RIIO – GD1

Year 4 Report

July 2017

Northern Gas Networks


Northern
Gas Networks

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NETWORKS

CEO and Board update

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RIIO-GD1 Strategy

The 2016/17 reporting year represents the mid-point of the RIIO-GD1 regulatory period and as such is a good point at which to consider how we at Northern Gas Networks are delivering against our customers' expectations in terms of both service and value.

We remain fully focussed on, as a minimum, meeting the requirements as set out in the 'RIIO-GD1 Regulatory Contract'. However, where it is clearly supported by our customers and efficient to do so – we will always look to go above and beyond those minimum requirements and deliver the best possible service for our customers.

A relentless focus upon Customer Service and Value has led to NGN being at the frontier of performance in the industry over the RIIO-GD1 period. NGN are ranked as number one for customer satisfaction in Ofgem's league table over the period and continue as the most efficient gas network over the period since 2005. For 2016/17 Ofgem ranked NGN as the leading GDN in stakeholder engagement. Input from our stakeholders is shaping our business and leading to measurable improvements and benefits.

Ensuring that these levels of performance are both sustainable and provide the basis for further improvements in a rapidly changing energy landscape, requires new ways to improve efficiency whilst providing the flexibility to provide secure and affordable energy under a range of alternative future scenarios.

Mark Horsley, CEO, Northern Gas Networks

NGN has chosen to address some of the more difficult challenges the industry faces early in the process including:

- **Modernising Terms & Conditions** – The first half of RIIO-GD1 has seen us transform our workforce. Over 60% of our people are employed on new, modern terms and conditions.
- **Workforce Refresh** – A shareholder funded voluntary early retirement programme has allowed us to refresh a significant percentage of our workforce to ensure we have the skills and job profiles for the future. More than 50% of our workforce are now under 40 – the comparable figure in 2013 was over 50 years of age.
- **Contracting Models** – Our model of using small, locally run engineering firms to deliver our iron mains replacement programme is now fully embedded, with new contracts awarded up to the end of RIIO-GD1. 2016 also saw the outsourcing of our whole Network Maintenance activity – another first for UK GDNs – helping unlock further efficiency potential. 2016/17 also saw us extend this contracting principle of using small, agile service providers to some of our corporate activities, in particular information services and technology – again creating further efficiency and service improvements.
- **Technology & Innovation** – Growing a culture of innovation and change within NGN that encourages challenge to traditional working practices and identification ownership of delivering new solutions has been key to developing and implementing change. Adoption of Technology has a key role in facilitating significant change both in operational and engineering disciplines but also increasingly in facilitating new back office processes and ways of working.

Performance during 2016/17

The results for the 2016/17 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 2016/17 we outperformed the Totex allowance by £36 and £136m over the first four years of RIIO-GD1. This will result in £49m being returned directly to customers in the form of lower network charges relating to this four year period.

  The majority of this outperformance is driven directly by genuine and enduring efficiency improvements as a result of the highlighted initiatives that have changed the way in which we deliver our key services.

  This performance has been delivered with an asset management strategy that has focussed on delivering the greatest customer benefit in terms of reducing asset risk and overall network performance. This has in many cases involved tackling the more difficult investment and asset intervention decisions early in the regulatory period. As an example, the Repex programme delivering a basket of higher diameter band, higher cost and higher risk removed work than set out by the regulatory contract avoiding future risk and cost beyond RIIO-GD1.

  Strong financial performance over the period is allowing us to effectively manage cost uncertainties that surround our business without impacting upon customer bills. This has allowed us to make a commitment to forgo the opportunity to employ the uncertainty mechanisms within the regulatory framework that allow GDNs to apply for additional funding during the RIIO-GD1 period. Whilst also committing to doubling the amount payed to customers for failures in standards of service.

- **Service Delivery (Outputs)** – Our strategy is to treat all primary and secondary outputs within the Regulatory Contract as firm commitments over the period and where appropriate go above and beyond those minimum requirements and deliver the best possible service for our customers.

  Our performance in 2016/17 illustrates we are firmly on track to deliver all of our commitments across the 6 output categories over the period and in many areas significantly exceed those targets.

We are confident of continuing the strong performance seen in both 2016/17 and the combined first four years of the RIIO-GD1 period. We are forecasting to deliver or exceed all the output targets set for the period and continue driving genuine efficiency throughout our business.

We monitor performance against the regulatory contract monthly, including forecasts to the end of the period and manage risks as they arise. Our business and our physical assets operate within a very dynamic environment, as such we face a changing profile of risks over time. During the RIIO-GD1 period we have seen new risks develop that were not present when agreeing the Regulatory Contract. These include but are not limited to:

- **Flooding** – Climate change is leading to more frequent and severe instances of heavy rainfall across the region. This has led to localised flooding and damage to the physical environment and local infrastructure that surround our network assets. The impact upon those assets has included large scale water ingress, loss of roads, bridges and river banks and storm damage to above ground assets.
- **Safety (Overcrossings)** - Following a fatality in the industry from a member of the public falling from unprotected overcrossing a significant risk to public safety was highlighted.
- **Cyber Security** - The increasing use of technology and the more 'connected' nature of our operations alongside an environment of heightened security risk in this area is leading to this becoming an increasing priority for businesses and in particular those like utilities that own and operate critical national infrastructure.

Each of these areas has required unforeseen responses and interventions to date and will continue to require investment over the remainder of RIIO-GD1 and beyond. Identification and effective management of these issues form part of NGN's role in owning and operating the gas distribution network and are reflected in the risk profile of the business.

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 Beyond

The energy industry in the UK is going through a period of significant change which is likely to increase in its pace and intensity as we look for further ways to improve efficiency and service but also delivers a secure, affordable and low carbon energy system for the longer term.

We have made good progress in developing our business over the first half of RIIO-GD1 to continue as the frontier performing business in the sector. However, there remains significant work to do to ensure that we are ready for the challenges of the future beyond this period and the business and services we deliver are sustainable for the longer term.

With this in mind there are a number of key initiatives that have begun during 2017 that will further transform our business:

- **Full Totex Operating Model** – Within our Customer Operations division we will move towards a Full Totex Model across each of our 9 operational regions. Each region will have a single senior manager and dedicated resources responsible for delivering our Emergency, Repair, Replacement and Connections workload in their geographical area. Each area will be empowered to develop their own local initiatives to deliver their services for the local community and further drive levels of customer service and efficiency.
- **Future Ways of Working** – 2017 will see NGN deploy the new SAP S4/HANA enterprise resource management product across the business. We will be the first company in the UK to fully implement this solution. The system will eventually allow us real time access to business information and data and we have already been engaging with Ofgem and our customers about providing real time access to information on the financial and operational performance of NGN.

  We are taking the significant step to completely reorganise our business processes and organisational structure to match the best practice already built into the SAP4/HANA core product. This investment will allow us to become more agile with a smart technology enabled approach to back office and operational support.

  This will have the significant benefit of streamlining our current processes, removing duplication, manual interventions and unnecessary data handling and processing. Leading to increased efficiency and improved access to accurate and timely information and data.
- **Asset Risk Decision Support Tool** – We have also chosen to invest in a new technology that will build upon the Network Outputs Measure methodology developed across the industry. This will be aimed at improving our decision making within our asset management processes through sophisticated analysis of asset risk allowing more refined and targeting those activities that deliver the most value for customers in terms of asset performance.

We are continuing our work to investigate how we can adapt our current energy infrastructure to ensure an affordable, secure progression to a low carbon economy. The most efficient and practical pathway to a green energy sector is still uncertain. However, it is becoming clear that alternative uses for the extensive gas network in the UK provides a valuable option for policy makers on this pathway.

NGN's visionary concept of converting the UK's main source of heating from natural gas to hydrogen will progress further with significant investment into key aspects of the proposal:

- Hydeploy - £7m project project to demonstrate that natural gas containing levels of hydrogen up 10 20% can be distributed and utilised safely & efficiently for the first time in a section of the UK distribution network.
- £25m of funding secured from BEIS to investigate the potential use of hydrogen gas for heating UK homes and businesses; and
- H21 - a £15m joint industry Network Innovation Competition (NIC) bid to provide safety based evidence for using 100% hydrogen and support the case for a UK hydrogen conversion led by NGN in 2017

2017 will also see the launch of IntEGReL, a ground-breaking integrated electric and gas utility scale research facility in a partnership between NGN and Newcastle University. The underpinning philosophy of InteGReL is that a 'whole systems' approach to energy is required to deliver what customers want. The facility will help in understanding our complex energy system and the interdependencies between heating, cooling, transport, gas and electricity.

NGN is committed to remaining at the frontier of performance in the energy industry. Providing exceptional customer service and value in the short and long term.

2 Board Update

The company's business strategy is to provide, develop and maintain a safe and secure gas distribution pipeline system for the provision of gas supplies to the people and the businesses within the distribution network. The company's vision of success is to be consistently benchmarked by Ofgem and the Health and Safety Executive ("HSE") as being in the top two comparable utilities in safety management, efficiency and customer service, which in turn will generate benefit for customers, employees and the shareholders of the company. Underpinning this strategy is a strong compliance culture which the Board directly monitors through its risk management, audit, treasury and compliance committees. Incentive arrangements for the senior management team are directly linked to safety, customer and efficiency targets. These targets are updated annually.

I am pleased the company has met all the output targets agreed as part of the RIIO-GD1 price control in 2016/17 and has again demonstrated strong customer and safety performance.

Andrew Hunter, Chairman, Northern Gas Networks

During the year the focus of the Board has been to support the strategy through significant investments and innovations aimed at improving the performance of the business. These include continuing to modernise the terms and conditions of employees to meet the requirements of today's customers, renewing the information technology infrastructure of the business by moving to a cloud based platform, acquiring the new SAP4hana product and renewing the direct service provider model for delivering the mains replacement programme. For the coming year the company will use these investments to become more agile with a smart technology enabled approach to back office and operational support. Alongside this it is important that we continue develop and retain employees and a senior management team who can adapt in a climate of change and we continue to support initiatives in this area.

The principal risks associated with the business and the associated mitigations are regularly reviewed by the Board and remain largely unchanged over the course of the year. These include breach of legal & regulatory obligations, health and safety failure, network asset performance failure, employee retention and financial risks associated with interest rates, liquidity and credit.

The long term future of the business is directly linked to the role of gas in meeting the UK's decarbonisation targets. We see significant potential in repurposing the gas network in whole or part over the longer term to transport 100% hydrogen or a hydrogen natural gas blend. The Board has supported the company with two major projects in each of these scenarios: the H21project with Leeds City Council; and the Hydeploy project with Cadent and Keele University. More generally it is important the UK government recognises and fully understands the current and future role of gas network in meeting the energy needs of the UK. As a company we will continue to influence policy makers by making the case for decarbonised gas as an essential fuel for the future.


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Executive Summary

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3 Performance – Executive Summary

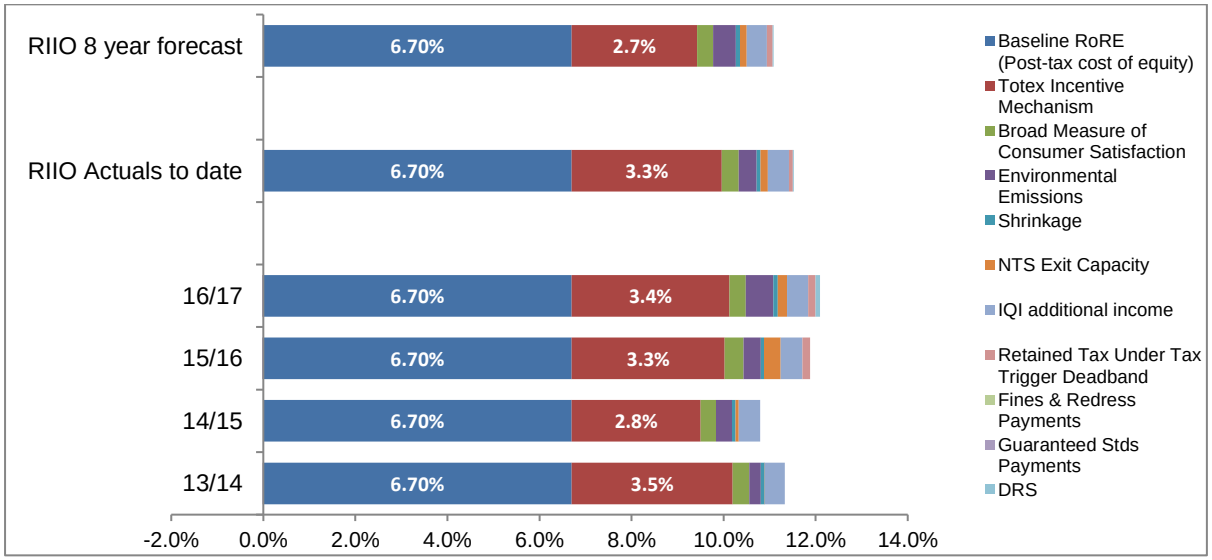
Gas distribution was the first sector in the energy industry to have a periodic review of its prices carried out under the new RIIO principles. This new price control applies for the eight year period from 1 April 2013 to 31 March 2021 and is referred to as RIIO-GD1. We have now successfully completed the fourth 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.

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	RIIO to date		RIIO 8 year forecast
Base cost of equity	**6.7%**	**6.7%**	**6.7%**	**6.7%**	**6.7%**		**6.7%**
Totex	3.5%	2.8%	3.3%	3.4%	**3.3%**		**2.7%**
Customer Service	0.4%	0.3%	0.4%	0.4%	**0.4%**		**0.3%**
Environmental Emissions	0.3%	0.3%	0.4%	0.6%	**0.4%**		**0.5%**
Shrinkage	0.1%	0.1%	0.1%	0.1%	**0.1%**		**0.1%**
Exit Capacity	0.0%	0.1%	0.4%	0.2%	**0.2%**		**0.1%**
IQI Income	0.4%	0.5%	0.5%	0.5%	**0.5%**		**0.4%**
Tax Trigger retained Tax	0.0%	0.0%	0.2%	0.2%	**0.1%**		**0.1%**
Fines & Redress	0.0%	0.0%	0.0%	0.0%	**0.0%**		**0.0%**
Guaranteed Standards	0.0%	0.0%	0.0%	0.0%	**0.0%**		**0.0%**
DRS	0.0%	0.0%	0.0%	0.1%	**0.0%**		**0.0%**
RORE	**11.3%**	**10.8%**	**11.9%**	**12.1%**	**11.5%**		**11.1%**

Figure 3.1: RORE breakdown



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 2016/17 prices (£m)	**13/14** Actual	**14/15** Actual	**15/16** Actual	**16/17** Actual	**17/18**	**18/19**	**19/20**	**20/21**	**Total**	**Allowed**	**Variance**
Opex	84.9	86.9	81.9	82.4	83.5	81.0	80.0	79.1	659.7	**817.6**	**(157.9)**
Capex	42.4	50.2	62.3	59.0	50.7	50.0	52.8	45.4	412.9	**412.1**	**0.8**
Repex	93.0	97.6	87.9	85.4	92.8	88.3	85.2	84.3	714.3	**821.6**	**(107.3)**
Totex	**220.2**	**234.7**	**232.2**	**226.8**	**227.0**	**219.4**	**218.0**	**208.8**	**1786.9**	**2051.3**	**(264.4)**
Allowance	**256.1**	**263.6**	**267.3**	**263.7**	**250.0**	**249.6**	**250.7**	**250.3**	**2051.3**		
Variance	(35.9)	(28.9)	(35.2)	(37.0)	(23.0)	(30.2)	(32.7)	(41.5)	(264.4)		
Cumulative Variance	(35.9)	(64.9)	(100.0)	(137.0)	(160.0)	(190.2)	(222.9)	(264.4)			

Figure 3.2: Totex Performance

In 2016/17 we have outperformed the Totex allowance by £37.0m (14.0%) which generates a RORE of 3.4%, just over the average of 3.3% we have achieved in the first four years of RIIO-GD1. Over RIIO-GD1 we expect our Totex outperformance to generate an average RORE of 2.7%, reducing from the current levels.

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.

Opex financial and output performance

To date we are outperforming the controllable Opex allowances by £75m (18%), generating an average RORE of 1.9% p.a. We expect to make further efficiencies over the remainder of RIIO against a reducing allowance, maintaining our outperformance at c18%, and delivering an equivalent RORE performance.

There are several key drivers for our strong performance against the Opex allowances. Firstly we have modernised our employee terms and conditions which is delivering a number of benefits;

- Refreshing of an ageing workforce;
- Introducing more flexible working arrangements that match business and customer requirements;
- Incentivising employee performance – employee reward is now mainly linked to delivery of the Regulatory Contract;
- Terms and conditions that more closely reflect market rates; and
- A workforce ready to meet future challenges.

So far we have over 430 employees on new terms and conditions out of an internal workforce of over 1,400. In terms of efficiency we estimate this is now delivering c£5m of benefits each year in Totex, with the majority (£3.5m) 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.

Secondly we have experienced milder winters so far in RIIO-GD1, which has impacted overall workload, overtime payments and contractor costs. This has been somewhat offset by periods of severe flooding, in particular in

2015/16, which resulted in three major off-gas incidents. Severe weather throughout the year is now becoming more prevalent. We estimate more typical winters could increase our costs by c£3m p.a.

Thirdly, we have made significant efficiencies in our IT and Telecoms delivery model and have seen operating costs reduce by over £5m in the last two years through the refresh of our service contracts and review of our licence and system requirements.

Fourthly, our opex allowance in RIIO 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£4m p.a.

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. 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 fourth year in a row, significantly outperforming the 97% target;
- Our Annual Repair Risk score improved again to 17.4m, a near 7% annual improvement and a near 50% improvement since 2013/14;
- We completed 62.3% of repairs within 12 hours against a target of 60.5%;
- We outperformed the proposed revised targets for the number and duration of unplanned interruptions; and
- Delivered a very strong customer service performance, scoring 9.5 out of 10 on our customer satisfaction surveys.

We are also targeted with decommissioning 23 gas holders over RIIO-GD1. We are now ahead of target having removed 7 holders this year, bringing our cumulative total to 13.

Capex financial and output performance

To date we are outperforming the Capex allowances by £18.8m (8%), generating an average RORE of 0.5% p.a. However we plan to continue investing significantly over the remaining four years against a reducing allowance, and expect to spend broadly in line with the overall eight year allowance by 20/21. This will reduce our average RORE by an equivalent 0.5%.

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 c£5m in the security and erosion protection of our river overcrossings in response to the extreme flooding incidents we have seen over the two previous winters. We also expect to fund significant levels of specific reinforcement associated with new large load connections to the network over the next four years, with close to £1m funding expected in 2017/18.

On the non-network side we expect to invest c£67m in IT and c£12m in our depot and office infrastructure over RIIO. This is c£35m 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.

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. This also includes investing in our key above 7 bar assets in order to deliver against the asset utilisation and capacity output targets. 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 nearly 8,000 connections so far.

Repex financial and output performance

To date we are outperforming the Repex allowances by £42.2m (10%), generating an average RORE of 1% p.a. We expect to deliver further efficiency benefits against a broadly flat allowance, improving outperformance to 13% by the end of RIIO-GD1, and increasing RORE to 1.1%.

We expect to deliver significantly more workload within this forecast than is funded within the allowance. One of the major outputs associated with Repex is the length of iron mains abandoned. To date we have abandoned 1,947km of iron main, 34km (1.6%) behind the inferred target. This target included an assumed 62km of iron mains work delivered from customer driven rechargeable diversions. Actual volumes have been much lower at 13km and this 49km shortfall has been a major driver for the deficit to date. We are expected to fund this shortfall and are targeting to fully recover the position in 2017/18.

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

- We forecast we will abandon nearly 70km 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 239km of steel to date, 44km ahead of the inferred 4 year target and allowance. This 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 c470km over RIIO-GD1, nearly 80km over the allowed volume; and
- We have abandoned 38km of other materials mains to date and expect to abandon 74km over RIIO-GD1. There is no workload target for this type of work.

Despite this material increase in workload, we expect to continue our outperformance against the allowance. 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, removing a layer of cost and profit. We also built our own in house workload and programme management structure in order to gain control of the end to end repex investment process. Together these changes have delivered significant improvements in workload delivery and efficiency and are the major driver for our outperformance.

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 26,727 this year which gives a cumulative total of 140,953, which means we are now 27% 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;
- Gas in buildings events and fractures were both significantly below the target supporting our approach to targeting the riskiest pipes;
- We outperformed the proposed revised targets for the number and duration of planned interruptions which both vary in line with the length of mains abandoned; and
- We delivered a very strong customer service performance, scoring 9 out of 10 on our customer satisfaction surveys, an increase of 0.1.

RORE impact of the other Incentives

Customer Service and Stakeholder Engagement

We have delivered a strong performance in our customer service outputs. We achieved an average score of 9.17 across the three customer satisfaction survey areas, an excellent performance and in line with last year, ranking us a close second across the GDNs. We improved our complaints handing scores, reducing the matrix score from 3.2 down to 2.7, well below the level at which any penalty payment would be due. We performed well in the stakeholder engagement assessment, scoring 7.25. This improved from 6.8 last year and was the highest score achieved by any of the gas networks.

Overall this delivers an incentive of £3.4m and a RORE impact of 0.4%. 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.

Shrinkage and Environmental Emissions Incentive

We have achieved an excellent result this year, increasing our outperformance against the Shrinkage and Leakage output targets which drive these incentives. This performance has been driven by three main factors:

- As outlined above we have abandoned more mains overall than planned when considering both iron and steel which is a major factor in leakage reduction;
- We have reduced average system pressures from 31.46 to 30.62 mbar over the last year through strong management and the investments we have made in pressure monitoring and control equipment; and
- We have increased our MEG saturation from 24.82% to 29.75%. MEG is a 'wet' gas used to saturate joints and prevent leaks.

Overall this delivers an incentive of £5.9m this year and a RORE impact of 0.6%. We are targeting to sustain and improve on this strong performance against increasingly challenging targets.

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 2016/17 we have outperformed the target bookings by 13%. This delivers an incentive of £1.7m this year and a RORE impact of 0.2%. We are targeting to sustain and improve on this strong performance.

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 continued to promote and support new biomethane connections to our network and expect a further six to be connected in the next year;
- We have delivered a 50% reduction in our use of virgin aggregate and a 66% reduction in the amount of spoil to landfill, an excellent performance against two of our key environmental targets;
- We have reduced our business carbon footprint across all 3 of the measures we target; and
- We have worked continuously to deliver many and varied social schemes as part of our 'community promises' scheme.

Revenue and customer bills impact

Figure 3. below shows our actual and latest forecast allowed revenues for the 8 years of RIIO-GD1.

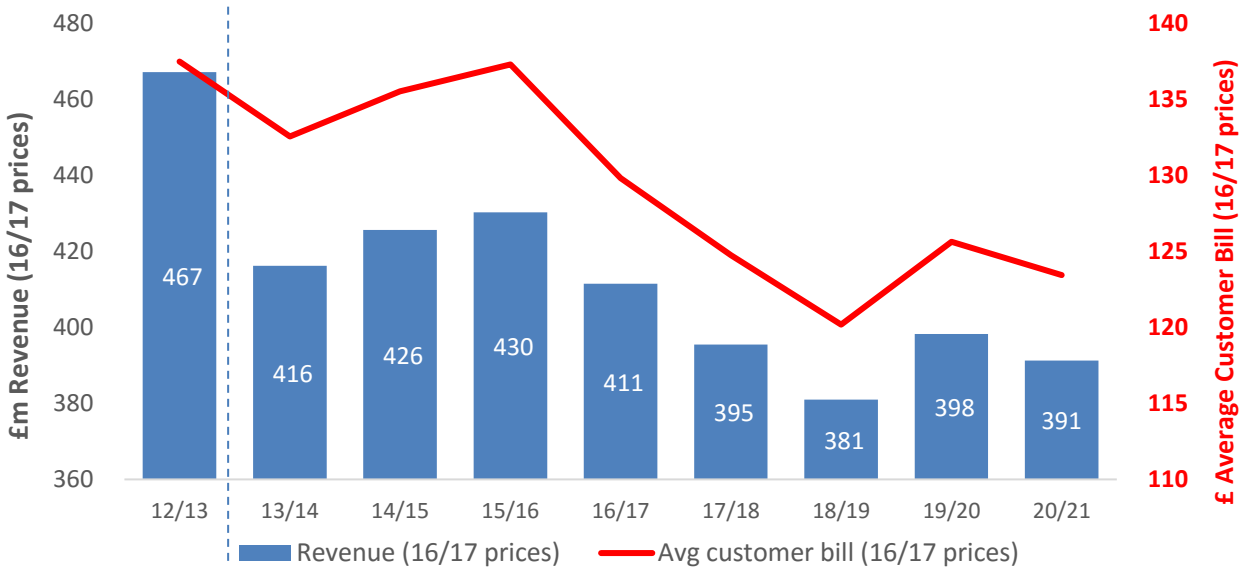


Figure 3.3: Allowed Revenue and Customer Bills

Allowed revenue for 2016/17 was £411m, a decrease year on year of -£18.8m / -4.4%. This was largely driven by a reduction in base allowed revenues.

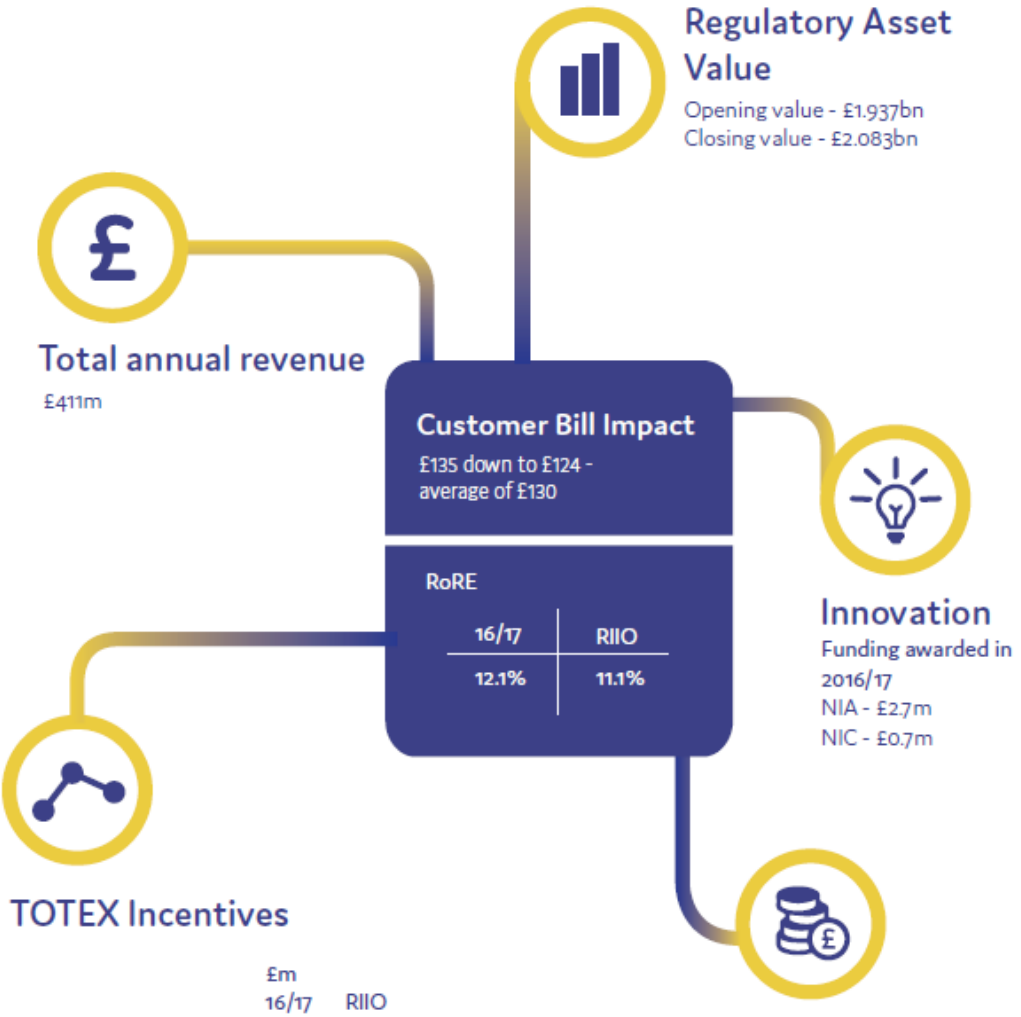
Our domestic customer bill analysis shown above is calculated based on NGN average Annual Quantities (AQ) and peak daily capacity requirements. NGN's average AQ in 16/17 was 13,967Kwh which when applied with load factors and our unit rates gave an average domestic customer bill impact of £130.

Our forecast for total revenue over RIIO-GD1 has decreased from £3.222bn last year to £3.206bn, an average reduction of over £2m per annum. The primary driver for this has been reduced forecasts for the Retail Prices Index (RPI) which is used as part of the annual process to set our unit prices.

In terms of customer bills, we are forecasting that the average annual domestic customer bill will decrease from £135 to £124 over RIIO-GD1, a real reduction of 4.6%.

4 RIIO – Performance Overview

Northern Gas Networks
Financials



	£m 16/17	RIIO
Actual	227	1787
Adjusted allowances	264	2051
Outperformance	(37)	(264)
Outperformance %	(14%)	(13%)
Return to customers	13	95

	£m 16/17	RIIO
Customer service	3.4	24.4
Shrinkage	0.9	6.2
Leakage	5.0	34.0
Exit capacity	1.7	9.8
Total	11.0	74.4

Revenue and Customer Bills

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5 Revenue and Customer Bills

5.1 Revenue components

The total transportation revenue we can collect each year, our 'allowed' revenue, is calculated in line with the methodology set out in our licence. Our allowed revenue is updated each year so that it reflects the latest costs and incentives earned. This process is known as the annual iteration process, and occurs every November. This process also ensures that monies that are due to be returned to customers is done so on a timely basis, two years after the end of each regulatory year.

The key areas that drive the amount of revenue that network companies can collect are:

Base revenue

- Revenues set out in the licence as determined by the price control settlement;
- Updated cost of debt allowance driven by the iBoxx 10 year trailing average (and the associated impact on WACC);
- Adjustments relating to Totex out / underperformance – establishing the amount network companies can keep vs. amounts to be returned to customers;
- Latest pension deficit valuations and the impact on deficit funding allowances in the future;
- Any tax allowance implications resulting from either changes to legislation or tax rate changes (subject to a materiality threshold); and
- RPI Inflation – prices are set based on HM Treasury forecasts in November each year and trued up to reflect actual RPI two years after.

Cost 'true-ups' on non-controllable (pass through) areas

- Costs that are 'non-controllable' are always fully funded in revenue; and
- Prices are set based on a forecast of costs with any difference between actual and forecast adjusted for two years later.

Incentives

Incentive mechanisms that can increase or decrease our revenues during RIIO-GD1 include:

- Overall customer service (inclusive of customer service, complaints and stakeholder engagement);
- Shrinkage and environmental emissions volumes;
- NTS exit capacity volume bookings; and
- Discretionary rewards.

There are other incentives which are assessed at the end of RIIO-GD1 which will affect revenues in the next price control period from 2021 onwards.

Customer demand

- Whilst over the long term network companies can only collect what is 'allowed' (as calculated above), there may be timing differences from year to year due to how revenue is physically collected, (known as the 'K' correction factor);

- The vast majority of our revenue is charged out on a network capacity basis, in terms of a pence per peak day kilowatt hour basis. Prices are set in advance of a regulatory year and include a forecast of network capacity – which always results in a slight difference once actual levels are known;
- If actual demand is lower than our forecast then we will under collect revenue – and have to collect more two years later to bridge the gap;
- If actual demand is higher than our forecast then we will over collect revenue – and have to return income two years later; and
- With the introduction of project nexus and a fixed charging base from April to March each year, in the future any over/under recovery should be minimised. A snapshot of the capacity data will be taken in December each year and this will be used for calculating charges for the following regulatory year.

5.2 Allowed Revenue and Customer Bill impact

Figure 5.1 shows actual and latest forecast allowed revenues for the 8 years of RIIO-GD1.

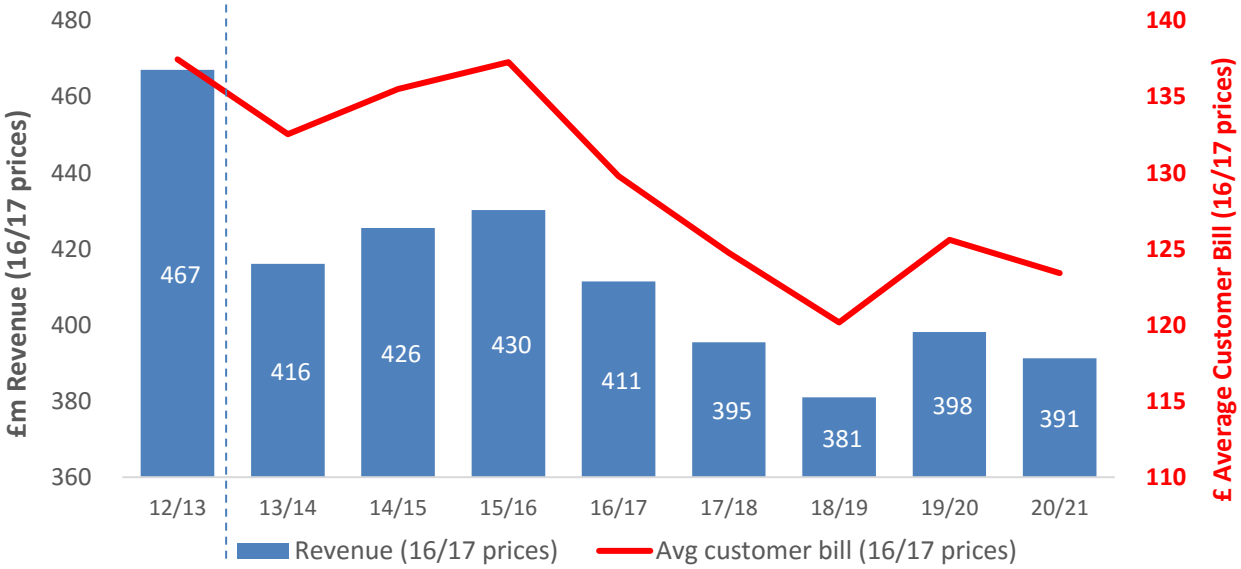

Figure 5.1: Allowed Revenue and Customer Bills

Allowed revenue for 2016/17 was £411m, a decrease year on year of -£18.8m / -4.4%. This was largely driven by a reduction in base allowed revenues. The breakdown of allowed revenue is shown in figure 5.2 below:

(16/17 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	**417**	**421**	**437**	**419**	**406**	**410**	**413**	**419**	**3,342**	**418**
Adjustments to Base Revenue Allowances:										
Cost of debt	0.0	(2.5)	(4.7)	(6.9)	(9.1)	(13.1)	(17.9)	(24.5)	(78.6)	(9.8)
Non Controllable Costs	0.1	(0.0)	(6.7)	(7.1)	(6.9)	(8.1)	(2.9)	(6.1)	(37.7)	(4.7)
Totex Incentive	0.0	0.0	(2.6)	(1.8)	(3.4)	(3.4)	(1.7)	(2.0)	(14.9)	(1.9)
RPI true up	0.0	0.0	1.5	(5.9)	(9.1)	(1.6)	(0.0)	0.0	(15.2)	(1.9)
Pension Deficit	0.0	0.0	0.4	0.4	0.4	(3.4)	(3.4)	(3.4)	(9.1)	(1.1)
Other	1.2	2.2	1.3	1.4	(0.9)	(1.7)	(2.4)	(4.4)	(3.2)	(0.4)
Total	**1.3**	**(0.3)**	**(10.8)**	**(19.9)**	**(29.0)**	**(31.4)**	**(28.3)**	**(40.3)**	**(158.7)**	**(19.8)**
Incentive Income:										
Earned during RIIO-GD1 (with 2 year lag)	0.0	0.0	5.8	7.7	10.0	10.5	11.2	10.1	55.2	6.9
Earned before RIIO-GD1	1.2	4.5	1.4	1.6	1.8	2.0	2.2	2.5	17.1	2.1
Total	**1.2**	**4.5**	**7.2**	**9.2**	**11.8**	**12.5**	**13.4**	**12.5**	**72.4**	**9.0**
(Over) / Under Collection	(3.2)	0.0	(3.2)	2.8	6.3	(9.6)	(0.7)	(0.0)	(7.7)	(1.0)
ALLOWED REVENUE	**416**	**426**	**430**	**411**	**395**	**381**	**397**	**391**	**3,248**	**406**

Figure 5.2: Allowed Revenue breakdown

- Our domestic customer bill analysis shown above is calculated based on NGN average Annual Quantities (AQ) and peak daily capacity requirements. NGN's average AQ in 16/17 was 13,967Kwh which when applied with load factors and our unit rates gave an average domestic customer bill impact of £130.
- The remaining years of RIIO-GD1 have RPI forecast in line with the last HM Treasury publication in February 2017 – this has RPI growth for calendar year 2017 @ 3.5%, 2018 @ 3.4%, 2019 @ 3.2%, 2020 @ 3.2% and 2021 @ 3.3%.
- We have not included in the above allowed revenue analysis any indicative profile on recovering the additional pension deficit payment made during calendar year 2017 of £22m. NGN has made a one off payment to the scheme of £22m to secure lower future payments with an asset backed contribution scheme – the profile of future allowances is being developed and will be known with certainty by the November 2017 Annual Iteration Process.

5.3 Allowed Revenue movement year on year

Table 5.3 shows a high level reconciliation of the key movements between our revenue forecast year on year:

(16/17 Prices)	Actual				Forecast				RIIO Total
	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21	
2016 FORECAST	**416**	**426**	**430**	**412**	**393**	**386**	**399**	**397**	**3,259**
Inflation impact:									
2016 RPI forecast	2.9%	2.0%	1.1%	2.0%	2.7%	3.1%	3.2%	3.3%	
2017 RPI forecast	2.9%	2.0%	1.1%	2.1%	3.5%	3.4%	3.2%	3.2%	
Variance %	0.0%	0.0%	0.0%	0.1%	0.8%	0.3%	0.0%	(0.1%)	
Cumulative Variance %		0.0%	0.0%	0.1%	0.9%	1.1%	1.2%	1.1%	
Impact £m on base revenues	**0.0**	**0.0**	**(0.0)**	**0.0**	**3.5**	**5.1**	**4.7**	**4.5**	**17.8**
Other Changes:									
Over Collection of Income	0.0	0.0	0.0	0.0	(0.0)	(9.7)	(0.7)	(0.0)	(10.5)
Cost of debt Index	0.0	0.0	0.0	0.0	0.0	(1.9)	(3.0)	(4.0)	(8.9)
FGO allowances	0.0	0.0	0.0	(0.0)	(1.1)	(1.9)	(2.6)	(3.0)	(8.5)
Business Rates	0.0	0.0	(0.0)	(0.0)	0.0	(0.1)	(3.8)	(3.8)	(7.7)
Other	0.0	0.0	(0.4)	(0.4)	(0.0)	(0.0)	(0.2)	(1.3)	(2.3)
Exit Capacity Incentive	0.0	0.0	(0.0)	(0.0)	0.0	0.0	0.3	0.3	0.6
Totex Incentive	0.0	0.0	0.3	0.3	(0.5)	1.2	1.6	(0.3)	2.7
Shrinkage & Environmental Incentive	0.0	0.0	0.0	0.0	0.0	2.0	2.1	2.1	6.3
2017 FORECAST	**416**	**426**	**430**	**411**	**395**	**381**	**397**	**391**	**3,248**
YOY Movement	**0.0**	**0.0**	**(0.1)**	**(0.2)**	**2.0**	**(5.2)**	**(1.6)**	**(5.5)**	**(10.5)**

Figure 5.3: Year on Year Revenue Movements

5.4 Incentives

RIIO-GD1 incentive performance to date has resulted in average incentive income earned per year of £8.6m (16/17 prices). We are also receiving incentive income during RIIO-GD1 that relates to GDPCR1 performance:

- DRS monies from 11/12 and 12/13 have been collected in 13/14 and 14/15 (£2m in total);
- Capex incentive income has been spread across all years of RIIO-GD1 (£15.1m in total); and
- Note there is a 2 year lag on all incentive income – so incentive money earned in 14/15 will be collected during 16/17 regulatory year.

A breakdown of the overall incentive income earned is shown below in table 5.4. Note this is based on performance earned in year and ignores the 2 year lag for income collection purposes which is built into table 5.2 within section 5.2.

16/17 Prices Incentive Earned in Year	Actuals (Earned)				Forecast (Earned)				RIIO Total	Avg. Yr
	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21		
Shrinkage & Environmental Emissions	2.9	3.6	3.7	5.9	6.0	6.0	6.0	6.1	40.2	5.0
Customer Service	1.9	2.2	2.2	2.1	2.0	2.0	2.0	2.0	16.2	2.0
Exit Capacity	0.0	0.6	3.0	1.7	1.8	1.5	0.9	0.2	9.8	1.2
Stakeholder Engagement	1.1	0.6	1.2	1.3	1.0	1.0	1.0	0.9	8.2	1.0
RIIO - DRS	0.0	0.8	0.0	0.0	0.8	0.0	0.0	0.0	1.6	0.2
Complaints Penalty	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total RIIO-GD1	**6.0**	**7.8**	**10.1**	**11.0**	**11.6**	**10.5**	**9.9**	**9.2**	**76.0**	**9.5**
GDPCR1 – DRS	1.2	0.9	0.0	0.0	0.0	0.0	0.0	0.0	**2.0**	**0.3**
GDPCR1 – Legacy	0.0	3.7	1.4	1.6	1.8	2.0	2.2	2.5	**15.1**	**1.9**
Total	**1.2**	**4.5**	**1.4**	**1.6**	**1.8**	**2.0**	**2.2**	**2.5**	**17.1**	**2.1**
Total Incentive Earned in year £m	**7.1**	**12.3**	**11.5**	**12.5**	**13.4**	**12.5**	**12.1**	**11.7**	**93.2**	**11.6**
Income Collected with 2 year lag £m	**1.2**	**4.5**	**7.2**	**9.2**	**11.8**	**12.5**	**13.4**	**12.5**	**72.4**	**9.0**

Figure 5.4: Year on Year Revenue Movements

Customer Service and Stakeholder Engagement

We have achieved an excellent outcome in our customer service outputs, achieving the number two ranking in customer satisfaction amongst the gas networks. We have maintained a strong performance for complaint handling, and performed well in the stakeholder engagement assessment.

We anticipate that we will continue to sustain and improve on this strong performance, and continue in our pursuit to deliver the best possible experience for our customers. More detail on each individual measure can be found in the following sections, together with our forecast for the rest of the RIIO period.

- Our incentive forecast assumes we will maintain our maximum incentive position and incur no cash complaints penalty.
- Stakeholder Engagement award of £1.3m has been based on our score of 7.25 announced on 25th July 2017.

(16/17 Prices)	Target Score	Actual Scores					Incentive Income earned in year £m			
		13/14	14/15	15/16	16/17		13/14	14/15	15/16	16/17
Planned	8.09	8.38	8.65	8.86	**8.90**		**0.5**	**0.7**	**0.7**	**0.7**
Unplanned	8.81	9.25	9.38	9.52	**9.46**		**0.7**	**0.7**	**0.7**	**0.7**
Connections	8.04	8.61	9.01	9.12	**9.16**		**0.7**	**0.7**	**0.7**	**0.7**
Total Customer	**8.31**	**8.75**	**9.01**	**9.17**	**9.17**		**1.9**	**2.2**	**2.2**	**2.1**
Stakeholder	**-**	**6.75**	**5.50**	**6.80**	**7.25**		**1.1**	**0.6**	**1.2**	**1.3**

Figure 5.5: Customer Service and Stakeholder scores

Complaints

Complaints Scores	Weighting		13/14		14/15		15/16		16/17
D+1	10%		39.5%		19.0%		17.2%		18.2%
D+31	30%		1.5%		1.3%		2.7%		2.2%
Repeats	50%		1.2%		0.7%		1.1%		0.3%
Ombudsman	10%		0.1%		0.0%		0.0%		0.0%
Complaints Metric Score			**4.99**		**2.66**		**3.08**		**2.65**
Ofgem Target			**11.57**		**11.57**		**11.57**		**11.57**
£ Penalty			**nil**		**nil**		**nil**		**nil**

Figure 5.6: Complaints scores

Shrinkage and Environmental Emissions Incentive

NGN is responsible for purchasing gas to replace that 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 been set output targets to reduce the amount of shrinkage and leakage from our network over RIIO-GD1.

Table 5.7 below shows the target and actual volume levels and the incentive income due from this level of outperformance. Our forecast assumes we will maintain our GWh outperformance in the future years of RIIO-GD1.

(16/17 Prices)	Actuals				Forecast				RIIO Total	Avg. Year
	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	343	332	321	310	**2,859**	**357**
Variance	38	48	51	69	69	69	69	69	**483**	**60**
Variance %	8.4%	10.8%	11.9%	16.3%	16.8%	17.2%	17.7%	18.2%	**14.4%**	**14.4%**
Incentive Earned in year (£m)	**0.7**	**0.7**	**0.6**	**0.9**	**0.9**	**0.9**	**0.8**	**0.8**	**6.2**	**0.8**
Environmental Emissions GWh:										
Allowed volumes	434	420	408	398	386	376	364	354	**3,140**	**393**
Actual / forecast	399	375	360	332	320	310	298	288	**2,682**	**335**
Variance	35	45	48	66	66	66	66	66	**458**	**57**
Variance %	8.1%	10.7%	11.7%	16.6%	17.1%	17.6%	18.1%	18.7%	**14.6%**	**14.6%**
Incentive Earned in year (£m)	**2.2**	**2.9**	**3.1**	**5.0**	**5.1**	**5.1**	**5.2**	**5.3**	**34.0**	**4.2**

Figure 5.7: Shrinkage and Environmental Emissions Incentive

Exit Capacity Incentive

Within the allowed revenue licence formula exit capacity is separated into 2 areas as follows:

- Exit capacity costs – the NGN network has to pay for capacity rights to flow a level of gas through the 24 offtake sites to meet 1 in 20 winter weather conditions. The cost for this commitment is treated as non-controllable and we receive an allowance to match the cost. (16/17 costs were £7.4m).
- Exit capacity incentive – whilst the above area is a pass through, reducing this cost will ultimately benefit end consumers and networks are incentivised to reduce the bookings compared with the original licence allowed volumes.

Table 5.8 below shows the actual and forecast volumes and the incentive result from this level of outperformance.

(16/17 Prices)	Actuals				Forecast				RIIO Total	Avg. Year
	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	527	527	527	4,401	550
Variance	1	22	78	83	97	97	97	97	573	72
Variance %	0.1%	3.6%	12.6%	13.3%	15.6%	15.6%	15.6%	15.6%	11.5%	11.5%
Incentive Earned in year (£m)	**0.0**	**0.6**	**3.0**	**1.7**	**1.8**	**1.5**	**0.9**	**0.2**	**9.8**	**1.2**

Figure 5.8: Exit Capacity Incentive

The above forecast includes an indicative view of our latest position from the July 2017 Gemini bookings process which will become effective from 1st October 2017. We have further reduced our bookings to 527 Gwh and will continue to review capacity requirements for the remaining years of RIIO-GD1, albeit some sites are fixed due to being tied in with user commitment charges from decisions made pre RIIO.

Totex Incentive Mechanism

Totex covers Controllable Opex, Capex and Repex.

- 2016/17 outputs have been delivered for £36m (13.7%) lower than our Totex allowance of £264m. Our current forecast for RIIO-GD1 as a whole is to deliver Totex for 12.3% lower than allowances.
- When we outperform Totex we return money to customers through the IQI mechanism. Table 5.9 below shows our forecast outperformance and the amount we can keep (64%) and the amount to return to customers (36%).
- On average we will return c. £2.1m back to customers each year, albeit the revenue mechanics result in some being returned in year through fast money and the remainder over 45 years via slow money.

(16/17 Prices)	Actuals				Forecast				RIIO Total	Avg. Yr
	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21		
Allowances £m										
Opex	102	103	104	104	102	102	101	100	**818**	**102**
Capex	54	58	62	58	44	45	45	45	**412**	**52**
Repex	100	102	101	102	104	103	105	104	**822**	**103**
TOTEX	**256**	**264**	**267**	**264**	**250**	**250**	**251**	**250**	**2,051**	**257**
Actuals/Forecast £m										
Opex	85	87	82	82	83	81	80	79	660	82
Capex	42	50	62	59	51	50	53	45	413	52
Repex	93	97	88	85	93	88	85	84	714	89
TOTEX	**220**	**235**	**232**	**227**	**227**	**219**	**218**	**209**	**1,787**	**223**
Variance £m										
Opex	17	16	22	21	18	21	21	21	158	20
Capex	12	8	(0)	(1)	(6)	(5)	(8)	0	(1)	(0)
Repex	7	5	14	17	11	15	20	20	109	14
TOTEX	**36**	**29**	**35**	**37**	**23**	**31**	**33**	**42**	**266**	**34**
Variance %										
Opex	16.7%	15.6%	20.8%	20.5%	18.1%	20.3%	21.2%	21.2%	19.3%	19.3%
Capex	21.8%	14.1%	(0.2%)	(1.9%)	(14.5%)	(11.6%)	(18.0%)	0.1%	(0.2%)	(0.2%)
Repex	7.1%	4.5%	13.3%	16.4%	10.6%	14.6%	19.0%	19.2%	13.3%	13.3%
TOTEX	**14.0%**	**11.0%**	**13.1%**	**14.0%**	**9.6%**	**12.6%**	**13.5%**	**17.0%**	**13.0%**	**13.0%**
Incentive impact (£m)										
How much NGN keeps (64%)	23	19	22	24	15	20	22	27	172	22
How much NGN gives back (36%)	13	10	13	13	9	11	12	15	97	12
Revenue adj. with 2 year lag	**0**	**0**	**(2.6)**	**(1.8)**	**(3.4)**	**(3.4)**	**(1.7)**	**(2.0)**	**(14.9)**	**(1.9)**

Figure 5.9: Totex Incentive Mechanism

Performance Review

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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 16/17 prices (£m)	Allowance	2016/17	Variance
Controllable Opex	103.7	82.4	(21.3)
Capex	57.9	59.0	1.1
Repex	102.2	85.4	(16.8)
Totex	263.7	226.8	(37.0)

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 £37.0m this year, compared to an outperformance last year of £34.9m. The main drivers for this variance in outperformance are:

- An increase in capital investment in the network in particular into our IT systems and infrastructure to drive future benefits which saw us overspend the allowance by £1.1m, £1m more than last year;
- A reduction in Repex mains laid unit costs against a marginally higher workload, with an improvement in outperformance of £3.3m; and
- Opex outperformance decreasing by £0.3m, mainly as a result of increased holder demolition and environmental costs, offset by reductions in IT support costs and across Emergency and Repair.

The £37.0m 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 2016/17 prices (£m)	13/14 Actual	14/15 Actual	15/16 Actual	16/17 Actual	17/18	18/19	19/20	20/21	TOTAL
Controllable Opex	84.9	86.9	81.9	82.4	83.5	81.0	80.0	79.1	**659.7**
Capex	42.4	50.2	62.3	59.0	50.7	50.0	52.8	45.4	**412.9**
Repex	93.0	97.6	87.9	85.4	92.8	88.3	85.2	84.3	**714.3**
Totex	**220.2**	**234.7**	**232.2**	**226.8**	**227.0**	**219.4**	**218.0**	**208.8**	**1786.9**

Figure 6.2: Totex forecasts

The table above summarises our forecast for Totex over the RIIO-GD1 period. Overall we expect our annual Totex costs to drop to around £209m by the end of RIIO-GD1, a c9% drop from current levels. The main drivers for this are:

- Opex reducing by c£3.3m. The forecasts include an assumption that the exceedingly mild winters we have recently experienced will not continue, impacting our emergency and repair costs, but this will be offset by the end of RIIO with c5% of efficiencies;
- Capex reducing from just over £53m p.a. average in the early years of RIIO-GD1 to below £50m by 2020/21. We expect to increase the efficiency of delivery across all areas of Capex, and are looking to front load investment to maximise the benefits for our customers and ourselves; and
- Repex reducing from over £90m p.a. average in the early years of RIIO-GD1 to nearer £85m by 2020/21. The variances in the forecast above are workload driven. 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 activities; and
- **Indirect Opex** – covering training and apprentices, and business support activities such as finance 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 16/17 prices (£m)	Allowance	2016/17	Variance
Direct Opex			
Work Management	21.9	18.3	(3.6)
Emergency	15.9	10.3	(5.6)
Repair	16.8	13.4	(3.4)
Maintenance	9.2	10.1	0.9
Other direct activities	14.2	6.7	(7.5)
Direct Opex total	78.0	58.8	(19.2)
Indirect Opex			
Business Support costs	21.0	21.6	0.6
Training and Apprentices	4.6	2.0	(2.7)
Indirect Opex total	25.6	23.6	(2.1)
Total controllable Opex	103.7	82.4	(21.3)

Figure 7.1: Controllable Opex compared to the allowance

Overall our 2016/17 controllable Opex costs were £82.4m, outperforming the allowance of £103.7m by £21.3m. This is detailed by activity in the table above.

This outperformance 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.

7.3 Year on Year Controllable Opex performance

Controllable Opex 16/17 prices (£m)	2015/16	2016/17	Variance
Direct Opex			
Work Management	17.9	18.3	0.4
Emergency	10.5	10.3	(0.2)
Repair	13.8	13.4	(0.4)
Maintenance	10.0	10.1	0.1
Other direct activities	6.8	6.7	(0.1)
Direct Opex total	**59.0**	**58.8**	**(0.2)**
Indirect Opex			
Business Support costs	21.1	21.6	0.5
Training and Apprentices	1.8	2.0	0.1
Indirect Opex total	**22.9**	**23.6**	**0.7**
Total controllable Opex	**81.9**	**82.4**	**0.4**

Figure 7.2: Controllable Opex year on year variance

Overall we have seen a real cost increase of £0.4m in controllable Opex from 2015/16 to 2016/17. Direct Opex decreased by £0.2m, whereas Indirect Opex increased by £0.7m. 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 16/17 prices (£m)	2015/16	2016/17	Variance
Work Management			
Asset management	5.3	7.2	1.9
Operations management	9.3	7.6	(1.6)
Customer management	1.5	2.0	0.5
System control	1.9	1.5	(0.4)
Emergency	10.5	10.3	(0.2)
Repair	13.8	13.4	(0.4)
Maintenance	10.0	10.1	0.1
Other direct activities	6.8	6.7	(0.1)
Total Direct Opex	**59.0**	**58.8**	**(0.2)**

Figure 7.3: Direct Opex year on year variance

7.4.1 Work Management

Work management overall has seen a £0.4m year on year increase in costs across the four activities included here. This overall increase is driven by:

- An increase in asset management of £1.9m. We have demolished seven gas holders this year compared to three in 2015/16 which has increased costs by £1.8m. We also saw our land remediation costs increase by £0.4m as we carried out three remediation projects. This was offset by a £0.3m reduction across net staff and professional and consultancy costs which had peaked last year in order to support the development of our asset strategy and asset health methodologies;
- A decrease in operations management of £1.6m through reduced net staff costs, achieved through business process improvements across all of our back office processes that support our field based activities. We have further optimised all of our work patterns in Dispatch, reduced head count in our Streetworks teams through process improvements and the use of technology, and seen benefits from reduced overtime and average salaries across our supervisory workforce;
- An increase in customer management of £0.5m, mainly driven by a £0.3m increase in the charges for the National Grid contract for call handling services, driven by call volumes which have partially been impacted by smart metering.
- A decrease in System Control costs of £0.4m. Costs temporarily increase last year to cover succession planning and training.

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, three more than in our original plan. We now plan to complete four in 2017/18, then two each year for the remainder of RII-GD1.

	RIIO target	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21	Total
Number of gasholders decommissioned	23	1	2	3	7	4	2	2	2	23

Figure 7.4: Gasholder decommissioning forecast

7.4.2 Emergency and Repair costs and associated outputs

Emergency and repair costs have shown a combined decrease of £0.6m, whilst achieving a very strong performance in our emergency and repair outputs which is detailed below.

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. This year we have also experienced a mild winter overall, which impacted workload and hence performance, overtime payments and contractor costs. In terms of overall workload, the number of public reported escapes (PRE) remained broadly flat at 84,132 compared to 83,453 in 2015/16. We have seen a decrease in repairs from 19,933 last year down to 17,801 this year which has impacted costs. This validates our approach to the Repex programme, where we are focussing on the riskiest pipes.

We have continued to feel the benefit of the changes we have made over the past two years in emergency and repair, in particular the introduction of new terms and conditions covering ‘site start’ and ‘site finish’ working patterns, as well as new bonus arrangements which are now specifically linked to outputs. We estimate that these changes have led to avoided costs of in the region of £2.9m across emergency and repair. In addition this year we have seen the following impacts:

- Our emergency costs reduced by £0.2m this year, in line with the broadly similar PRE workload which is remaining consistent year on year, but with reduced fuel and other transport and plant costs; and
- Our repair costs saw a £0.4m reduction this year. This is partly driven by the reduced repair workload, as well as the benefits we have seen from the ‘core and vac’ equipment we now use following a successful trial which enables us to complete repairs with minimal reinstatement costs. In addition we have seen similar saving in fuel and other transport and plant costs.

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%	97.5%	97.5%	97.5%	97.5%
97% of controlled gas escapes attended within 2hrs	97%	99.97%	99.99%	99.96%	99.97%	97.5%	97.5%	97.5%	97.5%

Figure 7.5: Emergency response forecasts

In 2016/17 we have again performed significantly above the targets – achieving 99.76% and 99.97% 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 new Rapid Response Engineers to replace external contractors to support our winter resilience plans. We were also assisted by generally mild winter conditions, but we are increasingly seeing significant rainfall and flooding. Our forecast for the rest of RIIO-GD1 takes into account the exceptionally mild weather experienced in the last three years, and reduces for 2016/17 with the assumption of a more typical winter.

We expect to outperform the output targets in every year of RIIO-GD1.

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 2016/17, an excellent performance and again showing a year on year improvement. The main drivers for this improvement are;

- Focussing 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 which have improved the time to locate difficult to find repairs. We have made further investment in the equipment due to the positive results seen.

We were also assisted by consistent mild winter conditions. Our forecast takes into account the overall mild weather experienced recently, and our forecast increases for 2017/18 assuming this will be a more typical winter.

We then expect to make year on year improvements, whilst outperforming the target every year during RIIO-GD1.

	RIIO annual target	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21
Annual repair risk	<34.5m	34.4m	24.8m	18.6m	17.4m	26.0m	25.4m	24.8m	24.3m

Figure 7.6: 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.

	RIIO year 4 target	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21
% repairs completed within 12hrs	60.5%	62.3%	62.9%	64.4%	62.3%	>61.0%	>61.5%	>62.0%	>62.5%

Figure 7.7: % repairs completed within 12 hours forecast

We achieved 62.3% in 2016/17 against a target of 60.5%, an excellent performance which was achieved through the same drivers as detailed above for Repair Risk.

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 4 target	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21	Total
Number	13,459	11,464	13,034	12,859	12,427	13,339	13,220	13,103	12,987	102,433
Number related to major incidents	-	0	0	1,430	2,756	0	0	0	0	4,186
Total Number	-	11,464	13,034	14,289	15,183	13,339	13,220	13,103	12,987	106,619
Duration	6.8	4.8	4.2	4.4	4.8	6.7	6.7	6.6	6.6	44.8
Duration related to major incidents	-	0	0	7.4	4.7	0	0	0	0	12.2
Total Duration	-	4.8	4.2	11.8	9.5	6.7	6.7	6.6	6.6	56.9

Figure 7.8: Number and duration of unplanned interruptions

We had 15,183 unplanned interruptions in 2016/17 with a duration of 9.6mm but this includes a major incident at Withernsea that saw 2,756 customers off gas. Adjusting for this incident, our underlying performance is 12,427 unplanned interruptions with a duration of 4.8mm, a similar performance to prior years when they are also adjusted for any major incidents. This is an outperformance against the revised unplanned interruptions targets we have submitted to Ofgem as part of the RIIO-GD1 mid-point review.

Our forecasts for the remainder of RIIO-GD1 assume a targeted year on year improvement, but also assuming a more typical winter. 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. We anticipate the peak for smart meter installation will be in 2018/19, and may result in as many as c70,000 extra unplanned interruptions in that year alone.

Output – Customer Satisfaction Survey results for unplanned interruptions

In 2016/17 we have delivered a score of 9.5, in line with our performance in 2015/16.

Our 9 patch operation model has remained in place, and this has helped to deliver a local, quality service to our emergency and repair customers. We have continued to use Team 10, one of our customer focus groups, to help drive improvements forward. We have now fully rolled out an initiative called the Customer Interface Centre (CIC) to all patches after a successful trial saw our Bradford patch improve performance by 9%. Peer to peer coaching is an important part of the CIC, with engineers obtaining 'in-moment' feedback from customers, and any issues being promptly resolved by the engineers.

We have also continued to work hard to improve our incident response process. In the winter of 2016/17 we experienced a major incident at Withernsea, with 2,756 customers losing their gas supply. During the incident we trialled a new restoration process which aimed to get customers back on gas as soon as possible, and we have fed back nationally how successful it was. Following the incident we held several stakeholder events to identify areas for further improvement and will look to embed the lessons learnt in our incident response processes.

7.4.3 Maintenance and Other Direct Activities

Maintenance costs have marginally increased by £0.1m this year. Overall maintenance work varies year on year due to the different maintenance schedules each type of asset is subject to. OLI runs are the main variable this year. We have retendered our outsourced maintenance activities this year and expect to realise efficiency improvements in the rest of RIIO-GD1.

Other direct activities have decreased by £0.1m. We saw a £0.5m reduction in Xoserve operating cost recharges and a £0.2m reduction in one off costs captured here. This was offset by a £0.6m increase in costs associated with District Incidents. We experienced a major incident at Withernsea following a governor failure which saw 2,756 lose their gas supply which drove the majority of this increase.

7.5 Year on Year Indirect Opex performance

Indirect Opex 16/17 prices (£m)	2015/16	2016/17	Variance
Business Support			
IT and telecoms	7.9	6.2	(1.7)
Property management	1.9	2.4	0.5
Human resources	0.7	0.9	0.1
Audit, finance and regulation	3.5	4.0	0.5
Insurance	2.4	2.6	0.2
Procurement	0.3	0.7	0.4
CEO and group management	4.5	4.8	0.3
Training and apprentices	1.8	2.0	0.1
Indirect Opex total	**22.9**	**23.6**	**0.7**

Figure 7.9: Indirect Opex year on year variance

Indirect Opex overall has seen a £0.7m year on year increase in costs across business support and training and apprentices. This overall increase is driven by:

- A £1.7m decrease in IT and telecoms expenditure. We have outlined previously the significant changes we were making to our IT and telecoms strategy and delivery model, and we are now realising the benefits through reduced operating costs and improved services;
- A £0.5m increase in property management costs. We have made significant investments in our offices and depots in the last two years, 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. We now have three new sites in Leeds which has driven c£0.3m of this increased cost. We have also seen some one off costs and temporary duplication as part of the investment programme which will not reoccur;
- A £0.5m increase in Audit, finance and regulation costs. This is mainly driven by annual movements in professional and consultancy costs which can vary significantly year on year;
- A £0.4m increase in procurement costs, driven by an increase in resource in our commercial activities to better support our commercial decision making process;
- A £0.3m increase in CEO and group management costs, primarily as a result of increased expenditure on business communications, corporate social responsibility and stakeholder management - all of which have been made a priority focus for NGN as a key employer and influencer in the North of England. We have expanded our internal resources in this area to maximise our opportunity to make a positive contribution

7.6 Year on Year Non Controllable Opex performance

Non Controllable Opex 16/17 prices (£m)	2015/16	2016/17	Variance
Shrinkage	5.1	4.7	(0.4)
Ofgem Licence	1.6	1.4	(0.3)
Network Rates	37.8	37.3	(0.5)
Established pension deficit recovery plan payment	8.7	27.9	19.1
PPF levy costs	0.1	0.1	0.0
Pension scheme administration costs	0.5	0.5	0.0
NTS Pension Recharge	7.1	7.0	(0.1)
Bad debt	0.1	0.1	0.0
NTS exit costs	7.7	7.4	(0.3)
Network Innovation (ex IRM)	3.0	2.7	(0.3)
Non Controllable Opex total	**71.7**	**88.9**	**17.2**

Figure 7.10: Non Controllable Opex year on year variance

Overall non-controllable Opex costs have increased by £17.2m in real terms. The key variances are:

- A decrease in gas shrinkage costs due to reduced gas prices and our improvement in leakage performance;
- A decrease in the Ofgem Licence costs and our Network Rates payments;
- An increase in our pension deficit recovery payment. We have made an extra £19.1m contribution to reduce our existing deficit this year. This contribution is part of the arrangements we are establishing to increase the recovery period and reduce the short term costs to customers through implementing an Asset Backed Contribution (ABC) scheme. This ABC arrangement also reduces the potential for a trapped surplus being created;
- A decrease in NTS exit costs, driven by a reduction in bookings following further detailed analysis and assessments of our requirements at each offtake; and
- A decrease in Network Innovation costs, which varies every year dependant on the number and type of projects underway.

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. We have set ourselves a challenging monetary target for efficiency delivery and are using this process to ensure buy in from the field operations teams. This year we estimate we have delivered c£0.6m of efficiencies in Totex, the majority achieved in Repex through our Control Point and Stub End abandonment 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 16/17 prices (£m)	13/14	14/15	15/16	16/17	Cumulative Total	Cumulative Allowance	Variance
Work management	14.1	16.4	17.9	18.3	66.6	87.7	(21.1)
Emergency	10.3	10.5	10.5	10.3	41.7	64.5	(22.8)
Repair	17.2	15.5	13.8	13.4	59.9	69.6	(9.8)
Maintenance	8.8	9.7	10.0	10.1	38.6	37.3	1.3
Other direct activities	7.2	7.1	6.8	6.7	27.7	52.6	(24.9)
Total direct opex	**57.6**	**59.1**	**59.0**	**58.8**	**234.5**	**311.7**	**(77.2)**
Business support	24.8	25.4	21.1	21.6	92.8	83.5	9.3
Training/apprentices	2.5	2.5	1.8	2.0	8.8	16.9	(8.1)
Total indirect opex	**27.3**	**27.8**	**22.9**	**23.6**	**101.6**	**100.5**	**1.2**
Total controllable opex	**84.9**	**86.9**	**81.9**	**82.4**	**336.2**	**412.2**	**(76.0)**

Figure 7.11: Opex cumulative position

Cumulatively we have outperformed the controllable Opex allowance of £412.2m by £76.0m (18%). 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.

Direct Opex shows a £77.2m outperformance, which is offset by a £1.2m underperformance in Indirect Opex.

7.8 Opex forecasts

Opex forecasts 16/17 prices (£m)	16/17 forecast	16/17 actuals	Variance
Work management	18.9	18.3	(0.6)
Emergency	11.3	10.3	(1.0)
Repair	16.0	13.4	(2.6)
Maintenance	9.4	10.1	0.7
Other direct activities	6.6	6.7	0.1
Total direct opex	**62.2**	**58.8**	**(3.4)**
Business support	21.8	21.6	(0.2)
Training/apprentices	2.5	2.0	(0.5)
Total indirect opex	**24.3**	**23.6**	**(0.7)**
Total controllable opex	**86.5**	**82.4**	**(4.1)**

Figure 7.12: Opex forecast comparison

In our 2015/16 submission we forecast that our 2016/17 controllable Opex would be £86.5m. Our outturn costs have been £4.1m lower at £82.4m. The table above provides details of the variances by activity. The main drivers for this variance are:

- A £0.6m decrease in work management costs. The main driver was an increase in our holder demolition costs as we demolished seven gas holders this year, two more than originally planned. We are now ahead of target which increases our flexibility in the remaining years of RIIO-GD1. This was more than offset by the cost savings we have achieved in Operations Management and System Control which have been realised earlier than we anticipated;
- A combined decrease in Emergency and Repair costs of £3.6m. In our forecasts we assumed winter conditions would be more severe and typical of the longer term than the very mild conditions seen in the last two years, however this has not been the case. We have also benefited from very low fuel costs, and in repair the introduction and more widespread usage of innovative core and vac technology;
- Variances in maintenance work, specifically for OLI runs. We have also outsourced much of our maintenance activity and the expected benefits have not been fully realised yet; and
- A net £0.7m decrease in Business Support. We have realised savings in IT and Telecoms earlier than expected (£1.7m), which was offset by various cost increases in the other activities, mainly related to professional and consultancy costs and increased property costs.

RIIO-GD1 forecast

Opex forecasts 2015/16 prices (£m)	13/14 Actual	14/15 Actual	15/16 Actual	16/17 Actual	17/18	18/19	19/20	20/21	TOTAL
Work management	14.1	16.4	17.9	18.3	17.1	16.1	16.1	16.1	**132.2**
Emergency	10.3	10.5	10.5	10.3	11.0	10.8	10.6	10.4	**84.6**
Repair	17.2	15.5	13.8	13.4	15.8	15.6	15.5	15.4	**122.2**
Maintenance	8.8	9.7	10.0	10.1	9.8	9.6	9.4	9.2	**76.6**
SIUs	-	-	-	-	-	-	-	-	**-**
Other direct activities	7.2	7.1	6.8	6.7	5.8	5.1	4.8	4.6	**48.0**
Of which Xoserve	4.0	4.4	4.4	3.8	3.4	2.7	2.4	2.3	**27.3**
Total direct opex	**57.6**	**59.1**	**59.0**	**58.8**	**59.5**	**57.3**	**56.5**	**55.8**	**463.6**
Business support	24.8	25.4	21.1	21.6	21.5	21.3	21.0	20.8	**177.4**
Training/apprentices	2.5	2.5	1.8	2.0	2.5	2.5	2.5	2.5	**18.7**
Total indirect opex	**27.3**	**27.8**	**22.9**	**23.6**	**23.9**	**23.7**	**23.5**	**23.3**	**196.1**
Total controllable opex	**84.9**	**86.9**	**81.9**	**82.4**	**83.5**	**81.0**	**80.0**	**79.1**	**659.7**
Licence/network/other	48.4	49.8	51.8	69.8	53.7	53.7	53.7	53.8	**434.7**
NTS exit costs	7.0	8.9	7.7	7.4	7.5	4.7	9.6	7.6	**60.5**
Shrinkage	9.1	6.5	5.1	4.7	5.1	5.0	4.7	4.3	**44.4**
NTS pensions contribution	5.0	5.1	7.1	7.0	7.0	7.0	7.0	7.0	**52.2**
Total non-controllable	**69.5**	**70.3**	**71.7**	**88.9**	**73.3**	**70.4**	**75.0**	**72.7**	**591.7**

Figure 7.13: Opex forecasts

We have consistently been a frontier performer for operating expenditure and expect to maintain this position throughout RIIO-GD1. The table above summarises our forecasts for both controllable and non-controllable opex.

Work management includes our profile for holder demolition, from seven holders this year to four next year then two each year until 2021. 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 two years. We would expect to outturn lower than this when the winter weather is mild. We expect to deliver further net efficiency savings of £1.0m by 2020/21.

Within business support we are forecasting a further c£0.8m of efficiency savings across the various activities, including further savings in our IT and Telecoms functions. In addition xoserve costs are forecast to fall by the end of RIIO.

Training and apprentices expenditure follows our expected recruitment plans and demonstrates our commitment to reinvigorating our workforce and investing for the future. We are also supporting our contractor base with their recruitment and training activities, which in some places negates the need for us to recruit direct.

In terms of non-controllable expenditure:

- The variances in Licence/network/other are driven by an expected c11% increase in Business Rates in 2017/18 following their reassessment by the Valuation Office;
- NTS exit costs vary primarily due to price fluctuations offset by our reduced bookings;
- Shrinkage costs reduce based on our reducing forecasts for gas shrinkage volumes, and forecast gas prices; and
- NTS pension contributions are based on the latest forecasts from the NTS.

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 2016/17 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 16/17 prices (£m)	Allowance	2016/17	Variance
LTS, storage and entry	18.4	15.0	(3.4)
Connections	7.2	8.8	1.6
Mains Reinforcement	5.1	2.1	(2.9)
Governors (Replacement)	1.7	1.6	(0.1)
Other Capex	25.6	31.4	5.8
Including : IS and telecoms	11.0	16.0	5.0
Including : Vehicles	0.5	2.5	2.0
Capex total	**57.9**	**59.0**	**1.1**

Figure 8.1: Capex variance to the allowance

The table above summarises our actual capital expenditure in 2016/17 against the allowances by activity type. Overall we invested £1.1m more than the allowance of £57.9m.

8.2 Asset Health

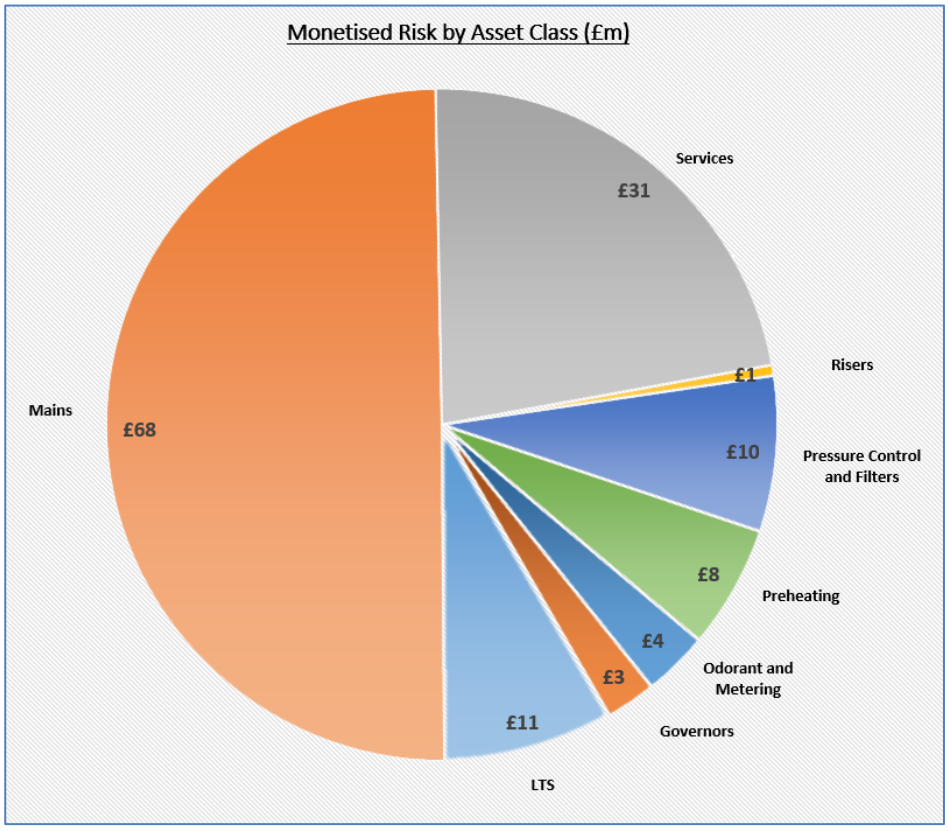
Network Output Measures (NOMs) outputs are used to establish the current and predicted movement in asset health monetised risk over time and the associated improvement as a result of asset interventions.

The monetised risk values within the 2016/17 cost and output return are derived from the asset-specific MRS (Monetised Risk Solution) Microsoft Excel models, which are based on the Network Output Measures Health & Risk Reporting Methodology & Framework (Version 3.2 – July 2017). A change log has been published to document revisions to the methodology agreed with Ofgem.

A significant amount of data collation and analysis has been undertaken by NGN to inform the modelling process. This has included a holistic procedure data update across all of the asset classes for the 2016/17 report. Where data deficiencies have been identified we have outlined future data improvement initiatives. These initiatives are outlined in NGN's Implementation report, submitted to Ofgem as a separate report. The NOMs methodology allows the use of pooled, shared or elicited data, however, there are a number of GDN-specific datasets and values for NGN and these will form part of those data improvement initiatives going forward.

Our submission provides NOMs outputs for our rebased 2013 GD1 start position, our current performance based on actual intervention activities undertaken to 2017, and our forecast 2021 position with and without current planned intervention. A separate rebasing submission to the 2016/17 cost and outputs return will be used to establish targets for RIIO-GD1 based on the new methodology.

At the start of RIIO-GD1 the total monetised risk associated with the NGN network was **£158.8m**. This has been statistically determined by applying back-casting Rebasing techniques using the 2017 position as a reference point (this is detailed in NGN's Rebasing Report to Ofgem). The current total network risk at 31 March 2017 is **£136.3m**. The chart below breaks this out into the respective asset classes.



Unmitigated, this risk will increase to **£152.9m** at 2021 based on our modelled outputs. The delivery of NGN's current planned work for Years 5-8 of RIIO-GD1 to 2021, based on the current risk position at 2017, will reduce the risk to **£131.2m** at 2021. The Iron Mains population holds NGN's highest total risk at a 2017 monetised risk value of approximately **£67.9m.**

8.3 LTS, storage and entry

8.3.1 Costs and Workload

LTS, storage and entry 16/17 prices (£m)	Allowance	2016/17	Variance
LTS pipelines		1.2	
LTS diversions		2.9	
NTS offtakes		2.9	
Gas entry points		0.0	
PRSs		8.0	
Storage		0.0	
Total	**18.4**	**15.0**	**(3.4)**

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 2016/17 allowance. Overall we have invested £15.0m against an allowance of £18.4m, an under spend of £3.4m.

Our £1.2m expenditure on **LTS pipelines** has primarily been in the following areas:

- £0.5m on upgrading overcrossings, a continuation of the £2.3m invested last year in response to the risk of damage from adverse weather conditions. This investment upgrades the supports, coating, wrapping and flood protections. Investment on overcrossings is prioritised on a risk basis;
- £0.3m on ball valve upgrades. Workload here is managed in conjunction with our On Line Inspection programme - the valves are upgraded when any pipe is due their inspection; and
- £0.4m on installing a pig trap on the Pickering to Old Malton pipe, in order to enable an On Line Inspection to take place.

LTS Diversions has seen a significant year on year increase, primarily as a result of the following projects:

- River Eden LTS Crossing (£2.7m) – this critical pipeline had become exposed on a river bed, and following several attempts to remediate it we decided a permanent relocation was required. The project was to directionally drill 750m of new HP pipeline under the river.
- Aislaby (£0.6m) – this involves the diversion of a pipe that has been severely impacted by a land slip and is being diverted to provide long term protection.

NTS Offtakes and **Pressure Reduction Stations** are both critical 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 2016/17 NGN invested in the following sites, either in terms of design or procurement and build:

- Offtakes £2.9m including c£0.6m at Towton and c£1.1m at Ganstead; and
- PRS £8.0m including c£2.4m at Carcroft, c£1.4m at Ushaw Moor, and c£1.7m at Low Thornley.

The upgrades covered items such as preheating, regulators, slamshut systems, metering upgrades, flow computers, electrical and instrumentation, generators and civils.

8.3.2 Reliability output – asset utilisation and capacity

NTS Offtakes enable gas to be taken from the National Grid managed National Transmission System (NTS) into NGN's high pressure pipe network. Pressure Reduction Installation's (PRI) then enable onward transportation through the network to customers. Both of these asset types need to be technically compliant and capable of meeting the required throughput volumes for us to meet our supply obligations.

Our output target is to improve our asset utilisation position over RIIO-GD1. The table below shows our current forecast. We will achieve the target by designing appropriate site upgrades in order to improve the utilisation figures.

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	75	74	71	70
Utilisation 50% < I <=70%	52	58	56	59	57	56	55	55	56
Utilisation 70% < I <=80%	45	25	27	22	27	29	32	32	31
Utilisation 80% < I <=100%	44	49	44	41	30	32	32	34	35
Utilisation > 100%	0	10	9	8	5	2	1	0	0
Total	192	193	195	194	194	194	194	192	192

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

We undertake an annual network analysis of all PRIs and Offtakes using our PRISM and Graphical Falcon modelling tools. Comparing this analysis to our forecast maximum flow data allows us to identify assets sites where specific investment is needed in order to ensure the asset operates within an acceptable utilisation band. This ensures we make the investment at the latest opportunity allowing us to avoid 'gold plating' of the system.

In 2016/17 all 194 offtake and PRI PRISM models were reviewed and updated where necessary, giving further confidence and increased accuracy in our capacity utilisation reporting figures. We have also adopted an updated methodology for measuring PRI capacity. The updated methodology uses the same constraint parameters and measures capacity using the same PRISM software. However, in order to maintain continuity and improve accuracy, the maximum flow figures for analysis are taken from the Graphical Falcon 1:20 peak model. These figures have been derived from internal modelling. They also align with the highest forecast demand day for which the GDN is licensed to provide gas.

We currently have five sites operating at above 100% capacity, a reduction of three from 15/16:

- The capacity utilisation at Carcroft 24 to 3.4 bar PRI and Low Moor 17 to 2 bar PRI are no longer above 100% following input of the updated methodology and revalidation of the PRISM models; and
- The capacity utilisation at Paull 38 bar NTS Offtake is no longer above 100% following 2016 upgrade works.

The current forecast for a total of 192 sites at the end of the RIIO period takes into account the decommissioning of Clay Flatts 3" and Clay Flatts 4" (Storage) PRIs and the transfer of the load onto the Derwent Howe Industrial Estate PRI, which previously fed the British Steel plant at Workington.

8.4 Connections

8.4.1 Costs and Workload

Connections	2015/16	2016/17	Variance
Workload			
Mains (km)	29.7	20.8	(8.9)
Services (number)	7,479	7,912	433
Governors (number)	3	1	(2)
Risers (number)	21	27	6
Costs (16/17 prices £m)			
Mains	3.0	1.7	-1.3
Services	11.8	11.7	-0.1
Governors	0.0	0.0	0.0
Risers	0.0	0.0	0.0
Gross Cost	**14.8**	**13.4**	**(1.4)**
Contribution	(4.8)	(4.6)	0.2
Net Cost	**10.1**	**8.8**	**(1.2)**
Net Allowance	**7.2**	**7.2**	**0.7**

Figure 8.4: Connections workload and costs variance

The table above summarises our connections performance against the 2016/17 allowance, and against our 2015/16 outturn. Overall this year we have spent a net £8.8m, £1.6m over the allowance of £7.2m.

This allowance now includes an extra £0.6m to fund our increased fuel poor workload target of 14,500 connections over RIIO. See 7.4.2 below for further details of our cumulative performance against this output target. This year we completed 2,638 fuel poor connections, c700 more than the phased target workload, which cost an extra £1.1m. This is the main driver of the £1.6m overspend against the allowance.

Our net costs have decreased by £1.2m compared to 2015/16, which is mainly due to:

- A decrease in contributions of £0.2m. This is a timing difference, as we report on a cash basis for connections, and so there is often a timing difference between incurring the costs and receiving payment. This leaves an annual decrease in gross costs of £1.4m;
- Mains laid decreased by 8.6km, which accounts for c£0.8m of this decrease in costs. 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 a decrease of 136 Non Domestic connections, offset by an increase of 539 Domestic connections, mainly in New Housing and Fuel Poor. This has a net zero impact on costs, as Non Domestic connections are three to four times more expensive than Domestic connections; and
- The £0.6m remainder of the gross cost variance is down to efficiency across mains and services delivery.

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 now agreed a new target with Ofgem of 14,500 fuel poor connections in the same period. In order to achieve this we have 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.

	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21	Total
Number of fuel poor network connections	1,164	1,707	2,458	2,638	1,739	1,625	1,626	1,641	14,598
Phased Target	1,500	1,500	1,917	1,917	1,917	1,917	1,917	1,917	14,500

Figure 8.5: Fuel poor workload forecast

During 2016/17 we wanted to get further ahead and successfully completed 2,638 fuel poor connections. This cumulatively puts us 1,134 ahead of the 6,834 phased RIIO Target. We now expect to see a gradual reduction over the rest of RIIO-GD1.

8.4.3 Customer Satisfaction Survey results for connections

In 2016/17 we have delivered a score of 9.2, an increase from 9.1 last year. We have continued to build on the improvements of the last three years, driving change directly from within our connections business. We are seeing increased usage of our online payment system, and continue to receive positive feedback for our 'one stop shop' approach to service alterations, which reduced the alterations process from 4-6 weeks to just 7 days, with some jobs even being completed on the same day as the application is made.

8.4.4 Output – Connections Standard of Service

We have had an excellent result in Connections this year as six of the outputs achieved near 100% scores, with six out of seven outputs marked as green this year against our very challenging performance targets. These targets are significantly above the existing guaranteed standards.

We also measure our performance against the Council of European Energy Regulators (CEER) targets. These represent a stretch on the existing GSOS standards, and through this we expect this to deliver further benefit to our customers. These results cement the progress we have made to date, and are further backed up by the improvement in our connections customer satisfaction score from 9.0 to 9.2. We expect to maintain or improve our performance for all the outputs over the next four years.

Our connections delivery model has undergone material changes over the last 3 years. We now have a new but fully established design team and back office support aligned to a new direct labour workforce who work closely together to deliver the best possible service.

In the last year we have continually reviewed and improved our delivery model. Key activities this year include:

- Fully embedding our new 'smarter' Audit Framework, increasing the focus on business critical elements with a corrective action and feedback mechanism;
- Continually improved our processes and governance to ensure best practice;
- Undertaking a 'Connections Review' to highlight and resolve any inefficiencies within our processes; and
- Expanding our dashboards to encompass all the measurable activities within connections, down to individual employee where appropriate.

We have implemented a number of new initiatives to benefit customers, stakeholders and the business. These include:

- **Improvement and development team:** This team has been specifically developed to look at our end to end processes and ensure they meet the changing demands of our customers. They will then be responsible to facilitate the changes and monitor their success; and
- **Performance dashboard:** This dashboard lets us see the level of service we are achieving, in terms of
  - Customer; includes customer satisfaction scores.
  - Integrity; Provides audit feedback data.
  - Efficiency: The speed and quality of the task they undertake.
  - Individual performance: both quantitative and qualitative.

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%	>99.6%	>99.6%	>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%	>99.6%	>99.6%	>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%	>99.6%	>99.6%	>99.6%	>99.6%
% of land enquiries where response sent within 5 working days	99.6%	99.5%	99.6%	100.0%	99.43%	>99.6%	>99.6%	>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%	>99.6%	>99.6%	>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%	100%	100%	100%
% of connection jobs substantially completed on date agreed with customer	95%	97.2%	98.6%	98.4%	98.50%	>95%	>95%	>95%	>95%

Figure 8.6: Connections forecast outputs

8.5 Mains Reinforcement

Mains reinforcement	Allowance	2016/17	Variance
Workload			
Mains < 180mm (km)		5.0	
Mains > 180mm (km)		1.1	
Total	**17.9**	**6.1**	**(11.9)**
Governors (number)	8	6	(2)
Costs (16/17 prices £m)			
Mains < 180mm		1.6	
Mains > 180mm		0.3	
Governors		0.3	
Total	5.1	2.1	(2.9)

Figure 8.7: Mains reinforcement workload and costs variance

The table above summarises our actual mains reinforcement expenditure against the 2016/17 allowance. We invested £2.1m on mains reinforcement and associated governors, delivering 6.1km of reinforcement mains and 6 governors. This equates to a unit cost of c£302 per metre, which is broadly in line with the equivalent rates 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 17.9km of reinforcement main. The key driver is the reduced mains laid workload, which is nearly 65% below that contained in the allowance.

Our new pressure management function has taken the lead in managing the drivers for potential reinforcement. The section was set up to address capacity constraints on the network without necessarily laying new pipe where there is a more cost effective solution. This has been a driver of increased average system pressures in RIIO-GD1 so far, with a corresponding reduction in environmental emissions incentive payments.

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. Peak demands have fallen below those levels forecast in the four year period since the 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	2016/17	Variance
Workload			
District Governors		20	
Service Governors		2	
Total	**30**	**22**	**8**
Costs (16/17 prices £m)			
District Governors		1.6	
Service Governors		0.1	
Total	**1.7**	**1.6**	**(0.1)**

Figure 8.8: Governor replacement workload and costs variance

We have invested £1.6m in our overall governor replacement programme in 2016/17. When designing the programme, we prioritise sites based on maintenance frequencies, capacity, physical condition of the unit and the locality using the 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. This year five of the district governors we replaced had particular issues relating to size, location, and access and site quality. This was reflected in the overall project cost.

8.7 Other Capex

Other Capex 16/17 prices (£m)	Allowance	2016/17	Variance
System Operations	-	0.3	-
Infrastructure and Systems	11.0	16.0	5.0
Xoserve	-	2.6	-
Plant, tools and equipment	-	3.6	-
Land, buildings, furniture and fittings	-	0.7	-
Vehicles	0.5	2.5	2.1
Security (Exc PSUP)	-	3.0	-
PSUP	-	0.0	-
Other	-	2.7	-
Capex total	**25.6**	**31.4**	**5.8**

Figure 8.9: Other Capex variance to the allowance

The table above summarises our actual Other Capex expenditure against the 2016/17 allowances. We have invested £31.4m in the areas detailed in the table against an allowance of £25.6m.

The majority of the expenditure (£16m) and the main driver for spending more than the allowance has been a significant investment in our IT Infrastructure and Systems. This investment will continue through to 2018/19. 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 2 key work programmes:

- **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; and
- **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.

The majority (c£2.3m) of the **Plant, Tools and Equipment** expenditure was associated with installing network loggers to enable remote management of pressures on the network, a continuance of a project begun in 2015. Remote pressure management is a key strategic project which will give advance warning of customer supply interruption and greater control of average system pressures in order to reduce leakage volumes and hence operating costs.

We also invested a further £0.4m in Core and Vac equipment and £0.2m in water extraction equipment. These are both used within our Repair activity, the former to complete repairs with minimal disruption and reinstatement costs, and the latter when water has entered the network due to flooding. This has increased in the last few years due to the very wet weather we have experienced. The balance is made up of many small projects to replace obsolete equipment across the network.

Expenditure on **Land, Buildings, Furniture and Fittings** consists of existing and new build related opportunities. Over the last two years we have developed 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 have invested £0.7m, primarily on 2 of our main offices in Leeds.

During this year we spent £2.5m on **Operational Vehicles.** We have an ongoing vehicle replacement programme to ensure we have a fit for purpose fleet, to improve operational efficiency and support new job roles. We use a risk model methodology to determine which vehicles are in greatest need of replacement based on actual data rather than any set mileage/age criteria. During 2016/17 we purchased 80 vehicles for both new and existing job roles, including 2 new tankers.

Within the **Other** category over half of the expenditure relates to major upgrade works on below 7 bar overcrossings supports and security. This is an area of work we expect to increase in the future. The extreme weather events and flash floods experienced in the last two winters has washed away three bridges, including our pipes, and caused major customer disruption. We are now taking proactive measures to prevent this happening in future using a risk based approach. The rest of the expenditure is on various small value projects.

8.8 Capex cumulative position under RIIO

Cumulative Capex 16/17 prices (£m)	13/14	14/15	15/16	16/17	Cumulative Total	Cumulative Allowance	Variance
LTS, storage and entry	9.3	15.5	20.3	15.0	60.1	67.2	(7.0)
Connections	6.9	7.0	10.1	8.8	32.9	27.4	5.4
Mains Reinforcement	3.0	1.8	3.3	2.1	10.3	20.4	(10.2)
Governors replacement	2.1	1.4	1.8	1.6	7.0	6.7	0.4
Other Capex	21.0	24.4	26.8	31.4	103.5	110.9	(7.4)
Including : IT	5.6	5.0	6.2	16.0	32.8	26.4	6.4
Including : Vehicles	4.1	4.6	2.8	2.5	14.0	18.8	(4.8)
Total	**42.4**	**50.2**	**62.3**	**59.0**	**213.8**	**232.6**	**(18.8)**

Figure 8.10: Cumulative Capex position compared to the allowance

The table above summarises our cumulative Capex expenditure over the first four years of RIIO-GD1 against the allowances for that period. Overall we have underspent the cumulative allowance by £18.8m. The main drivers for this are:

- Reduced mains reinforcement work (£10.2m) 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;
- Extended lives for our vehicles and timing of replacement. We now use a risk based model to determine replacement rather than a fixed period (£4.8m); and
- Timing and efficiencies in delivering both above and below 7 bar capital investment projects, contained with LTS, storage and entry, and Other Capex.

In terms of efficiencies, we have introduced a more commercial focus to the end to end Capex process with specific targeted efficiencies by activity area. This now includes processes to ensure we are engineering for value, specifically through:

- Investment teams, peer review and challenges of design;
- Smarter planning to long term targets; and
- Revised and improved network analysis to identify the best long term options on a wider scale.

We are specifically targeting synergies and economies of scale across both activity area and geographic location e.g. visit a site once to upgrade all components with one contractor, as opposed to revisiting year on year. We are also using more detailed analysis of asset health, which allows us to better manage trade-offs and decisions between maintenance and replacement of assets.

8.9 Capex forecasts

2016/17 actuals against forecast

2016/17 Capex forecast 16/17 prices (£m)	16/17 forecast	16/17 actuals	Variance
LTS, storage and entry	12.5	15.0	2.4
Connections	7.8	8.8	1.1
Mains Reinforcement	2.5	2.1	(0.3)
Governors replacement	1.7	1.6	(0.1)
Other Capex	26.0	31.4	5.4
Including : IT	7.3	16.0	8.8
Including : Vehicles	2.5	2.5	0.1
Total	**50.5**	**59.0**	**8.5**

Figure 8.11: 2016/17 actual Capex position compared to the prior year forecast

The table above summarises our actual Capex in 2016/17 against the forecast for 2016/17 we submitted last year. Overall we spent £8.5m more in 2016/17 than the £50.5m we forecast last year, a 17% increase. The main drivers for this variance are:

- A £2.4m increase in expenditure on LTS, storage and entry projects. We have continued to accelerate the construction phase of many projects over and above our plans to ensure we deliver our outputs and ensure the safety and reliability of these key assets;
- A £1.1m increase in Connections expenditure. This is largely due to the extra fuel poor workload we have completed this year, 2,638 fuel poor connections which is c700 more than the phased target workload. We have been more successful working with partner organisations to identify and develop projects; and
- An £8.8m increase in IT expenditure. As detailed in section 7.7 above we have accelerated a major investment in our entire IT system architecture and infrastructure, originally planned to start later in 2017/18.

RIIO-GD1 forecast

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

LTS, storage and entry expenditure varies year on year given the major project driven nature of the work. This is a key area that will be impacted by our revised Capex management approach. In addition to our planned work we have made significant investments here in work not foreseen when the business plan was agreed. Examples include our £3m investment in upgrading and securing our overcrossings in response to the adverse weather we have experienced in the last 2 years, and the investment this year in diverting our pipe at Aislaby in response to a land slip, which we expect to cost c£2m when completed. Overall we still expect to spend in line with the allowance due to cost efficiency and workload management.

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 7.4.2 above, where workload peaks this year and then reduces from then

on. This delivers our revised fuel poor output commitment following Ofgem's review of the Non Gas Fuel Poor Network Extension Scheme, and the front loading of the work shows our commitment to this key social obligation output.

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 slightly higher workload in 2017/18 then an increase in future years. This is largely driven by expectations that the network will fund significant levels of specific reinforcement associated with new large load connections to the network. We have seen a material increase in enquiries from generators in 2016/17, and this trend is continuing in 2017/18. The first actual new build connection for a generator starts construction in 2017 and involves c£0.5m of reinforcement funded through the economic test. We have one other currently progressing to the build phase with £0.3m of reinforcement again funded by the network.

We are currently finalising a new governor replacement strategy for district and service governors which is likely to marginally increase efficiency and potentially reduce workload. This is reflected in the forecast costs below.

Other Capex, similar to LTS, storage and entry, varies year on year given the project driven nature of this work. Again, this is a key area that should be impacted by our revised Capex management approach, in particular for plant and equipment expenditure. The other key elements that vary materially year on year are IT and vehicle expenditure.

We are now forecasting to spend c£67m on IT, materially above the allowance. Please see section 7.7 above for further details. We are also investing significantly in our depots and offices, 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. Both of these last 2 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 16/17	13/14 Actual	14/15 Actual	15/16 Actual	16/17 Actual	17/18	18/19	19/20	20/21	Total	Allowed
LTS, storage and entry	9.3	15.5	20.3	15.0	13.0	15.2	16.1	16.2	120.6	124.4
Connections	6.9	7.0	10.1	8.8	7.6	7.4	7.4	7.4	62.8	56.8
Mains Reinforceme	3.0	1.8	3.3	2.1	2.6	5.9	5.2	5.5	29.5	39.4
Governors replacement	2.1	1.4	1.8	1.6	1.2	1.2	1.2	1.3	11.9	13.3
Other Capex	21.0	24.4	26.8	31.4	26.3	20.3	22.9	15	188.0	178.2
Of which IT	5.6	5.0	6.2	16.0	10.8	8.6	7.6	8	67.8	44.8
Of which vehicles	4.1	4.6	2.8	2.5	3.6	0.9	3.9	0.3	22.7	29.3
Total	**42.4**	**50.2**	**62.3**	**59.0**	**50.7**	**50.0**	**52.8**	**45.4**	**412.9**	**412.1**
Allowance	54.2	58.4	62.2	57.9	44.3	44.9	44.8	45.5	412.1	
Variance	**(11.8)**	**(8.2)**	**0.1**	**1.1**	**6.4**	**5.2**	**8.1**	**0.0**	**0.8**	

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 fourth 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	18/19	19/20	20/21
Risk removed (incidents/year x10^{-6})	13,898	43,119	41,213	29,893	26,727	21,326	17,772	15,679	14,656
Length of Mains taken off risk	495.2	485.4	521.5	464.2	475.5	533.0	503.1	489.6	489.4
Number of services replaced	30,932	29,580	29,911	27,765	29,387	34,606	32,667	31,781	31,762
Number of GIB events	144	56	42	58	52	55	53	51	49
Number of fracture and corrosion failures	2,742	815	883	685	683	1,000	975	950	925
Sub deduct networks 'off risk'	100%	7%	58%	83%	90%	93%	96%	99%	100%
Number of Planned Interruptions	64,257	43,276	57,434	58,925	59,677	74,237	77,085	65,814	65,776
Duration of Planned Interruptions (mm)	17.3	22.4	30.3	13.7	15.1	20.0	20.8	17.8	17.8

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%)

Figure 9.2: Iron mains risk reduction 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 four years. In 2016/17 the total risk removed was 26,727, which gives a cumulative total of 140,953. The total RIIO-GD1 output target was to reduce risk by 111,191 over the eight year period. We achieved this last year, and now are nearly 27% 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 51.3km of main, which reduces the overall allowed workload to 3961.7km, an average target of 495.2km.

The table below illustrates the breakdown of these output targets, our performance to date, and forecasts for the remainder of RIIO-GD1:

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	448.0	445.4	487.8	439.8	452.9	489.4	462.0	456.4	456.4	3690.3	3584.0
Tier 1 – customer funded	15.4	1.8	2.1	2.9	1.9	2.0	2.0	2.0	2.0	16.6	122.9
Tier 2a	6.4	8.8	7.6	5.3	4.1	7.5	6.0	6.0	6.0	51.3	51.3
Tier 2b	20.4	22.1	18.3	12.2	12.4	29.0	28.2	20.7	20.7	163.5	163.5
Tier 3	5.0	7.4	5.7	3.9	4.3	5.0	4.8	4.5	4.3	40.0	40.0
Iron mains	**495.2**	**485.4**	**521.5**	**464.2**	**475.5**	**533.0**	**503.1**	**489.6**	**489.4**	**3961.7**	**3961.7**
Iron > 30m	-	8.7	9.3	11.4	10.8	7.3	7.3	7.3	7.3	69.5	-
Steel	48.7	57.6	75.6	45.9	59.5	53.1	60.1	58.4	58.2	468.3	389.8
Other	-	10.4	10.7	8.6	8.6	8.8	8.8	8.8	8.8	73.6	-
Total	**543.9**	**562.1**	**617.1**	**530.1**	**554.4**	**602.2**	**579.3**	**564.1**	**563.7**	**4573.1**	**4351.5**

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

In terms of **Total Irons Mains** we have abandoned 1946.6km of main to date at an average of 486.7km. This is 8.5km below the inferred annual target, and cumulatively 34.2km behind the inferred year 4 target. We plan to recover this position in 2017/18 by abandoning 533.0km of main, 37.8km above the inferred annual target, and to get further ahead by abandoning 503.2km in 2018/19.

The total iron mains target includes an annual allowed workload of 15.4km for customer driven rechargeable mains diversions. To date we have abandoned 12.6km of iron mains associated with this type of work, 49km behind the allowed four year target of 61.6km. We have however abandoned a further 25km 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. This is the main driver for the shortfall detailed above.

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 nearly 70km of this type of main over RIIO-GD1;
- **Steel** – we have abandoned 238.6km of steel to date, 43.8km ahead of the inferred 4 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 468.3km over RIIO-GD1, nearly 80km over the allowed volume; and
- **Other** – we have abandoned 38.3km of other materials mains date, and expect to abandon 73.6k 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 454.8km of Tier 1 mains this year, just below this target, driven by the lower than expected customer funded work. Cumulatively we have abandoned 1834.6km, which puts us 18.8km behind target. We expect to more than recover this position in 2017/18. Importantly we are 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 51.3km through dynamic growth. Cumulatively we have abandoned 25.8km of main, in line with this revised expected workload. We 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 86.3km against a target of 101.6km. We expect to recover this position in the next two years, and then deliver in line with the average annual programme.

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.

	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
GIB events (any concentration level)	1,153	144	56	42	58	52

Figure 9.4: GIB events performance

The number of GIB events during the first four years of RIIO is well below the annualised target of 144, and in part, is a reflection of the targeted replacement programme. This performance also reflects the further reductions seen during the year in both public reported escapes and the amount of repair work needed.

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.

	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
Number of fractures / failures (C1/S1/D1) over RIIO-GD1	21,936	2,742	815	883	685	683

Figure 9.5: Fractures and corrosion failures performance

The number of fracture and corrosion failure events during the first four 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, which we have based on trends over an eleven year period against the forecast of the remaining length of live iron pipe each year. This provides a prudent assessment over

the full RIIO-GD1 period taking into account both our replacement programme and an assessment of the uncertainties driven by the exogenous factors highlighted above.

9.2.5 Number of services replaced

This output relates to the number of 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.

	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
Number of services replaced	247,458	30,932	29,580	29,911	27,765	29,387

Figure 9.6: Number of services replaced

The total number of services replaced during the first four years of RIIO has averaged 29,161, below the average annual target of 30,932. We saw an increase of c1,600 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 four years of RIIO-GD1 this average has increased;
- Lower than forecast reactive relay after escape workload – this is due to our strategy of employing 'targeted service performance led mains replacement'. In the first four 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 and to recover the shortfall in service volumes seen in RIIO-GD1 so far. However we recognise that the health of our service asset population is deteriorating and will continue to do so in the future, and this potential increase in service failure would impact customers. Therefore we will continue to monitor the number of services replaced, and will potentially use a 'Bulk Service Renewal' programme should cost benefit analysis suggest it would be cost effective.

With these initiatives, we believe that it is prudent to continue to forecast that services replacement during RIIO-GD1 will broadly meet the output targets whilst also improving the underlying health of the services asset base, improving safety and reliability for customers.

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.

	RIIO target	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21	Total
Sub-deduct networks 'off-risk' by the end of RIIO	135	9	69	34	9	5	4	3	2	135

Figure 9.7: Major accident hazards prevention forecast

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. This year we have re-engineered six sub-deduct networks and removed three secondary meter installations to remove the identified risk, at a cost of £0.2m. We now have 14 sites remaining, and expect the operatorship of 12 of these sites to be formally taken on by a 3rd party. Discussions to confirm these arrangements have started. The remaining 2 are under review.

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 c98% of the total number;
- Service alterations at the request of a customer – which accounts for c2% 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	59,677	57,411	159	2,107
Duration of planned interruptions	17.35 mm	15.1 mm	14.86 mm	0.20 mm	0.04 mm

Figure 9.8: Number of planned interruptions

The table above details our 2016/17 performance. We had 59,677 planned interruptions in 2016/17 with a duration of 15.1 millions of minutes (mm). As expected this was mainly driven by the replacement programme, which accounted for 57,411 interruptions with a duration of 14.86mm. This was a 5% increase in volume from last year, driven by a broadly equivalent increase in total mains abandonment. We also saw an 8% increase in the average minutes lost per interruption from 238 minutes to 258 minutes, which is driven largely by the type and location of the mains and services we have replaced.

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 2016/17 we have delivered a score of 9.0, an increase from 8.9 in 2015/16.

We have continued to prioritise our replacement activities in the warmer summer months in order to minimise disruption of gas supplies in the colder winter months. Early in 2016 we trialled the Considerate Constructors Scheme (CCS) on a number of replacement schemes. We quickly identified that the CCS could help focus improvements across all aspects of our replacement activities, and have now rolled it out Network-wide. We have also focused on improving our communications around planned replacement work, and in some cases have recruited bilingual customer care officers.

9.3 Mains Replacement costs

9.3.1 Repex compared to the allowance

Replacement expenditure	Net Costs 16/17 prices (£m)	Workload
Tier 1 – Mains laid	52.8	485.9 km
Tier 1 – Associated services	13.0	36,949
Tier 2a – Mains laid	1.6	4.1 km
Tier 2a – Associated services	0.0	36
Other – Mains laid	8.4	33.2 km
Other – Associated services	0.5	1,247
Diversions – Mains laid	0.8	11.1 km
Diversions – Associated services	0.1	126
Other services	8.0	6,307
Risers	0.0	0
Sub deducts	0.2	9
Total	**85.4**	
Allowance	**102.2**	
Variance	**(16.8)**	

Figure 9.9: 2016/17 Repex costs and workload

The table above sets out our 2016/17 Repex costs and workload, along with the cost allowance. Overall we spent £85.4m against an allowance of £102.2m (after adjusting for lower than allowed Tier 2A workload). This £16.8m 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 2016/17. The two main techniques that have delivered efficiencies this year have 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’; and
- Control point – a piece of equipment that measures the effectiveness of new joints enabling any remedial work to take place on site without a revisit.

9.3.2 Mains and Services year on year performance

Mains and Services (16/17 prices)	2015/16			2016/17		
	Net Costs £m	Workload	Unit Costs £	Net Costs £m	Workload	Unit Costs £
Tier 1 + steel – Mains laid	50.2	464.7	108	52.8	485.9	109
Tier 1 – Services	14.1	34,302	410	13.0	36,949	352
Tier 2a – Mains laid	1.7	5.3	332	1.6	4.1	381
Tier 2a – Services	0.1	167	633	0.0	36	615
Other – Mains laid	10.3	27.9	368	8.4	33.2	253
Other – Services	0.3	583	507	0.5	1,247	366
Diversions – Mains laid	2.7	16.0	166	0.8	11.1	76
Diversions – Services	0.2	430	455	0.1	126	410
Other services	8.3	6,513	1267	8.0	6,307	1267
Total mains laid	**64.8**	**513.8**	**126**	**63.6**	**534.3**	**119**
Total services	**22.9**	**41,995**	**546**	**21.5**	**44,665**	**482**
All in mains cost	**87.8**		**171**	**85.2**		**159**

Figure 9.10: Repex year on year variance

In terms of year on year performance, the all in mains laid unit rate averaged £159 per metre in 2016/17 against the 2015/16 equivalent of £171 per metre, an overall decrease of 7%.

In terms of the breakdown in unit costs, when you consider mains and services together our Tier 1 costs have decreased by c2%, mainly driven by a reduced average project length. Tier 1 work makes up c93% of the total workload delivered.

Tier 2a costs have increased by 10%, but this has been more than offset by a 30% drop in the Other Mains unit costs. Workload across these tiers is in general more complex and unit costs can vary more dependent on the actual workload. Other Mains has also seen a movement towards lower diameter band work which is less expensive. Last year 26% of Other Mains laid was <125mm in diameter, whereas this year it increased to 42%. In the >355mm bands we saw an even more pronounced shift, from 15% of the workload to 4% this year.

9.3.3 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's mains laid which is the primary determinant of cost. However we do not target this specifically when designing projects.

With regards to Tier 1, which makes up c93% of our workload, 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, where there are small % movements across all bands. However the broad mix of work is generally consistent with the business plan, with c57% being >250mm compared to the Business Plan assumption of 58%.

Mains laid workload mix	Tier 1			Tiers 2 and 3		
	Business Plan	Actual	Variance	Business Plan	Actual	Variance
<=75mm	40%	29%	(10%)	1%	3%	2%
>75mm to 125mm	45%	57%	13%	6%	5%	(1%)
>125mm to 180mm	14%	12%	(1%)	9%	12%	2%
>180mm to 250mm	2%	1%	(1%)	26%	30%	2%
>250mm to 355mm	0%	0%	0%	40%	39%	(3%)
>355mm to 500mm	0%	0%	0%	14%	16%	1%
>500mm to 630mm	0%	0%	0%	4%	2%	(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 2016/17 no risers have been replaced.

In 2014/15 we completed a 3 year program to survey the existing population of high rise buildings held on our SAP asset repository. This exercise has resulted in a smaller number of riser replacements being required than anticipated. In 2015/16 we have started an annual sampling survey program for buildings below 5 storeys and therefore we expect costs, workload and complexity to increase in future years.

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 we have re-engineered six sub-deduct networks and removed three secondary meter installations to remove the identified risk, at a cost of £0.2m.

9.4 Repex cumulative position under RIIO

Cumulative Repex 16/17 prices (£m)	13/14	14/15	15/16	16/17	Cumulative Total	Cumulative Allowance	Variance
Repex	93.0	97.6	87.9	85.4	363.8	406.0	(42.2)
Total	**93.0**	**97.6**	**87.9**	**85.4**	**363.8**	**406.0**	**(42.2)**

Figure 9.12: Cumulative Repex position compared to the allowance

Cumulatively we have outperformed the £406.0m Repex allowance by £42.2m (10.4%).

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 1946.6km of iron main against an inferred 4 year target of 1980.8km, which puts us 1.7% behind target. However in addition we have also abandoned 40.2km of main outside of 30m of domestic properties, and 38.3km of Other Mains, based on cost benefit analysis. We have also abandoned 238.6km of steel against an inferred 4 year target of 194.9km.

9.5 Repex forecasts

2016/17 actuals against forecast

2016/17 Repex forecast 16/17 prices (£m)	16/17 forecast	16/17 actuals	Variance
HSE driven mains and services	68.0	67.4	(0.5)
Non HSE driven mains and services	21.6	18.0	(3.6)
Risers	0.0	0.0	0.0
Total	**89.6**	**85.4**	**(4.2)**

Figure 9.13: 2016/17 actual Repex position compared to the prior year forecast

The table above summarises our actual Repex expenditure in 2016/17 against the forecast for 2016/17 we submitted last year. Overall we spent £85.3m, a £4.2m decrease from the forecast (4.7%). The main drivers for this is workload mix, as we have completed proportionally less high diameter band work across Other Mains than we forecast, and have seen less Diversions work than expected. Reduced Tier 2a workload is adjusted for in the allowance.

RIIO-GD1 forecast

Repex forecasts 16/17 prices (£m)	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21	Total
HSE driven mains and services	67.8	74.0	66.1	67.4	73.2	69.7	67.2	66.5	552.0
Non-HSE driven mains and services	25.0	23.5	21.8	18.0	19.5	18.6	17.9	17.7	162.1
Risers	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Repex totals	**93.0**	**97.6**	**87.9**	**85.4**	**92.8**	**88.3**	**85.2**	**84.3**	**714.3**

Figure 9.14: Repex forecasts

The table above summarises our RIIO-GD1 Repex expenditure forecast, based on the first four years' actual performance and a forecast for the remaining four 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. We are investing more in 2017/18 and 2018/19 to make up the current 1.7% shortfall in iron mains abandonment work and to get ahead by the end of 2018/19 to provide some leeway in the final two years of RIIO-GD1.

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 2016/17 and our forecasts for the next four 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 51 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 2016/17.

One Year Outputs	RIIO-GD1 Year 4 target	16/17	RAG	
Emergency response				
97% of uncontrolled gas escapes attended within 1 hr	97%	99.76%	G	Link
97% of controlled gas escapes attended within 2 hrs	97%	99.97%	G	
Repair				
Annual repair risk (m)	<34.5	17.4	G	Link
Percentage of repairs completed within 12 hrs	60.5%	62.3%	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	9	0	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 4 inferred target	16/17	RAG	
Mains replacement				
Risk removed (incidents/year x10^{-6}) as measured by MRPS	13,898	26,727	G	Link
Number of Gas in Buildings (GIB) events	144	67	G	Link
Number of fractures and corrosion failures	2,742	683	G	Link
Length of main taken 'off-risk'(km)	492.9	475.6	A	Link
Number of services replaced	30,932	29,387	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. 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 and expect to achieve our target in relation to sub-deduct risk removal.

	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. All low pressure COMAH sites have been decommissioned and denotifed. This eliminates the legislative requirement associated with gas storage set out in COMAH regulations.

We have had no COMAH breaches in 2016/17. 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 the safety case required by this legislation. The culture of compliance with the safety case is embedded throughout NGN.

Our output target is to maintain full compliance with GS(M)R during RIIO-GD1. We have achieved this in 2016/17 and expect to in every year 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 4 inferred target	16/17	RAG	
Loss of supply				
Number of planned interruptions	64,257	59,677	G	Link
Number of unplanned interruptions	13,459	12,427	G	Link
Duration of planned interruptions (mins-millions of)	17.3	15.1	G	Link
Duration of unplanned interruptions (mins-millions of)	6.8	4.8	G	Link
Network capacity				
Meeting NGN's 1 in 20 planning standard (MWh pa)	507,466	476,850	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	0.0%	G	Below
Number and duration of telemetered faults	166 pa	63	G	Below
Pressure System Safety Regulation (PSSR) Faults (A1 and A2 faults per number of AGIs)	0.50 pa	0.35	G	Below
Gasholder decommissioning	2	7	G	Link

Figure 10.4: Reliability outputs 2016/17 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.

Our year four 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. 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.

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.

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

	RIIO annual target	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21
Meeting NGN's 1 in 20 planning standard (MWh pa)	512,701	500,315	502,916	492,560	476,850	475,121	473,411	471,715	470,029

Figure 10.5: Meeting NGN's 1 in 20 planning standard forecast

10.3.2 Network Reliability

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 error's of no greater than 0.1% of total throughput (measured in GWh).

	Year 4 inferred target	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21
Offtake meter errors	<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 have received one new meter error report in 2016/17 but it is expected to fall well below the 0.1% threshold.

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 4 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	166	105	63	135	63	92	82	77	72

Figure 10.7: Telemetered faults forecast

In 2016/17 we scored 63 against a target of 166 continuing our outperformance for this output, an excellent performance. The score has decreased from the relatively high level of 135 last year, which was driven by an increase in fault numbers from a new Biomethane site, and a specific fault where we experienced a significant delay in obtaining parts for equipment. 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.

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	0.50	0.43	0.26	0.31	0.35	0.49	0.49	0.48	0.47

Figure 10.8: PSSR faults forecast

The RIIO-GD1 target for the proposed new measure is <0.51 faults per inspection. We have achieved 0.35 faults per inspection in 2016/17, well 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 4 target	16/17	RAG	
Customer satisfaction survey				
Unplanned interruption (Overall satisfaction score from 0-10)	9.0	9.46	G	Link
Planned interruption (Overall satisfaction score from 0-10)	8.5	8.90	G	Link
Connections (Overall satisfaction score from 0-10)	8.4	9.16	G	Link
Complaints				
Complaints metric	11.6	2.7	G	Below
Stakeholder engagement				
Maximise rewards under the stakeholder incentive target (score from assessment panel)	>5.0	7.25	G	Below

Figure 10.9: Customer service outputs 2016/17 performance

We have achieved an excellent outcome in our customer service outputs, achieving the number two ranking in customer satisfaction amongst the gas networks. We have maintained a strong performance for complaint handling, and performed well in the stakeholder engagement assessment.

We have continued to work with companies outside our sector in order to further develop our learning and experience on managing the customer journey. In addition this year we have won two awards related to complaints handling. We are currently being reaccredited by the Institute of Customer Services accreditation and have committed to membership for the next five years. We anticipate that we will continue to sustain and improve on this strong performance, and continue in our pursuit to deliver the best possible experience for our customers.

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 2016/17.

	Complaint Scores
Percentage of complaints unresolved after one working day	18.2%
Percentage of complaints unresolved after 31 working days	2.2%
Percentage of repeat complaints	0.3%
The number of Energy Ombudsman (EO) decisions that go against NGN as a percentage of total complaints received	0.0%

Figure 10.10: Complaint metric breakdown

The above scores generate a weighted complaint score of 2.7 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	2.4	2.2	2.0	2.0

Figure 10.11: Complaints metric forecast

Over the last twelve months we have continued to focus on resolving issues first time, every time, and this is reflected in our continued strong performance for complaints outstanding after D+1 – 18% this year. We have refreshed our daily complaints call process to really focus on root cause analysis and to clarify rules of escalation. This covers 7 days a week, 365 days a year, ensuring that our customer processes mirror our operation obligations, to respond to customer emergencies 24/7.

Complaints outstanding after 31 days, and repeat complaints have improved marginally from last year, but we have still taken steps to improve both these areas. For complaints outstanding after 31 days, we now have trigger alarms after D+5 and D+10, and we have now fully embedded jeopardy reporting that highlights any customer issues that are potentially at risk of becoming a repeat complaint.

10.4.2 Stakeholder engagement

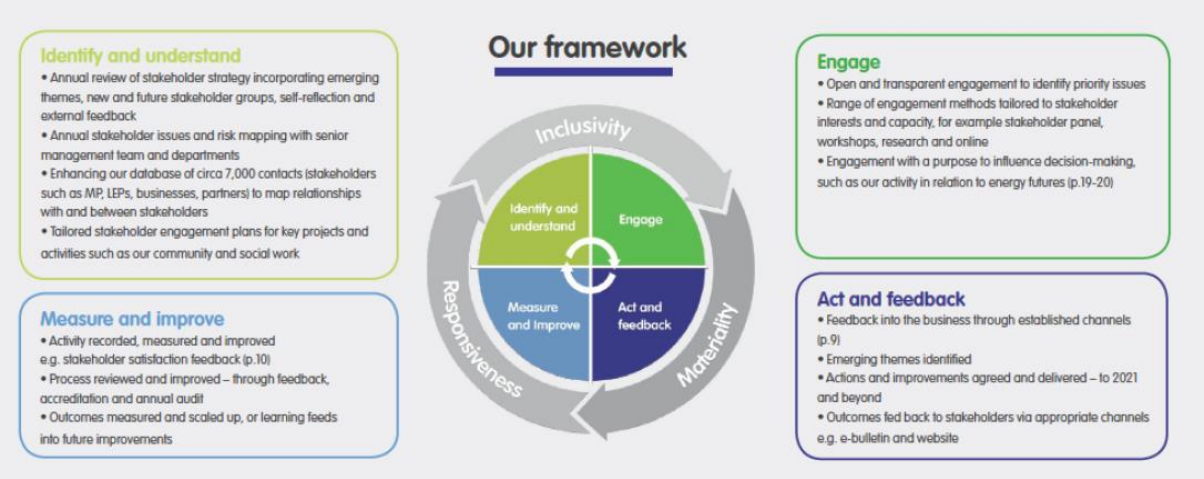
At NGN we firmly believe that stakeholder engagement and our response to feedback can lead to stronger outcomes for our stakeholders, our customers, our colleagues and our business.

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.

"The strengths of the company's approach are its business culture, the strategic nature of the response to stakeholder needs, and the provision of the resources to deliver engagement and respond to stakeholder inputs."

SGS independent audit report, March 2017



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 fourth year in a row and our approach to auditing throughout the year is helping us to continually measure and improve how we engage. In 2016/17 we have:

- Launched a dedicated vulnerability strategy and a new community fund to support grass root schemes;
- Teamed up with a wide range of stakeholders to develop trailblazing projects, from our new multi-vector test site near Newcastle to the H21 Citygate project in Leeds;
- Continued to engage emerging stakeholders and those whose voices we rarely hear;
- Improved our methods for gaining feedback including an improved satisfaction survey and a new 'test it' facility to gather views on new services; and
- Continued to build relationships with our stakeholder panel – ensuring they have regular input to our current and future plans.

> **"Working in partnership for over five years, we have successfully delivered a range of programmes helping the most vulnerable"**
>
> - Jenny Saunders, Chief Executive, National Energy Action

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, refining and scaling up our social responsibility programmes, to ensuring that the future of gas is on the national agenda. We have identified over 150 significant outcomes as a result of stakeholder engagement in the year – benefitting our stakeholders, customers and colleagues.

Stakeholder Incentive Scheme

In 2016/17 we achieved a score of 7.25 from the independent panel, an improvement on our score of 6.8 last year, and the highest of all the gas networks. We have worked extremely hard this year to better demonstrate how input from our stakeholders is shaping our business and leading to measurable improvements and benefits, and believe this is a very good result.

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	16/17	RAG
Total capacity of biomethane connected (SCMH)	No target	7,008	G
Total capacity of biomethane enquiries/applications in progress (SCMH)	No target	319,652	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 2016/17 performance

In 2016/17 we have seen a steady continuation in the number of enquiries received as the interest in bio-methane connections continue. The Renewable Heat Incentive (RHI) is provided by the Government to support such investment, and is reviewed every three months. The RHI has consistently been reduced as more connections have been made, but is fixed for 20 years at the time of any new connection. This has provided a clear incentive for interested parties to accelerate their plans and obtain the best possible RHI rate.

We have connected one new bio-methane plant and increased the NEA value for another providing a total capacity of 7,008 SCMH. With the continued interest there is the likelihood of a further six projects being delivered in the next 12 months. Interest will always be governed by movements in the RHI.

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 quotation data. These will be expanded to include quotation timescales, work scheduling and work completion when we have more experience of the market place. We have met all our voluntary targets.

	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	3,212	65,700	7,008	41,063	32,850	24,638	180,675
Total capacity of biomethane enquiries/applications in progress (SCMH)	No target	103,527	259,615	239,936	319,652	239,936	119,968	119,968	89.976
Information provision and connection charging for distributed gas	No target	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	16/17	RAG
Shrinkage gas			
Shrinkage baselines (GWh)	423 GWh	354	G
Leakage baselines (Gwh)	398 GWh	332	G
Business Carbon Footprint (BCF)			
BCF excluding shrinkage	None	7,999 Tn	A
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	17,140 (12.56%)	G
Amount of spoil to landfill sites	<13,000	6,232 (3.23%)	G
ISO14001 major non conformities	None	0	G

Figure 10.14: Environmental narrow measure 2015/16 performance

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. Please note the volumes below are now taken from version 1.4 of the leakage model which has been backdated to the start of RIIO.

(GWh)	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21
Shrinkage baselines	459	445	433	423	412	401	390	379
Shrinkage actual	417	397	382	354	343	332	321	310
Leakage baselines	434	420	408	398	386	376	364	354
Leakage actual	395	375	360	332	320	310	298	288

Figure 10.15: Shrinkage and leakage forecasts

We have outperformed both shrinkage and leakage targets in 2016/17 and 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, as well as the introduction of remote pressure monitoring and control equipment at targeted governor stations. The average system pressure in the network has reduced again this year from 31.46 mbar to 30.62 mbar; and
- 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 increased from 24.82% to 29.75% an increase of 4.93%.

The benefits of the introduction of remote pressure management and control equipment on 26 of the large mixed material networks has contributed to the outperformance in 2016/17. This project was a key investment outlined in our business plan and is proving very successful. The installation of the equipment is near completion and the Pressure Management team have been able to manage the network pressures remotely from the Control Room in Moorside. The ASP reduction has been tracked in each of the 26 networks and in some networks we have seen reductions in the ASP of up to 1.7mbar in 12 month period of 2016/17.

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.

Our total BCF excluding shrinkage has reduced by 11% since 2015/16. This is due to the following initiatives:

- Direct commercial vehicles (-5%):
  - Efficient Euro 6 engines in new fleet
  - Speed limiters; Greenroad technology; on-board weight indicators; Econetic stop/start technology
  - Driver training and awareness

- PE pipe (-8%):
  - Introduction of software to monitor and record the quantities of PE ordered / laid and their location
  - Trial of hexi-trailers to optimise PE pipe utilisation
  - 5% reduction in the length of mains laid

- Energy Use (-10%):
  - Implementation of energy efficiency initiatives during office and depot refurbishments
  - Purge and decommissioning of gas holders
  - Depot rationalisation – reduction of three

During 2016/17 we will continue to enhance the collation process of management information and drive BCF performance through the inclusion of specific objectives and target KPIs within our repex delivery contracts. These will focus specifically on optimising the use of ordered PE and fittings whilst minimising the resulting PE waste. We continue to undertake challenge and review of third party data at contract management meetings. Where relevant new contract awards will include specific environmental KPIs.

We plan to implement additional energy efficiency initiatives which will lead to a reduction in our BCF over the course of RIIO-GD1.

A Network Innovation Allowance (NIA) trial of two compressed natural gas (CNG) vehicles, in alliance with Leeds City Council (LCC), has led to the purchase of two additional CNG drop-side vehicles. These CNG vehicles have increased efficiency when compared to their diesel equivalent and have significantly reduced our environmental impact from an air quality perspective. This is key considering recent legal rulings relating to Clean Air Zones (CAZ) and public health. The trial supported our NIC project, in conjunction with LCC, in relation to the commissioning of a commercial CNG refuelling point. This project has since been enhanced and now includes a multi-fuelling project for renewable / alternative fuels. We are working with stakeholders to generate further interest in alternative vehicle fuels and ensure the project's success.

We are continuing to work with a range of stakeholders including Newcastle University, Newcastle City Council, Gateshead Council, Your Homes Newcastle, Phoenix Taxis and ITM Power to support the introduction of a hydrogen refuelling station within the Tyneside area. The proposal aims to combine our collective desires to trial a range of ultra-low emission 'fuel cell electric vehicles' (FCEV) for business use and to support the government's roll-out of this vital infrastructure to create a national network of 65 refuelling stations by 2020. We are continuing to explore potential sites for a refuelling station close to major transport routes and are working with the National Centre for Energy Systems Integration to independently evaluate the experiences and driving habits of our HFCV fleet users and to monitor air pollution levels within the city region.

Our BCF is calculated across three categories, described as Scopes 1, 2, 3. The table below provides forecast figures in accordance with our business carbon footprint programme. This considers our direct emissions, Scope 1 (excluding shrinkage) and Scope 2 emissions, and the variance in Scope 3 emissions relating to PE.

Scope 3 was not captured in our RIIO GD1 Business Plan. Our Scope 3 forecast is driven by our latest performance, and allows for changes in lengths and diameters of the replacement workload, totality of contractor data and requisite third party travel resulting from business needs.

	13/14 Actual	14/15 Actual	15/16 Actual	16/17 Actual	17/18	18/19	19/20	20/21
NGN non-shrinkage BCF (Scope 1 and 2) - tCO2e	8,918	9,244	8,476	7,999	7,712	7,581	7,483	7,340
NGN non-shrinkage BCF (Scope 3) - tCO2e	12,821	16,298	15,287	13,135	14,990	14,962	14,906	14,849
NGN non-shrinkage Total BCF - tCO2e	21,739	25,542	23,763	21,135	22,702	22,543	22,389	22,189

Figure 10.16: Business Carbon Footprint forecast

Other emissions and natural resource use

Statutory remediation of contaminated land

No specific targets have been set for statutory land remediation. During 2016/17 we continued our programme of reviewing our portfolio of sites with potential for land contamination. Land remediation monitoring and maintenance works were completed across 79 sites during 2016/17, including 53 desk based and 17 intrusive land contamination surveys to provide an updated assessment of the environmental risk and potential liability associated with each site.

In addition to the above, three remediation projects were undertaken during 2016/17 to reduce environmental risks to receptors at each site as detailed below:

- Normanton and South Milford Governor Sites: Capping of isolated hotspots of exposed soil contamination (cyanide and PAHs) identified during previous intrusive site surveys.
- Carcroft AGI: Source removal of gasworks contaminated (cyanide and coal tar impacted) soil, including removal of a relict tar tank identified to contain approximately 12,000 litres of liquid coal tar.

We expect to carry out further monitoring/maintenance works and remediations 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	22	20	20	20

Figure 10.17: Statutory remediation of contaminated land RIIO forecasts

Use of virgin aggregate and amount of spoil to landfill

We recorded a 64% reduction in tonnes of excavation spoil sent to landfill during 2016/17 compared to 2015/16 (11,079 tonnes reduction). Between 2013/14 and 2015/16 the tonnage of spoil we have sent to landfill has reduced by approximately 90% for a similar workload. Our tonnage of spoil to landfill for 2016/17 was approximately 50% below our annual business target for this measure.

Our usage of virgin aggregate decreased by approximately 50% between 2015/16 and 2016/17, equating to a reduction of 16,413 tonnes. Between 2013/14 and 2016/17 our usage of virgin aggregate has reduced by approximately 55% for a similar workload. Our usage of virgin aggregate during 2016/17 was within 1% of our annual business target for this measure.

The Yorkshire Highway Authorities Utilities Committee (YHAUC) imposes comparatively high quality requirements for recycled aggregate to be registered on their database and approved for use within the Yorkshire region. As a consequence there are only eight sites producing approved recycled aggregate in the NGN Yorkshire region, all located in the south and east of the region. Some of these centres do not produce approved recycled aggregate between October and March due to the sensitivity of the material and production process to the wet winter weather. A member of our Environment Team is a member of the YHAUC Recycling Group Committee and lobbies for further approved recycled aggregate providers in the region and promotes closer working with other utilities in our area on this matter to help us improve our performance. This has resulted in two new YHAUC approved recycling centres opening in previously poorly provided parts of our network (Wakefield and East Yorkshire) in 2016.

We have achieved the improvements during 2016/17 by implementing the following contractor management procedures:

- A dedicated monthly performance meeting with representatives from across the business to discuss performance and share feedback, including review of contractor performance and trends.
- Educating our own staff and contractors in the importance of recycling spoil and using recycled aggregate, and our Ofgem targets, via dedicated workshops and briefings. This has allowed two-way feedback and had demonstrable impacts as some contractors have directly changed their practices following challenge and support from NGN.
- Each contractor is individually challenged on their spoil and aggregate performance at the regular contract performance 1-2-1s held with the NGN Construction Services and EHS teams.
- 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 with a significant weighting within our contractor's 'League Table' challenge where performance is recorded, verified and rewarded as appropriate, including spot prizes for good performance in these areas.

In addition, NGN have also implemented the following to drive improvements in our spoil to landfill and virgin aggregate performance during 2016/17:

- purchasing two new 'core and vac' vehicles fitted with innovative acoustic camera technology which allows precision location of gas main leaks and repair within smaller, more accurately positioned excavations. This is one of many reduced dig techniques which NGN now operate.
- Transfer of our redundant material processing equipment from our former aggregate recycling plant in Leeds to one our contractors to enable them to establish an aggregate recycling centre in North Yorkshire which is currently a poorly provided area.
- Sourcing of recycling centres to taken spoil from our excavations as a cost-effective alternative to landfill.

Based on the above and trends shown throughout 2016/17, we anticipate that we will continue to achieve reductions in usage of virgin aggregate and disposal of spoil to landfill throughout the remainder of RIIO-GD1 enabling 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%)	16,500	16,250	16,000	15,750
Amount of spoil to landfill sites (t)	<13,000	61,555 (35.99%)	18,565 (10%)	17,311 (9.92%)	6,232 (3.23%)	6,000	5,750	5,500	5,250

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

ISO 14001 major non-conformities

Our annual surveillance assessment in September 2016 was completed. 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	16/17	RAG
Number of fuel poor network connections	1,500	2,638	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 2016/17. Cumulatively we are ahead of schedule on the number of fuel poor connections completed. This gives us flexibility given the external challenges in sourcing and supporting in-house measures particularly around Central Heating Funding. This year we have also focussed on raising awareness of the risks from Carbon Monoxide, and have looked at wider aspects of corporate social responsibility following the introduction of our 'Community Promises' scheme.

Off-gas communities – extensions and infills.

- We are working 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 2016/17 we have developed further relationships with more Social Landlords to extend our reach and delivery. We have also presented at Landlord and associated Energy group forums, engaging and offering support through the Fuel Poor Network Extension Scheme. 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.
- We supported 18 local authorities through 4 consortiums for delivery of the DECC central heating fund, this provided a gas supply, central heating and energy advice to around 900 gas customers.

Off-gas communities – rural

We previously piloted a 'Warm Hubs' scheme in remote rural areas with Community Action Northumberland. This scheme established communal places equipped to provide a place of warmth and community during winter, which helps to combat the challenges of low income / vulnerable people living in cold unheated homes. This scheme, a three year programme, has seen twenty warm hubs opened, three dementia friendly centres, dementia awareness training and unlocked £750k of funding for communities.

Following its success in rural areas, we have now started to look at urban warm hubs, opening our first in February 2017 in Newcastle. We now have three more planned for 2017/18. We have promoted the scheme to other network areas for widened participation, and one of the other GDNS has had initial meetings to consider replication in their area.

Energy Challenges

- Multi Storey Buildings (MSB): We continue to work with Newcastle University, Newcastle Council and Northern Power Grid to consider energy solutions for MSBs. This is largely a social science engagement, considering expectations and challenges for those living in high rise buildings. Key outcomes have been identified, which include some of the severe conditions that tenants live in and has brought much greater focus on the health impacts of living in cold homes. We have started a follow on piece of work investigating the benefits from improved heating and ventilation, results are expected to be tested during 2017/18.
- Working in partnership with the Children's Society in Bradford, we have focused on understanding the challenges faced by young people. As a result we have contracted a two year programme, initially based in Newcastle, supporting young people who live independently. The programme is delivered via a range of mentoring options, and focuses on employment, financial management, energy awareness and budgeting. The programme will reach 900 young people over two years.

Community Promises Fund

We recognise the benefits of working in partnership with "trusted intermediaries", and in 2016/17 we developed and rolled out our Community Promises Fund. This fund encourages community groups to bid for funding (between £1-£10k) for projects that support our key areas of;

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

Seventy applications were received resulting in awards to eleven community organisations. We are now working to support these successful organisations with a view to extend the most successful projects further.

A helping hand for our customers

Recognising that some of our customers need extra help, this year we 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; and
- Those in financial hardship.

We now progress a range of awareness and training programmes across our network and NGN in order to ensure understanding and support of these potential issues.

Green Doctors – home visits

We have continued our partnership with Northern Powergrid to engage with Groundwork to support their 'Green Doctors' initiative. This is a direct engagement activity providing basic physical insulation, energy efficiency and water saving measures. Due to the success of the pilot, the programme has been extended by a further two years and will support an additional 350 homes.

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 are using two workstreams to achieve this, in addition to the collaborative work we carry out with the other gas networks.

Our emergency staff use Gascoseeker devices which detects the level of methane and CO in customers homes. This enables us to determine whether CO is present and to detect the source with a much greater level of accuracy. Our emergency staff now routinely test for CO and have been trained to provide advice and guidance on causes, symptoms and avoidance of risk from CO. They also deliver briefings to individuals in their homes, followed by a questionnaire. The number of questionnaires returned increased by 3,000 to c7,000 this year. We have now developed an "app" to improve delivery and capture information in real time.

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. We have used local contacts and relationships to promote the competition, with around 120 entries. Two regional winners were awarded prizes at the House of Commons.
- Training an Army – we developed further formal training related to CO and in 2015/16 we became an accredited training centre for BPEC. We have subsequently registered to deliver training ourselves, and to date around 40 people have been trained. These community leaders have a large reach into the community. In parallel, we have delivered CO awareness sessions to the Womens Institute, scout groups, schools, and the air cadets.

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 7.4.4.

One Year Outputs	RIIO annual target	16/17	RAG
% of standard connection quotes issued in 6 working days	99.6%	99.92%	G
% of non-standard connection quotes below 275kwh issued in 11 working days	99.6%	99.85%	G
% of non-standard connection quotes above 275kwh issued in 21 working days	99.6%	100.00%	G
% of land enquiries where response sent within 5 working days	99.6%	99.43%	A
% of commencement and completion dates for connections below 275 kwh provided within 20 working days	99.6%	99.97%	G
% of commencement and completion dates for connections above 275 kwh provided within 20 working days	100%	100.00%	G
% of connection jobs substantially completed on date agreed with customer	95%	98.50%	G

Figure 10.21: Connections 2016/17 outputs

11 Uncertainties

RIIO-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 RIIO-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 developing a program to identify sites that are considered to be of national importance – Critical National Infrastructure (CNI). The Centre for the Protection of National Infrastructure (CPNI) then makes recommendations for security requirements at these sites, based on a series of security principles. BEIS worked initially with National Grid Transmission (NGT), who upgraded the physical security of a considerable number of sites. BEIS is now developing programs with NGN and the other gas distribution networks.

Current Position

Pannal Offtake site has been identified and confirmed as our only categorised CNI site that needs a security upgrade to meet the CPNI categorisation requirements. National Grid Transmission (NGT) also have a number of assets on four of our offtake sites that will require security upgrading. It has now been confirmed that the cost of these four upgrades will be funded by NGT.

Future expectations

BEIS has not specified timescales for completing the work, other than that the work must be completed in RIIO-GD1. We are required to detail our security strategy to BEIS and CPNI, which was approved in late 2016. The Security upgrade design and the design approval stages required by BEIS is forecast for completion summer 2018. The build and commission phase of the project is forecast for completion by the end of 2019. The Pannal site also includes NGT assets that will be incorporated into the security upgrade works. The total site upgrade cost is estimated at £4.2m. We will fund 72% of the total balance with the remaining 28% funded by NGT, based upon the percentage of land occupied by the respective companies assets (outlined by the shared site agreement methodology). We will continue to work with NGT to establish and implement a strategy for upgrading four of our sites, based on NGT's requirements of meeting CPNI recommendations for their CNI assets housed within the sites.

11.2 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 9th February 2015 covering all streets within their boundary, which has had a limited impact on our performance over the last two 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. No new schemes were introduced in our area in 2016/17

In terms of volumes:

- Since 2014/15 we have seen annual reductions in our overrun charges – 12.5% this year, cumulatively over 60%;
- This year we have seen a significant increase in FPNs received from both permit and non-permit authorities. There are a number of factors for this – there has been an increase in the number of different offence types for which FPNs are received from a number of authorities, and a particular increase has been noted in the number of FPNs issued by Sunderland. Some councils, notably Gateshead Council also began issuing FPNs in 2016/17 for the first time; and
- Volumes of coring failures have decreased by 3% since 2015/16. 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. Whilst it was expected that this would result in an increase in the number of local authorities undertaking permit schemes this has not yet been seen, although of the 24 local authorities within whose area NGN works, only those detailed above have implemented schemes to date so there is the potential for a large number of schemes to be implemented yet. North Yorkshire County Council have notified us of their intention to introduce a permit scheme late in 2017.

Whilst there are no active lane rental schemes in operation, the Department for Transport has been engaging with authorities so there may be potential for schemes to start in the near future.

There is a government proposal (through current consultation) to introduce seven day 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

This covers the cost of connecting new large loads (e.g. power stations) that pass the ‘economic test’ and therefore costs are not fully recovered from the connecting party. We are seeing a significant increase in enquiries regarding large load connections from generators this year, with potentially material levels of associated specific reinforcement, and this trend is continuing in 2017/18. The first actual new build connection for a generator starts construction in 2017 and involves c£0.5m of reinforcement funded through the economic test. We have one other currently progressing to the build phase with £0.3m of reinforcement again funded by the network.

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 was delayed until 2016. Some energy companies have already started to install smart meters, but given the delay to the national programme we don't expect to see mass installation until 2017/18. We have now started receiving more 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 c503k smart or advanced meters fitted in our network with approximately 112k fitted in the last year. We have updated our work management systems to track work carried out on these meters, and in the 2016/17 regulatory year we have seen just over c3,000 PREs involving a property with a smart meter. Of these call outs, 7% were due to a leak on the meter installation.

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 2018/19. 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	• 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
Making best use of data	• Understanding the opportunities smart metering data presents for us and our customers
Supporting roll-out	• Participating in a number of key industry groups and engaging with government • Leading the regulatory changes around sharing of suppliers roll out plans • Establishing pilot programmes with suppliers to assess impact and potential solutions • Working with Smart Energy GB to promote roll-out and keep them informed of potential customer impacts

11.6 Xoserve (central agency) review

Xoserve is currently funded by NGN, the other GDNs and the NTS under the Funding, Governance and Ownership (FGO) arrangement. However there are proposals to change the FGO, and should this occur then Ofgem will trigger this re-opener under the uncertainty mechanism, with the likely outcome being a reduction in our allowances for Xoserve costs.

Current position

The Gas Transporters, working collaboratively with shippers and Xoserve have completed delivery of changes to the governance and funding of Xoserve 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 GT 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

Ofgem concluded their review of the fuel poor network extension scheme in 2015 and have made several revisions to the scheme which took effect in 2016. 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 increased workload was in line with our submission to Ofgem:
- 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 account when setting targets in RIIO–GD2;
- District Heating projects are now included within the scheme, though no targets are set here; and
- Various administrative changes are necessary to improve the viability and operation of the scheme.

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 Benchmarking

Approach to benchmarking and performance improvement – in year and future

We recognise the importance of understanding how companies in a range of sectors outside utilities are run, helping us to be the best at what we do. In order to achieve this we provide our colleagues with a number of opportunities to visit different businesses, both in our local geography, nationally and internationally.

In 2016/17 we have focused on developing relationships and expanding our learning with other asset management organisations, as well as to share our own key projects, including the H21 Leeds City Gate Hydrogen project. Osaka gas visited NGN in November 2016 to compare and review all aspects of the UK gas distribution operating model. We have continued to work with South Australia Power networks across a wide variety of areas, including digital communications, finance systems and processes, and incident response. We have participated in conferences regarding the future of energy networks, which included a range of gas, electricity, wind and waste to energy organisations. This has enabled us to share the H21 hydrogen project as well as inform and validate the Energy Solutions strategy NGN is creating. We have visited Europe and Australia to share the H21 Leeds City Gate hydrogen project, and to learn from live projects involving hydrogen.

We will look to exploit these further in order to ensure we have best in class asset management techniques to support our future investments.

12.2 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%	0.2%
2014/15	1.3%	2.0%	3.3%	2.7%	(0.6)%
2015/16	1.3%	1.1%	2.4%	2.7%	0.3%
2016/17	1.3%	2.1%	3.4%	2.7%	(0.6%)

Figure 12.1: Labour RPEs

During the years 2014/15 to 2016/17 our average wage settlement was 2.7%, which at the time of the settlement was in line with the forecast RPI. This package of measures 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. 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.
- 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.
- 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.

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.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