0.5% per annum efficiency challenge as our other activities. Overall average costs will increase slightly. We expect to intervene on c.1,329 services associated with these types of main, with 60% re-lays and 40% transfers.

6.5.11. Other services

Other services account for 7.9% of the total replacement costs in RIIO-2. These services (both metallic and non-metallic) are not replaced as part of the mains replacement programme. Instead they are replaced after an escape has been reported on the network, as part of a service alteration, or when carrying out other meter work.

£m 2018/19 prices	RIIO-1	RIIO-2						
	Average	21/22	22/23	23/24	24/25	25/26	Total	Average
Re-lay after escape	6.1	5.92	5.77	5.63	5.49	5.35	28.16	5.63
Other services	1.2	1.29	1.28	1.28	1.27	1.26	6.38	1.28
Service alteration	1.4	1.49	1.48	1.47	1.47	1.46	7.37	1.47
Re-lay after escape	4213	4,149	4,066	3,984	3,905	3,827	19,930	3,986
Other services	1299	1,299	1,299	1,299	1,299	1,299	6,497	1,299
Service alteration	1047	1,047	1,047	1,047	1,047	1,047	5,234	1,047

Table 6.19: Other services

Reference: BPDT 4.01, IDP A23.M

Re-lay after an escape work is closely related to our repair activity, and we expect costs and workload to decrease at a similar rate, driven by the replacement programme. Please see section 6.6.3 for further details. We expect service alteration and other works to continue at the same rates seen in RIIO-1 to date. Unit costs are based on the average costs experienced in RIIO-1 to date, but subject to the same 0.5% per annum efficiency challenge as our other activities. Overall average costs will decrease year on year.

MOBs

£m 2018/19 prices	RIIO-1	RIIO-2						
	Average	21/22	22/23	23/24	24/25	25/26	Total	Average
MOBs	0.1	0.57	0.57	0.56	0.56	0.56	2.81	0.56

Table 6.20: Multi-occupancy buildings BPDT 4.08, IDP A23.N

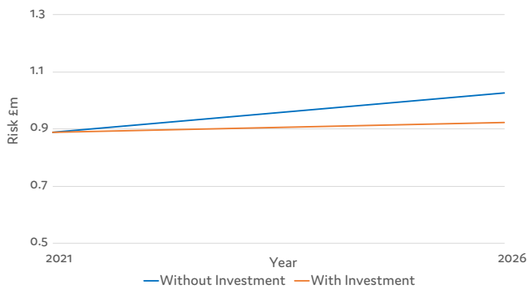

Figure 6.28: MOBs NARM Risk (£m)

We proactively manage the risk on our MOBs, specifically targeting areas of higher probability of failure and areas of criticality. We use an ongoing programme of surveys to regularly reassess risk and then carry out remedial work on a planned and reactive basis as required.

We consider several options when any risks are identified:

- Replacement, refurbishment or permanent isolation of the riser when there is a high risk of failure;
- Buy-out options and other mitigations where replacement or refurbishment are not appropriate action;
- Investment to mitigate consequences e.g. replacement/installation of service isolation valves; and
- Increasing frequencies of surveys.

The table above details our forecast costs for RIIO-2 for replacement, refurbishment or isolation of risers on a planned or reactive basis. The costs for the other interventions are captured in Opex and Capex as appropriate.

MOBs account for 0.5% of the total replacement costs in RIIO-2. The workload has been forecast using a bespoke risk model for these assets and is based on the survey data captured. Unit costs have been based on historic costs experienced in RIIO-1. We expect to deliver a higher workload in RIIO-2 as our survey work has now identified pipework that needs replacing – based on condition and some non-preferred materials such as cast or ductile iron.

6.6. Operating expenditure summary (Opex)

6.6.1. Controllable Opex

We use our controllable Opex to operate and manage our network and maintain our assets in order to ensure that the gas network is safe and resilient. We also provide a 24-hour, 365-day-a-year emergency and repair service when an interruption does occur. Our indirect costs provide business support functions such as HR and Training, as well as IT and Finance, all of which ensure that our network operations are resilient and have the right resources to deliver our key outputs.

Outcome and outputs from our operating costs

Our stakeholder engagement programme has reinforced the fact that safety and reliability should be our top priorities. In addition, stakeholders have told us that environmental considerations are an increasing priority for them and that we should be aiming to reduce the impact that our activities and our network have on the environment. The activities within our Operating costs directly support these key areas:

- We will ensure we can provide a safe and resilient network by closely monitoring and managing our cyber resilience and responding to gas escapes 24 hours a day, 365 days a year. In addition, we will complete our holder demolition programme, removing a key risk from our network and reducing costs;
- Our gas network is already extremely reliable – our targeted maintenance programme will at least maintain this whilst ensuring we minimise the whole life costs of our assets; and
- Methane gas leaking from our network is a powerful greenhouse gas and a contributor to climate change – we are aiming to identify leaks and complete permanent repairs faster than ever.

In addition, we are targeting improvement in how we deliver our operating activities, which will directly improve the customer experience and further reduce our impact on the environment. Our extensive stakeholder engagement has led to the following key updates:

- Our service levels, timescales and penalty payments for unplanned interruptions (Emergency and Repair) have improved across the customer journey – from responding to the call-out, getting gas back to the ECV and then the customer's appliance, and finally reinstating the site;
- The same applies to planned interruptions (service alterations), which will also see improvements with online booking and quotations where possible, and reduced timescales for work completion;
- We have introduced a new set of 'Market Service Standards' providing a challenging set of service levels when we respond to queries from our partners across the industry, and we will measure our customer service using a new questionnaire via multiple channels of communication; and
- We will continue to aim to reduce our impact on the environment with a challenging set of targets around our Business Carbon Footprint, use of virgin aggregate and spoil to landfill.

Our RIIO-2 expenditure and how it compares to RIIO-1

	RIIO-1	RIIO-2						
	6-year average	21/22	22/23	23/24	24/25	25/26	Total	Average
Asset management	2.4	2.0	2.0	2.0	2.0	1.9	9.8	2.0
Operations management	8.7	7.7	7.6	7.6	7.5	7.5	37.9	7.6
Customer management	2.2	2.2	2.2	2.2	2.1	2.1	10.8	2.2
System control	1.6	1.3	1.3	1.3	1.3	1.3	6.4	1.3
Work management	**14.9**	**13.1**	**13.1**	**13.0**	**12.9**	**12.9**	**64.9**	**13.0**
Holder demolition	1.9	3.0	3.1	3.3	3.7	2.8	16.0	3.2
Environmental remediation	0.6	1.4	0.3	0.2	0.4	1.1	3.4	0.7
Total work management	**17.5**	**17.5**	**16.5**	**16.5**	**17.0**	**16.8**	**84.3**	**16.9**
Emergency	11.1	10.8	10.6	10.5	10.3	10.2	52.3	10.5
Repair	15.9	15.7	15.3	14.9	14.5	14.1	74.4	14.9
Maintenance	10.7	16.4	17.2	17.3	16.2	16.9	84.1	16.8
Other direct activities	3.1	3.4	3.4	3.4	3.4	3.4	17.0	3.4
Interruptions	0.3	0.2	0.2	0.2	0.2	0.2	1.0	0.2
Work execution	**41.1**	**46.5**	**46.7**	**46.2**	**44.6**	**44.8**	**228.8**	**45.8**
IT and telecoms	8.6	7.2	7.1	7.1	7.1	7.0	35.7	7.1
Property management	2.2	2.8	2.8	2.8	2.7	2.7	13.8	2.8
Human resources	0.9	1.2	1.2	1.2	1.2	1.2	5.9	1.2
Audit, Finance and Regulation	4.0	3.7	3.7	3.6	3.6	3.6	18.2	3.6
Insurance	3.2	3.3	3.3	3.3	3.3	3.3	16.5	3.3
Procurement and logistics	0.5	0.3	0.3	0.3	0.3	0.3	1.6	0.3
CEO and group management	4.7	4.6	4.6	4.5	4.5	4.5	22.7	4.5
Training and apprentices	2.2	3.7	3.5	3.5	3.3	3.5	17.4	3.5
Indirect activities	**26.3**	**26.8**	**26.5**	**26.4**	**26.3**	**26.1**	**132.1**	**26.4**
Total controllable Opex	**84.8**	**90.9**	**89.7**	**89.1**	**87.9**	**87.7**	**445.2**	**89.0**

Table 6.21: Operating expenditure Reference: BPDT 2.00

Figure 6.29: Controllable Opex trace from RIIO-1 to RIIO-2

The table above summarises our RIIO-2 Controllable Opex costs and compares the average planned expenditure to the 6-year average we have seen in RIIO-1 to date. Overall, we expect to increase expenditure from £84.8m to £89.0m. The diagram below shows the key movements that drive this increase.

The main driver for this is an increase of £6.1m in our **Maintenance** workload. There are several reasons for this increase. We are increasing our pressure management capabilities which has a knock-on impact on costs, and we will complete more On Line Inspection work during RIIO-2. These growing areas account for c.40% of the increase. We are also encountering increased risks around our Intermediate Pressure (IP) and Medium Pressure (MP) valves and plan to increase our maintenance activities accordingly, accounting for a further 20% of the increase. The balance is driven by workload mix and our plans to increase maintenance on some targeted asset groups, in particular district governors. This allows us to intervene on more of these ageing assets, maximising their useful life and minimising whole life costs. There is a corresponding reduction in full asset replacement, reducing our Capex on these asset groups.

Our **Holder Demolition** costs show an increase of £1.3m. This is workload driven – we will complete the demolition of 23 holders over the five years of RIIO-2, whereas in RIIO-1 we are demolishing 23 holders over 8 years. This is safety driven – but does also provide cost savings through reduced maintenance.

Our recruitment strategy in RIIO-2 increases the number of apprentices we will train, driving the £1.3m increase in **Training and Apprentice** costs. During RIIO-1, we recruited a high proportion of adult recruits which enabled us to drive cultural changes, accelerate the level of our workforce on new terms and conditions, and replace some of the experience we were losing through our shareholder-funded Early Voluntary Retirement (EVR) programme.

We expect to spend more on **Cyber resilience** in RIIO-2 due to the increased threats in this area as we move towards a more automated network, and we have seen cost pressures in our **Property** portfolio as we have both invested in and relocated our depots. Together, these have increased our costs by c.£1.3m. These are more than offset by c.£2.4m of efficiencies across our **Indirect costs**. The largest savings are as a result of our IT strategy, with further savings in the other support activities, mainly driven by our new technology platform which enables us to automate and improve processes.

We have seen cost pressures in our **Repair** activity as repairs have become more complex, and our old metallic pipes have deteriorated further which has increased our average repair times. During RIIO-1, we have experienced comparatively mild weather which has suppressed workload; our forecast includes more **Extreme weather** when we would expect to see more peaks in workload and an increase in overall volumes, increasing costs in both Emergency and Repair. Together, these factors drive our costs up by £3.2m.

These are then more than offset by **Reduced workload**, and the **Efficiencies and Innovation** targets we have embedded in our emergency and repair forecasts, which reduce our costs by £5.0m. Workload reduces, mainly in Repair, as a result of our targeted mains replacement programme. Our Emergency workload does not reduce as fast, as c.80% of emergency calls are

about non-network related issues. We have seen savings in RIIO-1 from the innovations we have delivered, again primarily in repair, and from an increased number of employees on our new terms and conditions which impacts base line costs and productivity. We anticipate delivering further savings in these areas during RIIO-2.

We have seen savings during RIIO-1 across our **Work Management** activities, and are targeting to deliver further savings in RIIO-2. The most notable savings have been in Operations Management, where we have invested significantly in new technology to enable remote supervision and control of our operational activities.

6.6.2. Work management

	RIIO1 6-year ave.	21/22	22/23	23/24	24/25	25/26	Total	RIIO2 ave.
Asset management	2.4	2.0	2.0	2.0	2.0	1.9	9.8	2.0
Operations management	8.7	7.7	7.6	7.6	7.5	7.5	37.9	7.6
Customer management	2.3	2.2	2.2	2.2	2.1	2.1	10.8	2.2
System control	1.6	1.3	1.3	1.3	1.3	1.3	6.4	1.3
Ongoing activities	**14.9**	**13.1**	**13.1**	**13.0**	**12.9**	**12.9**	**64.9**	**13.0**
Holder demolition	1.9	3.0	3.1	3.3	3.7	2.8	16.0	3.2
Environmental remediation	0.6	1.4	0.3	0.2	0.4	1.1	3.4	0.7
Total work management	**17.5**	**17.6**	**16.5**	**16.5**	**17.0**	**16.7**	**84.3**	**16.9**

Table 6.22: Reference: BPDT 2.01, IDP A23.L

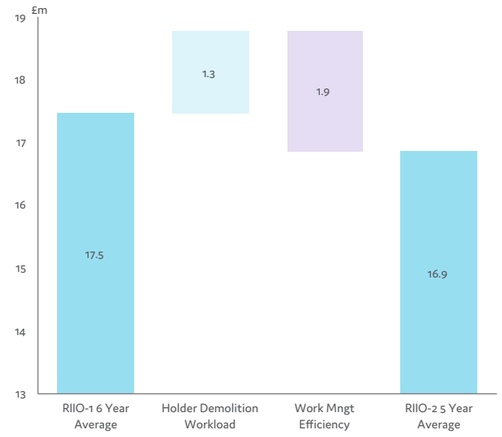

Figure 6.30: Work management trace from RIIO-1 to RIIO-2

During RIIO-1, our Work Management costs have averaged £17.5m per annum. We expect this to decrease by £0.6m to £16.9m during RIIO-2. Our Holder Demolition costs show an increase of £1.3m. This is workload driven – we will complete the demolition of 23 holders over the five years of RIIO-2, whereas in RIIO-1 we are demolishing 23 holders over eight years. This is then offset by efficiencies across all of our ongoing management and control function, the most notable being a £1.3m reduction in Operations Management.

Ongoing activities

Work Management includes two key areas with different cost drivers:

- The strategic asset management and day-to-day control of our distribution network assets (Asset Management and System Control), driven largely by the number and condition of our assets; and
- The day-to-day supervision of our emergency, repair and maintenance activities (Operations and Customer Management), driven by a mixture of workload and the one- and two-hour response time standards we are committed to achieving.

Our Asset Management functions saw significant investment in RIIO-1 in order to further develop and manage our Asset Risk and Total Network Management approaches to strategic asset management. These are critical activities and we expect to implement further changes and new techniques, moving forward to constantly stay ahead of the curve. Despite this change agenda, we expect to see marginal efficiencies across these functions by the end of RIIO-2, mainly as a result of our investment in new technology.

The other three work management activities saw similar levels of change in RIIO-1. We expect to see further efficiencies in RIIO-2:

- We operate a lean and efficient System Control function. We have invested significantly in technology and training to right-size this function and ensure that our employees are on modern terms and conditions and working practices. This has enabled us to reduce costs by 33% from c.£1.7m down to £1.3m currently;
- Operations Management has been a key focus area in RIIO-1 and has seen ~20% reduction in costs since 2013/14. We have invested significantly in new technology to establish operational 'Hubs' to allow remote supervision and control of our operational activities, enabling real-time work management and improved integrity of the work; and

- Customer Management costs are mainly driven by the National Emergency Call Handling Centre operated by Cadent Gas on behalf of the sector, with the balance consisting of our internal customer management teams. We saw cost movements early in RIIO-1, mainly driven by reducing costs from Cadent Gas.

In summary, we have already seen £3.2m (19%) of cost reductions in RIIO-1 across these activities. We expect to see costs reduce by a further c.£0.5m from their current levels by the end of RIIO-2.

Projects

Holder demolition and environmental remediation costs are also classified as Work Management activities, but are more project-based and variable in nature. The main cost driver for Holder Demolition is the number of holders demolished. Unit costs will vary materially for both Holders and Land Remediation depending on size, condition and other site factors.

We have established a clear cCBA case to remove all the remaining gas holders on our network. Over the eight years of RIIO-1, we will complete our targeted programme to demolish 23 of these holders on a risk-ranked basis. We will complete the remainder of the programme in the five years of RIIO-2 by demolishing four holders per year at an overall cost of c.£16.0m, in line with the programme delivered in RIIO-1.

We are also committed to addressing legacy land contamination and pollution attributed to historical land use. This contamination has the potential for material and unacceptable impacts on the environment and local communities. In RIIO-1, we undertook a reassessment of all our sites deemed at risk. This informed our RIIO-2 strategy to manage these risks with a pragmatic mix of monitoring, control and direct intervention, costing c.£3.4m over five years.

6.6.3. Work execution

Work execution includes our 24-hour, 365-day-a-year Emergency and Repair service, and our asset maintenance activities, as well as several other operating costs – interruption contracts, various survey works, odorant and wayleaves.

	RIIO1 6-year average	21/22	22/23	23/24	24/25	25/26	Total	RIIO2 ave.
Emergency	11.1	10.8	10.6	10.5	10.3	10.2	52.3	10.5
Repair	15.9	15.7	15.3	14.9	14.5	14.1	74.4	14.9
Maintenance	10.7	17.0	16.9	16.8	16.7	16.7	84.2	16.8
Other direct activities	3.1	3.4	3.4	3.4	3.4	3.4	17.0	3.4
Interruptions	0.3	0.2	0.2	0.2	0.2	0.2	1.0	0.2
Work execution	41.1	46.5	46.7	46.2	44.6	44.8	228.8	45.8

Table 6.23: Reference: BPDT 2.01, IDP A23.L

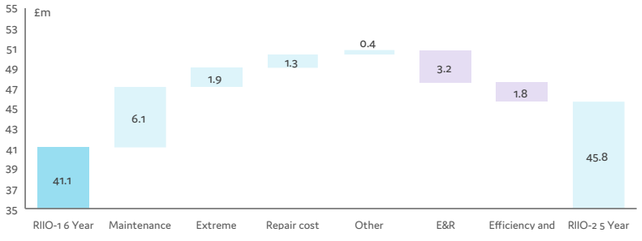

Figure 6.31: Work execution trace from RIIO-1 to RIIO-2

During RIIO-1, our Work Execution costs have averaged £41.1m per annum. We expect this to increase by £4.7m to £45.8m during RIIO-2. The main driver for this is an increase of £6.1m in our maintenance workload. We have also seen cost pressures in our Repair activity, and as we have experienced comparatively milder weather so far in RIIO-1 which has suppressed workload, our forecast includes more extreme weather when we would expect to see more peaks in workload and an increase in overall volumes, increasing costs. These are then offset by reduced workload, mainly in Repair, as a result of our target mains replacement programme. We have seen savings in RIIO-1 from the innovations we have delivered, again primarily in Repair, and from an increased number of employees on our new terms and conditions. These are the main drivers for the £1.8m savings highlighted above.

Emergency and Repair

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Our Emergency teams provide our first-line response service to any reports of gas escapes or loss of gas supply – a Publicly Reported Escape (PRE) – making the situation safe and carrying out remedial work if possible. This is a 24-hour, 365-day-a-year service, where we need to respond within one hour for an uncontrolled escape, and within two hours for a controlled escape. The appropriate level of resource always needs to be available to meet these key safety standards. The number of PREs we receive will be impacted by a number of factors, including weather and the condition of the network.

Our Repair teams carry out all work to permanently fix any gas escapes that result from a PRE. Historically, between 20 and 25% of PREs involve a gas escape, with the balance being internal issues often related to appliances, meter problems and no trace of gas found. We target the completion of more than 60% of repairs within 12 hours. The remainder are managed and repaired on the basis of risk.

Our Emergency and Repair performance in 2010/11 was severely impacted by the extreme weather conditions experienced over the winter months. We responded to the challenges of 2010/11, and the last seven years have seen considerable change in how we resource and deliver these key services. We have introduced:

- New modern terms and conditions for existing and new employees. This includes the introduction of 'site start' and 'site finish' working patterns, and bonus arrangements linked to specific outputs. Employees now work as standard between 7am to 10pm seven days a week, so resources are available when we need them the most;
- We have invested in more efficient and right-sized vehicles with all-wheel drive and four-wheel drive support, as well as vehicle telemetry to improve driver behaviour – impacting safety and efficiency; and
- New processes and controls around streetworks and a centralised plant desk to improve response times and efficiency.

We have also increased our internal resources through a mixture of direct recruitment and apprentice training, and now operate with c.220 Emergency Rapid Response Engineers and 180 Repair teams across our network. This ensures that we can meet our revised 'Extreme Weather' resilience plans, which replaced our 'Winter Resilience' plans, recognising that weather patterns are changing and in particular that flooding and water ingress can occur at any time. This extra internal resource has reduced our use and reliance on expensive third-party contractors that proved difficult to mobilise at short notice.

We have increasingly managed Emergency and Repair resource using a Totex approach to ensure we always make best use of the resource. When conditions allow, we use the resource on other activities. Emergency teams complete minor repair and replacement work, and carry out some maintenance and capital activities. On average over the year, c.28% of our Emergency resource is used on other activities. Our Repair teams also carry out these activities, and in addition complete connections work and replacement of metallic services.

Emergency and Repair – forecast costs and workloads

Our Emergency and Repair forecasts take our historical performance and weather conditions into account and are detailed in the table below:

	19/20	20/21	21/22	22/23	23/24	24/25	25/26
PREs (number)	90,529	89,869	89,234	88,626	88,041	87,480	86,942
Emergency cost (£m)	11.1	11.0	10.8	10.6	10.5	10.3	10.2
1-hour standard (%)	>97%	>97%	>97%	>97%	>97%	>97%	>97%
2-hour standard (%)	>97%	>97%	>97%	>97%	>97%	>97%	>97%
Network condition reports	17,200	16,512	15,852	15,217	14,609	14,024	13,463
Interference and other	4,200	4,200	4,200	4,200	4,200	4,200	4,200
Repair cost	16.5	16.1	15.7	15.3	14.9	14.5	14.
12-hour repair target	>65%	>65%	>65%	>65%	>65%	>65%	>65%

Table 6.24: Emergency and Repair forecast workload Reference: BPDT 5.07

Our analysis shows that in the first years of RIIO-1, we have experienced comparatively milder weather which has partially driven lower workload. Under more normal conditions, we could expect to see more peaks in workload and an increase in overall volumes. Our workload forecasts take this into account. We will retain more of our workforce in Opex to manage this increase. In Emergency, we forecast that this would increase costs to initially £11.1m, and in Repair to c.£16.5m.

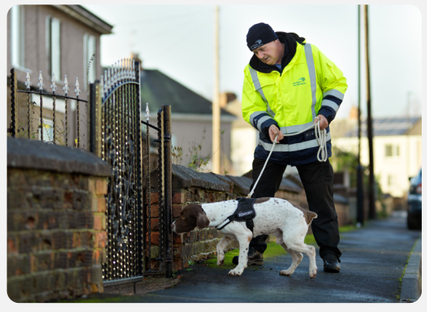
We then expect to see a c.4% annual reduction in Repair workload as a result of the Repex programme, whilst work driven by damages and other factors such as water ingress will stay broadly flat. Overall, work decreases by c.3% p.a. This reduction in Repair workload translates to a c.0.7% p.a. decrease in Emergency PREs. We expect the number of PREs driven by non-network issues to remain broadly flat.

In terms of costs, we expect Repair costs to reduce by c.2.5% p.a. The reduction in workload will partially be offset as Repair teams are already almost fully utilised. This means there is less scope to reduce teams and still deliver our Repair targets when teams are likely to have to travel further between jobs as the overall volume falls. We will look to mitigate this through improved scheduling tools delivered through our Future WOW/SAP 4 Hana investments and our Totex management approach. We also expect to see further savings from our investment in new terms and conditions over time, as well as reduced fleet costs as we invest in more efficient vehicles. Overall, we expect to see a reduction of c.£2.4m in annual costs by the end of RIIO-2.

In Emergency, we expect to reduce costs by 1.5% p.a. The 0.7% annual reduction in workload provides limited scope to reduce costs, as the primary driver of cost is the need to deliver the emergency response times over the whole of the network. However, we expect to reduce costs for similar reasons to those detailed for Repair above. In particular, our Totex management approach and new work scheduling systems will allow us to target reductions in the current levels of waiting time. Overall, we expect to see a reduction of c.£0.9m in annual costs by the end of RIIO-2.

Test case – Gas detection dogs

Accurate and speedy location of gas leaks is an ever-present challenge. Commencing in 2015, we undertook an NIA-funded project to understand if the deployment of specially trained gas detection dogs could deliver efficiency and reduce stakeholder impact and safety risks. This proved successful and has been embedded as a fully commercialised solution into business-as-usual operations, with an average deployment of 130 operations per annum delivering a range of benefits including reduced excavations, and more rapid identification of risk areas and cost savings (c.£500k in total throughout RIIO-1).



Maintenance

Maintenance includes all activities we undertake to ensure that our assets operate efficiently and reliably. Maintenance is undertaken on a proactive scheduled basis and on a reactive basis when faults and other issues arise. Consequently, actual workload and cost vary year on year by c.+/-5%. The main drivers for maintenance expenditure are asset condition, policy and the overall number of the assets in each category.

We outsourced c.40% of our maintenance activities in RIIO-1. We are now looking to rebalance this mix to make sure that we have the best balance between control and commercial cost management to deliver further cost savings of c£0.8m p.a. Taking this into account, our overall maintenance costs are increasing to £16.8m p.a. in RIIO-2, an average increase of £5.4m p.a. There are several key reasons for this, summarised below.

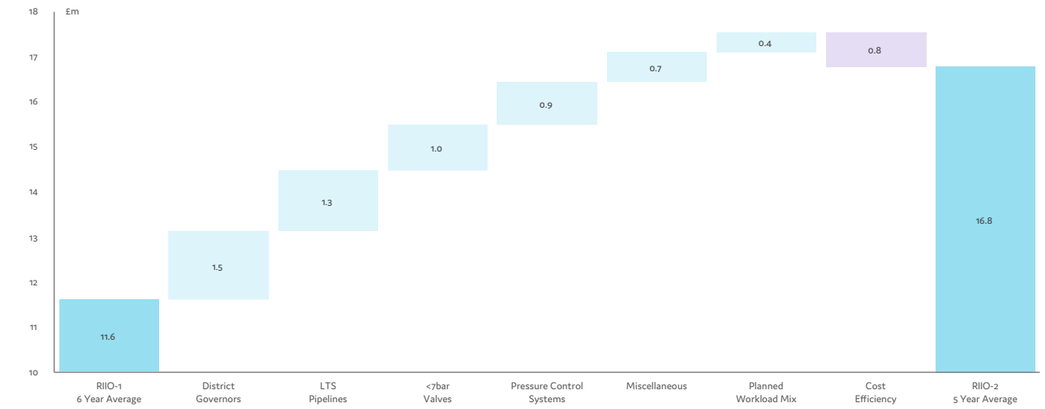


Figure 6.32: Maintenance trace from RIIO-1 to RIIO-2

We forecast to spend an extra £1.5m p.a. on District Governors. This increase includes investment in minor refurbishments such as governor painting and building repairs that will maximise the life of the governors themselves. Further information is included in our Case Study – District Governor in Section 6.4. We have also seen an increase in the number of incidents where members of the public have driven into our District Governors. We plan to reduce this societal risk by increasing impact protection on these assets.

Our maintenance for Local Transmission Pipelines will increase by £1.3m p.a. There are three key drivers for this. Emerging technology will allow us to inspect our 4" high pressure pipelines which will provide greater information on their condition and allow us to remediate any defects, thereby prolonging their life. We will 'line walk' the routes of our pipelines, improving integrity and reducing environmental risks by identifying areas of shallow cover, ground movement, flooding, river bank erosion and encroachment. We then plan to undertake a programme of works to improve the condition of our high pressure marker posts and ensure they are situated at suitable intervals to reduce the risk of third party interference.

IP & MP Valves will see a £1.0m p.a. increase. Due to the criticality of strategic valves within our distribution network and emerging risks associated with operability during incidents and repair jobs, we have commenced an upgrade programme to resolve the issues.

Pressure Control Systems will see increases to both minor and major refurbishments, including replacement of soft parts and worn components, in order to extend their life, thereby delaying expensive replacement programmes and mitigating the risk of asset stranding.

There are several other areas which will see increased maintenance, including the listed gas holder framework at Hendon which will require repair and painting during RIIO-2 to ensure it continues to be a safe structure. We also plan to increase our pressure management capability in RIIO-2, and the new equipment will require maintenance during RIIO-2.

Other direct activities – including interruptible contracts

Other direct activities include odorant costs, wayleaves and easements, some survey work and general expenditure on materials, tools and equipment. We do not expect the drivers behind these costs to change in RIIO-2 and so our forecast remains broadly flat.

Interruption is the cost of procuring interruption services from large customers where required. This avoids having to undertake very expensive pipeline upgrades to provide them with a firm supply – if gas demand spikes, we are able to interrupt them to ensure continuity of supply to all the other customers in that location. In RIIO-1, we have experienced generally milder weather conditions and in general reduced demand. However, peak demand has remained constant and it is this that drives the need for interruption contracts, together with localised constraints on the network. We currently have one interruptible contract in the North East.

We have managed so far not to interrupt the contract holder in RIIO-1 as the local conditions have not required it. This has driven the relatively low costs seen. Our forecast is marginally higher on the expectation that we may need to interrupt at some point in RIIO-2.

6.6.4. Indirect activities

	RIIO1 6-year ave.	21/22	22/23	23/24	24/25	25/26	Total	RIIO2 ave.
IT and Telecoms	8.6	7.2	7.2	7.1	7.1	7.1	35.7	7.1
Property management	2.2	2.8	2.8	2.8	2.7	2.7	13.8	2.8
Human Resources	0.9	1.2	1.2	1.2	1.2	1.2	5.9	1.2
Audit, Finance and Regulation	4.0	3.7	3.7	3.6	3.6	3.6	18.2	3.6
Insurance	3.2	3.3	3.3	3.3	3.3	3.3	16.5	3.3
Procurement	0.5	0.3	0.3	0.3	0.3	0.3	1.6	0.3
CEO and group management	4.7	4.6	4.6	4.5	4.5	4.5	22.7	4.5
Training and apprentices	2.2	3.7	3.5	3.5	3.5	3.5	17.7	3.5
Indirect activities	26.3	26.8	26.5	26.4	26.3	26.1	132.1	26.4

Table 6.25: Indirect activities expenditure Reference: BPDT 2.01

Figure 6.33: Indirect activities trace from RIIO-1 to RIIO-2

During RIIO-1, our indirect activities costs have averaged £26.3m per annum. We expect to see a very similar level of expenditure in RIIO-2. We will deliver c.£2.4m of efficiencies between the price controls on average, the largest savings from our IT strategy, with further savings in the other support activities, mainly driven by savings resulting from our new technology platform which enables us to automate and improve processes. However, we do expect to spend more on cyber resilience in RIIO-2, due to the increased threats in this area as we move towards a more automated network, and we have seen cost pressures in our property portfolio as we have invested in and been forced to relocate depots. Our recruitment strategy is changing in RIIO-2, which will increase the number of apprentices we recruit and train.

IT and Telecoms

The main cost drivers for IT and Telecoms are the number of users, the service levels and applications offered, and the IT infrastructure used to deliver the services. External factors such as legislation and increased risk from cyber security also drive cost.

During RIIO-1, we have completely changed how we deliver IT and Telecoms services. We now have a simpler and more cost-effective delivery model which is easier to manage and adapt, and has enabled us to take full control of our end-to-end systems and processes. We have in-house expertise to lead on all key decisions, and only outsource those areas where there are key benefits and cost savings. This investment will help our RIIO-2 plans in three key ways:

- Many of our improved outputs detailed in section 4 are supported by our new IT systems and processes. Our new work-scheduling systems allow us to provide online portals to book appointments and track our engineers' arrival times. Better control of our workflow allows us to offer shorter lead times for areas such as reinstatement;
- Data and digitisation are key for a modern energy system to deliver for the consumer. Our investments in RIIO-1 will directly support the development of a more integrated and data-driven network management model. We see this structured model as a key enabler for Net Zero, and for delivering an affordable, safe and resilient energy supply. Further details can be found in section 5 of our plan; and
- Data and digitisation bring with them the potential for an increase in the number and type of cyber threats we may face. This was a key consideration when developing our new model. Our cloud-based service providers invest heavily in cyber resilience, using cutting edge technology and software. We have rationalised our multiple systems and databases as well as our support contracts, and aligned them to our Cyber Strategy.

Our IT operating costs have reduced during RIIO-1. We expect these costs to increase marginally in the next two years as we further increase our cyber resilience resources. We have included £0.7m within our forecasts to take appropriate measures to manage this risk.

Property management

We have invested significantly in our property portfolio in RIIO-1 – refurbishing and where necessary relocating offices and depots across the network. Some moves were forced as leases expired and were not extendable, mainly due to redevelopment. Our aim has been to provide an excellent working environment for our colleagues in order to attract and retain staff and make the best use of their skills. As a result, we have seen a marginal cost increase as some of the new depots and offices are in better locations for operational reasons and with better facilities, offsetting other costs such as fuel and travel time. We expect costs to be broadly flat into the future.

Insurance

Insurance costs were generally on an upward trend prior to RIIO-1, but have since remained broadly flat. The level and type of insurance cover will vary between networks, based on attitude to risk and the history of claims received. This will also offset costs elsewhere in Totex. Claims, however, can vary materially year on year, in particular those related to ill health. We are currently seeing a slight reduction in the volume of claims, but this has generally been offset by higher payouts due to the increasingly complex nature of many of the issues. Our forecast for insurance and claims is based on the average costs we have experienced to date in RIIO-1.

Training and apprentices

During RIIO-1, we have taken a holistic approach to workforce planning. Rather than focussing solely on in-house apprentice recruitment, we have adopted a much wider strategy of renewing and refreshing our total workforce, revolution rather than evolution. This strategic approach was designed to address the historic and more costly terms and conditions of the existing workforce, and to drive productivity by implementing new terms and conditions. Our strategy has resulted in our age profile reducing from c.50 to just under 40. Direct apprentice recruitment alone would not have driven the cultural change we sought, or replaced the knowledge and experience we were losing. By the end of RIIO-1, we expect to have fewer than 250 colleagues on our old terms and conditions. Further details of our overall resilience strategy can be found in Appendix A9.

Following the above, we now plan to increase the number of trainees and apprentices we recruit, and this will continue on into RIIO-2. Our total staff turnover rate is c.12% – c.4%, of this is as a result of our Early Voluntary Retirement (EVR) programme. This is typical of the industry. Clearly, this provides an opportunity to recruit more apprentices into our network. We expect to upskill and train c.33 apprentices and graduate trainees across the network per annum. These new recruits will be across the business dependent on need – graduate engineers, quantity surveyors, IT specialists, finance and human resources, as well as operational apprentices.

Other indirect activities

The rest of indirect activities cover a variety of support and corporate functions – CEO and Group Management, Human Resources, Procurement and Logistics, Audit, Finance, and Regulation. We expect to deliver targeted efficiency improvements from FWOW across all of these activities from now until the end of RIIO-2. This will deliver a c.7% cost reduction of £0.7m from the £11m we currently spend across these areas.

6.6.5. Non-controllable Opex

Table 8.8 below compares our forecast non-controllable Opex costs for RIIO-2 against our actual and forecast costs for the remainder of RIIO-1.

£m 2018/19 prices	RIIO-1 average	RIIO-2					
	20/21	21/22	22/23	23/24	24/25	25/26	Total
Shrinkage	6.4	5.3	5.0	4.8	4.6	4.3	24.0
Network rates	41.3	44.0	44.0	44.0	44.0	44.0	220.2
Pensions deficit	12.0	4.2	4.2	4.2	4.2	4.2	21.0
NTS pensions	6.8	7.4	7.4	7.4	7.4	7.4	37.2
NTS exit	8.2	30.4	30.4	29.9	29.3	28.7	148.7
Bad debt	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ofgem licence	1.7	1.8	1.8	1.8	1.8	1.8	9.2
Innovation	2.6	3.1	3.0	2.6	2.0	0.9	11.5
Xoserve	3.0	3.1	3.3	2.3	2.2	2.2	13.2
Total non-controllable Opex	**82.0**	**99.4**	**99.3**	**97.9**	**95.6**	**93.6**	**485.0**

Table 6.26: Total Non-Controllable Opex

Reference: BPDT 2.02

Shrinkage gas

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We purchase gas to replace the gas lost from our network – this is known as Shrinkage. Three factors drive the volume of Shrinkage – leakage from our pipes (c.95%), theft of gas from the network (c.3%) and own use gas (c.2%). This is the gas we use in various types of network equipment, for instance water bath heaters.

We aim to reduce leakage gas volumes throughout RIIO-2. This is the main driver for the c.20% reduction in Shrinkage costs seen in our forecast. We will achieve this through a combination of:

- Reducing our iron and steel mains population through the replacement programme. Our total network management approach to mains replacement deliberately targets the leakiest metallic pipes with the highest risk;
- Reducing average system pressures through continued Capex investment in remote pressure management and control equipment. In RIIO-2, this equipment will be installed on targeted governor stations in a further ten zones in our network, compared to the 26 delivered in RIIO-1. Our Pressure Management team use this equipment to manage the network pressures remotely from the Control Room in Moorside. Current average system pressure in the network is c.31mbar and we expect to reduce this to below 30mbar over RIIO-2; and
- Effectively managing our levels and use of MEG, a 'wet' gas used to saturate and swell metallic joints which otherwise may leak gas.

We have used the 2018/19 forecast average wholesale gas price as the basis for the cost forecast. The actual costs will vary in line with the actual movements in wholesale prices.

Network business rates

Business rates are reviewed periodically. We saw a c.16% rates increase in our last review in 2017/18, which increased the rates to c.£44m. We have held our forecast constant at this level for RIIO-2.

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Pensions deficit

The trustees of the NGNPS have approved the implementation of an Asset Backed Contribution (ABC) scheme to address the pension funding deficit. The Pensions Regulator, HMRC and the Pension Protection Fund have all confirmed that ABCs are an acceptable alternative to funding deficits. ABCs can provide trustees with additional security, whilst reducing the cash funding pressure for employers. In particular, they support longer recovery periods whilst improving security for the scheme.

As a result of the implementation of the ABC, our deficit contributions will be £4.2m per annum, increasing in line with RPI from 2018/19. We have used this as the basis for our business plan forecast. The actual contributions will be reset every three years based on the latest triennial valuation.

National Transmission System (NTS) pensions and NTS exit costs

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Our plan contains the latest forecast of NTS pension costs provided by National Grid. We pay NTS exit costs to National Grid, driven by the bookings we make to take gas from each NTS Offtake into our LTS system. National Grid are currently rebalancing their NTS Offtake charging methodology to better reflect their latest costs. We expect this to lead to a significant increase in the exit costs we pay from October 2019. Our RIIO-2 forecast reflects the latest view of this likely increase.

Ofgem licence

The licence cost is forecast to remain at current levels throughout the period.

Innovation

Gas networks innovate in order to reduce costs and meet the increasing needs of a more complex energy system. The innovation stimulus Ofgem provided in RIIO-1 and in GDPCR1 focussed the networks on innovation, and has helped drive a cultural change in our business that promotes the generation, testing, challenge and implementation of new ideas. This has been of particular importance given the low levels of productivity growth the UK as a whole has seen since the financial crisis. We recognise there is more to do in order to continue to deliver improved, more reliable, safer, environmentally friendly and efficient services. We expect to continue at similar levels to RIIO-1 over the whole of RIIO-2. This has driven our forecast for funding to average c.£2.3m p.a. Read more on Innovation in section 5.4.

Xoserve

Xoserve is a data services company which provides a range of essential services to support the UK gas industry. Gas networks pay for the Central Data Service Provider (CDSP) services that we procure from Xoserve. Our business plan costs are based on Xoserve's latest forecasts for the provision of these services during the RIIO-2 period.

PART 7: FINANCING OUR PLAN

IN THIS SECTION

This section sets out financial parameters of NGN's business plan estimated using Ofgem's Sector Specific Methodology Decision (SSMD) working assumptions for cost of capital allowances and expected incentive outperformance. We identify key financial risks that NGN will face in RIIO-2 and suggest the most appropriate ways of balancing those risks between customers and investors.

We outline financial projections for each year of the RIIO-2 period, set out the company's target ratings and key credit metrics, demonstrate results of Ofgem-suggested stress test scenarios and analyse options to address financeability. Financial projections are provided for notional and actual financial structures under Ofgem's working assumptions. NGN's proposals for cost of capital allowances and for other elements of the financial package are contained in a separate document to the main business plan – Appendix A33– Proposed Financial Package for RIIO-2.

7.1. Principles and assumptions

We have previously detailed the background to this business plan confirming that the gas distribution network remains critical to the UK's energy needs in all future scenarios for decades to come. Gas will continue to play a key role in the UK energy system, providing energy for industry, and heating and cooking for millions of homes.

There is a clear need for continued and significant investment in gas distribution and the energy sector. One of the key principles of the UK regulatory framework is that efficient companies should be able to finance their activities and this investment. This remains core to attracting the future investment that will be needed.

7.1.1. An appropriate balance of risk and reward between customers and investors

The core objective of our business plan is to provide the services that meet the expectations of our present and future customers in terms of both quality and cost. We will continue to deliver outstanding and continuously improving service at the minimum cost to the customer through lower bills. At the same time, we must meet the reasonable requirements of our equity and debt providers who fund the significant investment required in our network, over £820m during the RIIO-2 period. This investment is essential to ensuring that the services and service levels demanded by our customers can be met sustainably.

Equity and debt investors have already locked up huge amounts of capital in asset-intensive gas distribution companies and should be incentivised to continue to do so. The return on their investment should provide an adequate remuneration commensurate with the risks they bear. However, it is important for the legitimacy and stability of the regulatory framework that risk and reward are balanced fairly between investors and customers. It is appropriate that the relevant party bears the risk that it is best placed to manage to minimise the overall costs.

7.1.2. Stability, sustainability and the regulatory framework

A stable regulatory framework with a well-understood risk profile is essential to maintain the UK energy networks' ability to continue to attract finance in competitive international markets. This has been a key feature of the UK regulatory framework since privatisation. Gas distribution networks have very long-life assets, with effective asset lives reaching 45–60 years. These assets need appropriate long-term financing and a sustainable regulatory framework conducive to attracting investors.

Changes to the regulatory framework must ensure intergenerational fairness and are just as important when assessing the framework from future customers' perspective. Some options for change would defer allowed revenue, resulting in current customers paying less now at the expense of their future generations. Conversely, when revenue is collected earlier, this reduces the risks for future customers.

Clearly, the correct calibration of the regulatory framework and the impact on revenue profile need to strike a delicate balance between the interests of present and future customers and investors.

7.1.3. Financeability

Ofgem has an obligation to have regard to the need to ensure that companies can finance their activities. That is they are able to generate enough cash to finance the activities they are required to carry out under their licence. A company, for its part, has an obligation to maintain an investment-grade credit rating (Standard Special Condition A38 of the gas transporter licence).

The business plan is based upon the financing of the efficient notional company and the premise that this structure is financeable in the short and longer term. We have assessed financeability both on the notional company basis and tested this against NGN's actual financial position to evidence that the company remains financeable over the longer term.

NGN is rated by two major credit rating agencies, Moody's Investors Service Inc. (Moody's) and S&P Global Ratings (S&P). To maintain our licence requirements, we need to maintain an issuer credit rating of not lower than BBB- by S&P or Baa3 by Moody's. We also have bank covenants that need to be met to allow us to continue to access funds to finance our investments.

PARAMETER	Moody's (Baa1 credit rating)	S&P (BBB+ credit rating)	Bank Covenants
AICR	>1.4x		>1.3x
Net debt/RAV	<75%		< 75%
FFO / net debt	>11%	>9%	
RCF / net debt	>7%		
FFO interest cover		2.5x	

Table 7.1: Target credit metric and bank covenant thresholds

The business plan has been developed based on the credit metrics, bank covenants and associated thresholds set out in table 7.1. We have targeted the bottom range of these metrics in our analysis and assumed that equity must play a significant role in managing financeability and uncertainty. These metrics are based upon the requirements of the two organisations that provide ratings for NGN – Baa1 from Moody's and BBB+ from S&P.

The target credit rating is an important factor in ensuring that the balance of risk and reward between customers and investors remains appropriate in the short and longer term. There are several key factors we have considered in identifying the correct target credit rating for both the 'notional' and 'actual' company.

- Consistency with Ofgem's cost of debt indexation methodology. We agree with the use of an appropriate index to fund interest payments at an efficient level. Ofgem have proposed the continuation of an index based on a basket of A and BBB rated bonds. This has the impact of lowering the assessment of the efficient level of interest costs for the Notional company. By implication, a company would have to have a rating notionally positioned between BBB+ and A- to incur interest costs aligned with this average.
- Linked to the above statement, a company that is rated at a level below the level consistent with the implied cost of debt could not be expected to achieve the cost of financing indicated by the pricing of the index chosen by Ofgem.
- Resilience, including financial resilience, is a key consideration. It is crucial for all stakeholders, particularly customers, that the company is financially resilient in the long run. The target credit rating is key to ensuring that the company can access debt markets at rates that match its funding criteria set by Ofgem and therefore be financeable in the long run. Targeting a rating lower than BBB+ as a steady-state credit rating, in the long run, would provide insufficient or no headroom to accommodate possible cost shocks, exposing NGN's customers to an increased risk of a potential escalation of its financing costs.

Alongside the quantitative factors set out in table 7.1, all the relevant credit rating agencies identify qualitative factors in their assessment of the credit ratings for the sector: the track record of performance of the company and the stability, predictability and supportiveness of the regulatory regime set by Ofgem in the UK. There is a weakening of the perception of the regulatory regime in the UK. The downgrading of the UK water sector by Moody's is a signal of this changing perception from rating agencies and the wider market. Ofgem's forthcoming initial and final determinations on RIIO-2 price control are a key factor in determining the overall assessment of the regulatory framework.

We have carried out a comprehensive assessment of the advantages and disadvantages of targeting a lower credit rating than NGN's proposal of BBB+/Baa1, specifically whether it would be in customers' interest for NGN to adopt a lower credit rating.

This analysis shows that the short-term customer benefit from lower allowed revenues which result in a downgrade from BBB+ to BBB would be more than offset by the higher future cost of debt (in present value terms). The net cost to customers of the downgrade from BBB+ to BBB has been estimated to be in the range of £32m–53m (in present value terms, as at the start of RIIO-2 in 2021). The net present value loss in the case of a downgrade from BBB+ to BBB- would be even more pronounced: the net cost to customers would reach £78m–121m (in present value terms, as at the start of RIIO-2 in 2021). More details can be found in Appendix A26 – Assessment of a Comfortable Investment Grade Credit Rating.

Based on the above factors, the assessment of the financeability of Ofgem's and NGN's proposals has been carried out against a target credit rating of Baa1 (Moody's) and BBB+ (S&P). This, in our opinion, strikes an appropriate balance between the cost of debt allowance, the broader financial package required to satisfy financeability criteria and the overall assessment of the regulatory framework. As such, this presents the lowest cost option for customers in both the short and longer-term.

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7.2. Assessment of Ofgem's 'base case'

Ofgem set out their base 'Working Assumptions' in the Sector Specific Methodology Decision document in May 2019, the subsequent Business Plan Guidance documents and separate guidance on assessing financeability. We have used Ofgem's Financial Model (LiMo GD2 20191107 d 4.1) to analyse the impact that these assumptions and our expenditure forecasts detailed here have on our revenue and credit metrics. Customer bills and credit ratings have been estimated using NGN's models, due to the fact that the LiMo does not have the relevant functionality. These additional models have been submitted alongside this business plan.

7.2.1. Key parameters

The most significant change from RIIO-1 to RIIO-2 is the significant reduction in revenue, which has a material impact on the financeability assessment. The revenue reduction is driven by several key factors, which are summarised below then discussed in more detail later.

- On a like-for-like basis, the **cost of equity** is assumed to reduce from 6.7% to 3.8% (expressed in RPI terms for direct comparison);
- A downward adjustment to the base cost of equity of 50bps to address Ofgem's view that there is an expected outperformance in the sector of 50bps. **An effective cost of equity of 3.3% (expressed in RPI terms for direct comparison) with 50bps of incentive income is included in revenue under Ofgem's base case**;
- The **cost of debt** is assumed to reduce from an average of 2.2% in RIIO-1 to 0.9% in RIIO-2 (expressed in RPI terms for direct comparison);
- **Notional gearing** reduces from 65% to 60%;
- The change in the measure of inflation from RPI to CPIH increases the **Real Weighted Average Cost of Capital** by 1.05%. (It is important to realise that this does not change the overall nominal return we receive, simply the timing of its payment);
- **One step transition from RPI to CPIH measure of inflation** at the start of RIIO-2 and a 1.05% 'inflation wedge' added to base cost of equity and cost of debt;
- The change in the **Fast:Slow Money split** from c.49% fast money down to 34%;
- **Reduction in dividend payout ratio by 1.8%** compared to the assumed cost of equity; and
- The overall debt portfolio of the notional company includes 25% of **index linked bonds.**

Table 7.2 below sets out the key financial outcomes of Ofgem's base case through an abbreviated income statement, and net operating cash flow. We outline the impact on the key credit metrics in Tables 7.3 and 7.4.

£m, 2018/19 prices

PARAMETER	2021/22	2022/23	2023/24	2024/25	2025/26	GD-2 Average
Closing RAV	**2277.99**	**2326.68**	**2371.61**	**2407.68**	**2433.65**	2363.52
Fast Money, %	35.24%	33.91%	33.70%	33.93%	35.05%	34.37%
Slow Money, %	64.76%	66.09%	66.30%	66.07%	64.95%	65.63%
Fast pot expenditure	87.83	86.56	85.82	84.20	84.91	85.86
Non-controllable opex	95.21	95.07	92.90	91.38	89.39	92.79
RAV depreciation	115.92	119.81	123.86	127.76	131.28	123.73
Return	65.08	65.63	66.40	67.22	67.90	66.45
Equity issuance cost	5.47	0.00	0.00	0.00	0.00	1.09
Additional income	0.00	0.00	0.00	0.00	0.00	0.00
Core DARTs	4.20	4.20	4.20	4.20	4.20	4.20
Recalculated base revenue (except tax allowance)	373.70	371.28	373.18	374.77	377.68	374.12
Tax allowance	17.99	17.07	17.44	17.84	18.30	17.73
Recalculated base revenue	**391.69**	**388.36**	**390.61**	**392.61**	**395.99**	**391.85**
Incentive income	4.45	4.54	4.63	4.71	4.77	4.62
Total revenue	**396.14**	**392.90**	**395.25**	**397.32**	**400.76**	**396.47**
Costs	-192.71	-185.83	-182.92	-179.78	-178.50	-183.95
EBITDA	**203.43**	**207.06**	**212.33**	**217.54**	**222.27**	**212.53**
Interest	-53.49	-53.85	-54.38	-54.89	-55.16	-54.35
Principal inflation accretion	6.54	6.73	6.89	7.01	7.08	6.85
Capital expenditure	-161.38	-168.71	-168.79	-163.94	-157.36	-164.04
Tax paid	-17.99	-17.07	-17.44	-17.84	-18.30	-17.73
Operating cash flow	**-22.89**	**-25.84**	**-21.39**	**-12.13**	**-1.48**	**-16.75**
Disposal proceeds	0.00	0.21	0.00	0.10	0.10	0.08
Dividend	-27.34	-27.92	-28.46	-28.89	-29.20	-28.36
Net cash flow	**-50.23**	**-53.56**	**-49.85**	**-40.92**	**-30.59**	**-45.03**

Table 7.2: Financial Parameters (notional): Ofgem's Base case

PARAMETER	2021/22	2022/23	2023/24	2024/25	2025/26	GD-2 Average
Adjusted ICR [>1.4x]	1.48	1.49	1.50	1.50	1.51	1.50
Gearing [<75%]	60.15%	60.33%	60.41%	60.33%	60.07%	60.26%
FFO/net debt [>9%]	9.63%	9.70%	9.81%	9.97%	10.18%	9.86%
RCF/net debt [>7%]	7.64%	7.71%	7.82%	7.98%	8.18%	7.87%
FFO interest cover [>2.5x]	3.47	3.53	3.58	3.64	3.70	3.58

Table 7.3: Credit Metrics (notional): Ofgem's Base case

PARAMETER	2021/22	2022/23	2023/24	2024/25	2025/26	GD-2 average
Adjusted ICR [>1.4x]	1.25	1.30	1.29	1.35	1.37	1.31
Gearing [<75%]	67.30%	68.04%	68.66%	69.04%	69.23%	68.45%
FFO/net debt [>9%]	8.31%	8.53%	8.58%	8.79%	8.96%	8.63%
RCF/net debt [>7%]	5.34%	5.59%	5.67%	5.90%	6.07%	5.71%
FFO interest cover [>2.5x]	3.75	3.69	3.54	3.75	3.87	3.72

Table 7.4: Credit metrics (actual): Ofgem's base case

7.2.2. Financeability assessment

Analysis of Ofgem's base case is summarised in Table 7.5:

	Minimum Target	Outcome – Notional NGN	Outcome – Actual NGN
AICR	>1.4x (Moody's) >1.3x (Bank covenant)	1.50x	1.31x
Notional net debt to RAV	<75%	60.26%	68.45%
FFO interest cover	>2.5X	3.58x	3.72x
FFO to net debt	>9% (S&P) >11% (Moody's)	9.86%	8.63%
RCF to net debt	>7%	7.87%	5.71%

Table 7.5: Ofgem's base case

Overall, under Ofgem's base case proposals, the key equity and credit metrics show a worsening position from those currently maintained in RIIO-1, but indicate that if a company matched the base case assumptions, particularly with respect to gearing and the cost of debt, then it would be financeable at those levels.

However, analysis of the gas distribution sector shows that Ofgem's base case assumptions are not representative of the wider sector, with gearing at 65% on average (in line with the assumption on efficient levels of gearing at RIIO-1) and an industry actual cost of debt that has been measured as efficient against the benchmark set in RIIO-1. With Ofgem's decision to rebase efficient gearing levels at 60% for RIIO-2 and to reduce allowed cost of debt to levels at which the gas distribution sector is expected to underperform over the period, it is unsurprising that at a notional level companies are viewed as being financeable.

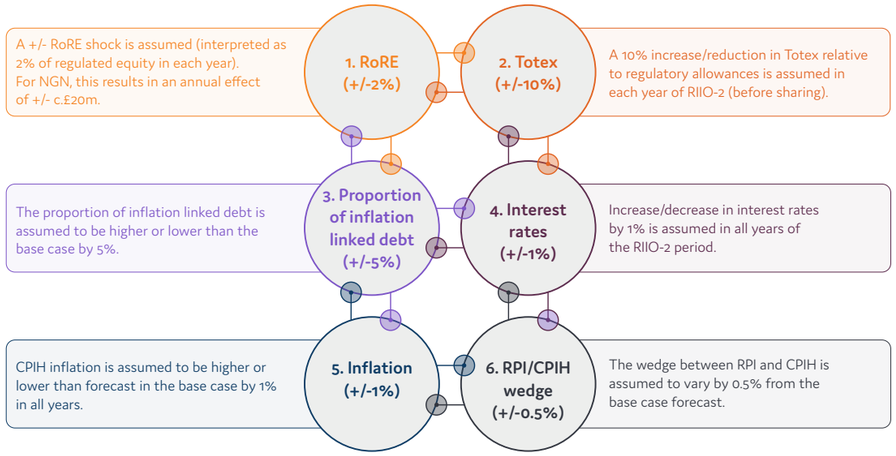
This is reflected in the assessment of NGN on an actual basis against Ofgem's base case. We see a worsening of all the key metrics over the RIIO-2 period, with key metrics being below the acceptable levels as set by the credit rating agencies and/or stipulated by NGN's bank covenants. This poses a risk when considered against a plausible range of sensitivities to the key parameters, especially in terms of the macro-economic factors that are outside of NGN's control.

Financial risk & resilience

In support of our overall assessment of financial resilience of the company, we have considered the principal short-and longer-term risks relevant to the company and stress tested the business plan for the period through to 2026. In stress testing the business plan we have considered risks that could impact on the financial viability of the business in isolation and in aggregate. More details can be found in Appendix A27 - Review of NGN's RIIO-2 Business Plan Financeability.

1. Financial stress testing

Ofgem requires each network company to have a robust financial plan over the RIIO-2 period that is stress-tested and proven to be financeable under a range of future outcomes. These results have been tested against the series of scenarios Ofgem has explicitly set out that it requires companies to consider as part of demonstrating financeability. Ofgem-mandated scenarios are set out below:



Each of these sensitivities has been stress tested for both the notional and actual NGN and the results of this analysis are summarised below:

2. Risk assessment of Ofgem's base case – 'Notional NGN'

The credit rating might be affected by zero RoRE outperformance (4.3% allowed equity return with an assumption of zero outperformance) and 2% RoRE shock. These scenarios result in key ratios falling below the guidance levels and might result in a credit rating downgrade to Baa2 and Baa3, respectively, based on mechanistic application of Moody's rating methodology. None of the scenarios result in a downgrade below investment grade.

Scenario	AICR	Gearing	FFO/net debt	FCF/net debt	Moodys' implied rating
	Notional financial structure				
Ofgem base case	1.50	60.26%	9.86%	7.87%	Baa1
High interest rates (+1%)	1.52	59.96%	10.08%	8.08%	Baa1
Low interest rates (-1%)	1.47	60.55%	9.63%	7.65%	Baa1
High inflation (+1%)	1.53	58.95%	9.93%	7.89%	Baa1
Low inflation (-1%)	1.46	61.62%	9.79%	7.84%	Baa1
High CPIH-RPI divergence (+0.5%)	1.48	60.93%	9.82%	7.85%	Baa1
Low CPIH-RPI divergence (-0.5%)	1.51	59.60%	9.89%	7.88%	Baa1
RPI ILD	1.62	60.25%	9.86%	7.87%	Baa1
High ILD proportion (+5%)	1.54	60.26%	9.86%	7.87%	Baa1
Low ILD proportion (-5%)	1.45	60.26%	9.86%	7.87%	Baa1
Totex underperformance (-10%)	1.41	61.85%	9.28%	7.34%	Baa1
Totex outperformance (+10%)	1.59	58.61%	10.49%	8.44%	Baa1
Zero RoRE outperformance	1.39	60.86%	9.41%	7.43%	Baa2
RoRE outperformance (+2%)	1.95	57.86%	11.76%	9.68%	A3
RoRE underperformance (-2%)	1.07	62.66%	8.11%	6.20%	Baa3

Table 7.6: Sensitivity analysis (notional)

3. Risk assessment of Ofgem's base case – 'Actual NGN'

Most scenarios result in sustained FFO/net debt of below 9%, S&P's guidance for BBB+ rating. In most cases, a mechanistic application of Moody's methodology results in a single notch downgrade to Baa2, apart from a more extreme scenario of 2% RoRE underperformance, whereby the credit rating may drop to Baa3.

Scenario	AICR	Gearing	FFO/net debt	RCF/net debt	Moodys' implied rating
	Actual Financial Structure				
Ofgem base case	1.31	68.45%	8.63%	5.71%	Baa2
High interest rates (+1%)	1.26	68.52%	8.56%	5.64%	Baa2
Low interest rates (-1%)	1.38	68.42%	8.68%	5.76%	Baa2
High inflation (+1%)	1.36	65.16%	9.19%	6.26%	Baa2
Low inflation (-1%)	1.26	71.99%	8.08%	5.16%	Baa2
High CPIH-RPI divergence (+0.5%)	1.30	69.48%	8.48%	5.55%	Baa2
Low CPIH-RPI divergence (-0.5%)	1.33	67.45%	8.79%	5.87%	Baa2
RPI ILD	1.31	68.45%	8.63%	5.71%	Baa2
High ILD proportion (+5%)	1.31	68.45%	8.64%	5.71%	Baa2
Low ILD proportion (-5%)	1.31	68.45%	8.63%	5.71%	Baa2
Totex underperformance (-10%)	1.23	70.08%	8.13%	5.32%	Baa2
Totex outperformance (+10%)	1.39	66.78%	9.17%	6.13%	Baa2
Zero RoRE outperformance	1.25	68.74%	8.41%	5.50%	Baa2
RoRE outperformance (+2%)	1.55	67.31%	9.56%	6.59%	Baa1
RoRE underperformance (-2%)	1.07	69.60%	7.74%	4.87%	Baa3

Table 7.7: Sensitivity analysis (actual)

Under Ofgem's base case, NGN's financial projections imply levels of financial metrics consistent with Baa1 rating under the notional structure and, broadly speaking, Baa2 rating under the actual structure. The metrics under the actual structure face significant pressure and are reducing to Baa3 or are on the borderline between Baa2 and Baa3 rating levels in some of the downside scenarios.

The analysis indicates downward pressure on financial metrics. This can have a negative impact on ratings when combined with qualitative factors considered by rating agencies such as stability of the regulatory environment, which could adversely affect NGN's position in the future. If Moody's downgrade the stability and predictability of the energy network regime, NGN's rating might be under even more pronounced pressure under Ofgem's base case.

4. Financial risk management

We have assessed the financial viability of the business with reference to the plan presented and have a practical expectation we will be able to continue to operate and meet our liabilities as they fall due over the plan period. Our assessment has been made with reference to the business plan forecasts presented, the business risks identified and how these are mitigated.

We identified actions, including reducing discretionary outflows of funds, working with providers of finance, and cost and expenditure management, that would mitigate the effects of adverse outcomes. Each of the scenarios tested was assessed against the impact on liquidity, solvency and credit metrics and an assessment of how these could be addressed by mitigating actions. The results of the scenario modelling, risk assessment and the mitigating actions are summarised below:

Scenario/Sensitivity	Impact: Credit Metrics	Impact: Loan/Debt Covenants	Mitigations: Cost Reduction	Mitigations: Short Term Exemptions on Covenants	Mitigations: Reduction in Distributions	Mitigations: Additional Sources of Finance	Mitigations: Profiling of Investment within period	Outcome: Credit Metrics	Outcome: Loan/Debt Covenants
High Interest rates (+1%)			✓	✓	✓				
Low Interest rates (-1%)			✓		✓	✓			
High inflation (-1%)			✓		✓				
Low inflation (-1%)			✓		✓				
High CPIH-RPI divergence (+0.5%)			✓		✓				
Low CPIH-RPI divergence (-0.5%)			✓		✓				
Totex underperformance (-10%)			✓	✓	✓				
Totex outperformance (+10%)									
RoRe underperformance (-2%)			✓	✓	✓	✓			
RoRe outperformance (-2%)									
Zero RoRe outperformance			✓	✓	✓				
Aggregared Scenario			✓	✓	✓	✓	✓		

Table 7.8: Financial risk assessment and potential mitigating actions

In support of our overall assessment of financial resilience of the company, we have considered the key short and longer term risks relevant to the company and modelled scenarios to stress test the business plan for the period through to 2026. We have modelled the impact of the scenarios proposed in Ofgem's Business Plan Guidance, on our key credit ratings and covenants. We have also assessed the impact of the scenarios and identified realistic mitigating actions for each scenario that we would be able to take. NGN have a strong track record of taking this approach in managing the short and long term financial viability of the business. We have concluded that under each of the scenarios, the mitigating actions would allow the company to remain viable for the period under review. However, we would highlight that these actions need to be considered in the context of the role that equity investors in particular would be required to play in addressing the base financability constraints.

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7.3. Options to address financeability

Ofgem's base case scenario is clearly a significant change to the existing regulatory financial parameters and framework. When combined with our business plan expenditure forecasts, this has a material negative impact on all the key financial metrics which are used to measure our financeability.

We have therefore, analysed the available financial mechanisms or 'Levers' to address financeability concerns in RIIO-2. We consider these on a case-by-case basis below. They include:

A. Shortening of asset lives to increase the depreciation allowance;
B. Changes to the capitalisation rate (Fast:Slow Money split);
C. Equity injection, dividend deferral and reducing gearing.

Each lever is assessed against the following criteria where appropriate:

- Ofgem's case for the base case position;
- Our critique of this position;
- The extent to which the lever could solve the problem;
- Whether its use would affect the metrics and the credit agency view; and
- Impact on the customer.

A. Asset lives and depreciation

Currently, gas distribution company assets – through the RAV – are depreciated in the following ways:

- Pre-2002 – over 56 years using sum of digits
- Post-2002 – over 45 years using sum of digits

Shortening of asset lives or changing the depreciation profile are both NPV-neutral adjustments and could potentially be utilised as they simply change the timing of when the indexed RAV is returned to the networks. It would increase the depreciation allowance providing more revenue to companies now – as an example, if we were to shorten the asset lives for new assets. Clearly this would have a converse impact on customers, increasing bills today with a corresponding NPV-neutral reduction in the future.

The major stumbling block to using asset lives as a lever is the treatment of regulatory depreciation in the credit agencies' metrics used to assess financeability. In their methodology, the RAV is the single most important indicator of economic value for a utility network – not the physical or 'accounting' value of the assets. In other words, the RAV is the major revenue driver and guarantees that funds will be available to service and pay back the debt in the future. Any increase in revenue arising from higher regulatory depreciation is effectively discounted by the rating agencies when they perform credit quality assessments. Therefore, shortened asset lives would entail higher customer bills, but would not support financeability in terms of stronger AICR credit metric (one of the key determinants of a credit rating).

We have concluded that using shorter asset lives to support financeability is not appropriate.

B. Change to the 'capitalisation rate' of expenditure

There are two options at play here that could benefit financeability:

- Artificially increasing Fast Money and reducing Slow Money; and
- Naturally increasing Fast Money and reducing Slow Money;

Fast Money is returned to the networks in the year in which the corresponding expenditure is incurred, whereas Slow Money is returned over the assumed asset life as depreciation. Clearly, any increase in Fast Money and/or a corresponding decrease in Slow Money could increase current revenue whilst reducing future revenue streams. In effect, this means reducing the capitalisation rate assumed within the regulatory model, in theory reducing the need to borrow as much to fund current investment.

Like reducing asset lives, increasing Fast Money is an NPV-neutral adjustment and simply changes the timing of when we are compensated for our investment expenditure, pulling it forward. It would increase the Fast Money allowance, providing more revenue to companies sooner. This would have the opposite impact on customers, increasing bills today with a corresponding NPV-neutral reduction in the future.

Artificially adjusting the capitalisation rate – We could make an artificial adjustment to the 'natural' Fast:Slow Money split in order to bring revenue forward and address any financeability concerns. However, this will not improve the rating agencies' financeability assessments as they make adjustments for excess fast money received in revenue. Consequently, we have ruled out using an artificial change to Fast:Slow money to support financeability

Naturally adjusting the Capitalisation Rate –It may be possible to naturally change the Fast:Slow money split in order to provide benefits to network owners and consumers. As part of our expenditure planning, we have carefully considered the mix of our asset-related expenditure, when considering whether to maintain or replace our assets. This is in particular focus now for the following reasons:

- The need to reduce the risk of asset stranding given the uncertainty over the UK's future energy mix;
- Our ageing asset population requires us to intervene on more assets each year to manage risk and avoid a bow wave effect of future asset replacement; and
- Our ability to leverage better asset data and analysis techniques to maximise efficiency and reduce the total cost of ownership, with consequent reductions in future customer bills.

As set out in Section 6, we have already sought to address this issue in our planned expenditure profiles. We have increased our maintenance expenditure and achieved a corresponding reduction in capital expenditure, which has naturally changed the Fast:Slow Money Split.

C. Equity Injection, dividend deferral & reducing gearing

We maintain our view that equity investors have a role to play in managing any financeability issues. Proportionate reductions in the dividend payout ratio, relative to the base cost of equity, will impact financeability positively without impacting revenue and customer bills materially.

The principles that underpin our dividend policy for RIIO-2 will remain unchanged from RIIO-1. We have a long-standing dividend policy that recognises that shareholder returns should be transparent, that promotes us exceeding our commitments to customers, that supports sustainable and prudent financing (gearing) and is fair and balanced in both the short and longer-term.

Our dividend policy is based on the premise that to deliver successful outcomes, all parties must share in that success. Our starting principle is that dividends paid will be in line with the base cost of equity but will also reflect our performance against the Regulatory Contract. This means customers and stakeholders benefiting from lower bills and better services, investors earning a reasonable return on the investment they have made and continue to make in the business, and employees being rewarded for delivering outcomes for customers. In this way, dividends paid will reflect our performance against the Regulatory Contract and our ability to generate value through the incentive arrangements that are in place. With this approach, investors will continue to challenge us to deliver the best long-term results for all stakeholders.

Additionally, we will maintain a prudent and efficient financial structure within the business. In this context, our dividend policy will continue to support appropriate levels of gearing in the business that are in line with our target credit rating of Baa1/BBB+. We will continue to target a level of gearing within the band of 60-70% over the RIIO-2 period.

Finally, we recognise that equity has an ongoing role to play in managing the overall financeability of the business. This includes the flexibility to shape dividend payments to allow continued investment in the business under a range of plausible downside scenarios.

Based on these principles our assessment of the Actual company shown above includes a base dividend pay-out ratio of 5% p.a. based upon Ofgem's core assumptions of a 4.3% Cost of Equity and 50bps of expected incentive income, NGN's actual cost of debt and gearing within the 60-70% range and a 1.5% dividend deferral rate (broadly in line with forecast GDP growth for the wider UK economy over the period and compliant with Ofgem's guidance for the Actual company) to reflect the ongoing role for equity. We have not included in the base case for the Actual company any assumption for equity issuance over the RIIO-2 period.

As far as the Notional company is concerned, an equity injection has been assumed in the amount of £118m to reflect Ofgem's working assumption on gearing reducing from 65% in RIIO-1 to 60% in RIIO-2. The dividend payout ratio for a Notional company has been reduced by 1.8% (in line with Ofgem's guidance for the Notional company) when compared with Ofgem's working assumptions on the expected equity return of 4.8%. This equates to a notional equity injection of £96m over the RIIO-2 period.

We have considered whether it is appropriate and in the long-term interests of customers to address the outstanding financeability issues through further equity injection over the RIIO-2 period either in the form of an immediate reduction in actual levels of gearing and/or further restrictions on distributions to equity holders. The results of each of these scenarios are presented below:

Further reductions to dividend payout ratio

The following table considers the extreme scenario using the base case as our starting point, where no profits are realised as cash within the period, and equity investors are not compensated for the risk they bear at all (the dividend payout rate is set to 0%).

PARAMETER	2021/22	2022/23	2023/24	2024/25	2025/26	GD-2 Average
Adjusted ICR [>1.4x]	1.27	1.35	1.36	1.48	1.56	1.41
Gearing [<75%]	65.26%	64.00%	62.67%	61.06%	59.25%	62.45%
FFO/Net Debt [>9%]	8.63%	9.18%	9.59%	10.25%	10.88%	9.71%
RCF/Net Debt [>7%]	8.63%	9.18%	9.59%	10.25%	10.88%	9.71%
FFO Interest Cover [>2.5x]	3.83	3.84	3.76	4.16	4.45	4.01

Table 7.9: Credit Metrics (actual) : 0% dividend pay-out ratio

The results of this assessment demonstrate that the actual company's financial standing achieves a position compatible with a comfortable investment grade (NGN's target of Baa1/BBB+) only by the end of the GD-2 period.

Reduction in the level of gearing

Actual gearing levels of companies in the sector show that average gearing for gas distribution is 64.7%, closely matching the RIIO-1 notional gearing assumption of 65%. Ofgem's base case position is to reduce Notional Gearing from 65% to 60%. This implies that Ofgem acknowledge that their base case assumptions and changes to the regulatory framework have increased cash flow risk in the sector.

Our view is in line with Ofgem's – that the risk has increased in the sector, which may have the knock-on effects discussed above and is likely to lead companies to reassess their gearing position. This increased risk could have knock-on effects in other areas, the cost of equity and cost of debt. Even if there is not a proven direct link, the chosen level of notional gearing can make a tangible difference in WACC, affecting a company's revenue and the bills that consumers pay.

Reducing gearing, as Ofgem suggest, requires equity holders to inject c. £151m of cash in 2021/22 to provide the necessary increased cash buffer to manage the increased risk.

PARAMETER	2021/22	2022/23	2023/24	2024/25	2025/26	GD-2 Average
Adjusted ICR [>1.4x]	1.19	1.38	1.35	1.42	1.45	1.36
Gearing [<75%]	61.31%	62.17%	62.91%	63.37%	63.62%	62.68%
FFO/Net Debt [>9%]	8.87%	9.53%	9.54%	9.76%	9.91%	9.52%
RCF/Net Debt [>7%]	5.60%	6.31%	6.36%	6.60%	6.77%	6.33%
FFO Interest Cover [>2.5x]	3.93	3.94	3.74	3.99	4.10	3.94

Table 7.10: Credit Metrics (actual): reduced gearing

The results of the assessment of the 'reduced gearing' case demonstrate that the actual company's financial standing improves only marginally on average compared with the Base case and achieves a position compatible with a comfortable investment grade (NGN's target of Baa1/BBB+) only by the end of the GD-2 period.

We have considered a further reduction of gearing compared with an already reduced level of 60%, which has been assumed by Ofgem for RIIO-2. We recognise that we should set our notional gearing level on the basis of our level of exposure to cash flow risk. We also acknowledge that there are weaknesses of very highly-geared companies. A sufficient equity buffer is needed to manage a range of risks and financeability issues.

However, reductions in notional gearing, for a given cost of equity, would increase the WACC and provide additional allowed revenue to address financeability issues. Reduced gearing also presupposes an increased role for equity providers in financing the investment programme which must be assessed against the ability of providers of equity to achieve appropriate returns. Every 5% reduction in gearing translates into a 0.12% increase in the average WACC (assuming Ofgem's SSMD working assumptions for the Cost of equity and the Cost of debt). This, in turn, leads to an increase in allowed revenue of c. £5.1m p.a. or c.£25.5m over the period. The drawbacks of this approach are significant. The transfer of money from customers to shareholders without any compensating reduction in charges in future years is, in our view, clearly inequitable.

Furthermore, falling returns on regulatory equity in RIIO-2 are not compatible with the increased role equity should play in such a scenario, which makes it unacceptable to equity investors. If this assumption were to materialise, it would further increase the level of risk perceived within the regulatory framework and place upward pressure on the long-term cost of equity for the sector.

More than a 5% reduction in gearing would deviate too much from the long-term regulatory assumption for the notional gearing. Given that current average actual level of gearing in the gas distribution sector almost matches this long-term assumption, it would be implausible to assume that the companies in the sector would be able to accommodate such an extreme change in their actual capital structure within one price control. Therefore, we have concluded that a further reduction of the notional gearing below 60% is not appropriate.

The key premise for these potential interventions to financeability constraints is that an efficient network operator will generate profits in two ways. The first element is that equity investors will realise profits in cash based upon a 'real' return on the RAV during the price control period. The second element relates to profits earned through the indexation of the RAV itself leading to higher regulatory depreciation until those assets are fully depreciated. It is assumed therefore that investors are indifferent to whether they take the cash return now, or in the case of Gas Distribution take the return through higher depreciation over a period of up to 45 years.

However, there are several key assumptions that need to hold if these options are to be considered appropriate both from an investor's perspective and to ensure that it is not increasing costs for customers in the long run, i.e. it is NPV-neutral in its application. The key assumption is that investors do not perceive there to be a change in risk over time and there are no systematic issues that would cause them to view risks in the future to be higher than today.

Additionally, the financeability constraints implied by Ofgem's base case highlight a longer-term issue in the industry and do not represent just a single-period problem, i.e. a RIIO-2 issue. Extending the financial modelling beyond RIIO-2 illustrates that the position implied by Ofgem's base case, and hence the requirement to continue deferring cashflows and equity returns, endures beyond the 2030s. This is in part compounded by the acceleration of more than £120m (2018/19 prices) of cashflows from future regulatory periods driven by the switch from RPI to CPIH. This, it must be recognised, is a short-term fix to an underlying structural issue and without any further changes to the framework implies significantly and constantly increasing requirements from equity beyond RIIO-2. This cannot be viewed as being NPV-neutral from an equity investor's perspective or in the long-term interests of customers, as it will result in higher costs to customers in the future than would otherwise be the case.

There is clear theoretical and empirical evidence that equity investors could be materially impacted by such a delay, (more details can be found in Appendix A28 – Review of NGN's Financial Analysis for RIIO-GD2.) A deferral in current dividends relies on the assumption that the GDNs would be able to yield higher cash flows in the long term, potentially on sale or through a higher WACC. However, there is no guarantee that this will be the case, and indeed there is a potential concern that investors are exposed to a heightened risk of asset stranding in the future – this is particularly true for gas distribution and transmission assets due to potential policy decisions that could impact the future role of gas in the energy mix.

In addition, a large increase in cash flow duration is likely to affect the base cost of equity, due to:

- A time-inconsistency effect resulting from the increased probability of events occurring which are not covered by the 'regulatory contract', and a potential impact on asset risk. This risk is heightened in the gas sector due to the uncertainty about decarbonisation pathways and the potential risk of asset stranding in the period beyond RIIO-2;
- A term premium effect, resulting from the increased sensitivity of the value of the stream of cash flows to interest rates. This effect means that the cost of equity will tend to increase with lengthening in the duration of cash flows;
- A beta effect, resulting from the increased sensitivity of the beta to longer-term interest-rate fluctuations and market risk; and
- Exposure to outturn inflation being lower than the expected level of inflation assumed in setting the real cost of equity.

The Ofgem base case implies a significantly higher deferral of returns to future periods than has been identified in any previous regulatory determination. In certain scenarios, this includes the requirement to defer all the real return on RAV element of profit to future periods.

It is also worth recognising that previous regulatory decisions on depreciation rates and profiles have meant that in many areas these have deviated from true economic lives, but also that there are significant discrepancies between different elements of the energy sector. Gas distribution has longer depreciation profiles than electricity distribution, and deferral of cashflows has a longer duration and hence higher risk than in other parts of the industry.

Therefore, we have concluded that the alternative scenarios discussed in this subsection are not appropriate for the reasons mentioned above.

The results of the analysis of the Ofgem base case, the requested sensitivity analysis and the assessment of the relevant risks set out above address the minimum business plan requirements included in the published Business Plan Guidance. These are presented to provide a clearer understanding of the results of Ofgem's base case assumptions on the notional and actual company and do not represent NGN's proposal for the RIIO-2 period.

7.4. Our proposed financial package for RIIO-2

The above analysis represents the required assessment of the financial package prescribed by Ofgem in the published Business Plan Guidance document . However, this should not be interpreted as acceptance of Ofgem's financial framework and the proposed working assumptions for cost of capital allowances nor that the business would be financeable beyond the RIIO-2 price control period. We continue to hold the view that a number of Ofgem's core SSMD assumptions are incorrect, including;

- **Cost of debt** - Analysis of Ofgem's working assumption on the cost of debt allowance based upon an 11–15 year trombone shows that the gas sector would be forecast to underperform the debt allowance over RIIO-2 . More details can be found in Appendix A29 – Cost of Debt in RIIO-GD2 – A report prepared for NGN, and A30 – Cost of Debt at RIIO-2 – A report for gas distribution networks. Ofgem's proposals do not meet their stated objective of broadly matching debt allowances with sector expected efficient debt costs for RIIO-2 through the calibration of the index.
- **Expected returns** - Ofgem have not provided and our own analysis has not identified a reasonable basis on which it could be assumed that an average/notional GDN can systematically outperform by 50 bps in RoRE terms (More details can be found in Appendix A31 – Outperformance Wedge).
- **Cost of equity** - There is strong empirical evidence that in conjunction with the assessment of Expected Returns, Ofgem's assessment of a base cost of equity of 4.3% is too low and indeed outside of the plausible range for the risk profile of the sector and particularly for gas networks that face systematic risks associated with uncertainty on the longer term role of gas in the energy mix in the UK (More details can be found in Appendix A32 - the cost of equity for RIIO-2 Q4 2019 update).

We are therefore proposing a financial package for RIIO-2 that we believe better reflects the underlying efficient financing costs and the short and longer term risks that exist in the sector. The proposal represents a more appropriate balance between the allocation of risk and reward between investors and customers. It also avoids the potentially significant longer term increases in cost to customers from the perceived increase in risk for investors implied by Ofgem's base working assumptions. In accordance with Ofgem's guidance, these proposals are set out in a separate document to this business plan. More details can be found in Appendix A33 – NGN's Proposed Financial Package for RIIO-2.

7.5. Customer bills

We have historically been the most efficient GDN in the UK. This has allowed us to keep revenues and our part of customer bills broadly flat for 10 years whilst continuing to invest significant amounts in the network and continuously improving the levels and quality of services we provide.

In this business plan we are committing to significantly improving performance in our key service areas. We are aiming to deliver a further step-change in efficiency whilst delivering these stretching targets in an increasingly uncertain environment. Our stakeholders have once again told us that we need to prioritise safety, reliability, customer service and environmental sustainability. We have built these priorities into our plan and our delivery model to ensure that we will remain resilient to the challenges and pressures we expect to face.

In order to deliver our overall proposals (including our proposed financial package set out in Appendix A33 to this document), we require an average annual revenue in RIIO-2 of £404.93m. When the RIIO-1 true-ups are included, we expect to collect on average £401.84m p.a. compared with the average revenue of £436.31m p.a. collected in RIIO-1, which totals to a c. £172.35m reduction over the 5-year period. When the average domestic customer bills are estimated using total collected revenue, we forecast they would fall from c. £139 p.a. in RIIO-1 to c. £127 p.a. in RIIO-2, which represents an 8.6% saving to customers.

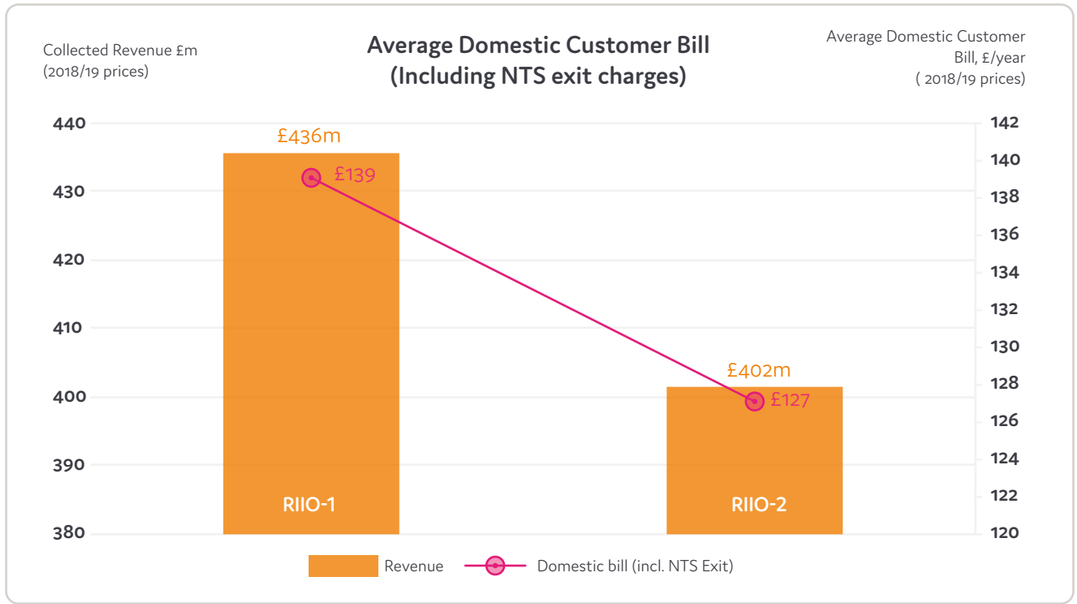

Figure 7.1: Average NGN revenue and average Domestic Customer Bill in RIIO-1 and RIIO-2.

(All figures are derived from NGN's Transportation Pricing Model adapted for the inclusion of NTS exit capacity costs. A summary of the model has been submitted alongside this Business Plan. Core assumptions for RIIO-2: 1. Bills are based on the collected revenue. 2. NTS exit costs (£27.5m) have been included. 3. Average AQ is 14084 kWh (as in 2018/19) 4. Average load factor is 34.23% (as in 2018/19).

However, it should be noted that domestic customer bills are normally quoted excluding NTS exit capacity costs to separate the impact of the distribution network's costs from the transmission network's costs on the customers. NGN would face an unavoidable increase in our uncontrollable costs relating to NTS exit charges. We will collect c.£8.4m p.a. of revenue to pay the NTS charges in RIIO-1. This number will rise to circa £27.5m p.a. in RIIO-2.

Therefore, when the NTS exit costs are excluded, NGN's forecast revenue falls from £427.93m in RIIO-1 to £374.34m in RIIO-2, which is a £267.97m reduction over the 5-year period. Average domestic customer bill, excluding an NTS exit element, is projected to fall from c. £138 p.a. in RIIO-1 to c. £120 p.a. in RIIO-2, which represents a 13.2% saving to customers.

An overview of our plan | Giving customers confidence that we will deliver | Giving customers a stronger voice | Delivering better outcomes for customers | A sustainable plan for the future | Delivering value for money | **Financing our plan**

Our List of Terms

ABC
Asset Backed Contribution

AER
Annual Environment Report

AESL
Advanced Engineering Solutions Ltd.

AICR
Adjusted Interest Coverage Ratio

BAU
Business As Usual

BCF
Business Carbon Footprint

BEIS
Department for Business, Energy and Industrial Strategy

BOL
Business Operations Leader

BDPT
Business Plan Data Table

CAPEX
Capital Expenditure

CASB
Cloud Access Security Broker

CAT
Cable Avoidance Tool

CBA
Cost Benefit Analysis

CCG
Ofgem's Customer Challenge Group

CCUS
Carbon capture and underground storage

CCS
Carbon capture and storage

CDSP
Central Data Service Provider

CEG
Customer Engagement Group

CESI
Centre for Energy Systems Integration

CHP
Combined heat and power

CNG
Compressed Natural Gas

CiVS
Customers in Vulnerable Circumstances

CKI
CK Infrastructure, owner of NGN

CMA
Competition & Markets Authority

CNI
Critical National Infrastructure

CO
Carbon monoxide

COMAH
Control of Major Accident Hazards

CPIH
Measure of consumer price inflation incl. housing

CNG
Compressed natural gas

CP
Cathodic Protection

CPI
Consumer Price Index

CPIH
Measure of consumer price inflation

CRC
Carbon Reduction Commitment

CSIRT
Computer Security Incident Response Team

CSR
Corporate Social Responsibility

CSS
Customer Satisfaction Surveys

CVP
Consumer Value Proposition

DART
Direct Allowed Revenue Terms

District Governor
Pressure Reduction Unit

DM & NDM
Daily Metered and Non Daily Metered

DNO
District Network Operator

DRS
Discretionary Reward Scheme

DSP
Direct Service Providers

EAP
Environmental Action Plan

EBITDA
Earnings Before Interest, Tax, Depreciation and Amortization

ECV
Emergency Control Valve

EDTF
Energy Data Task Force

EHS
Environment, Health & Safety

EIC
Energy Industries Council

ENA
Energy Networks Association

EPSRC
Engineering and Physical Sciences Research Council

E-SEAL
Electrion Seal

EVR
Early Voluntary Retirement

FES
National Grid Future Energy Scenarios

FFO
Funds From Operations

FPNES
Fuel-Poor Network Extension Schemes

FMECA
Failure Modes, Effects and Criticality Analysis

FWOW
Future Ways of Working

GDPCR
Gas Distribution Price Control Review

GD
Gas Distribution

GDN
Gas Distribution Network

GEMA
Ofgem's Board

GIGG
Gas Innovation Governance Group

GIS
Graphical Information System

GSOP
Guaranteed Standards of Performance

GVA
Gross value added

H21
Project to convert existing network to full hydrogen

HSE
Health and Safety Executive

HyDeploy
An energy trial to establish the potential for blending hydrogen, up to 20%, into the normal gas supply

IAM
Institute of Asset Management

I&C
Industrial and Commercial

IDP
Investment Decision Pack

IGT
Independent Gas Transporters

ILD
Index Linked Debt

IMRP
Iron Mains Replacement Programme

IMRRP
Iron Mains Risk Reduction Programme

InTEGreL
Integrated Transport Electric and Gas Research Laboratory

IoT
Internet of Things

IP
Intermediate Pressure

IQI
Information Quality Incentive

ISG
Investment Steering Group

LAEPs
Local area energy plans

LEP
Local enterprise partnership

LDZ
Local Distribution Zones

LO
Licence Obligations

LTIs
Lost Time Injuries

LTS
Local Transmission System

MECC
Making Every Contact Count

MEG
Mono-ethylene glyco

MFA
Multi Factor Authentication

MOB
Multi-Occupancy Building

MoP
Members of the Public

MP
Medium Pressure

MPRN
Meter POint Reference Number

MRPS
Mains Risk Prioritisation System

NAC
Network Access Control

NAPs
Network Analysis Polygons

NARMs
Network Asset Risk Metrics

NELEP
North East Local Enterprise Partnership

NGT
National Grid Transco plc

NIA
Network Innovation Allowance

NIC
Network Innovation Competition

NOMs
Network Output Measures

NOx
Nitrogen Oxide

NRSWA
New Roads and Street Works Act

NTS
National Transmission System

ODI/ODIs
Output Delivery Incentives

OES
Operator of Essential Services

OJEU
Official Journal of the European Union

OLI
On Line Inspection

OPEX
Operating Expenditure

OT
Operational Technology

PAM
Privileged Access Management

PARCA
Planning and Advanced Reservation of Capacity Agreement

PCD
Price Control Deliverable

PDP
Professional development programme

PE
Plastic Piping (polyethylene)

PEA
Proven Eligibility Assessment

PEMS
Post Emergency Metering Services

PMO
Project Management, Office

PR19
Water utilities price review 2019

PRE
Publicly Reported Escape

PSSR
Pressure System Safety Regulations

PRS
Pressure Reduction System

PSR
Priority Services Register

PSUP
Physical Security Upgrade Programme

R&D
Research and development

RAT
Risk Action Threshold

RAV
Regulatory Asset Value

RCF
Retained Cash Flow

REPEX
Replacement expenditure

RIIO
Regulatory Framework (Revenue = Incentives + Innovation + Outputs)

RORE
Return on Regulatory Equity

RPEs
Real price effects

RPI
Retail Prices Index

SCADA
Supervisory Control and Data Acquisition

SDG
Sustainable Development Goals

SGN
Scotia Gas Network

SIVs
Service Isolation Valves

SOAR
Security Orchestration, Automation and Response.

SOC
Security Operations Centre

STASS
System Two Assess and Seal

STEM
Science Technology Engineering and Maths

TOTEX/Totex
Total Expenditure

TRL
Technology Readiness Level

UEBA
User and Entity Behavour Analytics

UIP
Utility infrastructure providers

V-SAT
Satellite System

WACC
Weighted average cost of capital

WTP
Willingness to Pay


CENTURION
Concept
GAS