

RIIO – GD1 Year 6 Report

July 2019



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A. CEO and Board update

1. Chief Executive Officer's Report

Each year this report provides a great opportunity for us to set out the details of how we are performing against your expectations, both in terms of service and value. We believe that it is through placing our customers at the heart of our business and a genuine desire to constantly innovate and challenge ourselves and the wider industry that we will deliver our objective. This objective remains to provide an exceptional customer experience through delivering the services our customers require, at the levels they expect and at a price that represents great value for money.

This report sets out the details of our performance in 2018/19 and represents 'Year 6' of the eight year RIIO-GD1 Regulatory Period. I am very pleased that our performance during the year and indeed the six years period since 2013/14 shows that we are delivering well on behalf of our customers.

Whilst our focus remains on ensuring we are delivering during this regulatory period, attention is also now turning to the details of the next period that will commence in 2021. It has always been a key objective of our business that our levels of performance are sustainable for the longer term. In simple terms we aim to tackle the 'hard stuff' first and in doing so ensure that both the levels of cost and service achieved set the benchmark levels for the next period.

As a result, we are confident that our business is resilient to the challenges of the future and that our levels of performance are not only sustainable but provide a sound basis for delivering further value for customers going forward.

Value for Money – We remain the most efficient Gas Distribution Network in the UK - a position we have held consistently over the RIIO-GD1 period. The transformational changes we have made to core elements of our business over the period since 2013 include:

- moving the majority of our workforce onto modern terms and conditions;
- creating new and innovative supply chain models;
- aggressively introducing competitive frameworks into new parts of our business; and
- more recently, in 2018/19 we started to deploy the power of new technologies with significant investment in IT systems to completely redefine some of our business processes.

Collectively this is helping us to clearly define the frontier performance on cost for the industry and provide a benchmark for future expenditure.



Mark Horsley, CEO, Northern Gas Networks

Customer Experience – The regulatory framework has provided a strong competitive basis for ensuring gas distribution networks are seeking to improve the experience that customers receive. A small number of networks, including NGN, are now delivering satisfaction scores in excess of 9 out of 10 on a consistent basis and are pushing each other forward to achieve further improvement for customers.

There are a number of initiatives that we have implemented successfully in 2018/19 including a move to proactive payment of compensation for a number of standards where currently the customer has to make a claim. Additionally, we are now working to a standard of agreeing a resolution to a complaint within 60 minutes 90% of the time (Our 90 in 60 commitment).

Investing in our communities – We recognise the privileged position that we hold within the communities that we serve and the responsibility that we have to support the communities and individuals facing difficulties. We developed our Communities Promises Framework to challenge our entire business to come up with initiatives that make a real, sustainable, positive impact on people’s lives and the most vulnerable in our communities. Our stakeholders have been very clear that they see this as an increasingly important aspect of our business. With this in mind, we have been working hard to ensure we are delivering above the minimum required by our regulatory targets and have been ambitious in terms of reach and scale of our initiatives. Some examples include:

- **Fuel Poverty** – we are confident we will exceed the regulatory target of 14,500 fuel poor connections over RIIO-GD1 and deliver our stretch target of 16,000. On average each of these customers will save £350 on their annual energy bill. Additionally, we launched our Warm Hubs Community Project to help residents facing fuel poverty, isolation and loneliness by providing warm, friendly places where people can socialise, get warm, have a hot meal and access information, advice and referrals to relevant support. So far, 26 Warm Hubs have been established and been successful in attracting a further £750k of external funding.
- **Carbon Monoxide Awareness** – We have conducted over 22,000 doorstep awareness surveys to date, to measure our impact on raising CO awareness. Feedback has demonstrated that awareness has increased from 6.9/10 to 9.3/10 since 2013. We are the only GDN to be recognised as a BPEC accredited training provider in CO awareness. This allows us to train over 20 external organisations in the risks of CO who have in turn reached another 7,000 at risk customers.

I am very proud of the positive impact we have been able to make in our communities. It was particularly pleasing to recently be given a ‘Champion of Champions’ trophy at the International Corporate Social Responsibility (CSR) Excellence Awards. The award recognised our achievements above those from a wide range of organisations across the world. Proving once again that relatively small, regional companies in the UK can deliver frontier levels of performance in the global economy.

Energy Transition – The task of achieving Net-Zero carbon emissions by 2050 remains a significant challenge for the UK. We are continuing with or ground-breaking work on developing the technical, safety and business case for replacing natural gas with hydrogen. Working collaboratively with the wider industry, our projects include:

- **H21** – our flagship project to establish hydrogen as a future fuel is progressing well against the project objectives. For which a further £10.3m of Innovation funding was awarded by Ofgem in 2017.
- We published our **H21 North of England** report with Equinor and Cadent Gas in 2018. The report provides a detailed engineering solution for converting 3.7 million UK homes and businesses from natural gas to hydrogen in order to reduce carbon emissions.
- **Hydelpoy2** – Further funding of £14.9m has been secured to deliver two field trials on public gas networks, blending hydrogen with natural gas to heat around 750 homes in each of the year-long trials. Working in partnership with Cadent Gas there will be one trial in each company’s geographic footprint. This means one in the North West England and one in the North East.

Innovation – In 2018/19 we continued to invest in new innovative projects that stand to make a real difference on the streets of the North of England. Our STASS robotics project is a standout example of this – a robot that can be inserted into pipes to carry out condition surveys and repairs. This technology, unthinkable just a few years ago, is now reducing the cost of our pipeline maintenance activities and reducing disruption to our customers. The financial benefits of our innovation programme have continued to increase year-on-year, as more and more of these projects have become embedded within our business. Our investment of £12.9M throughout GD1 has delivered £4.6M of savings and will long continue to deliver benefit not only in the current price control period, but throughout GD2 and beyond.

Performance during 2018/19

The results for the 2018/19 reporting year shows continued strong performance against the RIIO-GD1 Regulatory Contract both in terms of value (cost to deliver) and service delivery (Outputs):

- **Value (Total Expenditure)** – in 2018/19 we outperformed the Totex allowance by £24.3m and £203.3m over the first six years of RIIO-GD1. This will result in £73.2m being returned directly to customers in the form of lower network charges relating to this six-year period. The majority of this outperformance is driven directly by genuine and enduring efficiency improvements as a result of the initiatives outlined above. These initiatives have changed the way in which we deliver our key services in our operating and replacement activities and more recently in our back office functions through new technologies and systems.
- **Service Delivery (Outputs)** – our strategy is to treat all primary and secondary outputs within the Regulatory Contract as firm commitments over this period and where appropriate go above and beyond those minimum requirements, delivering the best possible service for our customers. The introduction of Asset Risk and the ability to trade risks between assets within the regulatory framework provides the ability to ensure that more optimal investment decisions are being made to deliver value for consumers. It is likely during the RIIO-GD1 period that the requirement to invest in the replacement of metallic services will be lower than we forecasted back in 2013. However, we have ensured that investment levels in the network are maintained and invested this expenditure elsewhere in our network (e.g. additional steel and iron mains) to deliver the overall improvement to risk for customers. Where these trade-offs have been we are in a position to illustrate this fully. Our performance in 2018/19 illustrates we are firmly on track to deliver on our commitments across the 6 output categories over the period and in many areas significantly exceed those targets.

We continue to monitor and evaluate the key risks to our business in an evolving environment. We also continue to see new risks and opportunities develop that were not present when agreeing the RIIO-GD1 Regulatory Contract. At present we have not identified any risks that, with appropriate management, would impact upon the delivery of our commitments over the period.

Looking Forward - RIIO-GD1 and RIIO2

We continue to aim to be the leading GDN in the sector and the levels of performance we achieve are sustainable for the longer term. It is clear that the operating and financial environment in RIIO-GD2 will be increasingly challenging. However we believe that we are very well placed to respond to these challenges.

The focus on sustainable performance along with continued prudent management of our financial position means we now have a business that is resilient and well placed to meet the challenges of the future. Continuing to drive down bills whilst increasing service levels for our customers in the short and longer term.

2. Board Update

The company's business strategy is to provide, develop and maintain a safe, affordable and secure gas distribution pipeline system, for the provision of gas supplies to the people and businesses within our region. Underpinning this strategy is a strong compliance culture which the Board directly monitors through its risk management, audit, treasury and compliance committees.

I am pleased that NGN has again met all of the output targets agreed as part of the RIIO-GD1 price control. During 2018/19 we continued to demonstrate strong customer, safety and reliability performance. Incentive arrangements for the senior management team are directly linked to the safety, customer and efficiency targets within the regulatory contract. These targets are updated annually.

The focus of the Board continues to support NGN in its ambition 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.

We continue to support the investment in new systems and technologies that will facilitate the further development of business processes and increased efficiency and productivity of operations. These investments will also provide a solid basis from which the company can explore and utilise significant opportunities that exist with the utilisation of data and technologies enabling the automation of standard business processes.

The principal risks associated with the business and the associated mitigations are regularly reviewed by the Board. These include breach of legal and regulatory obligations, health and safety failure, network asset performance failure, employee retention and financial risks associated with interest rates, liquidity and credit. These remain largely unchanged over the course of the year though the Board has paid increased attention to the risks and has monitored the company activities associated with cyber security. The Board is satisfied with the arrangements the company has in place.

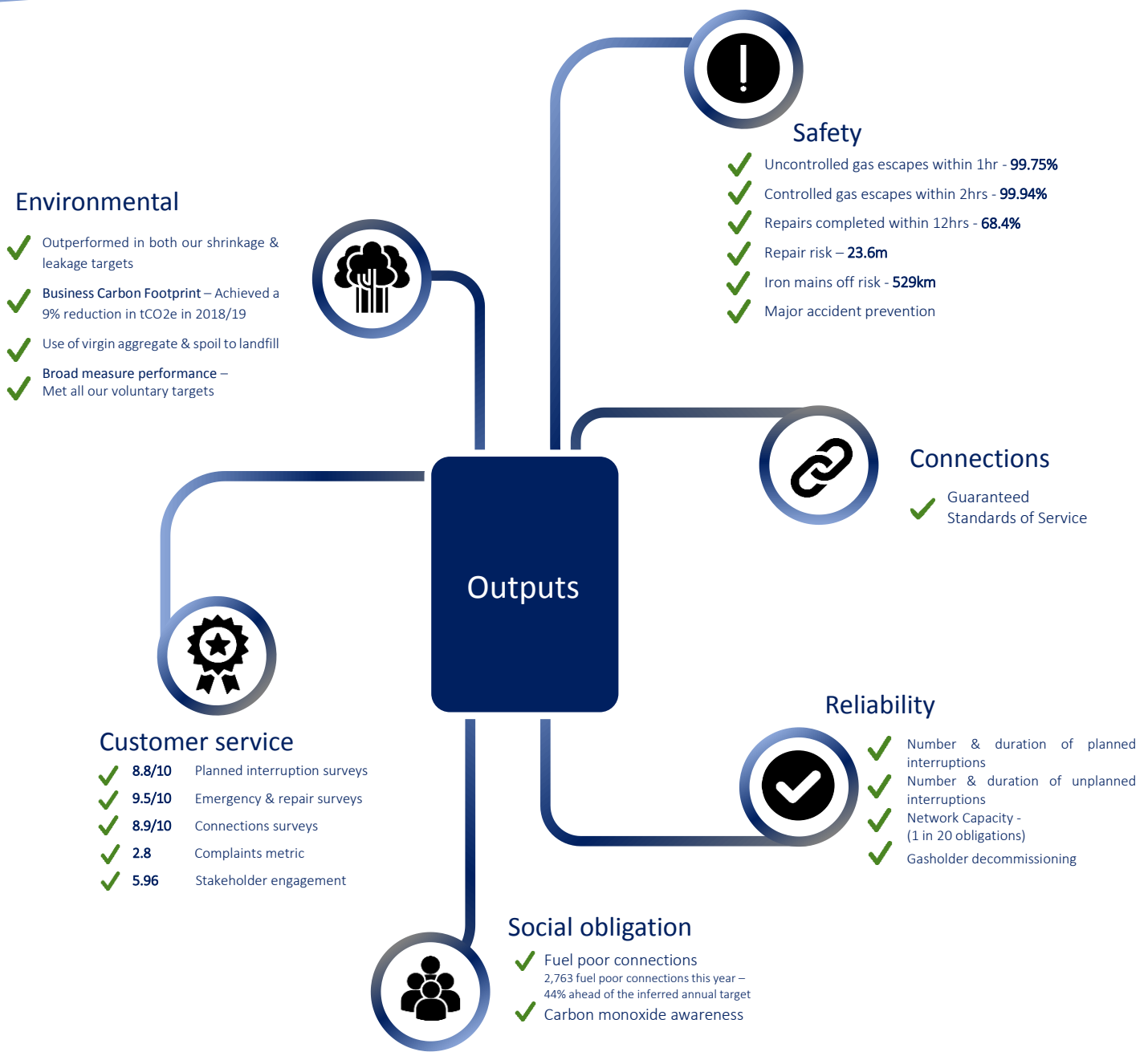
The challenges presented by the both the next regulatory price review and the transition to a low carbon economy in the UK are clear and significant. The Board continues to support the initiatives within the business that seek to directly address these challenges. We are pleased with the progress that is being made by ourselves and the wider industry in identifying the role of gas and the gas network infrastructure can play in the decarbonisation of heat through conversion to hydrogen. Our ground breaking work on the H21 project is continuing and our collaborations with Cadent Gas in securing additional funding for the Hydeploy2 project illustrate the continued progress in this area.



Andrew Hunter, Chairman, Northern Gas Networks

B. Executive Summary

3. RIIO - Performance Overview



Total Annual Revenue
£409m



Regulatory Asset Value

Opening value - £2126.4m
Closing value - £2212.6m



Innovation

Funding awarded in 2018/19
NIA - £2.55m
NIC - £8.92m



Customer Bill Impact

£134 down to £131 –
Average of £128

RoRE

18/19	RIIO
10.2%	10.9%

	£m	RIIO
Other Incentives	18/19	
Customer Service	2.1	17.3
Shrinkage	1.0	6.6
Leakage	4.3	38.7
Exit capacity	1.8	10.6
Total	9.2	73.2



	£m	RIIO
TOTEX Incentive	18/19	
Actual	238	1930
Adjusted allowances	262	2185
Outperformance	24	253
Outperformance %	9.1%	11.6%
Return to customers	9	91



4. Totex Drivers

The table below provides a high level summary of our Totex cost drivers for the RIIO-GD1 period. Further details and explanation are then provided in Section 5 – Performance Summary.

Driver	Category	Estimate of RIIO Totex under / overspend (£m estimate)				% of Totex Allowance
		Opex	Capex	Repex	Totex	
Allowance		861.7	438.4	884.5	2184.6	
Efficiency	Efficiency	(119.1)	(60.4)	(147.2)	(326.8)	(15%)
Land Remediation	External factors	(2.2)			(2.2)	0%
Weather impact	External factors	(15.7)			(15.7)	(1%)
Maintenance workload	Price control assumption	26.6			26.6	1%
Interruptions	Efficiency	(35.7)			(35.7)	(2%)
Xoserve	External factors	(6.7)			(6.7)	0%
Connections workload	External factors		(17.2)		(17.2)	(1%)
Connections efficiency	Efficiency		18.2		18.2	1%
Fuel Poor workload	External factors		2.7		2.7	0%
Fuel poor allowance	Price control assumption		10.5		10.5	0%
Reinforcement workload	Efficiency, External factors		(15.8)		(15.8)	(1%)
Governors workload	Price control assumption		5.2		5.2	0%
IT and Building investment	Price control assumption		67.3		67.3	3%
Unforeseen Capex	External Factors		10.0		10.0	0%
Risers and Subdeducts	Price control assumption			(11.2)	(11.2)	(1)%
Repex Transfers	External factors			(4.0)	(4.0)	0%
Steel workload	Price control assumption			10.0	10.0	0%
Other Mains Workload	Price control assumption			34.3	34.3	2%
Non Recurring		(3.4)			(3.4)	0%
Actuals		705.3	458.8	766.5	1930.7	88%

Figure 4.1: Totex Drivers

5. Performance Summary

Gas distribution was the first sector in the energy industry to have a periodic review of its prices carried out under the new RIIO principles. This new price control applies for the eight year period from 1 April 2013 to 31 March 2021 and is referred to as RIIO-GD1. We have now successfully completed the sixth year of operations under RIIO and are well on the way to delivering the key outputs and deliverables we committed to in our business plan and when accepting the outcome of the price control. Northern Gas Networks (NGN) continues to be the most efficient gas distribution network overall, evidenced by the financial benchmarking of the eight GDNs since 2005/06. We are looking to maintain this position whilst operating a safe and reliable network and delivering on our customer commitments.

5.1. Financial Performance

Ofgem use the Return on Regulatory Equity (RORE) to measure the potential financial returns or penalties on the portion of the value of the company that is financed by equity. RORE is calculated by using the cost of equity (6.7%) as the starting point as this amount is funded directly in revenue. The cash value of any outperformance from the incentive mechanisms is then divided by the 35% notional equity portion of the Regulatory Asset Value to calculate the additional return on equity earned. The table and graph below shows our annual, cumulative and forecast 8 year RORE:

RORE	13/14	14/15	15/16	16/17	17/18	18/19	RIIO to date	RIIO 8 year forecast
Base cost of equity	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%
Totex	3.5%	2.8%	3.4%	3.5%	2.7%	2.2%	3.0%	2.8%
IQI Income	0.4%	0.5%	0.5%	0.5%	0.4%	0.4%	0.4%	0.4%
Customer Satisfaction	0.4%	0.3%	0.4%	0.4%	0.3%	0.3%	0.4%	0.4%
Shrinkage	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
Environmental Emissions	0.3%	0.4%	0.4%	0.6%	0.5%	0.5%	0.4%	0.4%
Discretionary Reward	0.0%	0.1%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%
NTS Exit Capacity	0.0%	0.1%	0.4%	0.2%	0.2%	0.2%	0.2%	0.1%
Network Innovation	(0.0%)	(0.3%)	(0.0%)	(0.1%)	(0.1%)	(0.1%)	(0.1%)	(0.1%)
Penalties and Fines	(0.0%)	(0.0%)	(0.0%)	(0.0%)	(0.0%)	(0.1%)	(0.0%)	(0.1%)
RoRE - Operational	11.3%	10.7%	11.7%	11.9%	10.9%	10.2%	11.1%	10.9%
Debt Performance (notional gearing)	4.2%	1.9%	(0.2%)	1.7%	4.5%	2.9%	2.5%	2.4%
Tax performance (notional gearing)	(1.3%)	(1.3%)	(0.6%)	1.5%	0.0%	0.1%	(0.3%)	(0.0%)
RoRE – including Finance and Tax	14.3%	11.3%	10.9%	15.1%	15.4%	13.2%	13.4%	13.3%

Figure 5.1: RORE breakdown

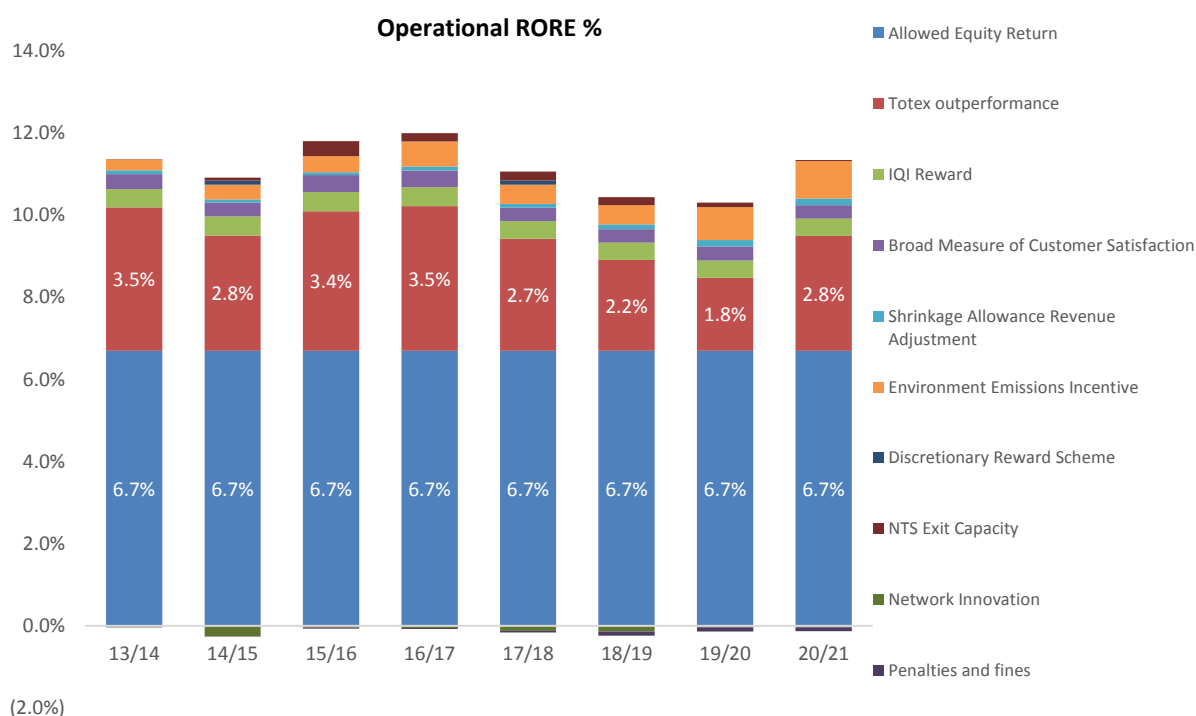


Figure 5.2: Operational RoRE Graph

5.2. Totex financial performance

The largest contribution to our RORE performance comes from our Totex outperformance. Under the Totex incentive mechanism any outperformance is shared with our customers who receive 36% of any outperformance through 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	(253.9)
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 5.3: Totex Performance

In 2018/19 we have outperformed the Totex allowance by £24.3m (9.3%) which generates a RORE of 2.2%, below the average of 3.0% we have achieved in the first six years of RIIO-GD1. Over RIIO-GD1 we expect our Totex outperformance to be £253.9m, an average of £31.8m, which generates a RIIO period RORE of 2.8%.

Overall this is a strong performance. It is important to remember that the allowances were benchmarked against the other GDNs and, as the frontier performer, the allowances we have been set are in some cases higher than our base costs were when the allowances were set. Further details on our performance are set out below.

5.2.1. Opex financial and output performance

The table below provides a summary of our controllable Opex performance against the allowance over the whole RIIO-GD1 period.

Opex forecasts 2018/19 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
Work management	15.0	17.5	19.1	19.6	16.4	14.6	15.8	15.0	133.1
Emergency	11.0	11.3	11.3	11.0	11.2	10.6	11.5	11.4	89.2
Repair	18.4	16.5	14.8	14.3	15.2	16.1	16.5	16.1	127.8
Maintenance	9.4	10.3	10.7	10.8	11.2	12.0	13.5	14.5	92.4
SIUs	-	-	-	-	-	-	-	-	-
Other direct activities	7.6	7.5	7.1	7.0	6.1	5.7	5.4	5.3	51.6
Of which Xoserve	4.3	4.7	4.7	4.1	3.4	2.5	2.6	2.6	28.8
Total direct Opex	61.4	63.2	62.9	62.7	60.1	58.9	62.6	62.3	494.1
Business support	26.5	27.1	22.5	23.1	23.8	21.2	23.9	24.1	192.3
Training/apprentices	2.7	2.6	2.0	2.1	1.8	2.0	2.3	3.5	18.9
Total indirect Opex	29.2	29.7	24.5	25.2	25.6	23.2	26.2	27.6	211.3
Total controllable Opex	90.7	92.9	87.4	87.9	85.7	82.1	88.8	89.8	705.3
Allowance	109.0	110.2	110.8	111.0	107.0	105.8	104.7	103.2	861.7
Variance	(18.3)	(17.3)	(23.4)	(23.1)	(21.3)	(23.7)	(15.9)	(13.4)	(156.4)
Cumulative Variance	(18.3)	(35.6)	(59.0)	(82.1)	(103.4)	(127.1)	(143.0)	(156.4)	

Figure 5.4: Opex forecasts

To date we are outperforming the controllable Opex allowances by £127.1m (19.6%), generating an average RORE of 1.9% p.a. We expect to continue outperforming the reducing Opex allowance, delivering a total outperformance over RIIO-GD1 of c£156.4m or c18.2%, and a RORE of 1.8%.

There are several key drivers for our strong performance against the benchmarked Opex allowances. The main driver is our historic operational efficiency and the further improvements we have delivered in RIIO-GD1. We estimate this will account for 76% of our outperformance over the period, c£119.1m out of c£156.4m, or £14.9m per annum.

A major driver for this efficiency is our modernised employee terms and conditions. These deliver a number of benefits which impact across the network, with the greatest impact in controllable Opex. We have:

- Refreshed our previously ageing workforce;
- Introduced more flexible working arrangements that match business and customer requirements;
- Incentivised employee performance – employee reward is now mainly linked to delivery of the Regulatory Contract;

- Revised terms and conditions that more closely reflect market rates; and
- Recruited, trained and developed a workforce ready to meet future challenges.

So far we have c550 employees on new terms and conditions and over 600 on personal contracts out of an internal workforce of nearly 1,500. In terms of efficiency we estimate this is now delivering around £6m of benefits each year in Totex, with the majority (over £4.3m) being realised in our Emergency, Repair and Maintenance activities in Opex. This will continue to increase over time, and we will continue to invest in new ways of working to deliver further benefits across all activities.

We have also invested significantly in technology and process improvements and will continue to do so in the remainder of RIIO-GD1. We have made significant efficiencies in our IT and Telecoms delivery model and have seen operating costs reduce by nearly £6m over the last three years through the refresh of our service contracts and review of our licence and system requirements. Details on our significant IT investment are provided in the Capex section below.

Further efficiencies have been delivered through business process improvements across all of our back office and front office processes. We have further optimised all of our field based work patterns, reduced head count in many areas such as Street works and Dispatch through process improvements and the use of technology, and seen benefits from reduced overtime and average salaries across our supervisory workforce. We have introduced a Digital Operations room and Remote Hub which allows us to monitor work patterns and results more effectively.

As part of our Repex programme we have consistently targeted replacing some of our poorest performing pipes. This is a key driver for improving our emergency and repair performance over RIIO-GD1, and over time we would expect both costs and workload to trend downwards. In addition winters have been relatively mild in RIIO-GD1 compared to the last price control period, which has impacted overall workload, overtime payments and contractor costs.

	13/14	14/15	15/16	16/17	17/18	18/19
PREs	89,290	83,446	93,411	90,016	90,224	82,713
Reports	24,197	22,082	20,260	18,676	18,672	20,220
Repairs	25,526	22,377	19,933	17,801	17,484	19,169

Figure 5.5: Emergency and Repair Workload

However in recent years we have experienced short periods of more extreme winter weather which has affected both costs and workload. We have seen severe flooding, in particular in 2015/16, which resulted in three major off-gas incidents, and in 2016/17 where one major incident resulted in 2,756 interruptions. During 2017/18 we saw increased workload across the winter months from December to March with the biggest increase in March during a sustained period of more extreme weather. Overall workload was flat but this spike in workload had a knock on impact on costs which increased by £1.0m.

In 2018/19 we have seen the number of Reports and Repairs actually increase, however this time the largest increase was during the summer months during a period of extreme warm weather. This most likely caused ground movement and increased leaks, leading to increased reports and repairs. This increase in workload had a knock on impact on repair costs which increased by nearly £1m.

Severe weather throughout the year is now becoming more prevalent. We have invested significantly in active pressure management and in adequate capacity at the local level to increase our ability to flexibly manage our system during these periods. This ensure that we minimise the risk of losing supplies during these difficult periods.

For the remainder of RIIO-GD1 our forecast assumes more typical winters which could increase our costs by more than c£1.3m p.a across emergency, repair and associated supervisory activities.

Despite this we estimate that over RIIO-GD1 weather would deliver net savings of c£15.7m compared to the equivalent allowance.

Our Opex allowance in RIIO-GD1 included a one off allowance to manage the risks associated with potentially reinforcing large customers who were currently on interruptible contracts. Our successful management of this risk through network analysis, system balancing and contingency plans is delivering a one off outperformance in this price control period of c£35.7m p.a.

Our maintenance workload has consistently been above the benchmarked workload allowed within the allowances, but has been broadly consistent with the workload we forecast to deliver in RIIO-GD1. We estimate this price control assumption is driving an £18.2m overspend against the allowance over the 8 year period. In addition we expect to increase our maintenance activities from now and into RIIO-GD2. This is a strategic change as we have invested significantly in Capex to replace and upgrade our riskier and more problematic assets. We plan to intervene on more of our assets in future through increased maintenance rather than undertaking full asset replacement. This is reflected in our forecast.

There are two other primarily externally driven factors that are impacting our overall outperformance against the allowance:

- We estimate Land Remediation costs to be £2.2m lower than the allowance over RIIO. Costs for this type of work are very difficult to estimate and are largely driven by what you discover when the work is underway; and
- Xoserve costs are expected to be £6.8m lower than the RIIO period Opex allowances.

In terms of Opex related outputs, the majority are related to our Emergency and Repair activities. We have delivered a strong performance across all of these outputs to date, and expect to continue to do so over the remainder of RIIO-GD1. However the abnormally warm weather we experienced across the summer months has impacted workload, with a knock on effect on some of the outputs. This is factored into our forecasts which are detailed in the relevant sections later in this document. Highlights of our performance this year include:

- We achieved a near 100% response rate for both the 1 and 2 hour emergency response standards for the sixth year in a row, significantly outperforming the 97% target. There was a very small increase in both compared to previous years;
- Our Annual Repair Risk score increased by 22% to 23.62m as a result of the increased workload experienced over the summer months. This is still well below the target of 34.5m;
- We completed 68.4% of repairs within 12 hours against a target of 61.5%. This is an excellent result and the highest we have achieved in RIIO to date;
- We saw 14,030 unplanned interruptions this year which is above the annualised target of 12,960. The duration was also above target at 6.3 million minutes, however the average duration was comparable to last year. Cumulatively we are ahead of the targets for both the number and duration of unplanned interruptions. It is important to remember that whereas we would expect the number of planned interruptions to trend downwards over time as a result of our investment in the Repex programme, the unpredictable nature of the incidents will lead to short term workload swings;
- We delivered a very strong customer service performance, scoring 9.5 out of 10 on our customer satisfaction surveys for unplanned works, so even when customers had an unplanned interruption we generally dealt with it well; and
- We are also targeted with decommissioning 23 gas holders over RIIO-GD1. We are ahead of target having removed 3 holders this year, bringing our cumulative total to 19.

5.2.2. Capex financial and output performance

The table below provides a summary of our capex performance against the allowance over the RIIO-GD1 period.

RIIO Capex forecast 18/19 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
LTS, storage and entry	10.0	16.5	21.7	16.0	11.7	15.7	13.3	13.5	118.6	132.9
Connections	7.3	7.5	10.8	9.4	10.3	10.3	9.1	8.2	73.1	60.7
Mains Reinforcement	3.2	2.0	3.5	2.3	2.3	2.4	4.8	8.9	29.2	42.1
Governors replacement	2.3	1.5	2.0	1.8	1.5	2.6	3.4	2.8	17.8	14.2
Other Capex	22.4	26.1	28.6	33.6	28.2	28.6	28.5	24.1	220.2	188.4
Of which IT	6.0	5.4	6.6	17.1	14.5	23.4	13.9	11.6	98.6	47.9
Of which vehicles	4.4	4.9	3.0	2.7	3.3	0.4	2.1	6.0	26.8	31.4
Total	45.3	53.6	66.6	63.0	54.0	59.7	59.1	57.6	458.9	438.4
Allowance	57.9	62.4	66.5	61.9	47.1	47.4	47.2	47.9	438.4	
Variance	(12.6)	(8.8)	0.1	1.1	6.9	12.3	11.9	9.7	20.5	
Cumulative	(12.6)	(21.4)	(21.3)	(20.2)	(13.3)	(1.1)	10.8	20.5		

Figure 5.6: Capex forecasts compared to the allowance

To date we are outperforming the cumulative Capex allowances by £1.1m (0.3%), which generates a negligible RORE of less than 0.03% p.a. We plan to continue investing significantly over the remaining two years of RIIO-GD1 and expect to spend £20.5m over the cumulative allowance by 20/21. This will have a negative impact on RORE of c0.2%.

This continuing investment covers both network and non-network areas. On the network side we have seen workload increases in response to unforeseen events, most notably we are investing in the security and erosion protection of our river overcrossings and major pipelines in response to the extreme flooding incidents we have seen over the three previous years. We estimate these factors may increase costs by c£10m over RIIO-GD1.

We expect our connections costs to be c£12.4m over the allowance over RIIO. We have seen a significant decrease in workload due to changes in the connections market place and general demand levels for new gas connections. We estimate these external economic factors will decrease costs over RIIO by c£17.2m or £2.2m p.a. This will be partially offset by an increase in Fuel Poor connections. Our aspiration has always been to exceed our target. We previously agreed a new target with Ofgem of 14,500 fuel poor connections. During 2018/19 we got further ahead of the pro rata 14,500 target, successfully completing 2,763 fuel poor connections. This cumulatively puts us 2,162 ahead of the 10,667 phased RIIO Target. As a result of this and working with new partner organisations we now believe we can beat the 14,500 target and forecast we will achieve in the region of 16,000 fuel poor connections over RIIO-GD1. This will increase costs by c£2.7m over the price control.

The overall reduced workload and the mix of work has also impacted our unit costs and recovery rate Compared to the benchmarked net costs we estimate to spend £18.2m more than the allowance over RIIO, or £2.3m p.a. This is after adjusting the net allowance related to Fuel Poor. There was an assumption in the price control that the near 60% recovery rate associated with connections would also apply to fuel poor which is incorrect. This has a £10.5m impact over RIIO.

We have also seen a significant reduction in reinforcement workload so far in RIIO – 45.3km of main compared to an allowance of 106.9km. There are two key reasons for this. Our pressure management function and a Cost – Benefit based filter process has allowed us to address capacity constraints on the network by managing system pressures rather than installing new pipework. The other driver is reduced demand on the gas network when compared to the assumed levels when the allowances were set. We are required to design and manage the gas network to meet 1 in 20 peak demand requirements, which is the level of demand that would be exceeded in 1 out of 20 winters. Although we are forecasting a slight increase in the Peak demand this year, overall Peak demands have fallen below those levels assumed when setting the allowance.

However we do expect volumes of work to increase over the next two years. We are seeing increased demand for new large load connections and expect to fund significant levels of specific reinforcement associated with these new connections to the network over the second half of RIIO. We also have a £7m reinforcement project for a major pipe reinforcement in Penrith to increase network capacity. This is the main driver for our reinforcement forecast increasing in the final years of RIIO. However we still expect workload over RIIO to be c75km against an allowed workload of c140km, with a cost impact of c£15.8m.

On the non-network side we expect to invest c£99m in IT and c£17m in our depot and office infrastructure over RIIO. This is c£67.3m in excess of the eight year allowance and will deliver a world class smart IT and work place environment, driving improvements in ways of working, decision making, and control. This will enable us to improve both the customer experience and deliver efficiencies and value for money into the future.

In terms of outputs, we have and will continue to invest in all our assets and fully expect to deliver the asset health improvements we committed to in our business plan by the end of RIIO. In addition:

- We have continued to invest in our key above 7 bar assets in order to deliver against the asset utilisation and capacity output targets which is on target to be delivered by the end of RIIO-GD1;
- We are ahead of schedule in delivering the 14,500 new fuel poor connections we committed to following Ofgem’s review of the fuel poor extension scheme, having delivered over 12,800 connections so far. We are now targeting to achieve 16,000 connections over RIIO;
- Our Connections GSOS performance is excellent with all measures well above the 90% minimum standard. We missed three of our own internal standards which are much higher, but two of them by less than 0.1%; and
- Our Connections Customer Survey results dropped slightly, achieving 8.93 out of 10 this year which is still a strong position. We are addressing the specific points that have caused this decrease by setting stricter internal service level lead times for connections customers, stricter timescales for reinstatement work, and providing in depth customer training for all customer facing colleagues in the connections process. Over the second part of 18/19 we saw an immediate impact of these improvements, and are forecasting sustained improvement for Connections.

5.2.3. Repex Financial and output performance

The table below provides a summary of our Repex performance against the allowance over the RIIO-GD1 period.

Repex forecasts 18/19 prices (£m)	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21	Total
HSE driven mains and services	72.5	79.1	70.7	72.0	68.3	70.2	71.9	66.5	571.1
Non-HSE driven mains and services	26.7	25.1	23.3	19.2	25.4	26.1	26.3	22.8	194.9
Risers	0.1	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.5
Repex totals	99.3	104.2	94.0	91.2	93.9	96.2	98.3	89.4	766.5
Allowance	107.0	109.2	108.6	109.2	110.8	109.1	115.3	115.2	884.5
Variance	(7.7)	(5.0)	(14.6)	(18.0)	(17.0)	(12.9)	(17.0)	(25.8)	(118.0)
Cumulative	(7.7)	(12.6)	(27.3)	(45.3)	(62.3)	(75.2)	(92.2)	(118.0)	

Figure 5.7: Repex forecasts

To date we are outperforming the Repex allowances by £75.2m (11.5%), generating an average RORE of 1% p.a. We expect to deliver further efficiency benefits, improving outperformance to 13.3% by the end of RIIO-GD1, and increasing RORE to 1.1%.

Repex workload and cost impact

We expect to deliver significantly more workload within this forecast than is funded within the allowance. The table below provides further details:

Type (km)	Inferred annual target	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21	Total	Total Allowed
Tier 1 – funded	448	445.4	487.8	439.8	452.9	479.4	491.6	459.7	433.2	3689.8	3584.0
Tier 1 – customer funded	15.4	1.8	2.1	2.9	1.9	2.0	2.2	2.1	2.1	17.1	122.9
Tier 2a	8.4	8.8	7.6	5.3	4.1	7.9	3.8	15.0	15.0	67.5	67.5
Tier 2b	20.4	22.1	18.3	12.2	12.4	24.7	26.8	26.1	20.9	163.5	163.5
Tier 3	5	7.4	5.7	3.9	4.3	2.4	4.5	6.8	5.0	40.0	40.0
Iron mains	497.2	485.4	521.5	464.2	475.5	516.4	529.0	509.8	476.2	3978.0	3977.9
Iron > 30m	-	8.7	9.3	11.4	10.8	2.7	7.3	6.6	6.6	63.5	-
Steel	48.7	57.6	75.6	45.9	59.5	59.6	58.6	60.3	60.3	477.4	389.8
Other	-	10.4	10.7	8.6	8.6	13.3	8.1	7.7	7.7	75.1	-
Total	545.9	562.1	617.1	530.1	554.4	592.0	603.0	584.4	550.8	4594.0	4367.7

Figure 5.8: Mains abandoned

One of the major outputs associated with Repex is the length of iron mains abandoned over the eight year price control. To date we have abandoned 2,992km of iron main, 8.8km ahead of the inferred target. This target included an assumed 98km of iron mains work delivered from customer driven rechargeable diversions. Actual volumes have been much lower at c18km. We are expected to fund this shortfall and have now fully recovered the position in 2018/19.

We are delivering more work than is funded in other areas as well:

- We forecast we will abandon over 60km of iron mains >30m from a domestic property in RIIO-GD1. We abandon this type of main where it represents the most cost effective long term option to deliver an all plastic network and to protect the network from encroachment or 'dynamic' growth. There is no allowed target or cost allowance for this;
- We have abandoned c357km of steel to date, c64km ahead of the inferred 6 year target and allowance. This increase has mainly been in <=2" steel which we abandon when found, and volumes have been higher than those we assumed when the Business Plan was set. We expect this to continue and to abandon c477.4km over RIIO-GD1, nearly 88km over the allowed volume; and
- We have abandoned c60km of other materials mains to date and expect to abandon 75km over RIIO-GD1. There is no workload target for this type of work.

We expect this material increase in workload to drive up costs over the 8 year price control. We estimate the combined increase to be £44.3m, £10m related to steel, £34.3m related to iron over 30m and other mains.

Repex efficiencies

Despite this material increase in workload, we expect to continue our outperformance against the allowance. The main driver is our historic operational efficiency and the further improvements we have delivered in RIIO-GD1. We estimate this will account for a c£147m efficiency outperformance against the £885m allowance (16.6%) more than offsetting the increase in workload detailed above. This equates to c£18.4m p.a.

The main driver for our outperformance has been our new operational approach to the delivery of the iron mains replacement programme, which we began reviewing in 2011. Over the next four years we removed the major contracting partners we had previously used, directly contracting with their smaller sub-contractors. This has had 3 main impacts;

- We removed a layer of man marking cost between ourselves and major contractor as well as their profit margin and corporate costs. We estimate this has reduced costs by between c£6m to £8m p.a.;
- We rebuilt our own in house workload and programme management structure in order to gain control of the end to end Repex investment process, estimated to have delivered between £3m and £4m savings p.a. We achieved this through a much more rigorous design process with operational reviews, site visits, better enabling works all allowing projects to start on time more often with vastly reduced contractor variations and down time; and
- Our materials and logistics costs have decreased by c£3m p.a. We have reworked and centralised our end to end procurement and logistics processes in order to gain greater control of costs and waste.

Together these changes have delivered significant improvements in workload delivery and efficiency and are the major driver for our outperformance.

Other Repex outputs

We continue to perform strongly against the other outputs associated with the Repex programme:

- Risk removed is the main driver for the Repex programme, and we continue to target pipes with the highest risk score. Total risk removed was 20,268 this year which gives a cumulative total of 184,659 which means we are now 66% ahead of the eight year RIIO target of 111,191. This is an excellent result as we now have a significantly safer network;
- We are c5% behind the cumulative target for the number of services replaced. This is partly down to mix and location of work, but we are also seeing fewer services replaced as a result of an emergency call out, reflecting the success of the replacement programme and the relatively mild winters we have seen so far in RIIO-GD1;
- We delivered a very strong customer service performance, scoring 8.8 out of 10 on our customer satisfaction surveys. Following stakeholder and customer feedback, we have introduced bespoke webpages for each of our replacement schemes, which are kept up to date with live information on useful customer information such as road closures, duration, and gas-on times. We are also continuing to use Roadworks.Org, and more recently have customised this tool to provide better information to road users visiting this website;
- Gas in buildings events and fractures were both significantly below target supporting our approach to targeting the riskiest pipes; and
- We outperformed the revised targets for the number and duration of planned interruptions which both vary in line with the length of mains abandoned.

5.3. Other Output highlights

Not all of our outputs are directly related to costs or have a specific incentive attached. In particular we are expected to deliver further outputs in relation to social obligations and the environment. Highlights this year include:

- We have maintained compliance with the Control of Major Accident Hazards Regulations (COMAH) and the Gas Safety (Management) Regulations (GS(M)R);
- We continue to operate and develop the network to meet our 1 in 20 planning standard;
- We are outperforming all of our Network Reliability outputs related to offtake meter errors, telemetered faults, and Pressure Systems Safety Regulations (PSSR) faults;
- We have continued to promote and support new biomethane connections to our network and currently have 10 sites connected to our network;
- We have delivered a 43% reduction in our use of virgin aggregate and are well ahead of our internal target. The amount of spoil to landfill did increase this year to 744 tonnes but this is still an excellent performance – down from 61,555 tonnes in 2013/14 and well below our target of 13,000 tonnes;
- We have reduced our business carbon footprint in 1 out of the 3 of the measures we target, whilst continuing to improve data capture across our contractor base to more fully understand performance; and
- We have worked continuously to deliver many and varied social schemes as part of our ‘community promises’ scheme.

The following section provides further details of our performance against those outputs that are directly related to incentives – shrinkage and leakage, the complaints metric, overall customer service and stakeholder engagement, and NTS exit capacity bookings.

5.4. Incentives – RORE impact

The table below details the actual incentive income earned in the first six years of RIIO-GD1 together with a forecast for the final two years. To date we have earned average incentive income per year of £9.8m, and expect to earn an average of £9.5m over the eight years of RIIO.

18/19 Prices (£m)	Actuals (Earned)						Forecast (Earned)		RIIO Total	Avg. Yr
	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21		
Customer Satisfaction:										
Customer Service	2.1	2.3	2.4	2.2	2.1	2.1	2.1	2.1	17.3	2.2
Stakeholder Engagement	1.2	0.7	1.3	1.4	0.9	0.8	1.0	0.9	8.2	1.0
Complaints Penalty	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shrinkage & Environmental Emissions	3.2	3.9	4.0	6.4	5.1	5.3	5.2	5.1	38.2	4.8
NTS Exit Capacity	0.0	0.7	3.2	1.8	1.9	1.8	1.0	0.2	10.6	1.3
RIIO – DRS	0.0	0.9	0.0	0.0	0.9	0.0	0.0	0.0	1.8	0.2
Total RIIO-GD1	6.5	8.4	10.9	11.8	10.9	10.0	9.3	8.4	76.2	9.5

Figure 5.9 : Incentives

Customer Satisfaction

The aim of the customer satisfaction incentives are to improve levels of customer satisfaction and minimise complaints from the activities carried out by the gas networks. The incentives also seek to encourage us to undertake effective engagement with our stakeholders and reflect their views in the day to day operation of our business.

Our results here have been consistently very strong here, and overall have delivered an incentive of £2.9m and a RORE impact of 0.3%. We are targeting to sustain and improve on this strong performance, and continue in our pursuit to deliver the best possible experience for our customers.

Customer Service

We have continued to deliver a very strong performance in our customer service outputs. We achieved an average score of 9.08 across the three customer satisfaction survey areas, a strong performance but there was a minor drop from last year's average score of 9.14. We ranked a close third across the GDNs, just behind the top score of 9.24.

The main reason for the reduced overall performance was a decrease in our Connections score, which reduced from 9.14 to 8.93. We are addressing the specific points that have caused this decrease by setting stricter internal service level lead times for connections customers, stricter timescales for reinstatement work, and providing in depth customer training for all customer facing colleagues in the connections process. Over the second part of 2018/19 we saw an immediate impact of these improvements, and are forecasting sustained improvement for Connections.

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

after 1 day, 31 days, the percentage of repeat complaints, and the number of Energy Ombudsman decisions that go against us

This year we have achieved a weighted complaint score of 2.8 which does not generate any penalties. Penalties would only be imposed if our score was 11.57 or more. This is a very strong performance and is an improvement on last year's score of 3.4. Over the last 12 months we have worked hard to resolve more complaints within D+1 and D+31, and this has had a positive impact on the overall score. We have been working hard to make improvements in both these areas. We have continued to hold our daily complaints call, but introduced an improvement to this by using one of the daily calls to focus on resolution for complaints over 1 day old. This has helped to improve our performance for D+31 complaints. We have also introduced a jeopardy report that focusses on open complaints approaching D+10 and D+20. Finally our robust quality checks ensure that repeat complaints are kept to a minimum. We continue to have had no Ombudsman findings against NGN for RIIO-GD1.

Stakeholder Engagement

In 2018/19 we achieved a score of 5.96, maintaining our strong position within the scheme. We have worked extremely hard this year 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.

Environmental Emissions and Shrinkage

We are responsible for purchasing gas to replace the gas lost through shrinkage and are incentivised reduce these losses over time. Shrinkage comprises leakage from pipelines (c.95%), theft from the gas network (c.3%), and own use gas (c.2%). The table below summarises our actual and forecast performance against the Environmental Emissions and Shrinkage incentives.

18/19 Prices	Actuals						Forecast		RIIO Total	Avg. Yr.
	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21		
Shrinkage GWh:										
Allowed volumes	459	445	433	423	412	401	390	379	3,342	418
Actual / forecast	421	397	382	354	352	341	330	319	2,894	363
Variance	38	48	51	69	60	60	60	60	448	56
Variance %	8.4%	10.8%	11.9%	16.3%	14.6%	15.1%	15.5%	16.0%	13.4%	13.4%
Incentive Earned in year (£m)	0.8	0.7	0.6	0.9	0.8	1.0	0.9	0.8	6.6	0.8
Environmental Emissions GWh:										
Allowed volumes	434	420	408	398	386	376	364	354	3,140	393
Actual / forecast	399	375	360	332	329	319	307	297	2,718	340
Variance	35	45	48	66	57	57	57	57	422	53
Variance %	8.1%	10.7%	11.7%	16.6%	14.9%	15.1%	15.6%	16.1%	13.4%	13.4%
Incentive Earned in year (£m)	2.4	3.2	3.4	5.5	4.3	4.3	4.3	4.3	38.7	4.8

Figure 5.10 : Shrinkage and Leakage

Our actual Shrinkage and Leakage volumes have reduced year on year in line with the target reduction, meaning that our outperformance stayed the same. Average system pressures rose slightly from 31.31 mbar to 31.95 mbar as a result of higher pressure requirements in March 2018, which meant that pressures were lowered later than in the previous year. Average system pressures would have been even higher if we had not introduced remote pressure monitoring and control equipment at targeted governor stations.

We also saw MEG saturation decrease from 29.75% to 22.84%, a decrease of 6.9%. MEG (Monoethylene Glycol) is a 'wet' gas used to saturate and swell metallic joints which otherwise may leak gas. Since last year we have implemented an annual cost benefit analysis on all foggers on our network and by targeting investment in the most beneficial units and turning off those that are uneconomic, we are ensuring we operate a more efficient and cost-effective gas conditioning strategy.

Our results here have been consistently very strong despite the net reduction this year, which still delivered an incentive of £4.9m overall and a RORE impact of 0.6%.

NTS Exit Capacity

The Exit Capacity incentive drives the gas networks to reduce gas exit capacity bookings, which are rights to flow volumes of gas from the national transmission system into our network. Reducing this cost will ultimately reduce overall costs in the gas transmission system and benefit end consumers.

In 2018/19 we have outperformed the target bookings by 17.4%. This delivers an incentive of £1.8m this year and a RORE impact of 0.2%. We are targeting to sustain and improve on this strong performance.

Gwh 18/19 Prices	Actuals						Forecast		RIIO Total	Avg.Yr
	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21		
Allowed volumes	612	618	624	624	624	624	624	624	4,975	622
Actual / forecast	611	596	546	541	527	514	514	514	4,361	545
Variance	1	22	78	83	97	110	111	111	613	77
Variance %	0.1%	3.6%	12.6%	13.3%	15.6%	17.7%	17.7%	17.7%	12.3%	12.3%
Incentive Earned in year (£m)	0.0	0.7	3.2	1.8	1.9	1.8	1.0	0.2	10.6	1.3

Figure 5.11 : Exit Capacity

Discretionary Reward Scheme

Our 2015-18 submission was ranked Number 1 among the gas networks. We were recognised for our commitment to local communities and the work we've undertaken over the last three years to help address a range of social, carbon monoxide safety and environmental issues.

5.5. Allowed revenue and customer bills

Customer Bills

The graph below shows our actual and latest forecast allowed revenues for the 8 years of RIIO-GD1.

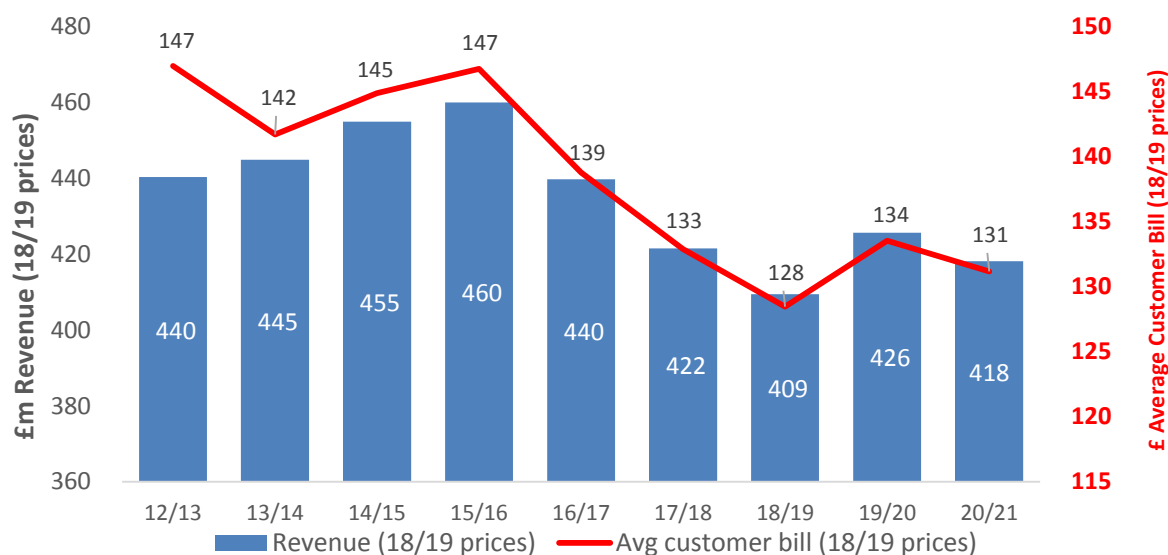


Figure 5.12 : Allowed Revenue and Customer Bills

Our domestic customer bill analysis shown above is calculated based on NGN average Annual Quantities (AQ) and peak daily capacity requirements. This shows an average Domestic customer bill of £128 for 2018/19.

Allowed Revenue

(18/19 Prices)	Actual				Forecast				RIIO Total	Avg. Year
	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21		
BASE REVENUE	446	450	467	448	433	438	445	448	3,576	447
Adjustments to Base Revenue Allowances:										
Cost of debt	0.0	(2.6)	(5.0)	(7.4)	(9.7)	(12.6)	(21.1)	(26.7)	(85.1)	(10.6)
Non Controllable Costs	1.4	2.3	(4.2)	(5.2)	(4.9)	(5.3)	0.5	(3.7)	(19.2)	(2.4)
Totex Incentive	0.0	0.0	(2.7)	(1.9)	(3.6)	(3.7)	(2.2)	(0.6)	(14.8)	(1.8)
RPI true up	0.0	0.0	1.6	(6.3)	(9.7)	(1.7)	1.1	(0.3)	(15.4)	(1.9)
Pension Deficit	0.0	0.0	0.4	0.4	0.4	(3.7)	(4.1)	(4.1)	(10.6)	(1.3)
Other	(0.0)	(0.0)	(1.5)	(1.1)	(3.5)	(4.8)	(5.5)	(7.0)	(23.3)	(2.9)
Total	1.4	(0.3)	(11.6)	(21.4)	(31.0)	(31.8)	(31.2)	(42.4)	(168.3)	(21.0)
Incentive Income:										
Earned during RIIO-GD1 (with 2 year lag)	0.0	0.0	6.2	8.2	10.7	11.2	10.6	9.6	56.6	7.1
Earned before RIIO-GD1	1.3	4.9	1.5	1.7	1.9	2.1	2.4	2.6	18.3	2.3
Total	1.3	4.9	7.7	9.9	12.6	13.4	13.0	12.2	74.9	9.4
(Over) / Under Collection	(3.5)	0.0	(3.5)	3.0	6.7	(10.4)	(1.3)	0.6	(8.4)	(1.1)
ALLOWED REVENUE	445	455	460	440	422	409	426	418	3,474	434

Figure 5.13 : Allowed Revenue breakdown

Allowed revenue for 2018/19 was £409m, a decrease year on year of £13m / 3.2%. The main driver for the variance was the movement in the amount of revenue Over Collected from the prior year, which was given back in this year.

Allowed Revenue movement year on year

18/19 Prices	Actual						Forecast		RIIO Total
	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21	
2018 FORECAST	445	455	460	440	422	410	425	423	3,478
Inflation impact:									
2018 RPI forecast	2.9%	2.0%	1.1%	2.1%	3.7%	3.3%	3.0%	3.1%	
2019 RPI forecast	2.9%	2.0%	1.1%	2.1%	3.7%	3.1%	2.6%	2.8%	
Variance %	0.0%	0.0%	0.0%	0.0%	0.0%	(0.2%)	(0.4%)	(0.3%)	
Cumulative Variance %		0.0%	0.0%	0.0%	0.0%	(0.2%)	(0.6%)	(0.9%)	
Impact £m on base revenues	0.0	0.0	0.0	0.0	0.0	0.0	1.0	(4.9)	(4.0)
Other Changes:									
Shrinkage & Env. Incentive	0.0	0.0	0.0	0.0	0.0	0.0	0.0	(0.2)	(0.2)
Cost of debt Index	0.0	0.0	0.0	0.0	0.0	0.0	(0.0)	(0.5)	(0.5)
Co-op Supplier of Last Resort	0.0	0.0	0.0	0.0	0.0	0.0	0.0	(0.6)	(0.6)
Under/(Over) Collection	0.0	0.0	0.0	0.0	0.0	(0.1)	0.1	1.7	1.8
Other									
2019 FORECAST	445	455	460	440	422	409	426	418	3,474
YOY Movement	0.0	0.0	0.0	0.0	0.0	(0.1)	1.0	(4.5)	(3.5)

Figure 5.14 : Allowed Revenue

Our forecast for total revenue over RIIO-GD1 has decreased very slightly from £3.478bn last year to £3.474bn. The primary drivers for this are increased forecasts for the Retail Prices Index (RPI), which is used as part of the annual process to reset our unit prices.

C. Performance Review

6. Totex Performance Review

Under the RIIO price control methodology we have been set cost allowances to enable us to deliver our outputs and associated secondary deliverables. These allowances are broken down into Opex, Capex, and Repex, and then by activity below this. We have also been set an efficiency incentive rate which determines the proportion of any under or over spend which is shared with customers.

The efficiency incentive rate is now the same for all expenditure areas, which are collectively known as Totex. This means that £1 spent or saved in Opex is treated in exactly the same way as £1 spent in Capex. In previous price controls different expenditure lines had different efficiency incentives, which could create an artificial bias towards one type of expenditure.

6.1. Totex compared to the allowance

Totex 18/19 prices (£m)	Allowance	2017/18	Variance
Controllable Opex	105.8	82.1	(23.7)
Capex	47.4	59.7	12.3
Repex	109.1	96.2	(12.9)
Totex	262.4	238.1	(24.3)

Figure 6.1 : Totex compared to the allowance

The table above summarises this year's performance against the Totex allowance. It is important to remember that the allowances were set by benchmarking all the gas networks. We have historically been assessed as the most efficient network, and so some of our allowances have been set at a level higher than our base costs.

Overall we outperformed the Totex allowances by £24.3m this year, compared to an outperformance last year of £31.4m. The main drivers for this £7.1m reduction in outperformance are:

- An increase of £5.7m in capital investment due to timing of projects, however the allowance increased by only £0.4m, so under performance increased by £5.3m year on year;
- Repex mains laid unit costs remained flat but with a slightly higher workload in particular in Tier 1, which saw outperformance reduce by £4.1m; and
- Opex outperformance increased by £2.4m, mainly as a result of efficiencies in Business Support, variances in the level of claims received, and some credits received from National Grid in relation to the call handling and metering contract. This was offset by increased Emergency and Repair costs as a result of increased workload seen over the summer period during the extremely hot weather.

The £24.3m outperformance is shared with our customers under the Totex incentive mechanism detailed above. Full explanations of our performance are contained in the following section.

6.2. Totex forecasts

Totex forecasts 2018/19 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
Controllable Opex	90.7	92.9	87.4	87.9	85.7	82.1	88.8	89.8	705.3
Capex	45.3	53.6	66.6	63.0	54.0	59.7	59.1	57.6	458.9
Repex	99.3	104.2	94.0	91.2	93.9	96.2	98.3	89.4	766.5
Totex	235.3	250.7	248.0	242.2	233.5	238.1	246.2	236.8	1930.7

Figure 6.2 : Totex forecasts

The table above summarises our forecast for Totex over the RIIO-GD1 period. The main drivers for the various costs movements from now are:

- Opex increasing by c6m. The forecasts include an assumption that the relatively mild winters we have recently experienced will not continue, impacting our emergency and repair costs, and an increase in maintenance costs as we maintain rather than replace a higher number of our assets. Our IT expenditure will increase as we expand our cyber resilience capabilities. In addition the credits received this year will not be repeated, and we expect claims to be more in line with our long term average;
- Capex will stay broadly in line with the £57m average seen in the first 6 years of RIIO-GD1. We expect to see increased Reinforcement costs, driven mainly by one major project in Penrith. We will also complete our significant investment in IT and several large Offtake and PRS schemes; and
- Repex will increase marginally in 2019/20 due to workload mix. Tier 1 work will reduce by c30km but this will be more than offset by an increase of 10km in Tier 2 work. In 2020/21 both Tier 1 and Tier 2 work will fall. We are targeting to deliver further efficiencies over the rest of RIIO-GD1.

7. Opex Performance Review

This section covers our performance against the Opex cost allowance, as well as the output targets which are associated with the emergency, repair and gas holder demolitions which all sits within Opex. The emergency and repair outputs include:

- The uncontrolled and controlled gas escapes attendance rate – Emergency Response;
- The annual repair risk score;
- The percentage of repairs completed within 12 hours;
- The number and duration of unplanned interruptions; and
- The customer satisfaction survey results associated with unplanned interruptions.

7.1. Types of Operating Expenditure

We categorise operating expenditure (Opex) depending on whether it is within our direct control or not. We then split controllable Opex into two categories:

- **Direct Opex** – covering work management, emergency, repair, maintenance and other direct costs; and
- **Indirect Opex** – covering training and apprentices, and business support activities such as HR and IT.

Non-controllable costs include items such as Ofgem’s licence fee, network rates and the NTS pension deficit recharge.

7.2. Controllable Opex compared to the allowance

Controllable Opex 18/19 prices (£m)	Allowance	2018/19	Variance
Direct Opex			
Work Management	23.2	14.6	(8.7)
Emergency	16.8	10.6	(6.2)
Repair	17.0	16.1	(0.9)
Maintenance	9.8	12.0	2.2
Other direct activities	11.6	5.7	(5.9)
Direct Opex total	78.4	58.9	(19.5)
Indirect Opex			
Business Support costs	22.6	21.2	(1.4)
Training and Apprentices	4.9	2.0	(2.9)
Indirect Opex total	27.4	23.2	(4.2)
Total controllable Opex	105.8	82.1	(23.7)

Figure 7.1 : Controllable Opex compared to the allowance

Overall our 2018/19 controllable Opex costs were £82.1m, outperforming the allowance of £105.8m by £23.7m. This is detailed by activity in the table above. This outperformance will be shared with our customers under the Totex sharing mechanism.

7.3. Year on Year Controllable Opex performance

Controllable Opex 18/19 prices (£m)	2017/18	2018/19	Variance
Direct Opex			
Work Management	16.4	14.6	(1.4)
Emergency	11.2	10.6	(0.7)
Repair	15.2	16.1	0.9
Maintenance	11.2	12.0	0.8
Other direct activities	6.1	5.7	(0.4)
Direct Opex total	60.1	58.9	(1.2)
Indirect Opex			
Business Support costs	23.8	21.2	(2.6)
Training and Apprentices	1.8	2.0	0.2
Indirect Opex total	25.6	23.2	(2.4)
Total controllable Opex	85.7	82.1	(3.6)

Figure 7.2 : Controllable Opex year on year variance

Overall we have seen a real cost decrease of £3.6m in controllable Opex from 2017/18 to 2018/19. Direct Opex decreased by £1.2m, and Indirect Opex by £2.4m. The sections below provide a detailed analysis of this performance by activity type, and considers the outputs related to Emergency and Repair.

7.4. Year on Year Direct Opex performance

The table below summarises our year on year Direct Opex performance:

Direct Opex 18/19 prices (£m)	2017/18	2018/19	Variance
Work Management			
Asset management	5.2	3.9	(1.3)
Operations management	7.8	7.7	(0.1)
Customer management	2.2	1.7	(0.6)
System control	1.2	1.3	0.1
Emergency	11.2	10.6	(0.7)
Repair	15.2	16.1	0.9
Maintenance	11.2	12.0	0.8
Other direct activities	6.1	5.7	(0.4)
Total Direct Opex	60.1	58.9	(1.2)

Figure 7.3 : Direct Opex year on year variance

7.4.1. Work Management

Work management overall has seen a £1.8m year on year decrease in costs across the four activities included here. This overall decrease is driven by:

- A decrease in asset management of £1.3m. We spend £0.6m less on holder demolition and land remediation this year, both costs are project specific and can vary materially year on year. The balance of the saving was seen across professional and consultancy costs and net salaries where we saw reduced headcount across some of our planning functions;
- A decrease of £0.6m in customer management, driven by two contractual refunds received from National Grid, one related to the Call Handling contract for the Emergency 0800 number, the other related to the costs of monitoring National Grids telemetry on hilltop sites in our Network; and
- A decrease in operations management of £0.1m through reduced net staff costs as a result of some minor headcount changes, which was offset by a minor increase in net staff costs in System Control.

Output: Gasholder decommissioning

We have 44 low pressure gasholders at 31 sites spread across the network which are no longer required to operate the network. Our gasholder decommissioning programme will reduce the risks associated with gas storage and the requirements set out in COMAH Regulations for managing gas storage assets. The programme also removes a number of other requirements to inspect and maintain the holders, in addition to the costs of maintaining such ageing assets. The programme will have an overall customer and stakeholder benefit. Our plans include the phased demolition of all of these gasholders over a 16 year period starting from April 2013.

Our output target for RIIO-GD1 is to decommission a minimum of 23 gasholders. We successfully accelerated the programme in 2016/17 and completed the decommissioning of seven holders, and then decommissioned a further three last year and again this year. We now plan to complete the final four over the next two years.

Number of gasholders decommissioned	RIIO target	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21	Total
	23	1	2	3	7	3	3	3	1	23

Figure 7.4 : Gasholder decommissioning forecast

7.4.2. Emergency and Repair costs and associated outputs

Emergency and repair costs have seen a combined increase of £0.2m, whilst achieving a very strong performance in our emergency and repair outputs. We saw our underlying costs decrease by £0.8m as an increasing proportion of our field force is on new Terms and Conditions, so this represents a real £1.0m increase, which was driven by workload.

As part of our Repex programme we have consistently targeted replacing some of our poorest performing pipes, which will be a key driver for improving our emergency and repair performance over RIIO-GD1. However over the last two years we have experienced short periods of more extreme weather which affected both costs and workload.

	13/14	14/15	15/16	16/17	17/18	18/19
PREs	89,290	83,446	93,411	90,016	90,224	82,713
Reports	24,197	22,082	20,260	18,676	18,672	20,220
Repairs	25,526	22,377	19,933	17,801	17,484	19,169

Figure 7.5 : Emergency and Repair workload

PREs vary year on year as seen in the table above, whereas we had been seeing consistent reductions in Reports and Repairs before 2017/18. The slowdown in workload reduction in 2017/18 was driven by increased workload across the winter months from December to March with the biggest increase in March during the period of more extreme weather. In 2018/19 we have seen the number of Reports and Repairs increase. However this time the largest increase was during the summer months during the extreme warm weather experienced at this time, which is likely to have caused ground movement and increased leaks. This increase in workload had a knock on impact on costs and drove the increase. We also used more specialist contractors on deep excavation medium pressure repairs this year, which cost c£0.3m extra.

Innovation is also helping keep our emergency and repair costs down in particular. This year we estimate we have delivered c£0.6m in Opex in the main from the use of;

- Core'n'vac techniques (£0.3m) which reduce time in the highways, the amount of spoil going to landfill and its associated transport costs, as well as the need to dig expensive larger holes;
- Our Dog Survey team, which finds escapes quicker and reduces the number of holes drilled; and
- Back Blade Protectors on digging equipment which reduces road scarring and expensive reinstatement.

Output: Emergency Response

Target – 97% of uncontrolled gas escapes attended within 1 hour

Target – 97% of controlled gas escapes attended within 2 hours

The primary outputs for emergency response are to attend 97% of uncontrolled gas escapes within one hour, and 97% of controlled gas escapes within two hours.

	RIIO annual target	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21
97% of uncontrolled gas escapes attended within 1hr	97%	99.85%	99.85%	99.76%	99.76%	99.61%	99.75%	97.5%	97.5%
97% of controlled gas escapes attended within 2hrs	97%	99.97%	99.99%	99.96%	99.97%	99.72%	99.94%	97.5%	97.5%

Figure 7.6 : Emergency response forecasts

In 2018/19 we have again performed significantly above the targets – achieving 99.75% and 99.94% respectively. This excellent performance was driven by the detailed day to day focus of our area managers and their teams and resourcing up our emergency response teams in the key winter period.

We now resource more of this activity internally following the recruitment of Rapid Response Engineers to replace external contractors to support our winter resilience plans. Our forecast for the rest of RIIO-GD1 takes into account the relatively mild weather experienced in the last six years compared the previous price control, and therefore reduces for 2019/20 with the assumption of a more typical winter.

Output: Annual Repair Risk

Annual repair risk is the total risk score associated with all pipes which require a repair, recorded on a daily basis and totalled over a year. The risk score is based on a range of criteria and is used to prioritise repair work. Our target for RIIO-GD1 is to maintain annual repair risk at or below the level that was achieved in 2012/13. We have significantly outperformed this output in 2018/19, an excellent performance. The main drivers for this improvement are;

- Focusing the Repex programme on pipes in the poorest condition;
- Ongoing daily monitoring of this output and sharing knowledge and experience across the Network;
- Ongoing training provided to all repair teams to ensure that we assess risk appropriately across the network and that all teams are fully aware of the importance and focus we have on this output;
- A further rebalancing of our workforce to those locations where most work occurs; and
- Expanded use of Core and Vac and Acoustic camera detection techniques, as well as the use of specifically trained sniffer dogs which have greatly reduced the time to locate difficult to find leaks.

However our risk score has increased over the last two years, largely as a result of the workload increases detailed above. Our forecast takes this into account. Ignoring any future extreme weather, we expect to make year on year improvements, whilst outperforming the target every year during RIIO-GD1.

Annual repair risk	RIIO annual target	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21
	<34.5m	34.4m	24.8m	18.6m	17.4m	19.3m	23.6m	22.1m	21.3m

Figure 7.7 : Annual repair risk forecast

Output: Percentage of repairs completed within 12 hours

We also have a requirement to complete repairs within 12 hours. We have committed to a gradual improvement in performance across RIIO-GD1, reflecting our commitment to repairing gas escapes on a first visit where possible. The table below details this target and includes our forecast against this, which similarly assumes a more typical winter moving forward. We expect to outperform our targets in every year.

% repairs completed within 12hrs	RIIO year 6 target	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21
	61.5%	62.3%	62.9%	64.4%	62.3%	66.1%	68.4%	>62.0%	>62.5%

Figure 7.8 : % repairs completed within 12 hours forecast

We achieved 68.4% in 2018/19 against a target of 61.5%, an excellent performance which was achieved through the same drivers as detailed above for Repair Risk. This performance is consistently high when compared across the industry.

Output: Number and duration of unplanned interruptions

Unplanned interruptions occur when there has been no prior notification given to the customer. Causes include problems with our assets (upstream of the ECV), damage to assets by third parties, and water ingress. The output targets are to keep the number and duration of planned and unplanned interruptions over the RIIO period below the levels set out in the table below. There are no formal year on year targets.

Unplanned Interruptions	RIIO year 6 target	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21	Total
Number	12,960	11,464	13,034	12,859	12,427	13,714	14,030	13,079	12,838	103,445
Number related to major incidents	-	0	0	1,430	2,756	765	4,577	0	0	7,651
Total Number	-	11,464	13,034	14,289	15,183	14,479	18,607	13,079	12,838	111,096
Duration	5.9	4.8	4.2	4.4	4.8	5.6	6.3	6.0	5.8	42.0
Duration related to major incidents	-	0	0	7.4	4.7	2.0	16.8	0	0	22.1
Total Duration	-	4.8	4.2	11.8	9.5	7.6	23.1	6.0	5.8	64.5

Figure 7.9 : Number and duration of unplanned interruptions

We had 18,607 unplanned interruptions in 2018/19 with a duration of 23.1mm. This included three major incidents impacting more than 250 properties, at Silsden, Menston and Netherpton. These incidents saw 4,577

customers off gas between them. Adjusting for these incidents, our underlying performance was 14,030 unplanned interruptions with a duration of 6.3mm, both increasing from 2017/18.

The number of interruptions is above the average yearly RIIO target of 12,960, but cumulatively we are ahead of the 8 year target phased target, having had 77,528 interruptions compared to a pro rata target of 77,757. It is important to remember that whereas we would expect the number of unplanned interruptions to trend downwards over time as a result of our investment in the Repex programme, the unpredictable nature of the incidents will lead to short term workload swings.

The duration of the interruptions this year was slightly ahead of target at 6.3 million minutes (mm) compared to a target of 5.9mm. We have more control over this, and on average customers were interrupted for a shorter period of time than the target. Cumulatively customers have been interrupted for 30.0 million minutes duration compared to the target of 35.4 million minutes.

Our forecasts for the remainder of RIIO-GD1 assume a year on year improvement. We will deliver the improvements by further embedding a customer focused management approach to unplanned interruptions. We operate a daily conference call to review, in detail, the outstanding position on all 'open' interruptions, which is attended by a cross section of operational managers and field operatives. These meetings have identified areas for improvement, such as training and equipment use and embedding ownership of the customer, which has increased focus on the management of interruptions.

The forecasts do not take into account the likely impact of the smart metering installation program, which we believe will materially impact the number of unplanned interruptions as a result of issues with the meter installations, in particular around the emergency control valve. The timing and scope of the programme is still unclear.

Output: Customer Satisfaction Survey results for unplanned interruptions

In 2018/19 we have delivered a score of 9.49.

We have built on the success of the Customer Interface Centre (CIC) and recently improved this app to allow for both customer referrals to the Priority Services Register (PSR) and also referrals to additional help beyond utilities, such as fire service checks and debt management. In terms of training, last July we introduced a new approach to delivering customer service training. We are engaging with the whole business to vote on what they need the most, and then tailoring 6 monthly training sessions around these topic areas. We have continued to enhance our approach to looking after customers during major incidents. We now work early to identify local social media routes that we can partner with, and we also provide bespoke food and heating support to vulnerably customers.

7.4.3. Maintenance and Other Direct Activities

Maintenance costs have marginally increased by £0.8m this year, primarily in non-routine maintenance which is more unpredictable by its nature. We also saw an increase of £0.4m related to OLI runs which can vary year on year depending on the type and length of the pipe being inspected. Overall maintenance work varies year on year due to the different maintenance schedules each type of asset is subject to.

Other direct activities have decreased by £0.4m. We saw a £0.8m reduction in Xoserve operating cost recharges following changes to the funding and governance arrangements for Xoserve. The balance is driven by variances in costs related to incidents and the timing of recoveries.

7.5. Year on Year Indirect Opex performance

Indirect Opex 18/19 prices (£m)	2017/18	2018/19	Variance
Business Support			
IT and telecoms	6.7	5.9	(0.8)
Property management	2.9	2.8	(0.1)
Human resources	1.1	1.3	0.1
Audit, finance and regulation	3.7	3.8	0.1
Insurance	3.3	2.9	(0.4)
Procurement	0.9	0.3	(0.6)
CEO and group management	5.1	4.3	(0.9)
Training and apprentices	1.8	2.0	0.2
Indirect Opex total	25.6	23.2	(2.4)

Figure 7.10 : Indirect Opex year on year variance

Overall Indirect Opex has seen a £2.4m year on year decrease in costs across business support and training and apprentices. This increase is driven by:

- A £0.8m reduction in IT costs as a result of reduced external contractor costs, driven by our IT strategy detailed above and in the Capex section below;
- A £0.4m decrease in Insurance costs driven by variations in liability claims costs which can change materially each year. We are generally seeing fewer claims but payments are increasing and more variable;
- A £0.6m decrease in Procurement costs driven by role rationalisation and headcount reductions across all departments, partly enabled by our IT investments; and
- A £0.9m reduction CEO and Group Management, again from role rationalisation, and headcount reductions, as well as reduced expenditure with 3rd party communications and stakeholder specialists.

7.6. Year on Year Non Controllable Opex performance

Non Controllable Opex 18/19 prices (£m)	2017/18	2018/19	Variance
Shrinkage	5.2	5.6	0.3
Ofgem Licence	1.8	1.9	0.0
Network Rates	44.0	43.9	(0.1)
Established pension deficit recovery plan payment	11.1	4.2	(6.9)
PPF levy costs	0.0	0.0	0.0
Pension scheme administration costs	0.9	0.4	(0.5)
NTS Pension Recharge	7.4	7.2	(0.2)
Bad debt	-0.1	0.1	0.2
NTS exit costs	7.9	3.8	(4.0)
Network Innovation (ex IRM)	2.7	2.8	0.1
Supplier of Last Resort	0.0	0.7	0.7
Non Controllable Opex total	81.1	70.7	(10.4)

Figure 7.11 : Non Controllable Opex year on year variance

Overall non-controllable Opex costs have decreased by £10.4m in real terms. The key variances are:

- Increased shrinkage costs due to increased gas prices offset by improvement in leakage performance;
- A decrease in our pension deficit recovery payment. We made an extra contribution to reduce our existing deficit last year. This was part of the arrangements we made to increase the recovery period and reduce the short term costs to customers through implementing an Asset Backed Contribution (ABC) scheme. We also saw a decrease of £0.5m in pension scheme administration costs which had increased previously as a result of one off costs associated with setting up the ABC scheme;
- A decrease in NTS Exit Costs driven by changes in the NTS Exit Unit Rates applied by National Grid; and
- A £0.7m payment for Supplier of Last Resort, which was a payment to cover and protect the credit balances of the customers from a Supplier (IRESA) who went into administration.

The innovation costs detailed above cover the Network Innovation Allowance. We have increased our focus this year on maximising the benefits we can realise from innovation funded through the allowance. All innovation projects start with a problem statement which is assessed for qualitative and quantitative benefits. Any assumptions and targets are then fully tested during the development of the solution.

We have fully reviewed and updated our approach to implementation, and have put in place a new process to track, monitor and report on the take up and use of the innovation across our various regions. This involves our implementation managers attending regional performance meetings, highlighting where specific tooling and equipment is or isn't being used. This demonstrates to each region the significant benefits that other areas are achieving from the new products. This process has increased the use of new products across the network, allowing for savings to be passed onto our customers faster than ever before. This year we estimate we have delivered c£1.2m of efficiencies in Totex, c£0.5m in Repex through our Stub End abandonment projects, and £0.6m in Opex in the main from the Core'n'vac, Dog survey team, and Back Blade Protector projects.

For further details on our innovation projects and strategy please visit <http://corporate.northerngasnetworks.co.uk/innovation/>

7.7. Opex cumulative position under RIIO

Opex forecasts 18/19 prices (£m)	13/14	14/15	15/16	16/17	17/18	18/19	Cumulative Total	Cumulative Allowance	Variance
Work management	15.0	17.5	19.1	19.6	16.4	14.6	102.2	140.3	(38.1)
Emergency	11.0	11.3	11.3	11.0	11.2	10.6	66.4	102.7	(36.3)
Repair	18.4	16.5	14.8	14.3	15.2	16.1	95.2	108.9	(13.6)
Maintenance	9.4	10.3	10.7	10.8	11.2	12.0	64.4	59.5	4.9
Other direct activities	7.6	7.5	7.1	7.0	6.1	5.7	41.0	80.2	(39.2)
Total direct Opex	61.4	63.2	62.9	62.7	60.1	58.9	369.2	491.5	(122.3)
Business support	26.5	27.1	22.5	23.1	23.8	21.2	144.3	134.4	9.9
Training/apprentices	2.7	2.6	2.0	2.1	1.8	2.0	13.2	27.8	(14.6)
Total indirect Opex	29.2	29.7	24.5	25.2	25.6	23.2	157.5	162.3	(4.8)
Total controllable Opex	90.7	92.9	87.4	87.9	85.7	82.1	526.7	653.8	(127.1)

Figure 7.12 : Opex cumulative position

Cumulatively we have outperformed the controllable Opex allowance of £653.8m by £127.1m (19.4%). The majority of the outperformance is in Direct Opex.

7.8 Opex forecasts

Opex forecasts 18/19 prices (£m)	18/19 forecast	18/19 actuals	Variance
Work management	16.2	14.6	(1.7)
Emergency	11.6	10.6	(1.0)
Repair	16.7	16.1	(0.7)
Maintenance	10.8	12.0	1.2
Other direct activities	5.7	5.7	(0.0)
Total direct Opex	61.0	58.9	(2.1)
Business support	23.5	21.2	(2.3)
Training/apprentices	2.6	2.0	(0.6)
Total indirect Opex	26.1	23.2	(2.9)
Total controllable Opex	87.1	82.1	(5.0)

Figure 7.13 : Opex forecast comparison

In our 2017/18 submission we forecast that our 2018/19 controllable Opex would be £87.1m. Our outturn costs have been £5.0m lower at £82.1m. The table above provides details of the variances by activity. The main drivers for this variance are:

- A £1.7m decrease in work management costs. The main driver was the decrease in our holder demolition costs as the holders demolished three cost less than forecast, and we spent less on

environmental remediation. Together these account for £0.8m of the variance. Our forecast did not include the two contractual refunds received from National Grid, one related to the Call Handling contract for the Emergency 0800 number, the other related to the costs of monitoring National Grids telemetry on hilltop sites in our Network. These account for £0.5m of the variance. The balance was driven by cost savings we have achieved which have been realised earlier than we anticipated;

- A combined decrease in Emergency and Repair costs of £1.7m. In our forecasts we assumed winter conditions would be more severe and typical of the longer term than the relatively mild conditions seen recently. We did experience periods of more extreme summer weather that saw costs increase by £1.0m year on year;
- Variances in maintenance work, primarily in non-routine maintenance which is by its nature more unpredictable. We have also outsourced much of our maintenance activity and the expected benefits have not been fully realised yet; and
- A net £2.3m decrease in Business Support. We saw reduced employee liability claims (£0.4m) and then further savings across the board from role rationalisation and headcount reductions, as well as reduced use of professional and consultancy support.

7.9 RIIO-GD1 forecast

The table below summarises our forecasts for controllable and non-controllable Opex for the RIIO-GD1 period.

Opex forecasts 2018/19 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
Work management	15.0	17.5	19.1	19.6	16.4	14.6	15.8	15.0	133.1
Emergency	11.0	11.3	11.3	11.0	11.2	10.6	11.5	11.4	89.2
Repair	18.4	16.5	14.8	14.3	15.2	16.1	16.5	16.1	127.8
Maintenance	9.4	10.3	10.7	10.8	11.2	12.0	13.5	14.5	92.4
SIUs	-	-	-	-	-	-	0.0	0.0	-
Other direct activities	7.6	7.5	7.1	7.0	6.1	5.7	5.4	5.3	51.6
Of which Xoserve	4.3	4.7	4.7	4.1	3.4	2.5	2.6	2.5	28.7
Total direct Opex	61.4	63.2	62.9	62.7	60.1	58.9	62.6	62.3	494.1
Business support	26.5	27.1	22.5	23.1	23.8	21.2	23.9	24.1	192.3
Training/apprentices	2.7	2.6	2.0	2.1	1.8	2.0	2.3	3.5	18.9
Total indirect Opex	29.2	29.7	24.5	25.2	25.6	23.2	26.2	27.6	211.3
Total controllable Opex	90.7	92.9	87.4	87.9	85.7	82.1	88.8	89.8	705.3
Licence/network/other	51.8	53.2	55.4	72.8	60.5	54.1	53.7	51.9	454.7
NTS exit costs	7.5	9.6	8.2	7.9	7.9	3.8	15.0	21.0	80.9
Shrinkage	9.7	6.9	5.5	5.0	5.2	5.6	5.7	5.5	49.1
NTS pensions contribution	5.4	5.5	7.6	7.5	7.4	7.2	7.4	7.4	55.4
Total non-controllable	74.3	75.2	76.7	93.1	81.1	70.7	81.9	85.9	640.1

Figure 7.14 : Opex forecasts

Work management includes our profile for holder demolition, completing three holders next year and then one in the final year. The holder programme is the main driver for the overall cost movements in this activity.

Our emergency and repair forecasts are based on a more prudent 'normal' winter workload than has been experienced in the last six years. We would expect to outturn lower than this when the winter weather is mild.

Within business support we are forecasting an increase in IT costs as we increase our cyber resilience capabilities, as well as a more typical level of claims based on historic run rates. We also expect to see increased levels of professional and consultancy costs associated with developing our RIIO-2 plan, and some increases in our property costs due to changes in our portfolio. Training and apprentices expenditure follows our expected recruitment plans and demonstrates our commitment to reinvigorating our workforce and investing for the future.

In terms of non-controllable expenditure, the main variance comes from our NTS exit costs, which vary primarily due to price fluctuations offset by our reduced bookings. We expect to see material price increases from October 2019 due to National Grid's current work to rebalance these charges nationally. Shrinkage costs reduce based on our reducing forecasts for gas shrinkage volumes, but vary in line with forecast gas prices.

8 Capex Performance Review

Capital expenditure (Capex) covers a wide range of investments in both network and non-network assets. This investment is key in delivering many of our outputs, in particular those associated with asset health, asset utilisation, fuel poor and connections.

Throughout 2018/19 we have continued to improve the investment decision making process behind our capital programme, as well as the way we work together in order to deliver it. Each asset class has an Investment Lead, and where appropriate this is a full time rather than a part time responsibility within another role. Investment Leads are entirely accountable for the investment plan associated with a particular asset class/classes. They lead a multi skilled investment team of colleagues containing the following:

- Asset Integrity – provide expertise regarding asset risk, performance and compliance with legislation and technical standards. They also sign off designs and commission assets;
- Major Projects & Maintenance – provide expertise including design management, project management, procurement, commercial and risk management throughout the project delivery cycle; and
- Finance, property and system operations – who all play a key role in enabling the delivery of the capital programme.

To improve ways of working together further, Major Projects, Asset Integrity and Investment Planning hold a weekly ‘surgery’ to troubleshoot live projects. Alongside this there is a monthly Capex forum to discuss investment decisions, long term resource plans, delivery risk and financial performance.

8.1 Capex compared to the allowance

Capital expenditure 18/19 prices (£m)	Allowance	2018/19	Variance
LTS, storage and entry	17.0	15.7	(1.3)
Connections	7.8	10.3	2.6
Mains Reinforcement	5.1	2.4	(2.7)
Governors (Replacement)	1.8	2.6	0.8
Other Capex	15.8	28.6	12.8
Including : IS and telecoms	3.7	23.4	19.8
Including : Vehicles	3.0	0.4	(2.6)
Capex total	47.4	59.7	12.3

Figure 8.1 : Capex variance to the allowance

The table above summarises our actual capital expenditure in 2018/19 against the allowances by activity type. Overall we invested £12.3m more than the allowance of £47.4m. Further detail on the capital investment in each asset class can be found in the sections below.

8.2 Asset Health

The Network Output Measures Methodology (NOMs) was developed to consider the assessment of asset health and criticality using the principles of monetised risk. NGN has used this methodology to develop a standardised set of regulatory reports which show the monetised risk value for each key asset group both before and after investment. The first report using the new methodology was submitted in July 2016.

The monetised risk values within the July 2019 return are derived from the Network Output Measures Health & Risk Reporting Methodology & Framework (Version 3.2 – July 2017), and have been reported through models developed and implemented within NGN's asset management decision support tool. In June 2017, we submitted to Ofgem a rebased set of risk targets using the new methodology and in June 2019, Ofgem approved our rebased risk targets.

In 2019 we have commenced a refresh of the data supporting our NOMs models. This was undertaken to ensure that our modelling is informed by the most up to date information for our annual reporting, and to inform our future planning for RIIO-2 which will utilise the NOMs models to inform the Network Asset Risk Metric (NARM's) for RIIO-2 investment planning. We note that our RIIO-1 targets have not been rebased, as the formal targets had not been approved. We have undertaken the necessary analysis to understand where any risk improvement or detriment is as a result of data changes as opposed to interventions on the network and do not intend to claim any risk benefit for data changes. Where data deficiencies have been identified we have outlined future data improvement initiatives. These initiatives are outlined in Part 2 of our Implementation report, which was submitted to Ofgem by 1 April 2019 consistent with Special Condition 4G a(ii) of the Gas Transporters licence. Our 2019 RRP submission provides NOMs outputs for our rebased 2013 RIIO-1 start position, our current performance based on intervention activities undertaken to 31 March 2019, and our forecast 2021 position without further intervention and based on planned interventions for the remainder of RIIO-1.

NGN's RIIO-1 starting monetised risk position was £158m. The current total network risk at 31 March 2019 is £103.1m. This compares to a total network risk of £135.7m reported for 2018. Without further intervention, this risk will increase to £108.2m by 2021. The delivery of NGN's current planned work for Years 7-8 of RIIO-1 to 2021 will reduce the risk to £96.7m by 2021. This compares to £129m at 2021 which was reported at 2018. Our analysis indicates that the forecast additional £32m risk reduction compared to last years' RRP is due to:

- The mains asset data refresh included refinement of the methodology to allocate customer numbers to mains. This meant that rather than an average per property being applied across a wider range of pipes, a more targeted allocation was applied to provide a more robust approach. The same data source as previous RRP has been utilised in the data refresh.
- The services asset data refresh included refinement of the methodology to allocate customer numbers to services as well as refinement of the calibration of length of services to be by material rather than a higher-level approach. The same data source as previous RRP has been utilised in the data refresh.
- The delivery of our security strategy for offtakes and PRS has increased the number of fence replacements. Within the models, fence replacements contribute to a large reduction in monetised risk.
- We have carried out full site rather than previously forecast system upgrades on offtakes and PRS.

Due to the large reduction in risk caused by the asset data refresh, NGN expect to rebase the agreed NOMS target to reflect the asset data adjustments. Further data improvement initiatives will be carried out to inform our RIIO-2 submission over the course of 2019. As such we intend to undertake any rebasing once the data update is complete.

As with 2018, the Iron Mains population holds NGN's highest total risk at a 2019 monetised risk value of approximately £32m. The length of iron mains replaced so far in RIIO-1 is in-line with business plan targets.

8.3 LTS, storage and entry

8.3.1. Costs and Workload

LTS, storage and entry 18/19 prices (£m)	Allowance	2018/19	Variance
LTS pipelines		1.3	
LTS diversions		1.9	
NTS offtakes		5.1	
Gas entry points		0.0	
PRs		7.4	
Storage		0.0	
Total	17.0	15.7	(1.3)

Figure 8.2 : LTS, storage and entry variance to the allowance

The table above summarises our actual capital expenditure for LTS, storage and entry against the 2018/19 allowance. Overall, we have invested £11.4m against an allowance of £16.2m, an under spend of £4.8m.

LTS pipelines

Our £1.3m expenditure on **LTS pipelines** has primarily been in the following areas:

- Overcrossing upgrades (£0.5m) – upgrades to overcrossing to improve the condition of the asset. Investment includes repairs to pipe defects, blasting and painting, wrapping, repairs to brackets, and security upgrades. Investment on overcrossings is prioritised on a risk basis;
- Pipeline Re-life and Cathodic Protection upgrades (£0.1m) – upgrade to our pipelines including re-coating of pipes and the installation of shells, as well as replacing transformer rectifier units with more reliable units;
- Ball Valve upgrades (£0.1m) – As part of the Pressure Systems Safety Regulations (PSSR) NGN undertake In line inspections (ILI) on OLI1 pipes. As part of this process the ball valves of pipeline being inspected are upgraded prior to the inspection to make sure they are safe during operation; and
- Pig Trap Bridal upgrades (£0.1m) – As part of the In Line Inspections (ILI) pipelines which do not have a permanent pig trap facility require portable pig traps to be brought to site and bridal pipework to be manufactured and installed.

LTS Diversions

Our £1.9m expenditure on **LTS diversions** has primarily been in the following areas:

- Aislaby (£1.6m) – non-rechargeable diversion of a section of a high pressure pipeline due to land slip in order to prevent loss of supply. Design and procurement is complete with build ongoing and due completion in 2018;
- Trans Pennine Railway Diversion (£0.1m) – non-rechargeable diversion of a high pressure Network Rail overcrossing. Design and procurement complete however build is suspended until decisions are made in respect to the Trans Pennine Route Upgrade (RTU) programme by the Department for Transport; and

- Bullerthorpe to Towton (£0.2m) – rechargeable diversion due to a new office and leisure development at Thorpe Park. Build complete.

NTS Offtakes and Pressure Reduction Stations

NTS Offtakes and **Pressure Reduction Stations** are both critical above ground assets within the gas network. When making investment decisions on these assets we need to ensure that they both have the required **capacity** to ensure we can meet our 1 in 20 supply obligations, and are in a suitable operational **condition** to deliver that capacity.

The asset **condition** is determined using existing asset health data, including site condition information, fault history, and operating costs. This information is combined with recent known operational conditions and a site investment appraisal visit to capture actual condition and to prioritise the site for investment against other NGN installations. In terms of **capacity**, where a site is expected to exceed 100% Capacity Utilisation, it is progressed as a project for further investigation and potential upgrade through the capital investment programme. There is a specific output attached to this.

In 2018/19 NGN invested in the following sites, either in terms of design, procurement or construction:

- Offtakes;
 - Humbleton (£1.0m) – construction of a preheating upgrade;
 - Bishop Auckland (£0.6m) – Design and the start of procurement of a volumetric regulator and preheating upgrade; and
 - Saltwick (£2.8m) – Design completion and procurement for the odorant and metering upgrade.
- PRS's;
 - Meadow Lane (£0.5m) – Design and procurement of a regulator upgrade;
 - Saltend (£1.5m) – Construction for a preheating upgrade, an element of this will continue in 2019/20;
 - Brenda Road (£2.0m) – Construction for a preheating upgrade; and
 - West Cumberland Hospital (£1.2m) – Phase two of the build of a preheating upgrade, new district governor and PRS which has been completed in 2018.

8.3.2. Reliability output – asset utilisation and capacity

Offtakes enable gas to be taken from the National Grid system into NGN's high pressure pipe network. Pressure Reduction Installations (PRIs) then enable onward transportation through the network to customers. To meet our supply obligations, both of these asset types need to be technically compliant and capable of meeting the required throughput volumes. If not, we invest to upgrade or replace the asset.

Our output targets for improving the utilisation of our assets are outlined below, based on capacity utilisation analysis for the 18/19 Table 6.5 submission.

Capacity utilisation	RIIO target	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21
Utilisation < / =50%	51	51	59	64	75	80	80	78	77
Utilisation 50% < l <=70%	52	58	56	59	57	60	53	54	58
Utilisation 70% < l <=80%	45	25	27	22	27	26	25	24	22
Utilisation 80% < l <=100%	44	49	44	41	30	25	30	34	35
Utilisation > 100%	0	10	9	8	5	3	4	2	0
Total	192	193	195	194	194	194	192	192	192

Figure 8.3 : Asset utilisation and capacity forecasts – RRP Table 2.5 and 6.5

On an annual basis, NGN undertake a full and detailed network analysis of all PRIs and Offtakes using our Prism and Graphical Falcon modelling tools. Aligning this work with our expected maximum flow data allows us to identify where specific site investment is required to maintain each unit within an acceptable utilisation band. This ensures we make the investment at the latest opportunity allowing us to avoid ‘gold plating’ of the system.

The methodology for measuring PRI capacity uses maximum flow figures derived from the Graphical Falcon 1:20 model as opposed to flows derived from the PK6 modelling. Expected and design minimum pressures are modelled in PRISM, along with the maximum flows, to determine the capacity of each site. All PRI’s were analysed applying methodology stated in IGEM TD/13 where velocities are measured with a maximum of 20m/s before filtration and 40m/s at the outlet header.

Variations from RIIO Target and 2017/18 Table 6.5 Submission

- The total number of sites has reduced by 2 from 194 to 192 since 2017/18. This is due to the removal of Little Saltwick Offtake from the Downrated system and West Cumberland District Hospital PRI from the Trans Pennine system.
- There has been a change in utilisation bands in most instances, due to the year to year variations in forecast flows and inlet pressures resulting from re-validation of models and changing demand forecasts.
- 4 sites remain above 100% for 2018/19 reporting, which is an increase of 1 site from the 2017/18 reporting year. These sites have been reviewed individually and plans have been made to reduce capacity utilisation. The reason for the increase is due to the sites with 2018 upgrade plans having run over the planned upgrade dates (Lillyhall and Meadow Lane), one site not due for upgrade until 2020 (Penrith), and one new site (Rawcliffe) moving into the >100% capacity category.

The differences in the numbers in the various capacity utilisation bands are due to the year to year variations in forecast flows and inlet pressures resulting from re-validation of models and changing demand forecasts.

Going forward the aim is to improve capacity utilisation analysis and reduce the capacity utilisation levels wherever possible. With this in mind, a programme of review and re-analysis has been put in place in order to optimise the outcome for each site prior to the compilation of data for the 2020 submission.

8.4 Connections

8.4.1. Costs and Workload

Connections	2017/18	2018/19	Variance
Workload			
Mains (km)	32.3	41.3	9.0
Services (number)	7,201	8,390	1189
Governors (number)	2	2	0
Risers (number)	6	3	(3)
Costs (18/19 prices £m)			
Mains	3.0	3.4	0.4
Services	11.4	12.7	1.2
Governors	0.2	(0.1)	(0.3)
Risers	0.0	0.0	0.0
Gross Cost	14.6	16.0	1.4
Contribution	(4.3)	(5.6)	(1.3)
Net Cost	10.3	10.3	0.0
Net Allowance	7.6	7.8	0.1

Figure 8.4 : Connections workload and costs variance

The table above summarises our connections performance against the 2018/19 allowance, and against our 2017/18 outturn. Overall this year we have spent a net £10.3m, £2.5m over the allowance of £7.8m.

Our net costs stayed the same as last year, however both gross costs and contribution increased by c£1.4m. This was mainly due to:

- Mains laid increased by 9.0km which accounts for c£0.4m of the cost increase. This workload change is driven by the type and location of projects, which can vary significantly year on year;
- In terms of services workload we saw increases over all categories – 164 Non Domestic connections, 361 Domestic connections (both new and existing housing), and 664 Fuel Poor connections. This equates £1.2m of increased cost; and
- A decrease in Governor costs of £0.3m driven by the type and size of governors installed.

The increase in contribution is partially driven by the increased workload and is partially a timing difference. We report on a cash basis for connections, and so there is often a timing difference between incurring the costs and receiving payment.

8.4.2. Output – Number of fuel poor network connections

Our RIIO output target was originally to supply 12,000 gas connections to customers in fuel poverty over RIIO-GD1. However our aspiration has always been to exceed our target. We have previously agreed a new target with Ofgem of 14,500 fuel poor connections. In order to achieve this we put in place a number of initiatives and activities against a backdrop of revisions to fuel poverty definitions associated with the Fuel Poor Network Extension scheme. During 2018/19 we got further ahead of the pro rata 14,500 target, successfully completing 2,763 fuel poor connections. This cumulatively puts us 2,162 ahead of the 10,667 phased RIIO Target. As a result of this and working with new partner organisations we now believe we can beat the 14,500 target and forecast we will achieve in the region of 16,000 fuel poor connections over RIIO-GD1.

	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21	Total
Number of fuel poor network connections	1164	1707	2458	2638	2099	2,763	1,800	1,371	16,000
Phased Target	1500	1500	1917	1917	1917	1917	1917	1917	14500

Figure 8.5 : Fuel poor workload forecast

8.4.3. Customer Satisfaction Survey results for connections

In 2018/19 we have delivered a score of 8.93, a decrease from 9.14 last year.

We are addressing the specific points that have caused this decrease by setting stricter internal service level lead times for connections customers, stricter timescales for reinstatement work, and providing in depth customer training for all customer facing colleagues in the connections process. Over the second part of 18/19 we saw an immediate impact of these improvements, and are forecasting sustained improvement for Connections.

8.4.4. Output – Connections Standard of Service

We have had another strong year in Connections; we did miss three out of the seven targets but two were missed by 0.1% respectively. The third target which fell out of the service level agreement was the % of commencement and completion dates for connections **above** 275 kwh provided within 20 working days; of the 5 projects within this areas one project missed the service level by a day due to more intrusive surveying. Stricter service levels have been introduced within the team to ensure that standards are met.

All seven outputs are significantly above existing OFGEM guaranteed standards. The connections standard % of commencement and completion dates for connections **above** 275 kwh is combined with the below 275kw to form the GSOS standard which achieved a score of 99.6% combined.

The table below compares our RIIO-GD1 output target with our actual performance to date and forecast performance for the remainder of the RIIO-GD1 price control period.

	RIIO annual target	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21
% of standard connection quotes issued in 6 working days	99.6%	99.5%	99.7%	99.98%	99.92%	99.66%	99.59%	99.6%	99.6%
% of non-standard connection quotes below 275kwh issued in 11 working days	99.6%	99.5%	99.6%	99.98%	99.85%	99.52%	99.50%	99.6%	99.6%
% of non-standard connection quotes above 275kwh issued in 21 working days	99.6%	97.5%	98.7%	100.0%	100.0%	99.68%	99.65	99.6%	99.6%
% of land enquiries where response sent within 5 working days	99.6%	99.5%	99.6%	100.0%	99.43%	98.26%	100%	99.6%	99.6%
% of commencement and completion dates for connections below 275 kwh provided within 20 working days	99.6%	99.5%	99.8%	100.0%	99.97%	99.94%	99.74%	99.6%	99.6%
% of commencement and completion dates for connections above 275 kwh provided within 20 working days	100%	100%	98.5%	97.6%	100.0%	100%	80.00%	100%	100%
% of connection jobs substantially completed on date agreed with customer	95%	97.2%	98.6%	98.4%	98.50%	97.69%	97.21%	95%	95%

Figure 8.6 : Connections forecast outputs

8.5 Mains Reinforcement

Mains reinforcement	Allowance	2018/19	Variance
Workload			
Mains < 180mm (km)		6.4	
Mains > 180mm (km)		1.7	
Total	16.8	8.1	(8.7)
Governors (number)	7	1	(6)
Costs (18/19 prices £m)			
Mains < 180mm		1.8	
Mains > 180mm		0.5	
Governors		0.0	
Total	5.1	2.4	(2.7)

Figure 8.7 : Mains reinforcement workload and costs variance

The table above summarises our actual mains reinforcement expenditure against the 2018/19 allowance. We invested £2.4m on mains reinforcement and associated governors, delivering 8.1km of reinforcement mains and one governor. This equates to a unit cost of c£290 per metre which is the lowest achieved in RIIO-GD1 to date. It is important to remember that unit costs will vary dependent on the type, length, location and complexity of the projects undertaken.

This is a significant outperformance against the £5.1m allowance to deliver 16.8km of reinforcement main. The key driver is the reduced mains laid workload, which is nearly 52% below that contained in the allowance. A combination of our new pressure management function and a CBA based filter process has allowed us to address capacity constraints on the network whilst successfully mitigating the volume of new pipework we install where there is a more cost-effective Totex solution.

The other driver for reduced reinforcement workload is reduced demand on the gas network when compared to the assumed levels when the allowances were set. We are required to design and manage the gas network to meet 1 in 20 peak demand requirements, which is the level of demand that would be exceeded in 1 out of 20 winters. Overall peak demands have fallen below those levels forecast in submission of the RIIO-GD1 business plan, and subsequent setting of the allowances. This has been driven by a slower than expected economic recovery in the North of England and increases in energy prices.

This affects both general and specific reinforcement:

- General reinforcement usually occurs as a result of our network validation process, where we model forward-looking demand against each network to ensure we can meet our 1 in 20 peak demand requirements. The lower peak demand requirements have meant much of our forecast work in the business plan has not been required to date.
- Specific reinforcement usually occurs as a result of customer requests for new connections, requiring specific investment to supply a new load or increased load to an existing supply. The depressed economic environment has directly impacted new connections-driven work, in particular for new housing developments. Many Local Authority economic development plans have also been reduced.

8.6 Governor replacement

Governor replacement	Allowance	2018/19	Variance
Workload			
District Governors		53	
Service Governors		33	
Total	30	86	56
Costs (18/19 prices £m)			
District Governors		2.4	
Service Governors		0.2	
Total	1.8	2.6	0.8

Figure 8.8 : Governor replacement workload and costs variance

When designing our governor programme we prioritise sites based on maintenance frequencies, capacity, physical condition of the unit and the locality using local knowledge and hands on experience of field staff. District governor unit costs in particular vary materially depending on the size and type of the governor and the exact nature of the work we need to complete.

We have invested £2.6m in our overall governor replacement programme in 2018/19, a £0.9m year on year increase. The main driver for this has been an increase in District Governor workload, which has increased from 36 to 53 year on year. The bulk of this increase is due to an increase in civils work (11) and general governor workload. We expect the civils workload to increase further in 2019 and 2020. In addition, there has been some costs in 2018/19 associated with design and procurement for governors which will be commissioned in 2019. RIIO to date we have spent £11.7m, just over the cumulative allowance of £10.7m.

8.7 Other Capex

Other Capex 18/19 prices (£m)	Allowance	2018/19	Variance
System Operations	-	0.1	-
Infrastructure and Systems	3.7	23.4	19.8
Xoserve	-	0.3	-
Plant, tools and equipment	-	0.5	-
Land, buildings, furniture fittings	-	1.6	-
Vehicles	3.0	0.4	(2.6)
Security (Exc PSUP)	-	0.3	-
PSUP	-	0.0	-
Other	-	2.0	-
Capex total	15.8	28.6	12.8

Figure 8.9 : Other Capex variance to the allowance

The table above summarises our actual Other Capex expenditure against the 2018/19 allowances. We have invested £28.6m in the areas detailed in the table against an allowance of £15.8m.

The main driver for spending more than the allowance has been a significant investment in our IT **Infrastructure and Systems** through an IT enabled business transformation programme called Future WoW (Ways of Working). This investment commenced in 2017 and will continue through to 2019/20. The aim of this investment is to turn NGN into a 'Smart' organisation. Improving our systems and how we interact with them will enable fundamentally new ways of collaborative working between multi-disciplinary, flexible teams. This will lead to improved decision making, ever developing customer and colleague experiences and a far more flexible organisation that can respond quickly to the future demands of the energy market.

NGN's existing systems architecture is complex, which makes it difficult to access data and information, and create relationships between data sets. The current SAP platform is reaching the end of its life, and will be out of support in 2021, which would then be a risk to our operations. As a result we have decided to implement the SAP 4 HANA platform, with a range of cloud based modules. This will include a full data migration into a newly created data model. The functionality offered by this product is considered to be the best available in the market, and it is more cost effective than switching to any other product.

Currently we are focused on a number of technology areas:

- Smart Information Management – this programme is focused on optimising and improving our Information Life Cycle Management to leverage the best results from our data. It will deliver new capabilities, revised processes, systems and working practices. This is being enabled through SAP's S4 HANA technology and includes investment in:
 - S4 HANA;
 - BPC (Business Planning and Consolidation);
 - SAP Governance Risk and Compliance;
 - Success Factors to enable manager and employee self-service for HR activities such as attendance management and training; and
 - Concur for expense management.
- Smart Work Management – this programme is focused on optimising the processes and systems that are used to support our operational and back office support functions, delivering efficiency and improved customer management performance. This covers areas such as scheduling, dispatch, mapping, work execution, and data capture and includes investment in:
 - New mapping technology through the GeoCortex platform;
 - New field data capture applications using SAP's cloud platform application technology; and
 - New scheduling and dispatch technology through SAP's MRS (multi resource scheduler).
- Asset Decision Support Tool – This programme is focussed on embedding the Asset Management capability within NGN to ensure that we are conscious in our decision making and continue to deliver value to our customers and stakeholders. Specifically, the implementation of our decision Support tool will provide the capability to:
 - Improve our ability to efficiently forecast the long-term risk profile for network assets consistently with the Network Output Methodology using monetised risk;
 - Embed a consistent and transparent approach to Cost Benefit Analysis that can be applied across and within asset classes; and
 - Enable the optimisation of cost, risk and service outputs in the development of our GD2 business plan so that we can demonstrate that our plan will continue to deliver value for customers at least cost without compromising our service objectives.

Most of the **Plant, Tools and Equipment** expenditure (£0.5m) was associated with the following work:

- Hexi Pipe Trailers (£0.3m) – These trailers are designed to reduce PE pipe waste. They are larger capacity pipe trailers which can hold up to 500 metres of pipe. We purchased 13 units which reduces the amount of wasted PE;
- Service Cameras (£0.1m) – These cameras allow us to track water ingress to reduce the number of excavations; and
- Hornet Drills (£0.1m) – These drills allow users to remotely drill which reduces vibration improving safety.

The balance is made up of many small projects to replace tools and small items of plant across the network.

Expenditure on **Land, Buildings, Furniture and Fittings** consists of continuing the roll out of our office and depot upgrades to provide a common ‘look and feel’ template for all of our properties, the aim being to provide the best possible working environment for our colleagues and to provide them with the workspace that best enables them to work in the most efficient manner possible. This year we started the upgrade of the ground floor at Thorpe Park (£0.7m) after National Grid left the site. This will continue into 2019/2020. In addition our Scarborough depot was finished in early 2018/19.

During this year we spent £0.4m on **Operational Vehicles**, significantly lower than last year. We use a risk based model to determine which vehicles are in greatest need of replacement based on actual data rather than any set mileage/age criteria. This can generate material year on year swings in our vehicle investment programme.

Within the Other category over 50% of the expenditure relates to major upgrade works on overcrossings, including repairs to the pipework, supports and upgrades to the security. 28% of the expenditure relates to PSSR Validations and remedial works which is compliance driven work to prevent serious injury from the hazard of stored energy because of a failure in the pressure system. The rest of the expenditure is on various small value projects, typically on below 7 bar assets.

8.8 Capex cumulative position under RIIO

Cumulative Capex 18/19 prices (£m)	13/14	14/15	15/16	16/17	17/18	18/19	Cumulative Total	Cumulative Allowance	Variance
LTS, storage and entry	10.0	16.5	21.7	16.0	11.7	15.7	91.7	105.5	(13.8)
Connections	7.3	7.5	10.8	9.4	10.3	10.3	55.7	44.7	10.9
Mains Reinforcement	3.2	2.0	3.5	2.3	2.3	2.4	15.6	32.2	(16.6)
Governors replacement	2.3	1.5	2.0	1.8	1.5	2.6	11.7	10.7	0.9
Other Capex	22.4	26.1	28.6	33.6	28.2	28.6	167.5	150.1	17.4
Including : IT	6.0	5.4	6.6	17.1	14.5	23.4	73.1	36.9	36.2
Including : Vehicles	4.4	4.9	3.0	2.7	3.3	0.4	18.7	23.6	(4.8)
Total	45.3	53.6	66.6	63.0	54.0	59.7	342.2	343.3	(1.2)

Figure 8.10 : Cumulative Capex position compared to the allowance

The table above summarises our cumulative Capex expenditure over the first five years of RIIO-GD1 against the equivalent allowances. Overall we have underspent the allowance by £1.2m. The main variances are:

- Reduced mains reinforcement work (£16.6m) through proactive management of network pressures as an alternative to reinforcement, and lower than expected customer demand for reinforcement as economic conditions have not recovered as expected when the allowances were set;
- Reduced investment to date on LTS, storage and entry (£13.8m) due to timing and efficiencies in delivering both our above and below 7 bar capital investment projects;
- Increased Infrastructure and Systems investment (£36.2m) due to our business transformation programme (Future WoW) and the implementation of the SAP 4 HANA platform, with a range of cloud based modules; and
- Increase investment on Connections (£10.9m) which can be explained through the low unit costs set in the allowances and increased Fuel Poor work.

We have continued to develop our commercial and delivery models to produce efficiencies, greater competition and cost savings. Examples of these are:

- Engaging closely with our supply chain the drive improvements in their planning and programming capabilities;
- Integrated new contractors into to our supply chain to increase competition;
- Improved our planning capabilities and held expression of interest events to ensure we are early to market with tenders therefore securing best price;
- Optioneering best cost solutions to drive cost savings such as modular buildings and refurbishment programmes; and
- Widened our involvement in Considerate Constructors Scheme by registering more sites and achieving better results as we believe a well organised site is a safer one.

8.9 Capex forecasts

2018/19 actuals against forecast

2018/19 Capex forecast 18/19 prices (£m)	18/19 forecast	18/19 actuals	Variance
LTS, storage and entry	13.8	15.7	1.9
Connections	10.8	10.3	(0.5)
Mains Reinforcement	4.1	2.4	(1.8)
Governors replacement	1.8	2.6	0.8
Other Capex	32.2	28.6	(3.6)
Including : IT	16.0	23.4	7.4
Including : Vehicles	0.9	0.4	(0.5)
Total	62.7	59.7	(3.0)

Figure 8.11 : 2018/19 actual Capex position compared to the prior year forecast

The table above summarises our actual Capex in 2018/19 against the forecast for 2018/19 we submitted last year. Overall we spent £3.0m less in 2018/19 than the £62.7m we forecast last year. The main drivers for this variance were:

- A £1.9m increase in expenditure on LTS, storage and entry projects. The phasing of some larger projects has meant that we invested more this year;
- A £1.8m reduction in expenditure on Mains Reinforcement. Several larger projects we expected to commence have not started yet; and
- A £7.4m increase in IT expenditure. As detailed in section 8.7 above we are transforming our business by investing significantly in our technology and systems and improving processes through a companywide programme called Future WoW.

Also in Other Capex we had a large forecast for Land and Building. This has reduced as we cancelled a £1m project to build a Training centre, and two projects were delayed – the Thorpe Park Ground Floor project and the upgrade of our Burradon depot.

RIIO-GD1 forecast

The table below summarises our RIIO Capex expenditure forecast, based on the first six years' actual performance and a forecast for the remaining two years. We fully expect to achieve all of our output targets through our Capex investment programme, in particular our asset health and capacity targets.

We are forecasting to spend £16.3m over our allowances, which is largely driven by non-network overspend on Infrastructure and Systems which is £50.5m over the allowance and Operational Vehicles which is £4.7m below the allowances.

LTS, storage and entry expenditure varies year on year given the major project driven nature of the work. We expect to spend £15m below the allowance whilst achieving all of our outputs. This is a change from last year's forecast. The main variances are:

- We have reclassified £7m as reinforcement work, associated with a major pipe reinforcement in Penrith to increase network capacity. This is the main driver for our reinforcement forecast increasing by nearly £5m year on year; and
- A project we had designed at Burley Bank, Harrogate proved not to be feasible, reducing the forecast by £3.9m. Several other projects have been rescoped.

Connections expenditure includes both normal customer driven connections work and fuel poor connections. We expect customer driven connections work to remain broadly flat, with increases in connections to new properties being offset by reductions in connections to existing properties. Fuel poor connections expenditure follows the profile detailed in the outputs section 8.4.2 above, with plans to increase the total number of connections to 16,000 from 14,500. This is the main driver for the increase to our forecast year on year.

Our forecast for mains reinforcement workload and costs are impacted by expected economic growth, and our proactive management of network pressures as a more cost effective alternative to reinforcement. We are forecasting higher workload for the remaining three years of the regulatory period which is largely driven by expectations that the network will fund significant levels of specific reinforcement associated with new large load connections. We have seen a material increase in enquiries from generators in the past year and this trend is continuing. The Penrith Project mentioned above also has a significant cost impact.

We are forecasting an increase in our governor investment in the final years of RIIO-1. We now have detailed workload plans down to individual projects, and expect to increase our civil upgrade programme to replace and refurbish buildings to ensure the ongoing protection of our governor assets.

Other Capex, similar to LTS, storage and entry, varies year on year given the project driven nature of this work. We are forecasting to continue to invest in our Infrastructure and Systems as detailed in section 8.7 above and our offices and depots to ensure we provide the best possible working environment that will drive collaboration and efficient working. Both of these investments will drive efficiencies in our ways of working, improve our decision making, and enable us to improve our management and control of activities across the network, supporting our colleague and customer experiences.

RIIO Capex forecast 18/19 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
LTS, storage and entry	10.0	16.5	21.7	16.0	11.7	15.7	13.3	13.5	117.9	132.9
Connections	7.3	7.5	10.8	9.4	10.3	10.3	9.1	8.2	72.7	60.7
Mains Reinforceme	3.2	2.0	3.5	2.3	2.3	2.4	4.8	8.9	29.1	42.1
Governors replacement	2.3	1.5	2.0	1.8	1.5	2.6	3.4	2.8	17.8	14.2
Other Capex	22.4	26.1	28.6	33.6	28.2	28.6	28.5	24.1	219.3	188.4
Of which IT	6.0	5.4	6.6	17.1	14.5	23.4	13.9	11.6	98.4	47.9
Of which vehicles	4.4	4.9	3.0	2.7	3.3	0.4	2.1	6.0	26.7	31.4
Total	45.3	53.6	66.6	63.0	54.0	59.7	59.1	57.6	458.9	438.4
Allowance	57.9	62.4	66.5	61.9	47.1	47.4	47.2	47.9	438.4	
Variance	(12.6)	(8.8)	(0.1)	1.2	6.9	12.3	11.9	9.7	20.5	

Figure 8.12 : Capex forecasts compared to the allowance

9 Repex Performance Review

Replacement (Repex) activities are generally associated with the replacement of old metallic pipes which potentially cause a safety risk if the pipe fractures and allows gas to escape. Pipes are generally classed as a main, serving a number of customers, or a service, which typically connects the main to a customer's meter.

This section covers our performance against the Repex cost allowance, as well as the output targets we are expected to deliver under the Repex programme. These outputs include;

- The level of risk removed;
- The length of mains taken 'off-risk';
- The number of services replaced;
- The number of gas in building events;
- The number of fracture and corrosion failures;
- The number of sub deduct networks 'off-risk';
- The number and duration of planned interruptions; and
- The customer satisfaction survey results associated with planned interruptions.

We also consider whether the workload mix delivered is in line with our expectations when the RIIO performance targets were set.

9.1 Overview and strategy

In May 2012 the HSE issued a new enforcement policy on iron mains risk reduction. Under the old policy, the HSE required NGN and the other GDNs to replace all iron mains within 30 metres of buildings within 30 years ('30/30' programme). The new policy is referred to as the 'Three-Tier Approach' and enables us to consider factors other than the safety risk in determining which pipes to prioritise for replacement.

The rules for each tier are:

- **Tier 1 Mains** (pipes with a diameter of 8 inches or less): under the new policy NGN must still achieve full decommissioning by 31st March 2032 and replace an agreed length of mains each year as under the old policy. In addition we can now prioritise replacement based on a wide range of benefits, including reductions in gas losses, operating costs, and improvements in safety risk;
- **Tier 2 Mains** (pipes of greater than 8 inches and less than 18 inches in diameter): all mains exceeding a defined risk action threshold must, by 31st March 2021, be abandoned, remediated or assessed for continued safe use (Tier 2a Mains). Pipes in tier 2 scoring below the risk-action threshold may be decommissioned where this is justified in cost benefit terms (Tier 2b Mains); and
- **Tier 3 Mains** (pipes with a diameter of 18 inches or above): in general, the new policy only requires GDNs to replace mains if the replacement is justified in cost benefit terms.

In the sixth year of RIIO-GD1 we have continued the mains replacement strategy set out in detail in our Business Plan. Our strategy is based upon utilising the flexibility within the 'Three-Tier Approach' to maximise the benefits for customers from mains replacement. We do this by considering other factors, not just safety risk, when choosing which pipes to prioritise for replacement. By continuing this strategy we have built upon our already strong performance and delivered improvements in asset condition and safety performance beyond that forecast previously. This approach has delivered significant additional value for customers and enabled us to

exceed a number of the key RIIO-GD1 outputs including Risk Removed, the number of Gas in Buildings events, and Fracture and Corrosion failures.

9.2 Mains replacement outputs

The table below sets out our replacement performance to date for the other outputs, along with forecasts for the RIIO-GD1 period. We expect to deliver all of these mains replacement safety outputs by the end of RIIO-GD1.

	Inferred / actual annual target	13/14 Actual	14/15 Actual	15/16 Actual	16/17 Actual	17/18 Actual	18/19 Actual	19/20	20/21
Risk removed (incidents/year x10 ⁻⁶)	13,898	43,119	41,213	29,893	26,727	23,439	20,268	16,680	14,750
Length of Mains taken off risk	495.2	485.4	521.5	464.2	475.5	516.4	529.0	509.8	475.5
Number of services replaced	30,932	29,305	29,609	27,579	29,275	29,908	30,984	30,774	29,260
Number of GIB events	144	56	42	58	52	60	53	61	58
Number of fracture and corrosion failures	2,742	815	883	685	683	689	678	762	738
Sub deduct networks 'off risk'	100%	7%	58%	83%	90%	90%	92%	100%	100%
Number of Planned Interruptions	64,257	43,276	57,434	58,925	59,677	62,669	63,774	60,628	57,526
Duration of Planned Interruptions (mm)	17.3	22.4	30.3	13.7	15.1	16.4	17.6	16.5	15.6

Figure 9.1 : Mains replacement forecasts

9.2.1. Risk removed (based on MRPS)

The primary output for mains replacement is the level of risk removed from the network as a direct result of replacing the main. Every iron pipe within our network has a risk score calculated by MRPS (Mains Replacement Prioritisation System) measured as incidents/year x 10⁻⁶. This output is based on reducing the amount of risk over RIIO-GD1 and does not have formal year on year targets.

Forecast iron mains risk at beginning of RIIO-GD1 (incidents/year x 10 ⁻⁶)	276,341
Risk reduction target over RIIO-GD1	111,191
% risk reduction over RIIO-GD1	40%
2013/14 risk reduction achieved	43,119 (15.6%)
2014/15 risk reduction achieved	41,213 (14.9%)
2015/16 risk reduction achieved	29,893 (10.8%)
2016/17 risk reduction achieved	26,727 (9.7%)
2017/18 risk reduction achieved	23,439 (8.5%)
2018/19 risk reduction achieved	---

Figure 9.2 : Iron mains risk education RIIO target

As the main driver for the replacement programme and primary output in this category, risk removal is one of the key criteria used in determining the selection of mains for replacement.

Our approach has been to target the pipes with the highest risk score early in RIIO-GD1 in order to maximise customer benefit. This has resulted in a significant risk reduction over the first six years. In 2018/19 the total risk removed was 20,268, which gives a cumulative total of 184,659. The total RIIO-GD1 output target was to reduce risk by 111,191 over the eight year period. We achieved this during 2015/16, and now are 66% ahead of the full period target. This is an excellent result for customers and vindicates our approach to delivering the replacement programme as we now have a significantly safer network. We expect the amount of risk removed in the remaining years of RIIO-GD1 to reduce year on year due to the risk profile of those assets not yet replaced.

9.2.2. Length of main taken 'off-risk'

This output measures the amount of iron main taken off-risk (abandoned) during RIIO-GD1. The RIIO-GD1 target for the length of iron main taken off risk was 3,991.9km over the full eight years, an average target of 499km per annum over the period. Of the 3,991.9km of main, 81.6km relates to Tier 2a mains. For these mains our allowance will be adjusted annually to match the actual workload. Our forecast for Tier 2a is to abandon 67.5km of main, which reduces the overall allowed workload to 3977.9km, an average target of 497.2km.

The table below illustrates the breakdown of these output targets, our performance to date, and forecasts for the remainder of RIIO-GD1. In terms of **Total Mains** we expect to abandon 4594.0km of main against a funded target of 4367.7, a 5% outperformance. The breakdown of this outperformance is discussed below:

Type (km)	Inferred annual target	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21	Total	Total Allowed
Tier 1 – funded	448	445.4	487.8	439.8	452.9	479.4	491.6	459.7	433.2	3689.8	3584.0
Tier 1 – customer funded	15.4	1.8	2.1	2.9	1.9	2.0	2.2	2.1	2.1	17.1	122.9
Tier 2a	8.4	8.8	7.6	5.3	4.1	7.9	3.8	15.0	15.0	67.5	67.5
Tier 2b	20.4	22.1	18.3	12.2	12.4	24.7	26.8	26.1	20.9	163.5	163.5
Tier 3	5	7.4	5.7	3.9	4.3	2.4	4.5	6.8	5.0	40.0	40.0
Iron mains	497.2	485.4	521.5	464.2	475.5	516.4	529.0	509.8	476.2	3978.0	3977.9
Iron > 30m	-	8.7	9.3	11.4	10.8	2.7	7.3	6.6	6.6	63.5	-
Steel	48.7	57.6	75.6	45.9	59.5	59.6	58.6	60.3	60.3	477.4	389.8
Other	-	10.4	10.7	8.6	8.6	13.3	8.1	7.7	7.7	75.1	-
Total	545.9	562.1	617.1	530.1	554.4	592.0	603.0	584.4	550.8	4594.0	4367.7

Figure 9.3 : Length of iron main taken off-risk performance

In terms of **Total Irons Mains** we have abandoned 2,992.0km of main to date at an average of 498.7km. This is 1.5km ahead of the inferred annual target, and cumulatively 8.8km ahead of the inferred year 5 target. Up until last year we had been behind the inferred target but have recovered the position during this year.

The total iron mains target includes an annual allowed workload of 15.4km for customer driven rechargeable mains diversions. To date we have abandoned 12.9km of Tier 1 and 4.8km of Tier 2b/3 iron mains associated with this type of work. This puts us 74.7km behind the six year target of 92.4km and was the main driver why

we were behind the inferred iron main target until this year. We have however abandoned a further 39.7km of main associated with rechargeable diversions but the mains have been made from other materials or outside of 30m from domestic properties, so don't count towards the iron mains target.

In terms of the other workload;

- **Iron mains >30m** – we continue to abandon this type of main where it represents the most cost effective long term option to deliver an all plastic network and to protect the network from encroachment or 'dynamic' growth i.e. where there is reasonable certainty the main will become risk scoring in the future. There is no target for this. We forecast to abandon over 60km of this type of main in RIIO-GD1;
- **Steel** – we have abandoned 356.8km of steel to date, 64.6km ahead of the inferred 6 year target. The increase has mainly been in <=2" steel which we abandon when found, and volumes are higher than those we assumed when the Business Plan was set. We expect this to continue and to abandon 477.4km over RIIO-GD1, nearly 90km over the allowed volume; and
- **Other** – we have abandoned 59.7km of other materials mains to date, and expect to abandon 75.1km over RIIO-GD1. There is no allowed target for this type of work.

Focusing back on iron mains and starting with – **Tier 1 Mains** – the annualised abandonment target for both funded and customer funded mains is 463.4km per annum. We abandoned 493.8km of Tier 1 mains this year, 30.4km ahead of this target. Cumulatively we have abandoned 2809.8km, which puts us 29.4km ahead of target. Importantly we are also well ahead of the annualised target of 440km of Tier 1 mains abandonment set by the Health and Safety Executive.

Tier 2a Mains – Tier 2a relates to pipes of greater than 8 inches and less than 18 inches in diameter whose risk score exceeds a defined risk action threshold. The risk posed by each iron main is modelled via MRPS. For the RIIO-GD1 period, the defined threshold for NGN is an MRPS score of 142.9.

There is uncertainty as to the exact workload that may be generated by mains passing beyond the risk action threshold as a result of the dynamic nature of the iron pipe network and risk model enhancements. This was recognised in setting the RIIO-GD1 targets and a revenue driver was included to address this issue. Therefore if a GDN abandons more or less iron main than assumed then the cost allowance will be adjusted accordingly.

Tier 2a workload allowances were set at 81.6km across the whole period. This was set on the basis of the anticipated population of pipe that would be above the risk threshold during RIIO-GD1 after allowing for dynamic growth over the period. Based on the current risk scores of Tier 2 pipes, at the start of RIIO we had 37.5km of pipe exceeding the threshold, less than half that assumed in the allowances. We now expect this to increase to around 67.5km through dynamic growth. Cumulatively we have abandoned 37.5km of main which puts us behind schedule to deliver this overall workload. However we have plans in place to recover this and expect to achieve the full revised target by the end of RIIO-GD1.

Tier 2b and 3 Mains – Tier 2b relates to pipes of greater than 8 inches and less than 18 inches in diameter that fall below the risk threshold. Tier 3 relates to pipes with a diameter of 18 inches or above. Iron mains in this category are non-mandatory and the new replacement policy only requires NGN to replace mains if the replacement is justified in cost benefit terms.

We have continued to employ the cost benefit analysis methodology set out in our RIIO-GD1 business plan to identify and design the mains replacement projects in this category. Whilst abandonment / replacement of these pipes will reduce the risk of an incident this is not necessarily the principal driver, as replacement will allow us to deliver a range of benefits that are significant in their own right. These include:

- Reduction in risk;
- Reduction in leakage (emissions);
- Reduction in reported escapes;

- Reduction in associated repairs; and
- Positive customer and stakeholder impact.

The workload volumes delivered in both of these categories are just behind the annualised target of 25.4km. We have focused on delivering the projects with the highest benefit as early as possible within the overall programme. Cumulatively we have completed 144.7km against a target of 152.6km. We expect to recover this position in 2019/20.

9.2.3. Number of Gas in Building Events (GIBs)

Gas in Buildings (GIBs) is a measure of the number of gas escapes on a network pipe upstream of the Emergency Control Valve (ECV) which results in gas entering a building. Gas can enter the building in a number of ways – entering along the line of a service, having an open escape near property or an escape within the property. The output target is based on minimising the number of such events over RIIO-GD1 and does not have formal year on year targets.

GIB events (any concentration level)	Max. number of events (RIIO-GD1)	Inferred annual target	13/14 actual number of events	14/15 actual number of events	15/16 actual number of events	16/17 actual number of events	17/18 actual number of events	18/19 actual number of events
	1,153	144	56	42	58	52	64	53

Figure 9.4 : GIB events performance

The number of GIB events during the first six years of RIIO is well below the annualised target of 144, and in part, is a reflection of the targeted replacement programme. However, across all of these measures it must be recognised that there are a range of factors that can influence the overall number of events in any year that are outside of our control. These factors include weather and ground conditions. There is therefore much uncertainty around forecasting future performance.

9.2.4. Number of fracture and corrosion failures

Fracture and corrosion failures on metallic gas mains are a key driver of gas escapes. The resultant release of gas can potentially lead to an incident. In a similar way to GIBs, fracture and corrosion failures can be influenced by other factors such as material deterioration, change in temperature and ground conditions.

Number of fractures / failures over RIIO-GD1	Max. number of events (RIIO-GD1)	Inferred annual target	13/14 actual number of events	14/15 actual number of events	15/16 actual number of events	16/17 actual number of events	17/18 actual number of events	18/19 actual number of events
	21,936	2,742	815	883	685	683	689	678

Figure 9.5 : Fractures and corrosion failures performance

The number of fracture and corrosion failure events during the first five years of RIIO is well below the annualised target of 2,742. This improvement can again be traced back to the improved asset health and performance of our distribution pipeline network. However, the incidence of fracture and corrosion failures in any year can be influenced by a number of factors that are outside of our control. There is therefore again much uncertainty around forecasting future performance.

9.2.5. Number of domestic services replaced

This output relates to the number of domestic services replaced during RIIO-GD1. These volumes include all services replaced as part of our activities:

- Services associated with the Iron Mains Replacement Programme;
- Stand-alone bulk-service renewal programmes;
- Relays after escapes; and
- Other services replacement categories.

The output target is based on achieving the total replacement volumes over RIIO-GD1 and does not have formal year on year targets.

Number of domestic services replaced	RIIO-GD1 8 year target	Inferred annual target	13/14 actual services replaced	14/15 actual services replaced	15/16 actual services replaced	16/17 actual services replaced	17/18 actual services replaced	18/19 actual services replaced
	247,458	30,932	29,305	29,609	27,579	29,275	29,908	30,984

Figure 9.6 : Number of services replaced

The total number of domestic services replaced during the first six years of RIIO has averaged 29,443, below the average annual target of 30,932. We saw an increase of c1,080 services replaced compared to last year, largely as a result of the increase in Tier 1 mains replacement work carried out.

There are a number of factors behind this lower level of services replacement:

- Mains replacement activities in lower ‘service density areas’ – the historic average underlying the RIIO output target is one service every 12.6m of iron main. During the first five years of RIIO-GD1 this average has increased to one service every 14m of iron main;
- Lower than forecast reactive relay after escape workload – this is due to our strategy of employing ‘targeted service performance led mains replacement’ and the milder than average winters we have experienced. In the first six years of RIIO-GD1 Relays after escapes have averaged over 3,000 jobs lower than forecast when setting the output targets.

Our project design methodology now has increased focus on both service asset performance and service density, and so we expect the service incidence rate to increase. However we do not expect that this increase will offset the below target volumes seen so far in RIIO-1 and do not expect to hit the 8 year target. Cost benefit analysis shows that it would not be cost effective and in the interests of our customers to carry out a bulk service renewal programme to make up this shortfall. We have confirmed this in writing to Ofgem.

9.2.6. Sub-deduct networks ‘off-risk’ by the end of RIIO GD1

A sub deduct network is a network configuration which consists of a primary meter, pipes and one or more secondary meters. The owner and operator of these networks is not always clear, presenting a potential safety risk. This risk can be removed by re-engineering the pipes and meters, or by establishing that a third party formally accepts responsibility for them. Our target is to remove the risk from these networks by the end of RIIO-GD1.

Sub-deduct networks 'off-risk' by the end of RIIO	RIIO target	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21	Total
	135	9	69	34	9	0	2	12	0	135

Figure 9.7 : Sub deduct networks off risk

At the start of RIIO-GD1 there were an estimated 134 sub-deducts connected to our network. One additional site was identified by Xoserve in 2015 bringing the total number of sites to 135. During 2018 / 2019 main laying work was undertaken for one out of the outstanding sites but the project could not be fully completed as the associated meter work will be completed during a factory shut down over summer 2019. We are under continuing negotiation to transfer the operatorship and ownership of the remaining 11 sites to the site owners. This will involve ensure that the site owners understand the safety and maintenance obligations they will be responsible for managing.

9.2.7. Number and duration of planned interruptions

Our output target covers all planned interruptions, which have three main drivers:

- The replacement programme – GDN initiated – which accounts for c96% of the total number;
- Service alterations at the request of a customer – which accounts for c4% of the total number; and
- Diversions at the request of a customer – which accounts for the balance.

Ofgem are currently reviewing the targets for planned interruptions as part of the RIIO-GD1 Mid-Point Review. The targets detailed below are those currently proposed.

	Annual Target	Total	GDN Initiated	Customer initiated diversion	Customer initiated service alteration
Number of planned interruptions	64,257	63,774	61,254	32	2,488
Duration of planned interruptions	17.35 mm	17.6 mm	17.4 mm	0.0 mm	0.2 mm

Figure 9.8 : Number and duration of planned interruptions

The table above details our 2018/19 performance. We had 63,774 planned interruptions with a duration of 17.4 million of minutes (mm). As expected this was mainly driven by the replacement programme, which accounted for 61,254 interruptions with a duration of 17.4 mm. This was a 2% increase in volume from last year, driven by an increase in total mains abandonment. We also saw a 8% increase in the average minutes lost per interruption from 261 minutes to 276 minutes, which is driven largely by the type and location of the mains and services we have replaced as well as individual customer requirements.

The length of mains abandoned is the main driver of the number of planned interruptions and accounts for the majority of variances in our year by year forecasts for planned interruptions. It is not the only driver however. Volumes will also be affected by the proportion of mains replaced via open cut – more open cut increases the number of interruptions required – and the length of mains we have been able to replace via live service insertion, which does not require an interruption.

Overall we expect to outperform both the number of planned interruptions and minutes lost eight year RIIO-GD1 output targets. We expect to improve all aspects of the management and control of our replacement programme to minimise any project churn and hence impact on the customer. This will support delivery of this output.

9.2.8. Customer Satisfaction Survey results for planned interruptions

In 2018/19 we have delivered a score of 8.83, a minor reduction from 8.85 in 2017/18.

Over the last twelve months we have made significant improvements to how we communicate with our customers during planned work. Following stakeholder and customer feedback, we have introduced bespoke webpages for each of our replacement schemes, which are kept up to date with live information on useful customer information such as road closures, duration, and gas-on times. We are also continuing to use Roadworks.Org, and more recently have customised this tool to provide better information to road users visiting this website.

9.3 Mains Replacement costs

9.3.1. Repex compared to the allowance

Replacement expenditure	Net Costs 18/19 prices (£m)	Workload
Tier 1 – Mains laid	57.1	512.5
Tier 1 – Associated services	11.5	39,017
Tier 2a – Mains laid	1.5	7.7
Tier 2a – Associated services	0.1	216
Other – Mains laid	17.3	48.6
Other – Associated services	0.5	1,474
Diversions – Mains laid	1.1	9.2
Diversions – Associated services	0.1	170
Other services	6.8	5,940
Risers	0.0	23
Sub deducts	0.3	2
Total	96.2	
Allowance	109.1	
Variance	(12.9)	

Figure 9.9 : 2018/19 Repex costs and workload

The table above sets out our 2018/19 Repex costs and workload, along with the cost allowance. Overall we spent £96.2m against an allowance of £109.1m (after adjusting for lower than allowed Tier 2A workload). This £12.9m saving will be shared with our customers under the Totex sharing mechanism.

It is important to remember that the allowances are benchmarked against the other GDNs, and as the frontier performer, the allowances we have been set are in some cases higher than our base costs were when the allowances were set. We have also made considerable changes to our delivery model and commercial strategy for Repex which have contributed materially to our outperformance. These changes have focused on:

- Using direct contracts with end service providers to deliver the work in the field, rather than contracting through larger intermediary contractors. This removes the profit of the intermediary and gives us greater control of the field activities, improving efficiency and customer service; and

- Reviewing and rebuilding our pre construction processes – project selection, project build and various pre construction enabling works – to remove duplication, improve decision making, and streamline all activities

We have also implemented new innovative techniques developed under the RIIO Innovation framework which have delivered efficiencies in Repex, estimated at £0.5m for 2018/19. The main technique that has delivered efficiencies this year has been Stub end abandonment – a new techniques that allows us to cap off a smaller pipe connected to a larger pipe without leaving a short ‘stub’.

We have also used Control Point extensively, a technique developed outside of the innovation stimulus. This is a piece of equipment that measures the effectiveness of new joints enabling any remedial work to take place on site without a revisit. We estimate this has saved c£0.7m of future avoided costs.

9.3.2. Mains and Services year on year performance

Mains and Services (18/19 prices)	2017/18			2018/19		
	Net Costs £m	Workload	Unit Costs £	Net Costs £m	Workload	Unit Costs £
Tier 1 + steel – Mains laid	54.8	512.5	107	57.1	527.9	108
Tier 1 – Services	11.0	39017	281	11.5	38658	297
Tier 2a – Mains laid	2.5	7.7	331	1.5	4.1	364
Tier 2a – Services	0.1	216	520	0.1	187	315
Other – Mains laid	16.0	48.6	330	17.3	53.1	326
Other – Services	0.6	1474	421	0.5	1614	313
Diversions – Mains laid	1.3	9.2	141	1.1	7.3	151
Diversions – Services	0.1	170	462	0.1	131	541
Other services	7.4	5940	1244	6.8	6736	1005
Total mains laid	74.7	578.0	129	77.1	592.4	130
Total services	19.2	46,817	409	18.9	47,326	399
All in mains cost	93.9		162	96.0		162

Figure 9.10 : Repex year on year variance

In terms of year on year performance, the all in mains laid unit rate averaged £162 per metre this year, in line with the equivalent cost in 2017/18. When you consider mains and services together our Tier 1 costs have increased by c4% whilst workload has increased by c3%. Tier 1 work makes up c89% of the total workload delivered this year.

Tier 2a unit costs have increased by c15%, whereas Other Mains unit costs are broadly flat. Workload across these tiers is in general more complex and unit costs can vary more dependent on the actual workload.

9.3.3. Iron mains laid workload mix

Section 8.2.2 above details where we are against the abandonment workload targets. This section considers what mains laid workload mix we have achieved when delivering this abandonment, compared to the mix we forecast in the Business Plan. There are no targets for this, however it is relevant as it is mains laid which is the primary determinant of cost. We do not target this specifically when designing projects, but achieving a similar

mains laid workload mix to that planned whilst also hitting the abandonment targets shows we are delivering the work as we expected and not targeting easier and cheaper projects.

With regards to Tier 1, which as mentioned above makes up c89% of our overall workload this year, most mains laid is in the bottom 2 diameter band Tiers. However when compared to the Business Plan there has been a significant shift towards the second tier from the first, which is marginally more expensive work. Things are less clear cut when looking at Tiers 2 and 3 which make up c6% of our overall workload this year. There are small % movements across all bands, with the majority of the work in the middle four bands. Here there has been a swing towards lower diameter band work.

Mains laid workload mix	Tier 1			Tiers 2 and 3		
	Business Plan	Actual	Variance	Business Plan	Actual	Variance
<=75mm	39%	29%	(10%)	1%	3%	2%
>75mm to 125mm	45%	58%	14%	6%	4%	(2%)
>125mm to 180mm	14%	11%	(2%)	9%	16%	6%
>180mm to 250mm	2%	1%	(1%)	25%	30%	5%
>250mm to 355mm	0%	0%	0%	40%	34%	(6%)
>355mm to 500mm	0%	0%	0%	14%	12%	(2%)
>500mm to 630mm	0%	0%	0%	4%	1%	(3%)
>630mm	0%	0%	0%	0%	0%	0%

Figure 9.11 : Mains laid workload mix compared to the Business Plan

9.3.4. Risers and Sub-deduct year on year performance

NGN have an obligation to manage the risks identified with mains and services associated with medium and high rise buildings. We manage this through an ongoing programme of surveys and then carry out remedial work on both a reactive and planned basis as required. In 2015/16 we started an annual sampling survey program for buildings below 5 storeys and therefore we expected costs, workload and complexity to increase in future years. As a result a total of 39 risers have been replaced this year.

Sub-deduct networks present a potential safety risk as the owner and operator of these networks is not always clear. We use a risk based approach to manage and target our sub-deduct work programme. This year two sub-deduct networks have been removed, and we have firm plans to deal with the remaining 12 networks at risk.

9.4 Repex cumulative position under RIIO

Cumulative Repex 18/19 prices	13/14	14/15	15/16	16/17	17/18	18/19	Cumulative Total	Cumulative Allowance	Variance
Repex	99.3	104.2	94.0	91.2	93.9	96.2	578.8	654.0	(75.2)
Total	99.3	104.2	94.0	91.2	93.9	96.2	578.8	654.0	(75.2)

Figure 9.12 : Cumulative Repex position compared to the allowance

Cumulatively we have outperformed the £654.0m Repex allowance by £75.2m (11.4%).

It is important to remember that the majority of the allowances are fixed and do not vary by workload, with the exception of Tier 2a which represents less than 1% of the total expected mains abandonment. To date we have abandoned 2992.0km of iron main against an inferred 6 year target of 2983.2km, which puts us 0.3% ahead of target.

9.5 Repex forecasts

2018/19 actuals against forecast

2018/19 Repex forecast 18/19 prices (£m)	18/19 forecast	18/19 actuals	Variance
HSE driven mains and services	66.4	70.2	3.8
Non HSE driven mains and services	29.8	26.1	(3.8)
Risers	0.1	0.0	(0.1)
Total	96.4	96.2	(0.1)

Figure 9.13 : 2018/19 actual Repex position compared to the prior year forecast

The table above summarises our actual Repex expenditure in 2018/19 against the forecast for 2018/19 we submitted last year. Overall we spent £96.2m, a £0.2m decrease from the forecast (0.2%). In terms of volume we completed 603km of mains abandoned against a forecast of 611.3km (1.3%). Our overall unit cost stayed flat compared to a forecast 1% reduction.

RIIO-GD1 forecast

Repex forecasts 18/19 prices (£m)	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21	Total
HSE driven mains and services	72.5	79.1	70.7	72.0	68.3	70.2	71.9	66.5	571.1
Non-HSE driven mains and services	26.7	25.1	23.3	19.2	25.4	26.1	26.3	22.8	194.9
Risers	0.1	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.5
Repex totals	99.3	104.2	94.0	91.2	93.9	96.2	98.3	89.4	766.5

Figure 9.14 : Repex forecasts

The table above summarises our RIIO-GD1 Repex expenditure forecast, based on the first six years' actual performance and a forecast for the remaining two years. We expect to achieve all of our output targets through our replacement programme whilst outperforming the allowances.

We will achieve this by re-engineering our replacement programme in line with our Total Network Management (TNM) approach. In particular we continue to fully utilise the added flexibility introduced in the new 3 tier approach to replacement, as well as maximising the return on this investment through a detailed cost benefit analysis approach.

In terms of the forecast cost profile above, we are introducing further efficiencies into our delivery model by expanding our commercial and operational strategy, which has already delivered benefits. We expect to achieve year on year unit cost savings as a result.

10 Overall Output Review

10.1 Introduction

The adoption of an outputs based framework is a key element of the RIIO framework. By defining the outputs companies need to deliver (e.g. risk removed), instead of prescribing a set of inputs (e.g. length of mains abandoned), the framework provides incentives for companies to innovate and deliver the services that customers require at least cost. An outputs based framework also provides greater transparency for customers in relation to the services companies need to deliver.

This section provides a summary of the outputs NGN is required to deliver during RIIO-GD1, our progress against these targets for 2018/19 and our forecasts for the next two years. This section also provides detailed commentaries on those outputs which are not directly related to costs – detailed commentaries on those outputs are provided in the relevant expenditure sections.

The outputs cover six areas:

Safety – Minimising the risks associated with operating the gas distribution network for our stakeholders and society;

Reliability – Improving the reliability of our network with the optimum level of expenditure;

Customer Service – Improving the service we offer customers by engaging with them fully so their views direct the way we operate our business;

Environment – Reducing the environmental impacts of gas distribution;

Social Obligations – Helping to alleviate fuel poverty and actively addressing the concerns and risks of carbon monoxide poisoning; and

Connections – Providing a high quality connections service for both entry and exit customers. Outputs are classified as primary (or principal) outputs and secondary deliverables. In theory the secondary deliverables were designed to measure performance against the primary outputs. However, this distinction is blurred and does not hold true in all cases. It is far simpler therefore to consider both the primary outputs and the secondary deliverables as a single set of outputs that we must deliver for our customers. There are 52 in total.

10.2 Safety Outputs

The aim of the safety output measures is to ensure the provision of a safe network in compliance with HSE safety standards and improve asset knowledge to ensure GDNs develop well justified investment plans.

The table below shows the safety outputs which have a one year output target, and our performance against target during 2018/19. We continue to outperform the 1hr and 2hr target and have seen our best 12hr repair percentage rising from 66.1% to 68.4%. Annual repair risk is comfortably within the annual target of <34.5m. Sub deducts although under the inferred 6 year target is on course to deliver the RIIO GD1 target.

One Year Outputs	RIIO-GD1 Year 6 target	18/19	RAG	
Emergency response				
97% of uncontrolled gas escapes attended within 1 hr	97%	99.75%	G	Link
97% of controlled gas escapes attended within 2 hrs	97%	99.94%	G	
Repair				
Annual repair risk (m)	<34.5	23.6	G	Link
Percentage of repairs completed within 12 hrs	61.0%	68.4%	G	Link
Major accident hazard prevention (MAHP)				
Compliance with the Control of Major Accident Hazards regulations (number of breaches)	0	0	G	Below
Compliance with the Gas Safety (Management) Regulations (GS(M)R) (number of breaches)	0	0	G	Below
Sub-deduct networks 'off-risk' by the end of RIIO	5	2	G	Link

Figure 10.1: 'One Year' safety outputs performance

The table below shows the safety outputs which have an eight year output target. In most cases we have inferred an annual target based on the eight year output target in order to track progress, but we assess the performance against our cumulative and forecast performance.

Eight Year Outputs	RIIO-GD1 Year 6 inferred target	18/19	RAG	
Mains replacement				
Risk removed (incidents/year x10 ⁻⁶) as measured by MRPS	13,899	20,268	G	Link
Number of Gas in Buildings (GIB) events	144	53	G	Link
Number of fractures and corrosion failures	2,742	678	G	Link
Length of main taken 'off-risk'(km)	497.2	529	G	Link
Number of services replaced	30,932	30,984	G	Link
Asset health and risk metrics	Phased plan	On Target	G	Link

Figure 10.2: 'Eight Year' safety outputs performance

We are making good progress delivering our safety outputs. We are cumulatively 8.8km ahead of the inferred year 6 target for length of mains taken 'off risk' which is 1% ahead of schedule. The number of services replaced is above target this year. However, we are currently 5% behind target here mainly as we have seen fewer services replaced when completing emergency response work, driven by the relatively mild winters we have experienced in previous years. More detail and explanation on each individual measure can be found below and by following the links in the table above.

10.2.1. Major Accident Hazard Prevention

NGN's existing safety requirements in relation to Major Accident Hazard Prevention are set out in legislation and monitored by the HSE. There are three outputs in this area. Two are related to compliance with legislation and the other relates to risk removal from sub-deduct networks.

As outlined in the table below, we are not forecasting any breach of legislation.

	RIIO target	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21	Total
Compliance with the Control of Major Accident Hazards regulations (number of breaches)	0	0	0	0	0	0	0	0	0	0
Compliance with the Gas Safety (Management) Regulations (GS(M)R) (number of breaches)	0	0	0	0	0	0	0	0	0	0

Figure 10.3 : Major accident hazards prevention forecast

Compliance with the Control of Major Accident Hazards Regulations (COMAH) (2015)

This output requires us to demonstrate that we have fully complied with COMAH and set out the details of any non-compliance within the relevant year. It requires us to have a major accident prevention policy backed by a robust safety management system. We have detailed policies and procedures in place to manage compliance.

NGN have removed all high pressure storage sites and have decommissioned and denotified all low pressure COMAH sites. This eliminates the legislative requirement associated with gas storage set out in COMAH regulations.

We have had no COMAH breaches in 2018/19. Our target is to have no breaches during RIIO-GD1.

Compliance with the Gas Safety (Management) Regulations (GS(M)R)

This output requires NGN to demonstrate that it has fully complied with GS(M)R and operated in accordance with the safety case required by this legislation. A culture of compliance with the safety case is embedded throughout NGN.

Our output target is to maintain full compliance with GS(M)R throughout RIIO-GD1. We have achieved this in 2018/19 and expect to for the remainder of RIIO-GD1.

10.3 Reliability outputs

The aim of the reliability output measures is to promote a network capable of providing long term reliability, whilst adapting to climate change, as well as minimising the number and duration of interruptions.

Eight Year Outputs	RIIO-GD1 Year 6 inferred target	18/19	RAG	
Loss of supply				
Number of planned interruptions	64,646	63,774	G	Link
Number of unplanned interruptions	12,960	14,030	G	Link
Duration of planned interruptions (mins-millions of)	21.3	17.6	G	Link
Duration of unplanned interruptions (mins-millions of)	5.9	6.3	G	Link
Network capacity				
Meeting NGN's 1 in 20 planning standard (MWh pa)	505,357	473,411	G	Below
PRI utilisation and capacity	Phased plan	On Target	G	Link
Network reliability – maintaining operational performance				
Percentage by volume of offtake meter errors	<0.1% pa	<0.1%	G	Below
Number and duration of telemetered faults	136 pa	116	G	Below
Pressure System Safety Regulation (PSSR) Faults (A1 and A2 faults per number of AGIs)	0.49	0.29	G	Below
Gasholder decommissioning	3	3	G	Link

Figure 10.4 : Reliability outputs 2018/2019 performance

The table above shows the reliability outputs which all have an eight year output target. In most cases we have inferred an annual target based on the eight year target in order to track progress. Number of unplanned interruptions & Duration of unplanned interruptions (mins-millions of) are above the inferred target however are within the RIIO GD1 6 Year cumulative inferred target.

Our year six performance on reliability outputs has been good. We expect to deliver all our reliability outputs. More detail and explanation on each individual measure can be found below and by following the links in the table above.

10.3.1. Network capacity

Meeting NGN's 1 in 20 planning standard

This output requires our network to have sufficient capacity to ensure that customers' gas supply is not interrupted during periods of highest demand.

Forecasts of peak demand are reviewed annually and are a primary influence on our modelling and capacity planning processes. The demand forecasting process employs specific modelling techniques which identify the peak (1:20) demand over a period of ten years. This is used alongside our storage simulation model which identifies the peak storage requirements using historic demand and weather patterns over a 52 year period.

Estimates of peak customer demand in 1 in 20 weather conditions have been falling since 2005 as a result of high energy prices, the economic downturn and increased energy efficiency. However, in our 2019 modelling process we have forecast an increase in peak demand for the year 2019/20. This is due to the inclusion of the actual demand data relating to the severe winter of 2017/18. After experiencing a series of mild winters since 2010/11 our peak demand had previously looked like it was in steady decline, but we believe this is no longer the case. Our peak demand profile appears steady and flat from 2020/21 onwards.

In 2018/19 we fulfilled our requirement to meet our 1 in 20 standard yet again as we have procured sufficient capacity to meet our expected system demand.

The table below details our latest peak demand forecasts. We expect to be fully compliant throughout RIIO-GD1.

Meeting NGN's 1 in 20 planning standard (MWh pa)	RIIO annual target	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21
	505,357	500,315	502,916	492,560	476,850	478,846	473,411	485,014	480,154

10.3.2. Network Reliability

Output: Percentage by volume of offtake meter errors

NGN is responsible for measuring and reporting meter accuracy for the delivery of gas from the NTS into our network. This is measured through a process administered by the Joint Office of Gas Transporters, which requires the identification and reporting of potential meter errors as part of a measurement error notification process.

There is a common industry output target for RIIO-GD1 in relation to meter errors of no greater than 0.1% of total throughput (measured in GWh).

Offtake meter errors	RIIO annual target	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21
	<0.1%	0%	0%	0%	0.0%	<0.1%	<0.1%	<0.1%	<0.1%

Figure 10.6 : Offtake meter errors forecast

All our offtake metering systems have been assessed for accuracy and repeatability through the full flow range with results assessed to identify sites where the accuracy and reliability could be improved by introducing new technology. A program of metering upgrades has been developed to replace the old metering systems with the latest ultrasonic meters which are more efficient as they have a higher accuracy through the full flow range and require less maintenance.

Meter errors can take a significant period of time to progress through the process detailed above. We received one new meter error report in 2018/19 for 0.74Gwh, but it is expected to fall well below the 0.1% threshold.

Output: Number and duration of telemetered faults

RIIO-GD1 includes output targets covering our response to telemetered faults on Above Ground Installations (AGI). This is measured as the average duration of 'now' faults per AGI. We have an output target to reduce the number and duration of telemetered faults over RIIO-GD1 as detailed in the table below.

	Year 6 inferred target	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21
Number of 'now' faults duration in hrs / number of telemetered AGIs	136	105	63	135	63	95	116	106	99

Figure 10.7 : Telemetered faults forecast

In 2018/19 we scored 116 against a target of 136 continuing our outperformance for this output. The score has increased from last year, driven by an increase in fault numbers from new pre-heating equipment related to our NIC projects in that area. Our future forecast reflects the potential for faults with new non-conventional gas connections.

Our system control and network maintenance functions have continued focussing on this output. Fault data is reviewed through weekly reports, which drives the reduction and close out of faults quickly and efficiently. They also hold monthly fault meetings to continuously identify further opportunities to reduce faults. It also drives a prioritised replacement programme to remove equipment identified as at the end of its asset life with significant fault risk.

Output: Pressure Systems Safety Regulations (PSSR) faults

Statutory inspections are carried out on our above two bar network under the Pressure Systems Safety Regulations which can find faults. Addressing PSSR faults allows us to limit the deterioration of network assets. Faults are reported by reliability categories, with A1 (imminent danger) being the most serious.

This output measure was not consistently defined across the GDNs, and so it has been agreed that all GDNs will move to a revised consistent approach when this has been reviewed further.

	RIIO annual target	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21
Number of PSSR A1 and A2 faults per inspection	0.49	0.43	0.26	0.31	0.35	0.37	0.29	0.48	0.47

Figure 10.8 : PSSR faults forecast

The RIIO-GD1 target for the proposed new measure is <0.49 faults per inspection. We have achieved 0.29 faults per inspection in 2018/19, significantly lower than last year and below the target. The target reduces year on year throughout RIIO-GD1, and we expect to outperform this target every year.

10.4 Customer service outputs

The aim of the customer service output measures is to improve levels of customer satisfaction from the activities carried out by NGN. The outputs also seek to encourage us to undertake effective engagement with our stakeholders and reflect their views in the day to day operation of our business.

There are no specific RIIO targets, only a sliding scale penalty or reward based on our performance.

One Year Outputs	RIIO-GD1 year 6 target	18/19	RAG	
Customer satisfaction survey				
Unplanned interruption (Overall satisfaction score from 0-10)	9.0	9.49	G	Link
Planned interruption (Overall satisfaction score from 0-10)	8.5	8.83	G	Link
Connections (Overall satisfaction score from 0-10)	8.4	8.93	G	Link
Complaints				
Complaints metric	11.6	2.78	G	Below
Stakeholder engagement				
Maximise rewards under the stakeholder incentive target (score from assessment panel)	>5.0	5.96	G	Below

Figure 10.9 : Customer service outputs 2018/19 performance

We have achieved a good outcome in our customer service outputs. We have maintained a strong performance for complaint handling, and performed well in the stakeholder engagement assessment.

In 18/19 we have seen a slight decline in performance overall. For our Emergency and Replacement scores, we have maintained performance from 17/18 to 18/19. However, we have seen a decline in our connections performance, which has impacted our overall performance. We are addressing the specific points that have caused this by concentrating on service level agreements and providing in depth customer training for all customer facing colleagues in the connections process.

Over the second part of 18/19, we saw an immediate impact of these improvements, and are forecasting sustained improvement for Connections.

No specific targets have been set for the customer satisfaction outputs. However, there are baseline targets for the associated financial incentive scheme. We are aiming to achieve the maximum reward under the scheme, and so the scores necessary to achieve this are our minimum targets. We are forecasting to outperform these targets throughout RIIO-GD1.

10.4.1. Complaints Metric

Under RIIO-GD1, complaints performance is incentivised through penalties for poor performance. Our aim is to avoid any penalties for all of the eight years of RIIO-GD1. Performance is measured via the complaints metric, which is a composite score calculated as the sum of each GDN's performance against four elements. The table below summarises the four elements and our performance in 2018/19.

	Complaint Scores
Percentage of complaints unresolved after one working day	21.17%
Percentage of complaints unresolved after 31 working days	2.03%
Percentage of repeat complaints	0.10%
The number of Energy Ombudsman (EO) decisions that go against NGN as a percentage of total complaints received	0.00%

Figure 10.10 : Complaint metric breakdown

The above scores generate a weighted complaint score of 2.8 which does not generate any penalties. Penalties would only be imposed if our score was 11.57 or more. This is a very strong performance but we will look to improve this year on year.

	RIIO Maximum target	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21
Complaints Metric	11.57	5.0	2.7	3.1	2.7	3.4	2.8	2.5	2.5

Figure 10.11: Complaints metric forecast

In 18/19 we have seen an improvement in our overall complaints metric score from 17/18. Over the last 12 months we have worked hard to resolve more complaints within D+1 and D+31, and this has had a positive impact on the overall score.

We have continued to hold our daily complaints call, but introduced an improvement to this by using one of the daily calls to focus on resolution for complaints over 1 day old. This has helped to improve our performance for D+31 complaints. We have also introduced a jeopardy report that focusses on open complaints approaching D+10 and D+20. Finally our robust quality checks ensure that repeat complaints are kept to a minimum. We continue to have had no Ombudsman findings against NGN for RIIO-GD1.

10.4.2. Stakeholder engagement

At NGN we firmly believe that stakeholder engagement and our response to feedback can lead to stronger outcomes for our stakeholders, our customers, our colleagues and our business.

We recognise that all our stakeholders are different and may have specific areas of interest. By ensuring our engagement programme allows these diverse views to be heard, we are confident that we are building the required evidence base and legitimacy for our current and future plans.

Our strategy

Our comprehensive stakeholder strategy has been established since 2014/15. It is reviewed and updated every year with increased checks to ensure it is robust.

Our framework allows colleagues at all levels to engage stakeholders effectively; it provides the flexibility to tailor engagement methods to the interests and capacity of our stakeholders, whilst ensuring our approach aligns to the AA1000 Stakeholder Engagement Standards (SES) best practice principles.

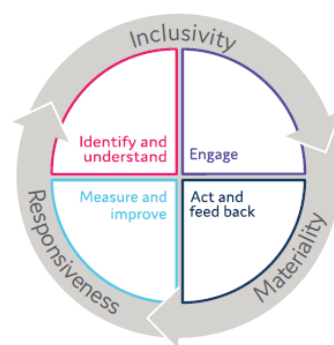
This year, we undertook extensive stakeholder mapping to enrich our dataset, help us prioritise our engagement activity and to inform how we engage. Mapping in this way allows us to more effectively target challenging groups of stakeholders; including seldom heard, time poor and those with lower satisfaction levels.

‘The engagement strategy sets out a clear framework for engagement. The detailed engagement plan is clearly based on the strategic priorities of the business’ AA1000SES Audit Report (Feb 2019).

The golden thread:

We believe that for our engagement to be have impact and be meaningful we should always be able to see the golden thread running from our stakeholder insight, to the business changes we make, and ultimately, delivery of our strategic objectives.

Our framework for engagement



Identify and understand

- Annual stakeholder opportunities, issues and risk mapping with senior management team and departments
- Tailored stakeholder engagement plans for key projects and activities such as our community work

Engage

- Open and transparent engagement
- Range of methods tailored to stakeholder interests and knowledge, e.g. our first Utility Infrastructure Provider workshop
- Engagement with a purpose e.g. influencing activity in relation to energy futures

Act and feed back

- Feed stakeholders' views back into the business
- Emerging themes identified
- Action plans agreed and delivered
- Outcomes fed back to stakeholders via appropriate channels e.g. face-to-face and website

Measure and improve

- Activity recorded, measured and improved e.g. stakeholder satisfaction feedback
- Processes reviewed and improved – through feedback, accreditation and annual audit
- Outcomes measured and scaled up; learning feeds into decision-making processes

Strengthening our engagement

In order to deliver great outcomes for our stakeholders we need to be great at engaging with our stakeholders. We are pleased to have retained the AA1000SES standard for the sixth year in a row and our approach to auditing throughout the year is helping us to continually measure and improve how we engage.

In 2018/19 we have:

- Engaged with more than 49,000 stakeholders from the doorstep to the boardroom.
- Seen an increase of 27% in stakeholder satisfaction through our monthly benchmarking
- Spent 150 hours engaging deliberately with vulnerable customers
- Introduced 4 new engagement mechanisms, including our NGN Public Panel which sees 50 domestic customers undertake 3 full days of engagement.

Delivering benefits

Stakeholder input continues to help us to focus our resources on delivering the right outcomes and improvements, and in developing our longer term plans - from driving up standards on our sites through the Considerate Constructors Scheme, training more than 330 colleagues to identify and support customers in vulnerable situations, to improving our services for specific sets of seldom heard customers, such as those who have recently had a driveway laid.

Stakeholder Incentive Scheme

In 2018/19 we achieved a score of 5.96, maintaining our strong position within the scheme. We have worked extremely hard this year 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.

10.5 Environmental outputs

The aim of the environmental output measures is to reduce the environmental impacts of gas distribution. This is delivered through the measures detailed below. The outputs in this area are split into a broad measure and a narrow measure.

The outputs under the broad environmental measure are aimed at ensuring that we play a role in delivering a low carbon energy sector. The most prominent role involves facilitating the connection of new renewable gas plant. As we don't have control over the delivery of such connections, the output measures are more around assisting and promoting such development rather than specific targets for the amount connected. The outputs and our achievements are set out below.

The outputs under the narrow measure are aimed at minimising the environmental impact of our own activities.

10.5.1. Broad measure

Eight Year Output	Inferred annual target	18/19	RAG
Total capacity of biomethane connected (SCMH)	No target	0	G
Total capacity of biomethane enquiries/applications in progress (SCMH)	No target	9,190	G
Information provision and arrangements for customers wanting to inject gas on the distribution network	No target	Met	G
Voluntary standards of service: 15 day response to initial enquiry under 7 bar	100%	100%	G
Voluntary standards of service: 30 day response to capacity study under 7 bar	100%	100%	G

Figure 10.12 : Environmental broad measure performance

Throughout 2018/19 there has been a stagnation in the number of biomethane enquiries that we have received. It is understood that the biomethane injection to grid timescales imposed by the Renewable Heat Incentive (RHI) Regulations announced in May 2018 are the cause of this. Under the Regulations, new plants must flow gas to grid by 31st January 2020 to be eligible for the Tariff Guarantee.

We have not connected any new biomethane plants throughout the 2018/19 regulatory year.

The table below provides a forecast of enquiries and connections for the RIIO-GD1 period, together with performance against the voluntary standards of service. The voluntary standards of service currently cover pre-quotations data. We have met all our voluntary targets this year & currently have 10 sites connected to our network.

	RIIO annual target	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21
Total capacity of biomethane connected (SCMH)	No target	0	1,200	7,800	500	550	0	5,190	0
Total capacity of biomethane enquiries/applications in progress (SCMH)	No target	11,800	29,600	27,390	38,440	18,740	9,190	3,529	0
Information provision and connection charging for distributed gas	No target	Met	Met	Met	Met	Met	Met	-	-
Voluntary standards of service: 15 day response to initial enquiry under 7bar	100%	100%	98%	89%	100%	100%	100%	100%	100%
Voluntary standards of service: 30 day response to capacity study under 7bar	100%	100%	100%	100%	100%	100%	100%	100%	100%

Figure 10.13: Environmental broad measure forecast

10.5.2. Narrow Measure

The table below shows the narrow environmental measure outputs, which all have an eight year output target. In most cases we have inferred an annual target based on the eight year target in order to track progress.

Eight Year Outputs	Inferred Annual Target	18/19	RAG
Shrinkage gas			
Shrinkage baselines (GWh)	401GWh	341GWh	G
Leakage baselines (Gwh)	386GWh	319GWh	G
Business Carbon Footprint (BCF)			
BCF excluding shrinkage	None	6737Tn	G
Other emissions and natural resource use			
Number of sites where statutory remediation has been carried out	None	3	G
Use of virgin aggregate	<17,000	8,160	G
Amount of spoil to landfill sites	<13,000	744	G
ISO14001 major non conformities	None	None	G

Figure 10.14: Environmental narrow measure 2018/19 performance

Output: Shrinkage gas

We are responsible for purchasing gas to replace the gas lost through shrinkage. Shrinkage comprises leakage from pipelines (c.95%), theft from the gas network (c.3%), and own use gas (c.2%). We have set output targets to reduce the amount of shrinkage and leakage from our network over RIIO-GD1. The table below sets out the target shrinkage and leakage volumes set out in our Licence against our actual and forecast performance. The baselines have been reset to reflect the 1.4 version of the Shrinkage and Leakage model.

(GWh)	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21
Shrinkage baselines	455	445	433	423	412	401	390	379
Shrinkage actual	417	397	382	354	352	341	330	319
Leakage baselines	430	420	408	398	386	376	364	354
Leakage actual	395	375	360	332	329	319	307	297

Figure 10.15: Shrinkage and leakage forecasts

We have continued to successfully outperform both our shrinkage and leakage targets in 2018/19. We plan to further outperform the annual targets throughout RIIO-GD1. We will achieve this through a combination of:

Reducing our metallic mains population through the replacement programme;

Reducing system pressures through strong governance and close working practices between our pressure management, network validation and network maintenance teams. In 2018/19 we have seen a small increase in our average system pressure from 31.31 mbar to 31.95 mbar, this is due to higher pressure requirements in March 2018 which meant that pressures were lowered later than the previous year;

Thanks to the ability to remotely control pressures in some of our biggest networks, we were able to prepare for some of the high demand days experienced in winter 2017/18 at very short notice while still maintaining a leakage reduction. For 2018/19 we further developed our strategy to ensure the pressure to our network is set appropriately. Technology to reduce the need for regular battery replacement is being rolled out this year which will allow us to reduce the number of faults which will greatly reduce the time that sites are in 'Fail High' state;

Effectively managing our levels and use of MEG (Monoethylene Glycol), a 'wet' gas used to saturate and swell metallic joints which otherwise may leak gas. This year MEG saturation has decreased from 29.75% to 22.84%, a decrease of 6.9%. Since last year we have implemented an annual cost benefit analysis on all foggers on our network and by targeting investment in the most beneficial units and turning off those that are uneconomic, we are ensuring we operate a more efficient and cost-effective gas conditioning strategy. We have also identified new points for installation and sampling, whilst effectively managing the routes to identify cost savings.

Output: Business Carbon Footprint (BCF) (excluding Shrinkage)

All GDNs are expected to reduce their BCF over time. No specific targets have been set for RIIO-GD1. However our performance will be compared with other GDNs and published on an annual basis. The table below shows our performance to date and forecast for the remainder of RIIO-GD1.

	13/14 Actual	14/15 Actual	15/16 Actual	16/17 Actual	17/18 Actual	18/19 Actual	19/20	20/21
NGN non-shrinkage BCF (Scope 1 and 2) - tCO ₂ e	8,918	9,244	8,476	7,999	7,418	6,737	9,244	8,919
NGN non-shrinkage BCF (Scope 3) - tCO ₂ e	12,821	16,298	15,287	13,135	14,409	15,095	16,298	12,821
NGN non-shrinkage Total BCF - tCO ₂ e	21,739	25,542	23,763	21,135	21,827	21,832	25,542	21,739

Figure 10.16: Business Carbon Footprint forecast

*Forecasts based on NGN's Scope 1 and 2 Science Based Targets for a well below 2 degree warming scenario in 2050 as developed in conjunction with the Carbon Trust. Our 2018/19 Scope 1 and 2 emissions have already achieved our target for 2020/21 so we have forecast additional 2% annual reductions beyond our 2018/19 performance to ensure we deliver continuous improvement.

Our Scope 1 and 2 BCF (excluding shrinkage) has reduced by 24% between end 2013/14 and end 2018/19, and by 9% between Years 5 and 6.

Achievements during 2018/19 compared to 2017/18 include:

We're traveling less

- 15.9% reduction in carbon emissions associated with business mileage (Scope 1). We achieved this by driving approximately 860,000 less business miles in cars during 2018/19 compared to the previous year. We have provided improved technology to our colleagues, to reduce the need for travel, and maintained a general focus on minimising business travel which has contributed to this improvement.
- 41% reduction in carbon emissions associated with business air travel (Scope 3) due to a 57% reduction in the number of business flights taken compared to the previous year.

We are more efficient

- 31.2% reduction in carbon emissions associated with electricity consumption in our buildings and gas infrastructure sites (Scope 2). This has been achieved as a result of 14% lower electricity consumption compared to the previous year, in addition to a 19% reduction in the DEFRA carbon conversion factor for electricity from the UK grid.

Why did we see some increase?

Notably, during 2018/19 we experienced an 18% (1079 tCO₂e) increase in carbon emissions associated with the production and transport of PE pipe and fittings (Scope 3) compared to the previous year for a similar mains replacement workload. This increase is attributed to temporary material stockpiling to ensure business resilience during the Brexit preparation process.

Statutory remediation of contaminated land

No specific targets have been set for statutory land remediation. During 2018/19 we continued our programme of reviewing our portfolio of sites with potential for land contamination, and land remediation monitoring and maintenance works were completed across 39 sites. This included 14 intrusive land contamination surveys and environmental sampling at a further seven sites to provide an updated assessment of the environmental risk and potential liability associated with each site.

Remediation projects were completed at three former gasworks sites during 2018/19 to reduce environmental risks to receptors at each site as detailed below:

- Snaith Governor Site: Dewatering and capping of an infilled in-ground former gas holder tank which had been identified as a contaminant source during a previous intrusive site survey.
- Selby Governor Site: Capping of a hotspot of exposed soil contamination (cyanide) identified during previous intrusive site survey.
- Todmorden Governor Site: Removal and off-site disposal of a coal tar containing in-ground former gasworks tank structure.

Two remediation projects commenced during 2017/18 were continued during 2018/19 to reduce environmental risks to receptors at each site as detailed below:

Redheugh Gas Holder Station: Installation of an innovative solar powered in-situ remediation system to recover coal tar from the base of an infilled 9m deep former gas holder tank.

Knottingley AGI: Installation of an in-situ remediation system to recover coal tar from the base of an infilled approximately 4.5m deep former gas holder tank.

We expect to carry out further monitoring/maintenance works and remediation throughout RIIO-GD1 as detailed below, with the study sites prioritised based on environmental risk and synergies with scheduled capital works.

	RIIO target	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21
Number of sites where statutory remediation has been carried out	None	0	0	3	3	3	3	2	2
Number of sites monitored or maintained	None	0	40	54	79	46	39	64	38

Figure 10.17: Statutory remediation of contaminated land RIIO forecasts

Output: Use of virgin aggregate and amount of spoil to landfill

In 2018/19 we comfortably achieved our annual business target for excavation spoil to landfill. Our performance was 94% below the target in 2018/19. Between 2013/14 and 2018/19 the tonnage of spoil we have sent to landfill has reduced by approximately 99% for a similar workload.

Our usage of virgin aggregate decreased by approximately 43% between 2017/18 and 2018/19, equating to a reduction of 6,161 tonnes. Between 2013/14 and 2018/19 our usage of virgin aggregate has reduced by approximately 78% for a similar workload. Our tonnage of virgin aggregate used during 2018/19 was approximately 52% below our annual business target for this measure. This is the second consecutive year that we have achieved this target during RIIO GD-1.

In comparison to other areas of the country, the Yorkshire Highway Authorities Utilities Committee (YHAUC) continues to impose comparatively stringent quality requirements which must be adhered to in order for recycled aggregate to be registered on their database and approved for use within the Yorkshire region for reinstatement. Collective lobbying by utilities, including NGN, has resulted in more producers becoming approved over time. Additionally, some of the YHAUC registered recycling centres do not produce approved recycled aggregate between October and March. This is due to the sensitivity of the material and production process to the wet winter weather. Therefore, hinders our ability to procure approved recycled aggregate during these times of the year in parts of our network area.

We have achieved the improvements during 2018/19 by continuing the contractor management procedures introduced during 2016/17, including:

- Each contractor is individually challenged on their spoil and aggregate performance at the regular contract performance 1-2-1s held with NGN.

- Supporting our contractors to find local recycling centres to help them improve their own performance and assisting with their data reporting to ensure they are correctly classifying their spoil to landfill and virgin aggregate performance.
- Inclusion of spoil to landfill and virgin aggregate usage KPIs within contracts for mains replacement.

As a result of our performance to date along with trends shown throughout 2017/18 and 2018/19, we anticipate that our spoil disposal to landfill will remain low and we will continue to achieve reductions in usage of virgin aggregate throughout the remainder of RIIO-GD1. This will enable us to consistently achieve our annual business targets for these measures.

	NGN target	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21
Use of virgin aggregate (t)	<17,000	37,862 (28.58%)	29,426 (23%)	33,553 (25.44%)	17,140 (12.56%)	14,321 (10.5%)	8,160 (6.1%)	8,000	7,500
Amount of spoil to landfill sites (t)	<13,000	61,555 (35.99%)	18,565 (10%)	17,311 (9.92%)	6,232 (3.23%)	308 (0.2%)	744 (0.4%)	700	600

Figure 10.18 : Use of virgin aggregate and amount of spoil to landfill sites RIIO forecasts

Output: ISO 14001 major non-conformities

During September 2018 our Environmental Management System was subject to an external annual surveillance audit against the ISO14001:2015 standard. No observed weaknesses or major non-conformities were identified.

We anticipate continued high-level performance with no major non-conformities during RIIO-GD1.

	RIIO target	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21
ISO14001 major non-conformities	None	0	0	0	0	0	0	0	0

Figure 10.19 : ISO 14001 major non-conformities output forecasts

10.6 Social obligations outputs

The aims of the social obligation outputs are to help alleviate fuel poverty through extending the gas network, and to improve awareness of the risks from carbon monoxide. There is also a general output to play an active role in addressing wider social issues. These outputs all have an eight year output target. In most cases we have inferred an annual target based on the eight year target in order to track progress.

Eight Year Outputs	Inferred Annual Target	18/19	RAG
Number of fuel poor network connections	1,917	2,763	G
Providing all emergency staff with upgraded detection equipment which will enable them to test for the presence of carbon monoxide and provide appropriate advice	-	-	G
Ongoing programme of activities to improve general customer awareness of the danger from carbon monoxide	See Below		-
Other social issues	See Below		-

Figure 10.20 : Social obligations outputs

We have achieved all outputs in this category in 2018/19. Cumulatively we are ahead of schedule on the number of fuel poor connections completed, getting close to completion of our full GD1 target of 14500 Fuel Poor Connections.

Off-gas communities – extensions and infills.

We continue to work with partner organisations, predominantly registered social landlords and local authorities, to develop a work book that provides ‘whole house’ solutions. This ensures that those who benefit from an assisted connection are also supported with effective in house measures such as insulation and central heating. This continues to be successful, and during 2018/19 we have developed further relationships with more Social and private Landlords to extend our reach and delivery, particularly successful has been raising the profile and impact of changes to FPNES, whereby geographic based schemes are less likely in future to be feasible following the removal of the LSOA criteria from June 2019. We continue to advertise in collaboration with the other GDNs in the National Landlord Magazine, and sponsor the NEA publication, reaching out to energy champions nationwide, and work with community based organisations to access those that could be considered hard to reach.

Having collated research based on the health impacts for those living in cold homes. We have worked hard and secured funding for both connections and central heating in order that we can move the research into pilot schemes in Durham and Sunderland , the purpose being to establish evidence to support the benefits of living in a warmer environment, particularly for those with cold related ill health.

Off-gas communities – rural

Our ‘Warm Hubs’ scheme in remote rural areas with Community Action Northumberland, came to an end, but we are delighted that after 3 years support from NGN the scheme now continues and is self-sustainable. A proposal from CAN is now under review and final approval, to move the Community based warm hub project into a series of Pop up warm hubs, this will be tested for two years.

Energy Challenges

Recognising that Fuel Poverty and Energy Efficiency go hand in hand, we have undertaken work to test a number of activities;

Green Doctors, a previously jointly funded initiative with NPG has been extended for another two years, in addition to previous switching/Energy efficiency we have funded the establishment of further services to cover more remote/rural areas.

Yorkshire Energy Doctor, currently being finalised a two year contract to promote Energy Efficiency to training community champions to work within their communities.

Support for Durham, we have agreed to Fund a role with DCC to work with people in the Durham area to promote WHD, Fuel Switching and provision of energy advice.

On the doorstep, as we engage with customers as part of our everyday business, in 2018/19 we tested an approach whereby our Engineers provide advice and guidance, we are currently looking at the benefits and impact of this.

Making Every Contact Count- an NIA funded project whereby we recognise the challenges if vulnerable customers are disconnected, ensuring that where vulnerability is sensed suitable follow up support is undertaken. The results once fully tested will help establish revised protocols to ensure we provide required support and assistance resulting in vulnerable customers not being disadvantaged.

Community Promises Fund

We recognise the benefits of working in partnership with 'trusted intermediaries', and in 2018/19 we developed further our Community Promises Fund, by partnering with Northern Powergrid, this has doubled the fund to £100k, and now provides two application rounds per year The fund continues to encourage community groups to bid for funding (between £1-£10k) for projects that support our key areas of;

- Fuel Poverty/Energy efficiency
- Priority Services
- Carbon Monoxide awareness
- STEM (Science technology engineering and maths).

A helping hand for our customers

Recognising that some of our customers need extra help, this year we have further developed our strategy for supporting customers in vulnerable situations. Working with BSI, we have developed a strategy focusing and extending support to;

- Those living with Physical Challenges
- Those living with Mental health challenges
- Those that are temporarily vulnerable
- Those with limited access to services from living in rural areas
- Those in financial hardship.

In Jan 2019 we invited BSI to assess our inclusive services provisions, and were delighted to be accredited against BSI 18477 Inclusive services.

10.6.1. Carbon monoxide detection and awareness

Under this output measure we are committed to improving awareness of the dangers from carbon monoxide (CO). We continue to provide CO alarms for vulnerable customers, but prefer to promote through education wherever possible. Additionally we have an ongoing programme of activities to improve general customer awareness of CO and its dangers. This includes:

- A CO Poster competition – following the running of a CO poster competition via charity CO-Gas Safe with the other GDNs, we have expanded the competition in our own network, and continue to support the competition
- Training an Army – we have continued to offer further formal training related to CO and in 2018/19 we have trained a diverse and difficult to reach customer group through delivery of sessions at Bradford University and a Somalian centre in Bradford.

- Safety Seymour- developed within Cadent and shared as part of collaboration with other GDNs. We have trained around 15 of our staff who have delivered training sessions in primary schools, these sessions are very engaging and very well received.
- In 2018/19 we delivered around 7500 Doorstep surveys.

10.7 Connections outputs

The aim of the seven primary connections output measures is to ensure that NGN provides an efficient and effective service to customers wanting to connect to the gas network.

Our RIIO-GD1 output targets for connections are significantly higher than the obligations required by our Licence, reflecting our aim to provide a best in class service. The table below provides details of our performance this year. Commentary about our performance can be found in [Section 8.4.4](#).

One Year Outputs	RIIO annual target	18/19	RAG
% of standard connection quotes issued in 6 working days	99.6%	99.6%	G
% of non-standard connection quotes below 275kwh issued in 11 working days	99.6%	99.5%	G
% of non-standard connection quotes above 275kwh issued in 21 working days	99.6%	99.7%	G
% of land enquiries where response sent within 5 working days	99.6%	100%	G
% of commencement and completion dates for connections below 275 kwh provided within 20 working days	99.6%	99.7%	G
% of commencement and completion dates for connections above 275 kwh provided within 20 working days	100%	96.9%	A
% of connection jobs substantially completed on date agreed with customer	95%	97.2%	G

Figure 10.21 : Connections 2018/19 outputs

We have had another strong year in Connections and are significantly above the Ofgem guaranteed standards; we missed two of the output targets, one of which by 0.1%. The second target which fell out of the service level agreement was the % of commencement and completion dates for connections **above** 275 kwh provided within 20 working days; 2 projects out of 65 projects fell outside of the service level agreement for the output. However the GSOS standard was comfortably met.

11 Uncertainties

RIO-GD1 provides allowances that allow us to deliver the key outputs. The risk of costs exceeding these allowances is borne by NGN and its shareholders, not customers.

However, where future changes are outside of a company's control, or it is not possible to accurately forecast the level of future costs, then RIO-GD1 re-opener mechanisms may be triggered. Such mechanisms provide additional (or reduced) revenue to cover in whole or in part the additional (or reduced) costs being incurred.

11.1 Site security

The Department for Business, Energy & Industrial Strategy (BEIS) has engaged with the energy sector for a number of years to develop a program to identify sites that are considered to be of national importance – these sites have been designated as Critical National Infrastructure (CNI). The Centre for the Protection of National Infrastructure (CPNI) has outlined recommendations for security requirements at these designated sites, based on a series of security principles.

Current Position

Pannal Offtake site has been identified and confirmed as Northern Gas Networks (NGN) only categorised CNI site, which consequently requires a security upgrade to meet the CPNI categorisation requirements. National Grid also has a number of assets on four of our offtake sites that will require security upgrading. It has been confirmed that the cost of these four upgrades will be funded by NG. NGN has commenced the planning and design phase of Pannal and spent c£0.4m to year end 2018/19.

Future expectations

The work must be completed in RIO-GD1 in line with the commitments within our regulatory contract. The build and commission phase of the project is forecast to commence in 2019/20 and run through until the end of GD1. The total site upgrade cost is estimated at £6.0m, which includes project risk and NGN overheads.

The Pannal site also includes NG assets that will be incorporated into the security upgrade works and NG will share funding of the project based on the percentage of the site footprint that these assets cover. The current split is anticipated to be 72%/28% split between NGN and NG.

We will continue to work with NG to establish and implement a strategy for upgrading four of our sites, based on NG's requirements of meeting CPNI recommendations for their CNI assets housed within the sites. We understand from NG that this work will be completed in GD2.

11.2 Street works

Street works

Street works costs vary considerably between networks as the Highways Authorities in different parts of the country have introduced permit schemes at different times with different approaches. Many authorities are yet to introduce schemes, and so an uncertainty mechanism exists to recover efficiently incurred costs associated with any new schemes or changes to schemes.

Current Position

North Tyneside introduced a new permit scheme from February 2015 covering all streets within their boundary, which has had a limited impact on our performance over the last three years. The Yorkshire Common Permit Scheme commenced in June 2012 covering Leeds, Kirklees, Calderdale and Doncaster, with Bradford, Calderdale and Wakefield joining the scheme in April 2015. The North Yorkshire Permit Scheme went live at the beginning of February 2018.

Throughout GD-1 there have been some large swings in the amount of overrun charges paid. In 2016/17 we incurred costs of £83,750, which was a 12.5% reduction on the previous year. In 2017-18 year there was a large rise in costs to £342,075, mainly as a result of settling prior years claims. This year costs have reduced to £150,000.

This year we have seen an increase in FPNs received from permit authorities, which is in keeping with the first full regulatory period of North Yorkshire operating a scheme. Calderdale Council began issuing FPNs for the first time in May 2017 and Wakefield Council did so in January 2018.

Charges related to coring failures continue to decrease from £214,858 in 2016/17 down to £25,666 in 2017/18 and £10,000 in 2018/19. The bulk of the received coring failures are from the two authorities with ongoing coring programmes – North Tyneside and Cumbria.

Future expectations

The approval of permit schemes was deregulated in October 2015 removing the requirement for the Secretary of State to approve schemes in England. This gave potential for an increase in the number of local authorities undertaking permit schemes, which is now beginning to materialise. By April 2020 we anticipate all 24 local authorities within NGN will have implemented schemes.

Whilst there are no active lane rental schemes in operation, following a Department for Transport consultation in 2017, the potential for schemes to start in the future remains.

There is a government proposal (subject to consultation) to introduce seven days working on 'A' roads in an attempt to minimise disruption. The potential costs and impacts of this are yet to be understood.

11.3 Connections of new large loads

Under the Gas Act we are obliged to develop and maintain an efficient and economical pipeline system for the conveyance of gas and to comply with any reasonable request to connect to our system any premises or any pipeline system operated by an authorised transporter.

The "Economic Test", a financial assessment tool, allows NGN to identify new requests for capacity where the level of investment is considered uneconomic. In such cases, we require a connecting party to pay a contribution towards the cost of the reinforcement in order to avoid our existing customers subsidising a new load. However, if a new connection "passes" the economic test, reinforcement costs are not recovered from the connecting party, but are fully borne by NGN.

Due to the inherently unpredictable nature of the large load connections the associated costs were not included in ex ante Totex allowances. Instead they formed part of a re-opener mechanism, where GDNs can claim additional costs if they arise and if a materiality threshold is reached.

We have been experiencing a significant increase in enquiries regarding large load connections from generators over recent years with potentially material levels of associated specific reinforcement and we expect this trend to continue. There are now 10 connected Power Generation Large Loads connected to our network, the resultant reinforcement costs for these sites were £1m funded by NGN and £204k funded by the end customer.

There is the potential for another 6 to connect in 2019-20, the potential resultant reinforcement costs for these sites are £0.8m which could be fully funded by NGN. We are looking at possible alternatives to pipe reinforcements in order to reduce costs. By working with our internal NGN Teams and external iGT/UIP customers, we've managed to reduce many contracted CSEP pressures and rebalanced network model settings. As a result, we have reduced the need for many large-scale reinforcements which in turn has a potential saving of approximately £3.4 million of NGN funding over the remainder of GD1 and into GD2.

11.4 Changes in the connections charging boundary for gas

This mechanism will only be triggered if there is a change from a 'deep' to a 'shallowish' connection boundary for distributed gas. Moving from a 'deep' to a 'shallowish' connection boundary would mean the connecting customer would no longer pay the full costs of connection up front. Such a mechanism would result in the connecting party paying less in connection charges with the shortfall being funded by NGN.

There are no current proposals to change the connections charging boundary and therefore there are no costs incurred in this area.

11.5 Smart meter roll out

The exact impact on NGN of the roll out of smart meters is uncertain. We do expect an increase in call volumes to the emergency response line, and increased call-outs to deal with problems with our equipment discovered when a smart meter is being fitted e.g. a faulty Emergency Control Valve.

Current and future position

The official national smart meter roll-out was expected to start in 2015, but second-generation smart meters only started to be installed in 2018. Some energy companies have already started to install smart meters, but given the delay to the national programme and the date for the New and Replacement Obligation on Suppliers not being set until 30 June 2019, we don't expect to see mass installation of the next generation of smart meters until late 2019 onwards. We continue to receive information from the Suppliers about their roll out plans as a result of the industry change request (SPAA) raised by us, although many of the plans are high level they will allow us to do more internal planning.

We currently have over 1m smart or advanced meters fitted in our network with approximately 262k fitted in the last year. We have updated our work management systems to track work carried out on these meters, and in the 2018/19 regulatory year we have seen just over c18,500 PREs involving a property with a smart meter. Of these call outs, only 345 were due to a leak on the meter installation. Approximately 59,000 emergency gas escape-related calls were handled by Cadent Gas throughout the year which were identified as directly being related to smart metering.

This is only having minimal impacts on our operations. However, this is likely to change when the accelerated roll-out plans begin. We anticipate that unplanned interruptions as a result of smart metering installations will peak in 2020/21. This is mainly as a result of inoperable Emergency Control Valves.

Preparations

We have been working closely with the wider industry for several years to support the smart meter roll out. Over the last year this has progressed from an initial emphasis on the regulatory framework and data to incorporate the wider opportunities and risks the rollout presents. Our holistic approach to smart metering over the last year is helping us to mitigate the impact for our customers and proactively support the rollout. The table below summarises the key issues and our approach to them:

ISSUE	OUR APPROACH
Addressing customer and operational impact	<ul style="list-style-type: none"> • Identify potential impacts • Securing required resource and developing NGN service standards in response to impact • Training our own colleagues • Working with Meter Operator training providers to better understand and inform their processes • Putting measures in place to assess impact and monitor services
Supporting roll-out	<ul style="list-style-type: none"> • Participating in a number of key industry groups and engaging with government • Establishing pilot programmes with suppliers to share information about interventions and improve operational relationships

11.6 Xoserve (central agency) review

Historically Xoserve was funded by NGN, the other GDNs and the NTS. Under the Funding, Governance and Ownership (FGO) review the funding and governance has changed to a collaborative model that now includes Shippers.

This collaborative arrangement was fully implemented with the phase 2 go-live on 1 April 2017. As a result of the Ofgem’s assessment of future Xoserve costs, an adjustment to gas transporters’ allowed revenue was made to take account of some costs being directly funded by shippers from April 2017. This adjustment is now taken into account for transportation charges and the enduring funding and governance is now established.

11.7 Non gas fuel poor network extension scheme (FPNES)

Ofgem concluded its review of the fuel poor network extension scheme in 2015 and has made several revisions to the scheme which took effect in 2016 and with most recent amends in 2018. The key conclusions of the review were:

- An increase in the targeted number of connections across all GDNs, with an equivalent increase in allowances. We are now targeted to complete 14,500 connections with an increase in our allowance of £3.2m in 2009/10 prices;
- The introduction of a fuel poor incentive mechanism to encourage us to deliver even more connections, with a reward or penalty of 2.5% of the assessed efficient costs of the over – or under-performance. Any volume variance will also be taken into account when setting targets in RIIO–GD2, along with limitations or amendments brought by Ofgem to the scheme;
- District Heating projects are now included within the scheme, though no targets are set here; and
- In 2017/18 Ofgem further consulted and subsequently revised the qualification criteria for the scheme. Whilst the intention was to drive a “worse first” approach it is highly likely that limitations will significantly impact our ability to install connections from 2020 and into the next regulatory period, as a result of removing the previous area based criteria (LSOA25)

NGN continues to work hard and is on track to deliver the above target. The total numbers of fuel poor connections delivered to 31 March 2019 is 12,948, including NGN and UIP/IGT connections. Recent changes to the scheme (removal of LSOA 25 criteria) brought forward a significant workload. The number of fuel poor connections delivered during 2018/19 regulatory year has reached 2,857, including 364 UIP/IGT connections.

In order to in part address the additional challenges these amendments made, we have looked to broaden our ability to both identify those in Fuel Poverty and deliver connections to those that could benefit most by:

- Promotion of changes to the criteria with Registered Housing Providers;
- Facilitating additional resources to deliver an accelerated workload over 2018/2019;
- Improved mapping and targeting of those who may qualify;
- Improved partnerships to assist with UIP and IGT-led schemes;
- Looking to further engage with private landlords; and

Whilst we are confident that we will exceed the agreed and targeted 14,500 connections, it is highly likely that as we approach the next regulatory period, the ability to identify fuel poor connections will be significantly restricted and as such our future targets are highly likely to be reduced significantly.

12 Performance improvement and efficiencies

This section details our approach to performance improvement, and how we have used this to both drive efficiencies and meet our output targets.

12.1 Real Price Effects (RPEs)

Under RIIO-GD1, allowed revenues are indexed by the Retail Price Index (RPI). However it is expected that the price of several inputs will not change in line with RPI inflation, most notably labour. To account for this differential our allowances are based on forecast differences between economy-wide inflation, as measured by RPI, and input price inflation, which is known as the Real Price Effect (RPE). In other words, RPEs represent the actual change in input prices over and above the level of inflation in the economy.

Specifically, RPE is calculated by the following formula:

RPE = Input Price Inflation minus Retail Price Inflation

The approach used to setting RPEs over RIIO-GD1 was to draw on outturn data and short term wage growth forecasts using the latest forecasts published by HM Treasury, and use the real average historical rate for relevant input price indices for all other years.

Labour RPEs

For labour costs, which comprise around 60% of our costs, forecast RPEs are based on independent forecasts for wage growth over the short term. This indicated negative real wage growth in the first year of RIIO reverting to the long term trend of 1.3% per annum from 2014/15 onwards.

For 2014/15, allowances were based on a positive labour RPE of 1.3% following two years of negative real wage growth as shown in the table below.

Labour RPEs	Assumption RPE	Retail Price Index	Assumed Labour wage change	Actual labour wage change	Actual RPE
2012/13	(0.8%)	3.1%	2.3%	2.7%	(0.4%)
2013/14	(0.2%)	2.9%	2.7%	2.9%	0.0%
2014/15	1.3%	2.0%	3.3%	2.7%	0.7%
2015/16	1.3%	1.1%	2.4%	2.7%	1.6%
2016/17	1.3%	2.1%	3.4%	2.7%	0.6%
2017/18	1.3%	3.7%	5.0%	3.4%	(0.3%)
2018/19	1.3%	3.1%	4.4%	3.2%	0.1%

Figure 12.1 : Labour RPEs

During the years 2014/15 to 2016/17 our average wage settlement was 2.7%, which then increased to 3.4% in 2017/18; the average in 2018/19 was 3.2%. These rates have been part of an overall package of measures which have included;

- In 2012, NGN introduced revised terms and conditions of employment applicable for new entrants and those existing colleagues who were promoted internally. The objective of the refreshed remuneration package was to drive efficiency improvements and achieve our outputs. Base pay levels were reduced, weekly contracted hours were increased and occupational sick pay was more reflective of the market. We revised the terms and conditions again in 2017 to cover working hours and further incentivise productivity.

The positive impact on the refreshed remuneration arrangements is now being experienced by the business. There has been no detriment to the attraction of talent to the business.

- As at 31/3/2019, the number of operational (industrial) colleagues on new terms and conditions was 481, with 166 remaining on legacy terms. This represents a shift from 7.5 % on new terms and conditions at the beginning of GD1, to 73% at 31/3/2019.
- In line with our ambition to be the best at all that we do, we are striving for increased productivity and output levels and a customer-focused culture of 'right first time'. To help this approach we have also introduced a number of process specific incentive schemes. These are designed to incentivise colleagues to deliver excellent customer service, adopting a culture of safety first, ensuring that work is undertaken in the most efficient way possible and that all records are accurately maintained at the end of each piece of work.
- We have also introduced other recognition processes to drive positive behaviours, most recently a recognition package to reward 'safe days' across the network.
- As we amend our remuneration packages to better reflect the appropriate reward strategies, we are quickly moving to a position where those colleagues within corporate / central functions are generally all retained on personal contracts. This allows us to incentivise them, setting specific personal objectives and achievements recognised with an annual bonus. This methodology keeps base salary levels at a reasonable level and provides us with the flexibility to reward performance on an annual basis, thereby not increasing the overall salary bill on an enduring basis.
- For those colleagues, the numbers on new terms and conditions or personal contracts has increased to 536 at 31/3/2019, which represents 76%. At the beginning of GD1, this figure was 5%.

Non-labour RPEs

For RIIO-GD1, RPEs for Capex and Repex materials were assumed to have a positive change of 1.7% from 2013/14 onwards. This means that material costs were assumed to increase more than inflation year on year. Capex and Repex material costs comprise less than 10% of our total costs.

This assumption was based on an unweighted average of PAFI indices for steel works, plastic pipes and copper piping. Our PE pipes and fittings are currently dictated by a variety of indices such as PIEWEB, LEBA, ICIS and Oanda, which monitor fluctuations in Power, Polymer and Copper markets.

In 2016/17 we undertook a full tender event and new contracts commenced in January 2017. The tender lead to an overall cost decrease of 10%, which was linked to metal commodity prices which impacted on electrofusion fittings, which saw a c35% reduction. PE pipe costs remained constant. The price review mechanism has remained the same. Contracts were awarded for a period of 3 years with options to extend for a further 5 x 1 year extensions. In 2018/19 we saw one contractual price review which saw an increase of 3.4% on PE Pipe and 0.74% on Electrofusion Fittings.

