

Shaping the gas transmission system of the future

A playback of what our stakeholders have told us so far and how we might address their feedback as we develop our business plan



How to use this document

We want your feedback

Ways to feed back:



Make notes

We have provided space for you to make notes at the end of the document. Type up your comments in the box provided and send a copy of this document with your notes jennifer.pemberton@nationalgrid.com



Email

We have a dedicated email address specifically for your feedback to this document. We welcome your thoughts at:

jennifer.pemberton@nationalgrid.com



Online

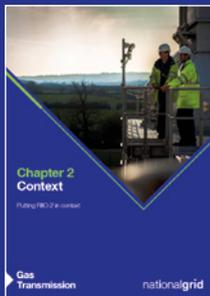
You can go directly to the website and submit your comments [here](#).

Alternatively, you can put your thoughts in writing and send to: Jennifer Pemberton, National Grid House, Warwick Technology Park, Gallows Hill, Warwick. CV34 6DA.

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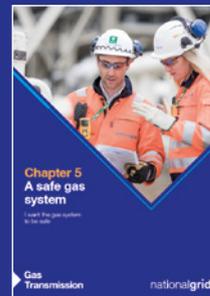
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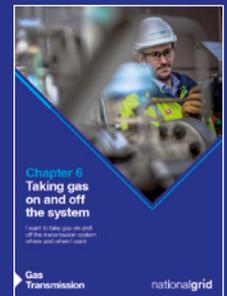
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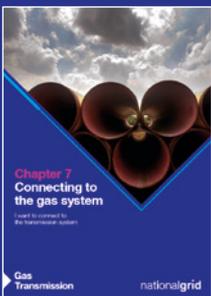
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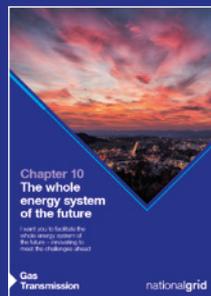
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Foreword

Who we are

We are National Grid Gas Transmission (NGGT). We own and operate the gas National Transmission System for Great Britain. We bring energy to heat homes, power industry and generate electricity. We facilitate markets to deliver the cheapest sources of gas for consumers.

Our vision is:

We will exceed the expectations of our customers, shareholders and communities today and make possible the energy systems of tomorrow.

Everything we do must deliver value for consumers. To meet this goal, we are creating a stakeholder-led business plan to submit to our regulator, Ofgem, later this year.

This consultation explains what stakeholders have told us during our extensive engagement process so far, across all areas of our business. We want to check that we understand your views correctly. In this document we share initial thinking for our priority areas for the five-year regulatory period (2021-22 to 2025-26). We also present indicative ranges for our total spending to deliver on these priorities.

Although we engage with stakeholders regularly, the opportunity to significantly update the areas of focus in our business plan is less frequent. This was last undertaken with Ofgem in 2012. **Please get involved and help to shape the future of gas transmission.**

Phil Sheppard,
Director of Gas Transmission.



Who is this consultation aimed at?

We are interested in the views of all stakeholders who are affected by what we do and how we map out the future of gas transmission. Our stakeholders are varied. They include:

- **Customers** who pay us for the products and services we provide (like Gas Distribution Networks and shippers).
- **Consumers** including domestic households (with whom we have no direct relationship).
- **Other parties** with a stake in the future of gas transmission like government and non-government organisations, regulators, consumer groups and academics.

Tell us what you think

This consultation is open until 31 March 2019. You can feedback your views online, by email to jennifer.pemberton@nationalgrid.com or in writing to Jennifer Pemberton, National Grid House, Warwick Technology Park, Gallows Hill, Warwick, CV34 6DA or calling 07920 701 440. We are particularly keen to hear your views in response to the specific questions we have posed. These are summarised on page 11. You may respond to all questions or just those relevant to your specific views.

Find out more

You can learn more about how we are working with stakeholders by visiting [your energy future](#).

This makes it easy to follow our progress as we work collectively to shape our RIIO-2 plans – and shows you how to get involved.

Introduction

Why we are consulting

This consultation is about our business priorities for the five-year regulatory period 2021-22 to 2025-26. We want to share what we have learned from our stakeholder engagement so far in a structured way. In this document, we are sharing what stakeholders are telling us is important to them. We also want to show how those priorities fit together and help to mould our business plan.

We need to have an eye on the future. Our direction of travel in the 2020s must position us to meet longer-term stakeholder needs into the 2040s and beyond. This is an opportunity to gather more views so that we can plan more effectively.

We are continuing to work together with stakeholders to develop alternatives and preferred solutions that will go into our business plan. We believe sharing our thoughts now makes sense. It will make the process more transparent, encourage wider engagement and help us to prepare a better informed and more robust first draft of the business plan. This is currently due in July 2019.

Revenue = Incentives + Innovation + Outputs (RIIO)

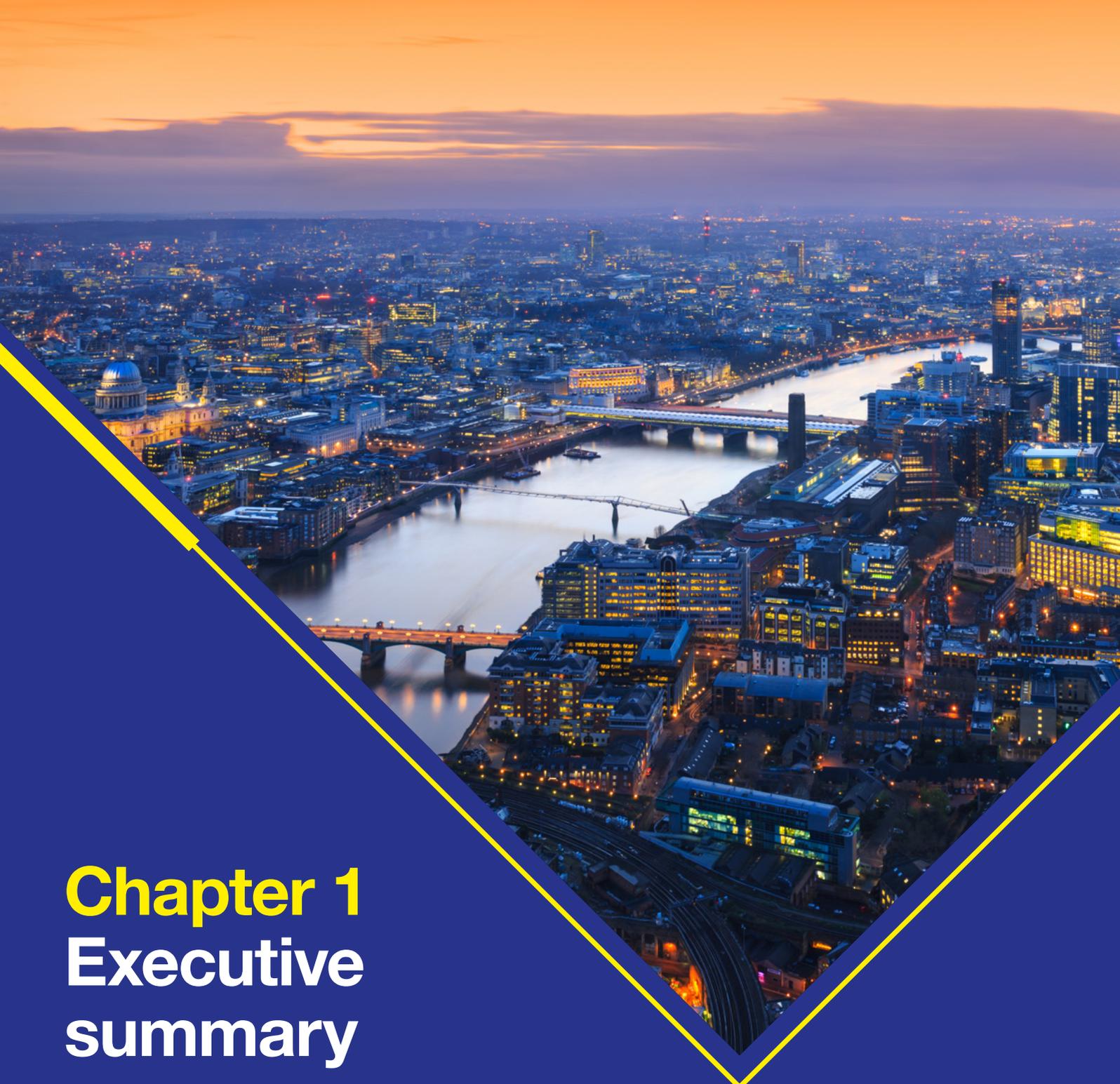
As the sole provider of gas transmission for Great Britain, our business is economically regulated by the Office of Gas and Electricity Markets (Ofgem). Ofgem has a duty to protect the interests of current and future gas consumers.

We operate under the RIIO regulatory framework. This means that our allowed revenue is influenced by attaining target outputs. We are incentivised to innovate and find service or efficiency improvements that benefit our customers and their domestic and commercial consumers. We are nearing the end of the RIIO-1 period (2013-14 to 2020-21) and we're now developing our business plan proposals for the RIIO-2 period (2021-22 to 2025-26). This consultation will help us to deliver a truly stakeholder-led business plan that focuses on consumer needs.

What you will find here

This document is broken down into chapters:

- In Chapter 2 we frame the context for our business plan preparation. This explains how we see the future role of gas transmission. It also covers the implications for our business of uncertainties like the future level of gas supply and demand.
- In Chapter 3 we explain our RIIO-2 approach to enhanced stakeholder engagement. This is fundamentally different to how we've worked before. We'll be engaging on a deeper level, with greater challenge and review. We're doing this to achieve more customer and consumer-centric outcomes. By working collaboratively we will achieve greater universal understanding of our resulting business plan.
- In Chapter 4 we set out our ongoing commitment to customer focus. We aim to put customers at the heart of what we do. By delivering for our customers we will meet the outcomes consumers want and need, because we have no direct relationship with domestic consumers.
- Chapters 5 to 12 correspond to each of the eight key stakeholder priorities we have identified from our [Listen Report](#). We have structured our consultation around these priorities to make sure we focus on the things that add most value. Here you will find:
 - a. Summary – what the priority means for our business.
 - b. What our stakeholders tell us – playing back your views to test understanding.
 - c. Our activities and current performance.
 - d. Our direction of travel – sharing our thinking on how we can respond to your priorities.
 - e. What it could cost – indicative spending ranges and cost drivers.
 - f. Initial planning assumptions.
 - g. We welcome your views – consultation questions where we seek your feedback.



Chapter 1

Executive summary

Shaping the gas transmission system of the future

Gas
Transmission

nationalgrid

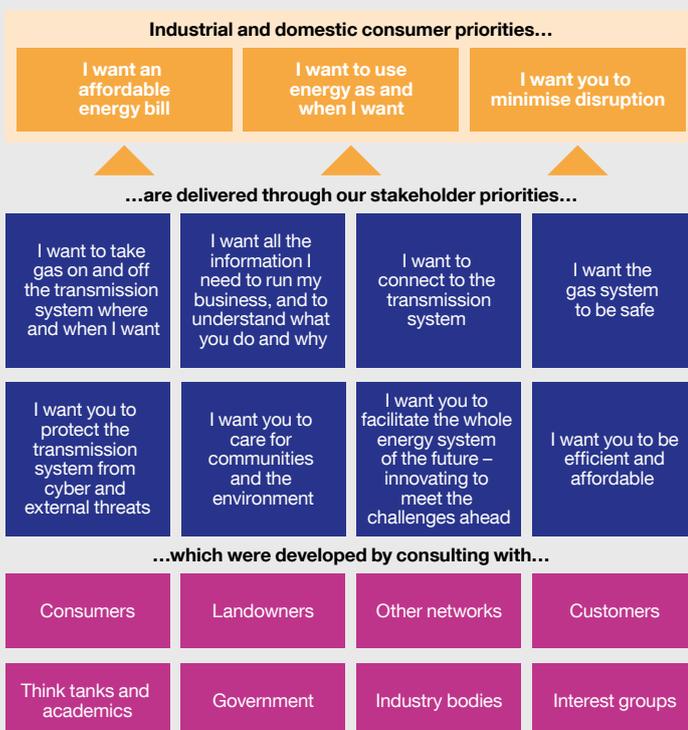
1. Executive summary

We are carrying out a programme of coordinated, structured and inclusive engagement to listen to what our stakeholders want in RIIO-2, and to build our plans with them. At all levels in our business, we are committed to working closely with our stakeholders to deliver a truly stakeholder-led plan.

Playing back your priorities for us

Through listening to our stakeholders we have identified three consumer priorities, which we will deliver through focusing on eight stakeholder priorities for our business plan. We are building our business plan, and have structured this consultation, around these eight priorities.

Figure 1.1: Gas transmission consumer and stakeholder priorities



How we are responding to your priorities

I want the gas system to be safe

You tell us consistently that safety is a top priority and you are aware of the risks and the crucial role of the gas transmission system. Without it, much of industry would be without energy and the public would be without heating.

For RIIO-2, we aim to be recognised as a high performer in process safety. We will do this by demonstrating industry leading risk controls, performance and safety culture in the way we manage all our major accident hazards.

I want to take gas on and off the transmission system where and when I want

You are clear how important gas transmission is in the energy mix. You also support a continued role for gas while ensuring the network is efficient and delivers the right capabilities for current and future stakeholders.

For RIIO-2, we will work with you to define the network capability you want and need. We will shape our business plan to deliver this efficiently. This will mean integrating commercial and asset solutions that balance the network implications across cost, reliability and environmental performance.

I want to connect to the transmission system

You tell us it should be quicker, simpler and less costly to connect to our network.

For RIIO-2, we will build on the connection enhancements we have put in place during RIIO-1. Our focus is on responding better to customer needs, improving the overall connections experience and making our network easier to access for new entrants, particularly smaller “green gas” projects.

I want all the information I need to run my business, and to understand what you do and why

You say that you value the information we provide. The data we supply is crucial in managing your commercial processes. Your information needs are changing and you want different forms of information, as well as continued improvements in data quality and access.

We are establishing a community approach. This will allow us to work together with stakeholders to prioritise what information we publish, where and how. In RIIO-2, we will strive to meet the growing needs of our stakeholders at minimal cost.

I want you to care for communities and the environment

You tell us we should consider all types of emissions. Our biggest environmental impact is the emissions from using gas-powered compressors to move gas around the system.

For RIIO-2, we expect to undertake work to ensure our compressor fleet meets tightening air quality legislation. We will also explore with you other initiatives we could focus on. These might include reducing the carbon intensity of our construction activities or cutting our methane emissions. We could also focus on removing redundant assets and using non-operational land to support local communities.

I want you to facilitate the whole energy system of the future – innovating to meet the challenges ahead

Feedback tells us that you support the principle of a whole energy system approach. There are different views as to what this really means. You recognise that gas transmission will play an important role in the energy transition, but it is for us to work with you to clarify that role.

We will work collaboratively with other sectors, for RIIO-2, to identify the right ways of working and arrangements to support whole energy system thinking. This will help us to pinpoint where we can improve consumer outcomes by taking a whole system approach.

I want you to protect the transmission system from cyber and external threats

We understand that you want us to be resilient to external threats, such as cyber-attacks and physical attacks. They can threaten our systems and our service to consumers. You want us to be able to deal with such threats and incidents effectively.

For RIIO-2, we will invest to ensure we have the right levels of resilience to external threats as agreed by the Government.

I want you to be efficient and affordable

You want your energy to be affordable. We will ensure we play our part in this by creating our business plan using the appropriate techniques. For example, we will explore consumers' willingness to pay for alternative service levels. We will test the acceptability of the plan, undertake benchmarking, and use cost benefit analysis to underpin our spending decisions.

Indicative cost ranges

We are providing an early indication of total expenditure (totex) in the RIIO-2 period. The indicative range for our average annual totex during RIIO-2 is between £0.56bn and £0.72bn a year. This compares with an estimated annual average of £0.40bn during RIIO-1.

The biggest factors driving the increase and the range are:

- 1. Gas on and off the system:** To avoid disruption we must maintain our assets to ensure they are operational and reliable. We have an ageing asset base. This means increased work will be needed to maintain the same level of service that customers have seen in RIIO-1. The range is driven by potential differences in how much activity we need to undertake.
- 2. Communities and environment:** The trend is for increased spending to reduce the level of harmful emissions from our compressors that move gas around the system. We are also obliged to meet emissions compliance deadlines. The range is driven by different possible compliance strategies and timing of work during RIIO-2 and out to 2030.
- 3. External threats:** We need to do more work to combat the increasing level and sophistication of external threats. Cyber security is particularly important.

Against each section of our playback we have outlined indicative cost ranges so that we can be transparent with you about our current position.

These numbers do not yet represent our business plan. Feedback from this process will be used to inform our draft business plan scheduled for July.

Figure 1.2: Indicative cost ranges by stakeholder priority. £m per annum

£250m to £350m		£120m to £145m	£90m (minimum)
Gas on and off the system (RIIO-1: £212m)		Communities and environment (RIIO-1: £44m)	External threats (RIIO-1: £34m)
£20m to £30m	£14m to £16m	£6m to £10m	£1m*
Whole energy system (RIIO-1: £21m)	Safety (RIIO-1: £14m)	Information provision (RIIO-1: £6m)	Connect to the system (RIIO-1: £1m)
£60m to £75m (business support) underpinned by an efficient and affordable plan (RIIO-1: £68m)			

2017/18 price base

*Approximate values

Key assumptions underlying the ranges include:

- Starting point for analysis is that the GT Network stays largely as it is – this will be subject to stakeholder engagement on network capability.
- Figures do not include any allowance for general inflation or future changes in specific commodity prices like the cost of steel (real price effects).
- Organisational and other efficiencies already delivered in RIIO-1 have been embedded into the RIIO-2 ranges.
- Our range is based on our current level of efficiency – as we develop the detail of our plan we expect to share how we plan to deliver future efficiencies.
- The totex ranges only relate to the sum of our controllable operating expenditure (opex) and capital expenditure (capex). There are some elements of our funding (and therefore consumer bills) that we do not control and where the costs are passed straight through to consumers (such as rates and licence fees).

Consumer bills

As we develop our business plan, we will look carefully at the potential impact of our plans on current and future bills. We calculate our consumer bill impact using Ofgem’s consumer bill methodology. This splits costs into segments including wholesale, environmental and network charges.

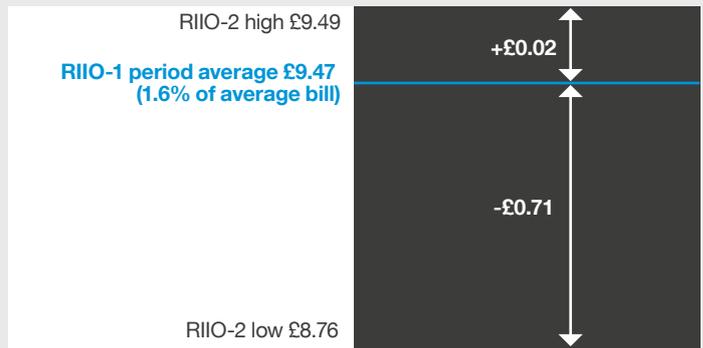
Around half of our total revenue comes from the charges paid by our direct customers. This is either for specific services or when they put gas onto the transmission system. This is considered part of wholesale market prices.

The remaining half of our total revenue is recovered as network charges when gas is taken off the system. This element is currently around £9 per year for the average domestic dual fuel bill.

Other things being equal, a plus or minus £100m per year variance in RIIO-2 totex could affect the gas transmission part of a typical domestic consumer bill by plus or minus 40 pence.

The impact of our provisional RIIO-2 totex range on consumer bills would be between a reduction of 71 pence and an increase of 2 pence on the average household gas bill. This is based upon a like-for-like comparison with RIIO-1 e.g. excluding output incentive revenue and not considering changes in finance parameters.

Figure 1.3: Indicative consumer bill impact



In this illustration we have not considered other factors that can affect consumer bills such as cost of capital for RIIO-2 and future inflation.



Next steps

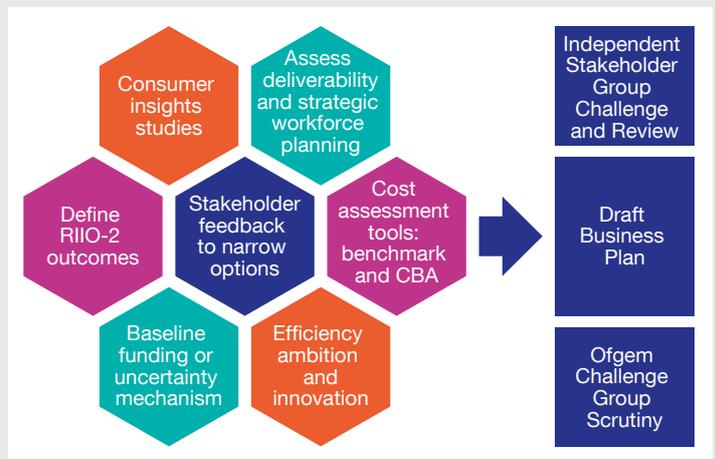
Alongside this consultation we will continue to explore the individual topics that are important to you. We have prioritised the following areas to engage further with stakeholders. This will enable us to firm up costs and options for the highest spend areas of our business plan:

- **Network capability:** We will develop a definition of network capability. It will cover the range of outputs our stakeholders want and need, for example the level of access to the network. The capability needed will then help us formulate our business plan. Taking this approach will ensure we only incur costs where they are required to meet stakeholder needs, or to keep the desired options open for future generations.
- **Asset health**
 - i. Network-wide: We will continue to consult stakeholders on the costs to achieve different levels of service as we weigh up different strategies to mitigate the reliability risks from ageing assets. We will also seek consumer insights on our asset health plans.
 - ii. Bacton site: Around a third of the country’s gas needs flow through our Bacton facility on the north Norfolk coast. This facility has been running for over 50 years. We will consult stakeholders on alternative strategies to manage and replace ageing infrastructure.
- **Environment:** We will consult stakeholders on the pros and cons of different ways to curb harmful emissions from our compressor fleet. This engagement will be linked to our network capability assessment particularly in the south east of England. Here we have three compressor sites affected by tightening emissions legislation.
- **External threats:** We will continue to engage with Ofgem and the Government on our detailed response to mitigate these threats. This will include our cyber security responsibilities under the new Network and Information Systems Regulations.

We plan a range of activities to listen to the views of end consumers. We will conduct ‘willingness to pay’ studies, so that we understand the value consumers place on certain outcomes.

Exploring all the options with stakeholders will allow us to narrow down the scope, and hence cost range, of our business plan. A tighter scope means we can better assess how deliverable the plan is, for example in terms of system access requirements. It will also enable us to undertake strategic workforce planning.

Figure 1.4: Firming up draft business plan – illustrative process



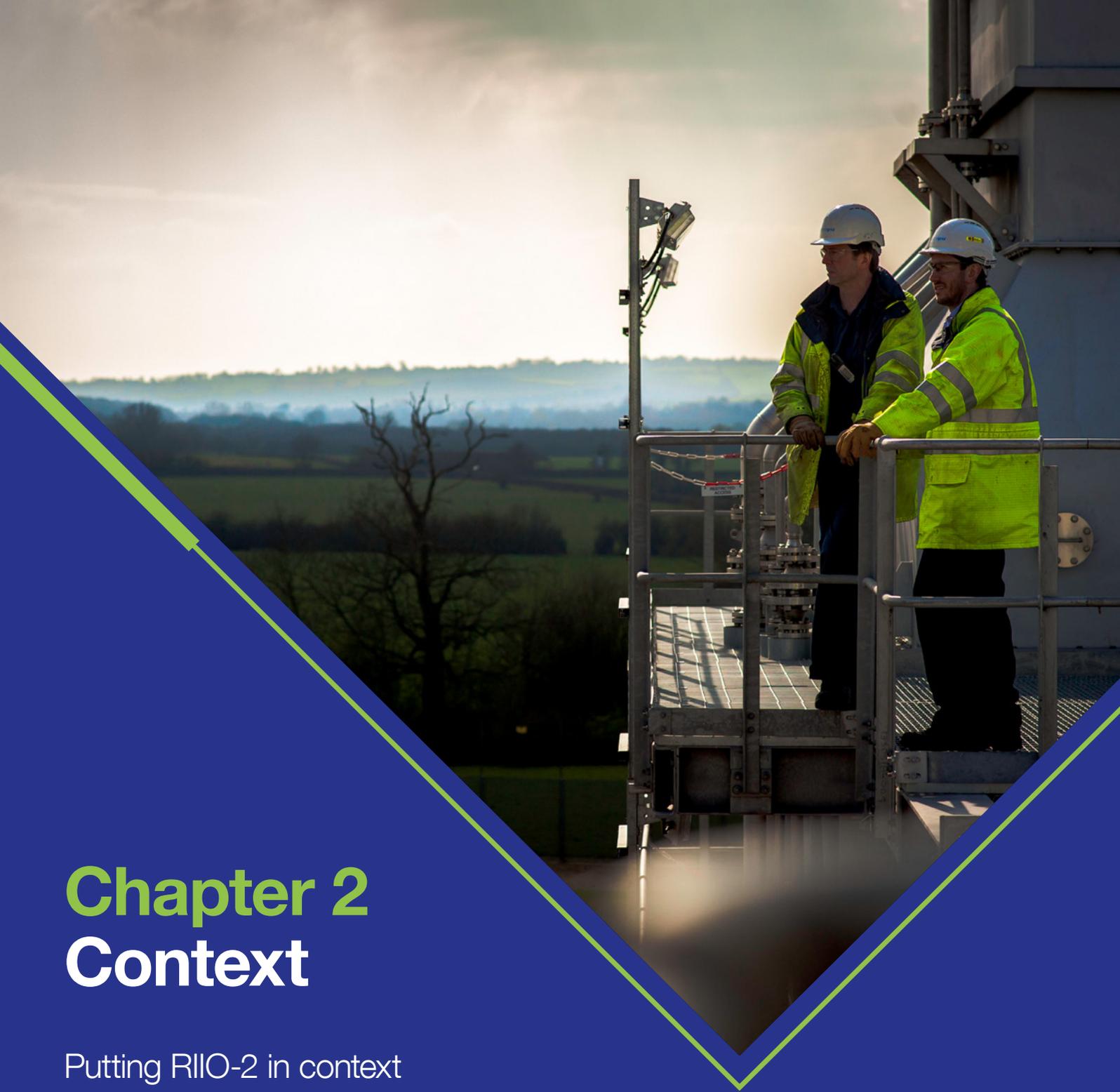
Summary of consultation questions

In this consultation we pose specific questions for each chapter. Here is a summary of all the questions we would like you to consider.

How you can respond:

Our consultation is aimed at all users of our network, government, regulatory bodies and energy industry professionals. However, we welcome responses from anyone who is interested in the future of gas transmission. Please send your responses to jennifer.pemberton@nationalgrid.com by 31 March 2019.

Question	Chapter
1. Do you agree with our priority areas for further stakeholder engagement to firm up key aspects of our plan? The areas are (i) Network capability (ii) Asset health – Network-wide and Bacton site (iii) Environment, (iv) External threats.	Executive summary
2. Where have we reflected your wants and needs for RIIO-2 well? Are any of your priorities for RIIO-2 not yet reflected here?	General
3. Do you have any views on our style of presentation of business plan information (via the eight key stakeholder priorities)?	General
4. Have we provided you with enough information on our business to allow you to understand why and how we are responding to your priorities?	General
5. What are your views on our direction of travel for RIIO-2?	General
6. What are your views on our initial planning assumptions for RIIO-2?	General
7. Do you agree with our summary of what is important context for our business planning? Are we missing anything from this summary?	Context
8. How would you like us to engage going forward as we build our business plan for the RIIO-2 period?	Stakeholder engagement
9. What are your views on our direction of travel for safety?	Safety
10. An increased work programme to maintain the health of, and deliver the right capability from, the transmission network may be beneficial to keeping overall gas costs down for consumers. What are your views on this statement?	Gas on and off
11. What views do you have on how we could further improve our connections service?	Connecting
12. What information could we provide that would increase benefits for our customers and consumers?	Information provision
13. We must take action to curb our harmful environmental emissions in line with legal deadlines. To what extent should we be more proactive in reducing our overall impact on the environment? For example, reducing methane emissions or going beyond minimum legislative requirements.	Communities and environment
14. Where can National Grid Gas Transmission add most value through the RIIO-2 period to facilitate integrated energy systems of the future?	Whole system
15. The detail of our cyber and physical security plans will be developed confidentially with Ofgem and the Government. How would you like to be kept updated?	External threats
16. What are your views on the methods we have proposed to demonstrate efficiency and value for money in our plan?	Efficient and affordable



Chapter 2

Context

Putting RIIO-2 in context

Gas
Transmission

nationalgrid

2. Context

Putting RIIO-2 in context

Our customers' requirements are changing. We are seeing different patterns of gas supply and demand on the network meaning that we face new challenges in operating the system.

This comes at a time when our ageing assets also need greater care and replacement to maintain a safe, reliable and flexible transmission system.

Here we explain the external views on the future role of gas and the gas transmission system to meet the challenges of tomorrow.

What we do today

We own and operate the high-pressure gas transmission system in Great Britain. It comprises 7,660 km of pipelines, 24 compressor stations and 504 above ground installations. Our system is connected to eight regional Gas Distribution Networks. We deliver industry leading safety performance with a 99.996% network reliability achieved in 2017/18.

The importance of gas to Great Britain

Gas is used to heat the nation's homes, power our industry and generate the electricity we all use every day:

- Eight out of 10 GB homes use gas for heating.
- A domestic unit of gas energy costs about a quarter of the price of a unit of electrical energy. This shows the important role of gas in meeting the needs of vulnerable consumers and addressing fuel poverty.
- Each year, the 40-year-old gas networks deliver three times the amount of energy as electricity networks. In 2017, we delivered 810 TWh of gas demand to our customers.
- Gas is also critical for industry. It is used for industrial heat and as an important fuel source for manufacturing.
- Gas helps to maintain secure electricity supplies. It is a responsive, flexible fuel source for electricity generation and balances the variable output from renewable energy like solar and wind.

810 TWh

In 2017 we delivered 810 TWh of gas demand to our customers.

Figure 2.1 Sources of gas into Great Britain

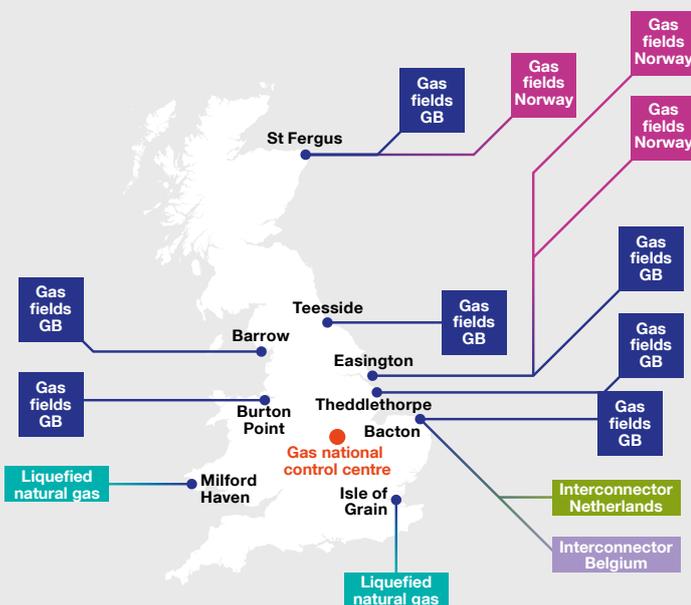
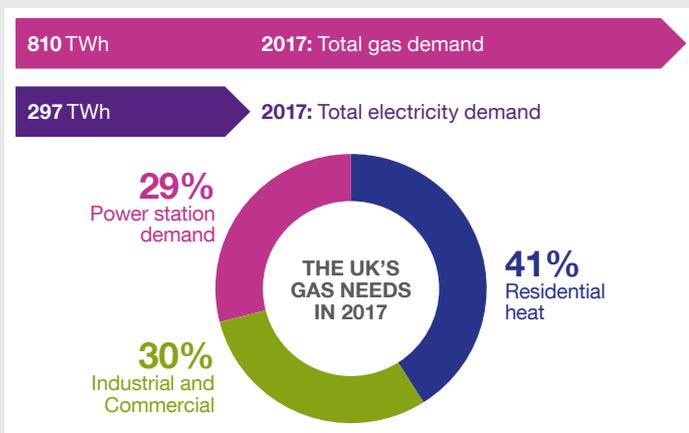


Figure 2.2 Comparison of electricity and gas demand and the breakdown of gas usage

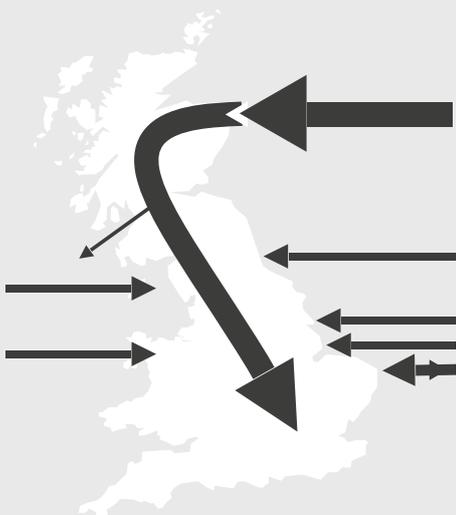


So, what's changing? The network was originally designed for a predominantly north to south flow of gas. This gas came from the UK Continental Shelf (UKCS).

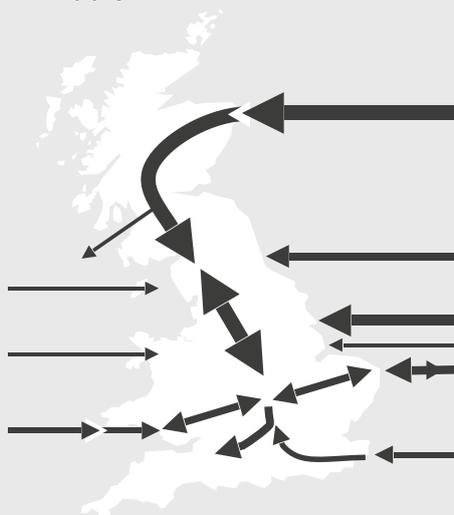
Today, gas is a global commodity. This means a more diverse supply pattern, which can change from day to day. Sources include Norwegian gas fields, pipeline interconnection to continental Europe and imports of liquefied natural gas (LNG) from different continents. Looking ahead to RIIO-2, we will need to manage an even greater range of supply patterns to keep supplies secure and make sure GB consumers can access the cheapest sources of gas.

Figure 2.3: Changing sources of gas supply

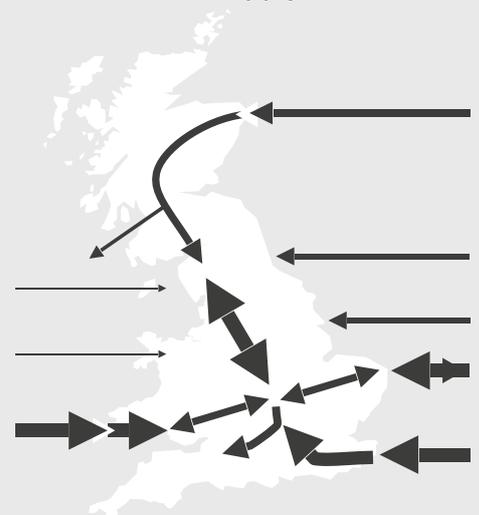
Gas flow – typical day in 2000
Predominantly north to south



Gas flow – typical day in 2018
Increasing diversity of supply



Gas flow – plausible scenario 2040
Higher LNG and interconnector supply



UKCS Green gas Norway Interconnectors LNG

“We will need to manage an even greater range of supply patterns to keep supplies secure.”

Operating the network is more challenging than ever. We don't control where our customers choose to bring gas onto our system. Even for our customers, it is becoming increasingly difficult for them to anticipate how their future requirements may change.

This evolution means that we are working our assets harder to keep pace with changes in gas flow and demand. For example, we use compressors to move gas around the network. We also ensure that supply and demand are balanced, and we maintain safe operating pressures.

Our customers tell us they value the ability to flow gas using within day profiles. We try to balance what our customers need with our own safety, operational, maintenance and commercial obligations.

We provide flexibility to flow gas at the most efficient profile for our customers. This allows them to keep operating costs down and benefit consumers.

What our stakeholders tell us

During our engagement we have gathered a range of views on the future of gas and the transmission network. We've engaged with stakeholders directly and drawn on external publications.

The future of energy remains uncertain, with a range of different views. We believe, and there is a broad agreement that, gas transmission will have an important role to play for many decades to come. Here we summarise the key findings from published independent reports.

Figure 2.5: The role of the GT Network in meeting carbon targets

Stakeholder	Key message for gas transmission	Example quote
KPMG for the ENA (2016), <i>2050 Energy Scenarios The UK gas networks role in a 2050 whole energy system</i>	Gas transmission is required across all scenarios for industry and power, even in electrification scenarios where the gas distribution network is decommissioned.	“There are a range of heating technologies with the potential to support our 2032 and 2050 decarbonisation commitments. Whilst we don’t yet know which approaches will work best at scale and minimise costs to UK taxpayers, consumers and businesses, we remain committed to laying the groundwork in this Parliament to prepare for decisions in the first half of the next decade about the long-term future of heat.”
UK Energy Research Centre (February 2018), <i>The Future Role of Gas¹</i>	In a scenario where carbon capture and storage (CCS) is available as a technology, natural gas can play a major role in a hydrogen economy. However, even in an electrification scenario and without CCS, gas is still required in industry and the power sector.	“In scenarios where heat is fully electrified, there may be a case for decommissioning the gas distribution networks. The gas transmission system could continue to remain useful in order to provide natural gas to power stations or industrial users (e.g. for use in combination with carbon capture and storage).” “The UK’s existing gas distribution networks are expected to be suitable for transporting hydrogen at all lower pressure tiers. However, use of hydrogen as an energy carrier at scale in the UK is likely to involve building a new transmission network, at a cost of around £0.5bn/year.”
National Infrastructure Commission (July 2018), <i>National Infrastructure Assessment²</i>	It is not yet clear which low carbon option should replace gas for heating. New gas-fired power stations may be required in the 2020s.	“The UK cannot achieve its emissions targets while relying on natural gas, a fossil fuel, for heating. Delivering a low cost, low carbon heating system is the major outstanding challenge”. “It may also be cost-effective to deploy a limited amount of new gas power stations, provided they can be accommodated within the carbon budgets, and recognising that load factors are likely to be on a reducing path.”
Committee on Climate Change (November 2018), <i>Hydrogen in a low carbon economy³</i>	The GT Network is likely to be required in all decarbonisation scenarios, even where heat is fully electrified. Where a switch to hydrogen is made, a new parallel hydrogen transmission system is likely to be required.	“If the UK sticks with its current climate policy and carbon budgets this will constrain gas consumption, initially in the late 2020s in power generation, and then in the 2030s and beyond in buildings. But if CCS is available there is an alternative future that uses natural gas to fuel a hydrogen economy and to decarbonise gas-fired power generation to support renewable generation.”
BEIS (December 2018), <i>A future framework for heat in buildings⁴</i>	The UK will not be able to continue to rely on natural gas to 2050, but it is not yet clear which low carbon option should replace it.	“Continuing to use the gas network offers significant savings versus alternative heating sources.”

¹ <http://www.ukerc.ac.uk/publications/the-future-role-of-gas.html>

² https://www.nic.org.uk/wp-content/uploads/CCS001_CCS0618917350-001_NIC-NIA_Accessible.pdf

³ <https://www.theccc.org.uk/wp-content/uploads/2018/11/Hydrogen-in-a-low-carbon-economy.pdf>

⁴ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/762546/Future_Framework_for_Heat_in_Buildings_Govt_Response_2_.pdf

The role of gas in a decarbonised future

External publications, our Future of Gas Programmes and the Future Energy Scenarios (FES) all paint a similar picture. Gas has a role to play in meeting environmental targets. It can also support the transition to low carbon power, heat, industry and transport.

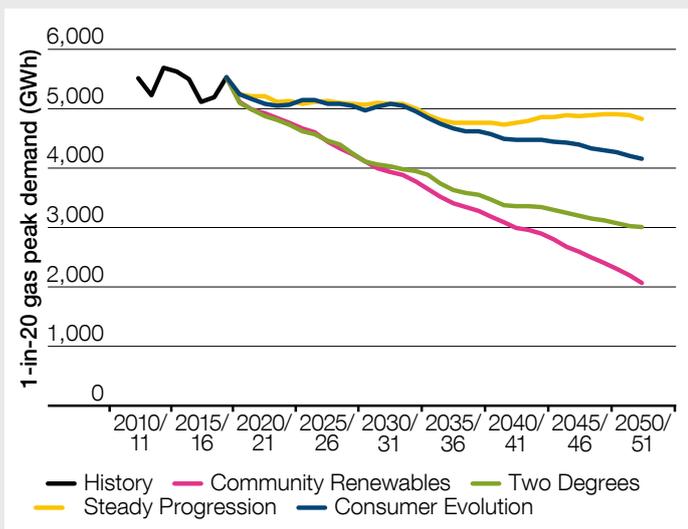
Power: Gas provides a reliable and flexible way to support intermittent renewables.

Heat: Gas can help decarbonise heat at lowest cost and disruption to consumers.

Transport: Commercial vehicles could use biogases, natural gas or hydrogen.

Industry: The NTS provides options for hydrogen and Carbon Capture Usage and Storage. Our Future Energy Scenarios show a range of credible pathways for the future of energy out to 2050:

Figure 2.6: Future Energy Scenarios for annual and peak gas demand to 2050



All the FES 2018 pathways show an enduring role for gas until at least 2045.

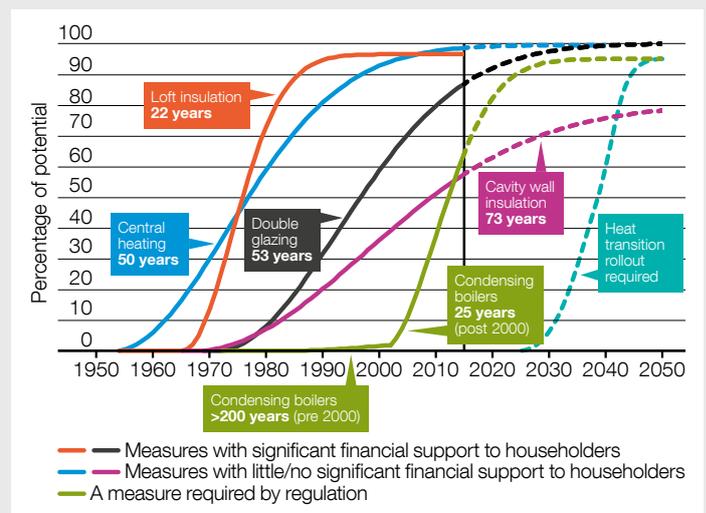
Peak demand across all scenarios remains significant. Peak demand in 2045 is about 50% to 90% of today's peak.

The size of the decarbonisation challenge to come is massive. Heat policy, for example, is not likely to be determined until the mid-2020s.

The heat challenge:

To move homes from gas to electric heating by 2050 would require the conversion of 20,000 homes a week, costing around £11,000 per household (to deploy electric-powered heat pumps). The roll-out would need to be faster than other comparable technology changes in recent decades.

Figure 2.7: Heat transition challenge compared to previous national large-scale roll-outs



With this uncertain future, it is important to keep our options open so that GB consumers achieve the best outcome.

We can keep our options open on the GT Network at a relatively low cost. The rest of our document explains more about what will be needed to achieve this.

“With this uncertain future, it is important to keep our options open so that GB consumers achieve the best outcome.”

Summary: The role of gas

- Gas will continue to play an important role.
- Under all scenarios, gas will be used until at least 2045.
- Preserving capability in the gas grid keeps options open and reduces long-term risk at minimal cost.
- We are working with stakeholders to determine the type of network they need.

Initial planning assumptions

What does all this mean as we develop our business plan? Based on what we have heard from stakeholders so far, we have distilled what we think this means for our business planning through the identification of initial business planning assumptions:

- **GT Network – future:** Most of our stakeholders tell us that there is a long-term future for gas and the GT Network to at least 2045. We share that view. However, there is uncertainty about how customers will use the system in the future. We will explore with stakeholders and consumers their views on the costs and alternative options.
- **GT Network – value to society:** The GT Network provides wider benefits to society. For example, it supports decarbonisation by flexing with gas-fired power stations to balance intermittent renewables. We consider the wider impact on society in our plans and we are supporting research in this area.
- **Keeping options open:** The network is playing an important role in facilitating decarbonisation. We should maintain a GT Network, for minimal cost, which keeps our options open because the future for decarbonisation is uncertain.

For a full list of all our initial planning assumptions please see [Appendix – Assumptions](#).



We welcome your views:

Chapter:
Context

Question:

7. Do you agree with our summary of what is important context for our business planning? Are we missing anything from this summary?

Submit your feedback online [here](#):

¹ <http://www.ukerc.ac.uk/publications/the-future-role-of-gas.html>

3. Stakeholder engagement

The importance of stakeholder engagement

We work with a wide variety of stakeholders, including:

Customers who pay us for the products and services we provide.

Consumers, including domestic households, businesses and industrial users.

Other parties with a stake in the future of gas transmission like government and non-government organisations, regulators, consumer groups, consultancies and academics.

We have been listening carefully to what all these different groups are telling us. We've set up a wide-ranging engagement process to find out more about what our stakeholders want in RIIO-2, and to build our plan with them. At every level of our business, we are committed to working closely with stakeholders to deliver a plan that is led by them.

We're using a best practice approach, which is based on the AA1000 Stakeholder Engagement Standard. We're also learning about the experience of other sectors such as the aviation and water industries as well as engaging with Ofgem, Citizens Advice and PwC. This is helping to understand what works and what doesn't work in developing a stakeholder-led plan.

Alongside National Grid Electricity Transmission (NGET), we were the first network to create our independent chaired Stakeholder Group for RIIO-2. This Stakeholder Group challenges who we engage with and how we engage with our stakeholders as well as the content of our business plan. The Stakeholder Group will also report to Ofgem with its views on the business plan.

We have already acted on expert feedback from the Stakeholder Group. Among other issues, the group is challenging us to improve how we plan our engagement and how we map and target our stakeholders. This is to ensure we reflect all relevant voices in our business plan proposals. Critically, this includes making sure that we fully reflect the needs of consumers in everything we do.

The three phases of turning stakeholder insight into a RIIO-2 business plan

We have split our engagement into three overlapping phases that build on each other. These are:

1. Establish the priorities of stakeholders and consumers;
2. Build plans with stakeholders, our customers and consumers by priority; and
3. Bring together a holistic business plan with stakeholders, our customers and consumers.

You can see more detail in the diagram and descriptions below.

Figure 3.1: Three phases of turning stakeholder insights into our business plan



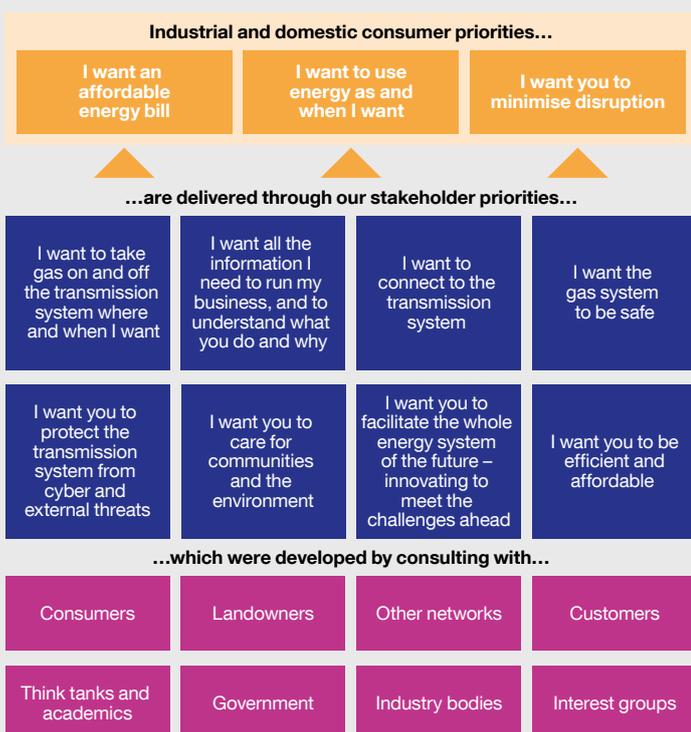
1. Establish the priorities of stakeholders and consumers

We listen to your feedback using a variety of channels. These include ongoing conversations during our day-to-day interactions, specific meetings, workshops, webinars and online consultations. Over time, this has allowed us to build up a picture of your priorities.

We have encapsulated this feedback into three consumer priority statements. We will deliver on these via eight stakeholder priorities. During 2018 we checked with stakeholders that we had reflected their priorities accurately and did some further work to refine them. Find out more in our [Listen Report](#).

This consultation is structured around the eight stakeholder priorities. This will ensure we focus on the areas of our business plan that are most relevant to you and make sure they deliver the necessary outcomes for consumers.

Figure 3.2: Gas transmission consumer and stakeholder priorities



2. Build plans with stakeholders, our customers and consumers by priority

During this stage, we work with stakeholders to develop alternatives and identify preferred solutions to be included in our business plan.

We're using insights from different sources. These include primary channels where we speak directly to our stakeholders through targeted RIIO-2 activities or via our everyday business engagement. We are also including secondary sources or 'desk research'. This ensures we benefit from insights that have already been published elsewhere.

Our independent Stakeholder Group performs an important role. It challenges us on how to make our stakeholder engagement as effective as possible.

We are also working with a specialist third-party organisation to check that we're talking to the right stakeholders, in the right way, about the right topics. We want to make sure that we're accurately reflecting what you tell us in our business plan.

3. Bring together a holistic business plan with stakeholders, our customers and consumers

We are just starting this phase and this document is an important step in our journey. Once we have worked with stakeholders to fully develop our proposals, we will submit a draft business plan to our Stakeholder Group. Then in July 2019 and October 2019, we will submit draft business plans to Ofgem's Challenge Group. We will publish our draft business plan so that we can gather stakeholders' views on our proposals before we submit our final RIIO-2 plan to Ofgem in December 2019.

“Our independent Stakeholder Group performs an important role. It challenges us on how to make our stakeholder engagement as effective as possible.”

“At every level of our business, we are committed to working closely with stakeholders.”

Our independent Stakeholder Group

Since July 2018 our independent Stakeholder Group has met regularly. The group is chaired by Trisha McAuley OBE. It includes people from consumer, environmental and public interest groups, as well as large energy users, large-scale and small-scale customers and distribution networks.

See [here](#) for more about the members of the group and its terms of reference.

The group has three main roles:

- Challenging and reviewing how we engage with stakeholders to develop our business plan.
- Scrutinising our business plan and checking that our proposals reflect what our stakeholders have told us.
- Reporting to Ofgem with its views on our business plan.

Following the group’s feedback so far, we remain committed to engaging more extensively with stakeholders.

We’re talking directly with domestic and business consumers

Domestic, industrial and commercial business consumers’ views are important to us, particularly those of bill payers. We know that our plan must deliver the energy system that will meet their needs today and in the future. So, we’re talking directly to households and businesses about what they want and what they are willing to pay for our services.

We are engaging in several ways to make sure consumers’ voices are heard. By doing this we can directly reflect consumers’ needs in the alternatives developed.

Once we’ve spelt out what this engagement has told us, we will finish our consumer programme for RIIO-2 with acceptability testing. This is a way of testing the proposed business plan with consumers to understand if the outputs and costs are acceptable to them.

So far, we have surveyed more than 2,000 household bill payers across the country to understand their priorities. We’ve also spoken to business consumers at workshops to hear first-hand what they expect from us.

We have carried out a second attitude survey to assess our reputation among stakeholders. This includes consumers, MPs and, for the first time, small and medium-sized enterprise business consumers. This survey will finish in early 2019.

“We will publish our draft business plan so that we can gather stakeholders’ views on our proposals before we submit our final RIIO-2 plan to Ofgem in December 2019.”

We also need to understand what consumers do (or don't) want from their energy system and how much they are willing to pay for it. To do this we will carry out independent 'willingness to pay' research.

2,000+

So far, we have surveyed more than 2,000 household bill payers across the country to understand their priorities.

Starting with focus groups to identify consumer topic areas, the quantitative research will involve 1,000 domestic consumers and 600 business consumers. We will also create an interactive tool that allows consumers to adjust parts of our business plan and see the impact on their bill.

This approach is designed to educate an audience of consumers who may be unfamiliar with National Grid. We want to include consumers identified as 'vulnerable' in terms of practical needs or budget.

We've learnt from others to make sure we're doing this in the right way. And we're using other types of research and engagement to make sure we have a full picture of what consumers value. This includes people who may be harder to reach or who may be classed as vulnerable.

Overall, this detailed level of consumer engagement goes beyond what we've ever done before.

“We also need to understand what consumers do (or don't) want from their energy system and how much they are willing to pay for it.”

We want to be as inclusive and open as possible

To reflect stakeholders' needs in our business plan, we need to make sure a broad range of views are represented.

So, to tailor our engagement for each part of our business plan, we've mapped our stakeholders based on their interest in the topic and the impact our work has on them in that area. During our engagements, we ask stakeholders to gauge their own level of interest and impact in a topic to further validate our approach.

Finally, we evolve our engagement to make it as effective as possible, based on three factors:

- How stakeholders tell us they want to be engaged.
- What we're talking to them about.
- The type of insight we're seeking.

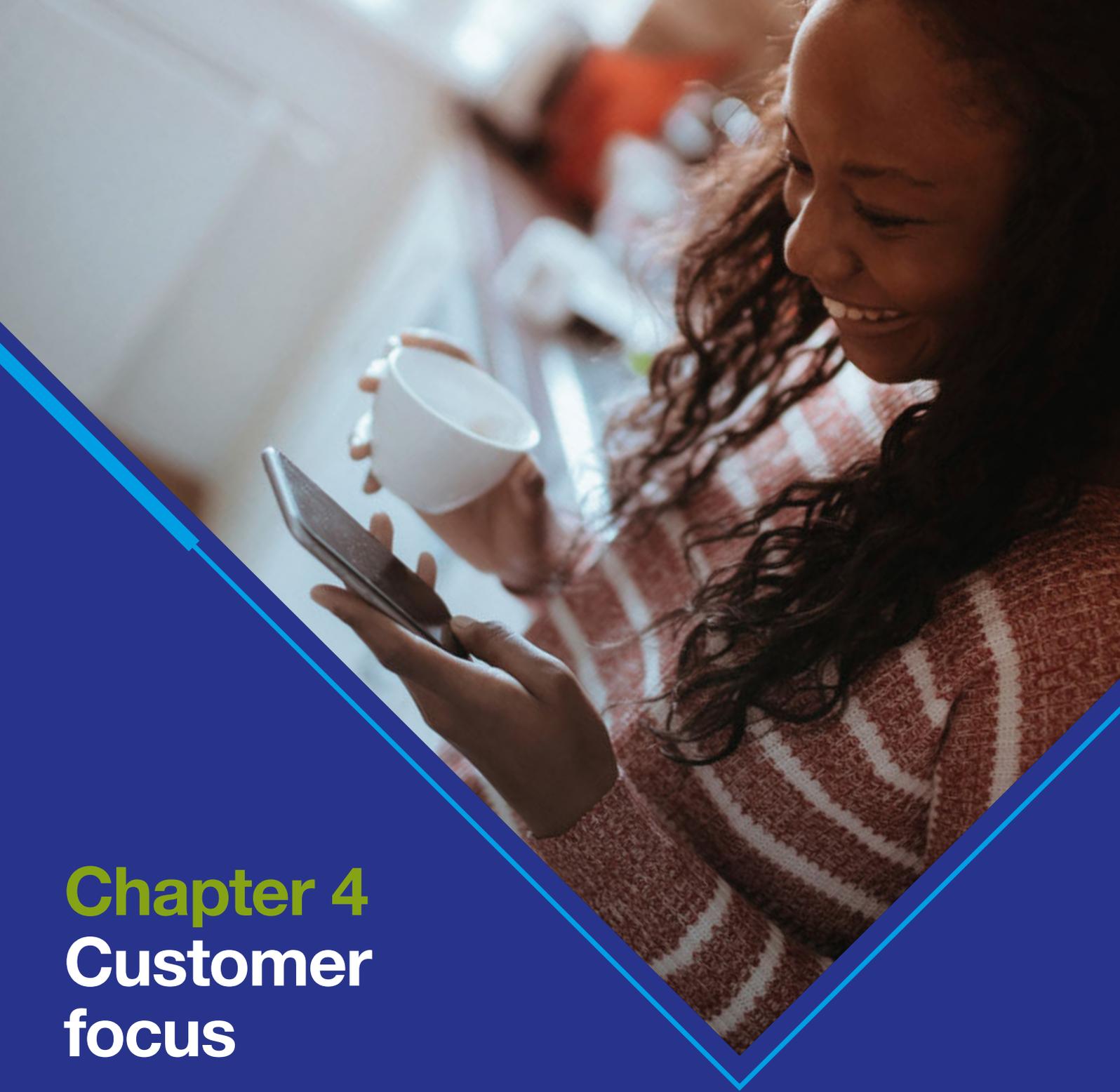


We welcome your views:

Chapter:
Stakeholder engagement

Question:
8. How would you like us to engage going forward as we build our business plan for the RIIO-2 period?

Submit your feedback online [here](#):



Chapter 4

Customer focus

Exceeding the expectations
of our customers

Gas
Transmission

nationalgrid

4. Customer focus

Summary

Our strategy is to become an even more customer-focused business. We reflect this in our vision of ‘exceeding the expectations of our customers’.

The largest customers for our gas transmission business are the gas distribution networks, shippers and connected customers. They pay us for the products and services we provide.

This chapter explains how we are listening and responding to customers in our day-to-day operations.

We are making changes to our RIIO-2 enhanced stakeholder engagement process to reflect the commitment we made during RIIO-1. We will continue and enhance this for RIIO-2.

We recognise that we need to put customers at the heart of our thinking for several reasons:

- Our customers are changing, becoming more diverse and expecting more.
- Our customers increasingly have a choice about how they use our services.
- Customers’ success will financially secure our long-term future.
- Through our customers, a linkage is formed between our gas transmission services and the needs of gas consumers. This is important for the functioning of the competitive gas market because we have no direct relationship with domestic consumers.

“We recognise that we need to put customers at the heart of our thinking.”

Our customer principles

We use a set of principles to help us become the trusted energy partner for our customers:

Figure 4.1: National Grid’s customer principles



We are doing the right thing by finding a better way through listening to what our customers need...

How we’re performing on customer focus

We interact with our customers in many ways. For example, our control room has daily contact with the parties taking gas on and off our system.

We hold regular Operational Forum meetings to discuss the issues affecting how the system operates and performs. We manage connection and change requests to the Unified Network Code. We also engage bilaterally with customers at different levels in the business.

We're working hard to improve the way we work with customers and we've put in place several initiatives to improve our customer engagement and customer service. These include:

- **Customer journey.** We have listened to connection customers. The goal is to understand their pain points and to gather views on the service we provide. In response, we have changed the way we work to improve customer experience at whatever stage they are at in their journey. We aim to provide a point of contact from initial enquiry through to being connected and to respond more quickly to queries.
- **Net Promoter Score** is an index ranging from -100 to 100 that measures the willingness of customers to recommend a company's products or services to others. We use this tool to understand how we can be more responsive to customer needs.
- We have **modernised our website** to make it more accessible and user-friendly. This includes a new online gas customers' connection portal.
- We've put in place and refined how we use **customer satisfaction** surveys. These surveys help us to understand how our customers rate the service they get from us. We have refined the process so that we target the surveys following key interactions with our customers. This will allow us to reflect and act on feedback in a timely way.

We've learned from the feedback and our customer service is getting better. This is reflected in our customer satisfaction rating which has increased from 7.2 at the start of RIIO-1 to 7.8 currently, in 2018/19. Our stakeholder satisfaction survey score has also gone up from 7.8 at the start of RIIO-1 to 8.0 currently, in 2018/19. But we're not complacent. We know that we can still do more to improve our customer focus.

"We hold regular Operational Forum meetings to discuss the issues affecting how the system operates and performs."

7.8

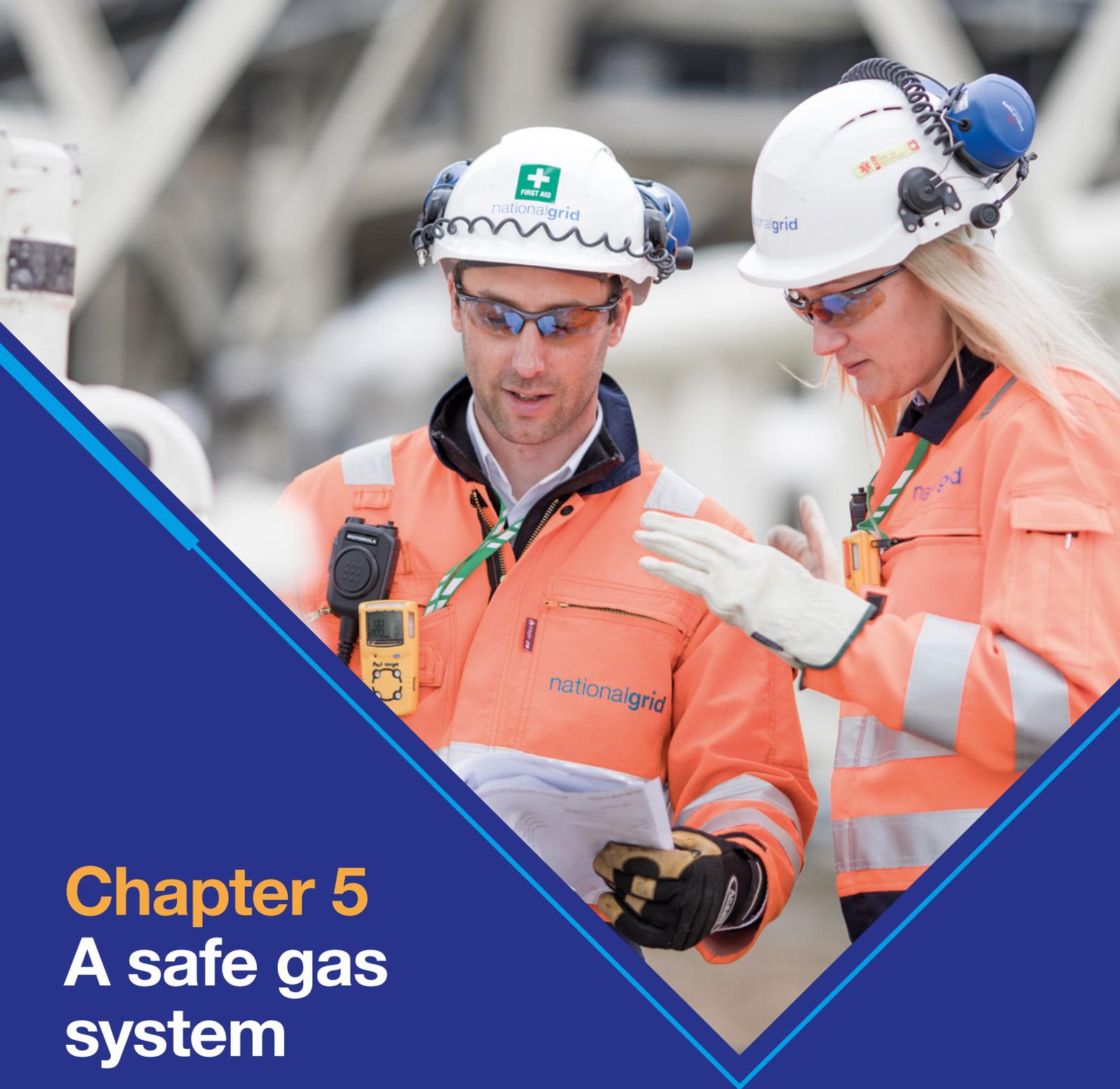
Our customer satisfaction rating has increased from 7.2 to 7.8.

8.0

Our stakeholder satisfaction score is now 8.0, up from 7.8.

Where we're heading

We have made a long-term commitment to customer focus in our business. During RIIO-1 this has seen us progress towards our goal of being a customer-centric organisation. We will continue to build on this in RIIO-2. We will deliver on our customer principles and ensure that we focus on the customer in everything we do.



Chapter 5

A safe gas system

I want the gas system to be safe

Gas
Transmission

nationalgrid

5. I want the gas system to be safe

Summary

We understand the vital importance of safety. Any major release of gas from the high-pressure gas transmission system could pose a threat to life. Consumers who use the gas that we transport, and society as a whole, expect us to maintain the highest safety standards.

Stakeholders tell us that they expect us to be safe in everything we do. We are proud of our safety track record, which is among the best in the industry.

Safety legislation for our business is based on ‘goal setting’. This means we must manage risks down to a level As Low As Reasonably Practical (ALARP). We cannot stand still. The safety standards expected of us are continually increasing as new technologies come on line, best practice evolves and new materials are fielded.

What our stakeholders tell us

Our stakeholders consistently say that safety is a priority. We understand this is because they are aware of the risks of our operations and they appreciate the crucial role of the gas transmission system. Without it, much of industry would be without energy and the public would be without heating.

At our “Shaping the Future” engagement events in autumn 2017 we asked stakeholders what was important to them about safety. Feedback included:

“Safety first. Ageing assets have known issues. We should provide assurance we will continue to be safe in future, not just now.”

“A major accident has the potential for injury to be caused... Domestic customers should not face any supply security risk.”

“Safety delivers now but increasing attention needed as assets age.”

The Health and Safety Executive (HSE) is the independent regulator that holds us to account for our safety performance. It has enforcement powers backed up by criminal law. HSE has defined its outcomes and priorities for our industry through its Gas and Pipelines [sector plan](#). Its focus for us includes:

- prevention of major incidents associated with the loss of containment of gas.
- management of the risks associated with ageing infrastructure and the failure of asset integrity.

We recognise that good safety makes good business sense. Incidents and accidents have no upside. There are human costs such as physical harm and emotional distress. There are financial costs in terms of healthcare, lost productivity and fines, as well as reputational harm. HSE estimates that workplace injury and illness costs Great Britain £14.9bn¹ per year.

“We recognise that good safety makes good business sense.”

Our activities and current performance

The safety challenge for gas transmission is different to that for electricity. In simple terms an electricity system can be made safe quickly by switching it off. On the other hand, a failed gas system stays hazardous until set procedures have been followed, or physics takes its course, to dissipate the stored energy inside the pipes. Parts of the gas transmission system pose a major accident hazard. These inherent hazards mean that prevention is vitally important.

¹ Source: <http://www.hse.gov.uk/statistics/cost.htm>

Major accident hazards – oil industry case study <https://bcove.video/2BbNA1E>

Some of our gas transmission sites, in common with other high risk sectors like the oil industry, are covered by the Control of Major Accident Hazard (COMAH) Regulations. On 11 December 2005, a series of explosions and fire occurred at an oil storage terminal at Buncefield. In the aftermath of the investigation and prosecution that followed HSE stated “Society rightly demands the highest standards from these high hazard industries...”

Safety legislation for our business is based on ‘goal setting’. This means we must manage risks down to a level As Low As Reasonably Practical (ALARP). We cannot stand still. The safety standards expected of us are continually increasing as new technologies come on line, best practice evolves and new materials are fielded. Our work covers both routine and non-routine activities.

“We cannot stand still. The safety standards expected of us are continually increasing.”

Routine activities

Our routine and preventative measures to keep the gas transmission system under control and working safely are summarised in Figure 5.1 below.

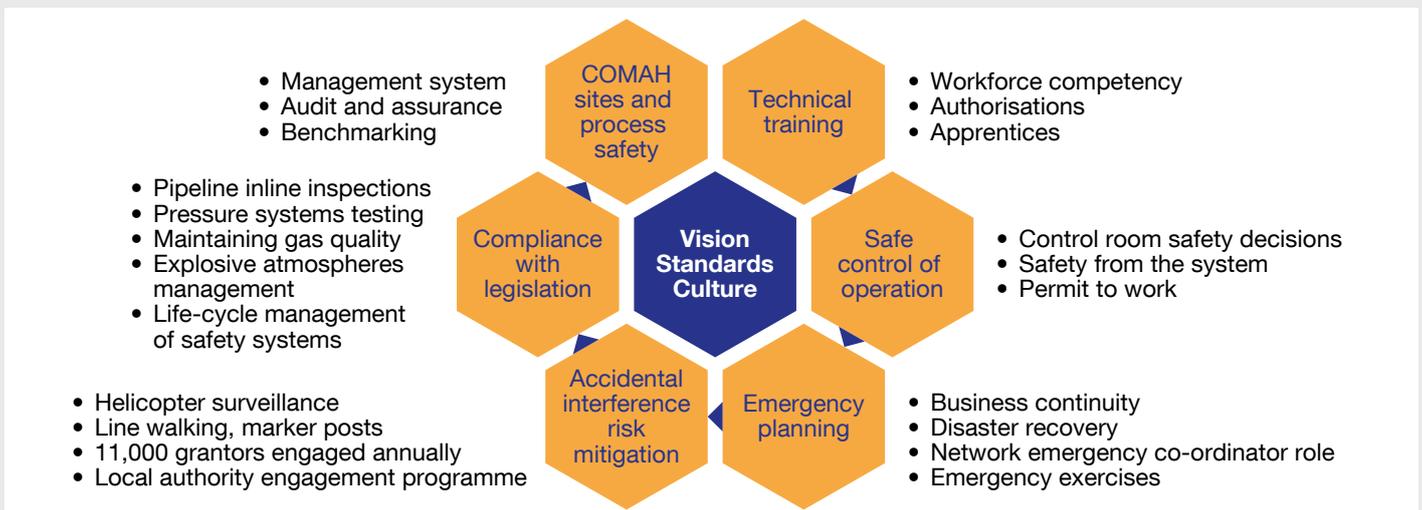
We have a moral obligation to keep everybody safe and to comply with statutory legislation. This legislation is mature. It therefore provides a high degree of assurance that we can carry out our duties safely.

Accidental damage to buried pipelines is our number 1 safety risk

Every two weeks we fly helicopters over 6,500 km along our pipeline routes looking out for potential hazards. This surveillance is part of the measures we take, day in day out, to keep the public safe.

Decades of national and international industry experience have helped to develop best practice for compliance. That means we can be confident in the routine work that lies ahead and the estimated cost to deliver it.

Figure 5.1: Summary of key routine safety activities



There is an increasing need to refurbish or replace facilities and buildings at our operational sites. This ensures our facilities meet HSE ‘welfare at work’ requirements. It involves delivering non-discriminatory working conditions for all employees and protecting assets within ageing buildings.

We also perform the independent role of Network Emergency Coordinator (NEC). We are responsible for coordinating action across the industry, to minimise the risk of a gas supply emergency.

For example, if there is a gas shortage, a controlled set of priorities would be put in place. This would enable domestic consumers to have gas for as long as possible to minimise risk to life. Our role requires us to carry out a range of emergency preparations and to lead regular cross-industry training exercises.

Non-routine activities

Safety considerations mean that we increasingly need to inspect, maintain or replace ageing assets. This work is assessed and costed as part of our asset health plan described in Chapter 6 to enable customers to flow gas on and off the system. There are typically multiple reasons for asset interventions including: safety, reliability and environmental considerations.

Standards and procedures

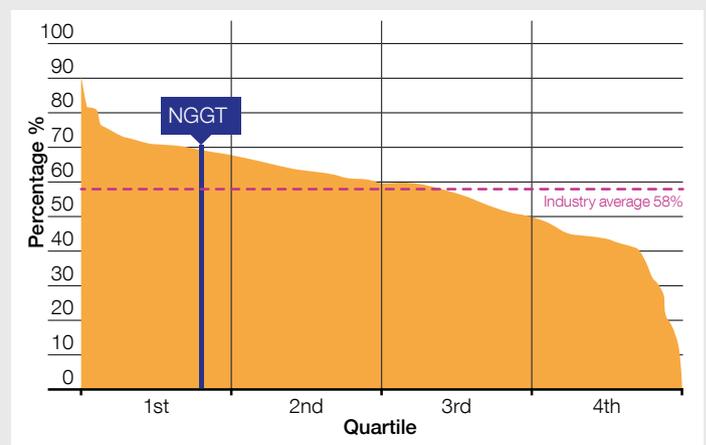
We have already simplified our Business Management Standards. They clearly communicate our commitment to occupational safety and process safety across the whole business. The standards help us to improve by defining what good looks like.

Process safety

We asked independent experts, DNVGL, to benchmark our process safety management performance using its International Sustainability Rating System. Our performance was rated in the upper quartile within a comparator group of over 200 worldwide oil and gas sites.

This objective assessment has helped us to be clear about what it means to be ‘industry leading’. It has given us a better picture of our strengths and weaknesses, and sharpened our focus on areas to improve in future.

Figure 5.2: Benchmarking National Grid gas process safety management performance, April 2018



Our direction of travel

Major accident hazards. Safety remains paramount. This is clearly in line with what our stakeholders want and expect from us:

- We will protect the public, our employees and the environment from the safety risks of our transmission system.
- We will do this through our process safety management system, attention to training and competency management, and the right safety focused culture.
- We aim to be recognised as a high performer in process safety by demonstrating industry leading risk controls, performance and safety culture in the way we manage all our major accident hazards.
- We will investigate any incidents or significant near misses in line with best practices.

Consumers want us to keep disruption to a minimum so that they can use gas as and when they need to. To support this aim we need to keep the likelihood of low-frequency, high-impact incidents low. By preventing failure events we will protect society from potential disruption and minimise damage to public health, business, transport and the natural environment.

“Safety remains paramount. This is clearly in line with what our stakeholders want and expect from us.”

Continual process improvement. We intend to continue to embed the benefits of process improvements into day-to-day work. We want to ensure we spend money in the best way to support affordability for consumers. We’re doing this in several ways. For example, we have been collecting more detailed asset condition data. We will use this, together with our enhanced asset management decision support tools, to ensure that the money we do spend is prioritised to reduce risks.

What it could cost

We do not expect much change in our underlying rate of operating expenditure on routine and preventative safety compliance between RIIO-1 and RIIO-2. This is based on assumptions of compliance with the same mature legislation, good practice for compliance remaining in place, a similar workload, and stable outsourced costs with appropriate asset health funding.

The largest elements of cost associated with the safety priority are operating expenditure for:

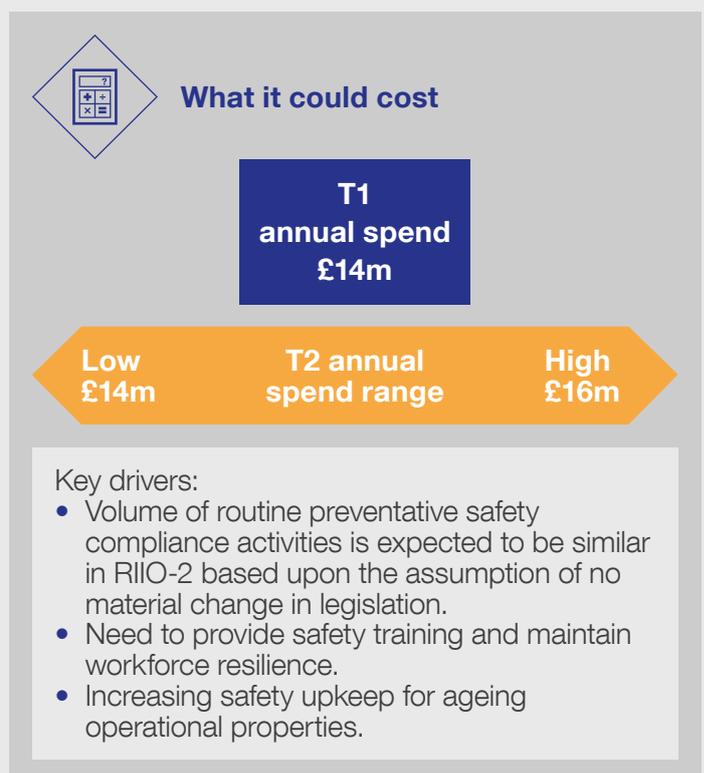
- Fortnightly helicopter surveillance of pipeline routes and line-walking of each pipeline every four years.
- A national, rapid response emergency repair service for pipeline damage.
- Technical competence training for workforce including apprentices.
- Safety upkeep of our operational sites to protect our assets and provide appropriate welfare facilities for our workforce.

Initial planning assumptions

Our starting assumptions for safety related activities include:

- **Legislation:** No significant change in key industry legislation and best practice for compliance.
- **GT Network – Pipelines & AGIs:** No major change in the size of the core network, meaning that the level of safety activity undertaken is expected to remain about the same regardless of which Future Energy Scenario may unfold.

- **Network Emergency Coordinator (NEC).** National Grid continues to discharge the NEC role.
- **Price Control Allowed Revenue.** We believe the safety compliance drivers and workload will be stable during RIIO-2. Therefore, we have assumed that funding for our core safety compliance work will be included in our price control allowed revenue, as it is currently in RIIO-1.

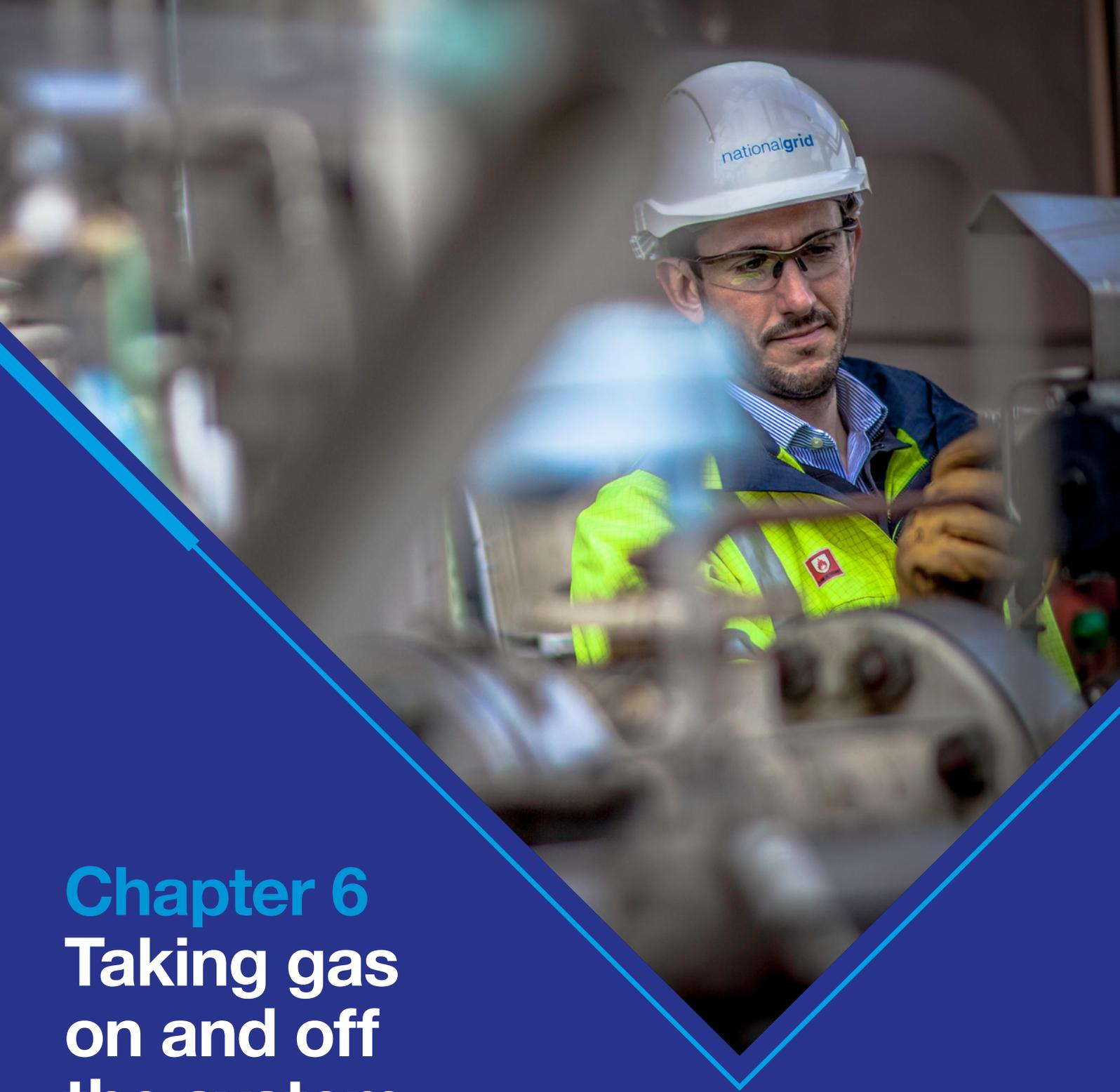


We welcome your views:

Chapter:
A safe gas system

Question:
9. What are your views on our direction of travel for safety?

Submit your feedback online [here](#):



Chapter 6

Taking gas on and off the system

I want to take gas on and off the transmission system where and when I want

Gas
Transmission

nationalgrid

6. I want to take gas on and off the transmission system where and when I want

Summary

Our stakeholders value being able to flow gas without restriction. They want to be able to alter the location, volume and profile of their gas flow in response to prevailing market conditions. We must ensure we have the right gas transmission system and commercial framework to meet the needs of both stakeholders and consumers.

Working with stakeholders, we will define network capability so that it covers the range of outputs our stakeholders want and need. The capability our stakeholders require will then drive our business planning. Taking this approach means we will only incur costs where they are required to meet stakeholder needs, or to keep the desired options open for the future.

We use the following principles to underpin our thinking¹:

- We believe there is a long-term future for gas and the GT Network to at least 2045 and beyond. This is based on timescales to decarbonise heat and limitations of alternative energy sources for industry. It also factors in limited alternatives to gas-fuelled power stations for large-scale flexible generation.
- We recognise there are a range of views over the long-term role of gas and need for the gas transmission system. Until the exact pathway for heat is more certain we believe that it is in consumers' interests, where it makes financial sense, to maintain existing assets and keep future energy options open.
- We need a business plan that provides the network capability and commercial framework that meets the needs of stakeholders and consumers. Consumer and stakeholder needs are unlikely to cause us to expand the network in the RIIO-2 period – the exception would be specific customer needs such as a new connection. However, we will need to maintain the health of ageing assets.
- We are the joint transmission owner and system operator. By maintaining the most efficient network or changing the commercial framework/tools we can create additional value for stakeholders and consumers.

“We must ensure we have the right gas transmission system and commercial framework to meet the needs of both stakeholders and consumers.”

What our stakeholders tell us

This is an important topic for our existing stakeholders. We've done lots of work already, listening and learning via several well-established channels. These include:

- [Future Energy Scenarios](#). National Grid has engaged 650 stakeholders to develop a credible range of energy scenarios out to 2050. The findings are already being used in our planning.
- [Future of Gas project](#). Stakeholders tell us that gas will play a critical role for many decades to come. They also see an opportunity for a greener future by using hydrogen and biogases along with natural gas.
- [Gas Future Operability Planning](#). This helps us to tackle operability challenges caused by variable supply and demand patterns. Stakeholders can challenge our assumptions about future uncertainties. Our customers share with us what they want from the GT Network. We also work together to understand the operational risks posed to the wider energy system.

Most stakeholders support a continued role for gas. They see the need for an efficient network that delivers the right capabilities for the future and allows the right access to an attractive GB gas market. We have also undertaken specific engagement activities to understand the impact of any disruption to their ability to take gas on and off the network as and when required. This will help to determine which elements of the services are most important and why. We will also be able to explore opportunities to do things differently. We will engage further on these topics during 2019.

¹ See Chapter 2 for further information on the views on the long-term role for gas transmission.

“Most stakeholders support a continued role for gas. They see the need for an efficient network that delivers the right capabilities for the future and allows the right access to an attractive GB gas market.”

Impacts on stakeholders’ businesses of any disruption to the ability to take gas on and off the network as and when required.

At stakeholder events in 2018² we asked stakeholders about the problems they would face if they couldn’t take gas on and off the network as needed.

We spoke to many different stakeholders. They included gas producers, gas shippers, gas storage operators and large industrial consumers. Points raised included:

- Impact on the ability to carry out day-to-day business.
- Impact on their commercial or financial position.
- Knock-on issues in areas such as reputation, long-term business viability and jobs.
- Several parties raised the impact on safety, particularly if there was little notice of any disruption to the ability to take gas on and off the network.

Here is some of the specific feedback you gave us:

“50% of our business comes from oil and gas so the impact physically and commercially are both really important as 50% of the business will be affected.”

“There would be a high impact to finances. As we would be unable to generate electricity, unable to meet stakeholder requirements and not be able to meet trader demands.”

“~£10m to replace furnace if gas supplies interrupted and can’t shut down in a controlled way over several days.”

“To power stations there will be a high operational and financial impact and could potentially break the plant.”

We also asked attendees about the level of tolerance they might have to any disruption to their ability to take gas on or off the networks. Clearly, there is no single answer. Different stakeholders tell us that, under current market conditions, their businesses have different levels of tolerance to disruption. Entry customers may be able to manage unplanned disruptions for a few hours due to the flexibility in upstream plant and assets. For many exit customers and the downstream gas consumers, the impacts of any disruption are immediate.

Overall 71% of responses at the events referred to a number of hours’ disruption being tolerable. A further 17% spoke of ‘a number of days’ as the critical time period.

“If unplanned, then six hours would be the maximum level of disruption we would be able to manage. This is because we’d be unable to meet our end of day nominations of upstream shippers.”

“If unplanned, we will not be able to meet trader’s demands. Six hours per day is the maximum level of disruption we can cope with.”

“A lot of these comments are hypothetical scenarios. Domestic customers must have gas at all times. Nuclear supply must have gas as a safety measure.”

“Different stakeholders tell us that, under current market conditions, their businesses have different levels of tolerance to disruption.”

² During July 2018, we held four regional events in St Fergus, London, Chester and Bacton which were attended by over 50 stakeholders from a wide range of organisations to discuss their requirements for the future needs of the GT Network.

Maintaining the network (asset health) to meet the future requirements of stakeholders

Maintaining the health of our assets is critical in avoiding disruption. An ageing asset base requires increasing work to maintain and improve the levels of service that customers have seen in RIIO-1.

To optimise where we invest in asset health, we use several goal-setting targets.

- The level of reliability risk (which gives a probability of failure of an asset).
- Environmental risk.
- Safety risk.
- Disruption to the transport sector³.

At the events in July, we showed stakeholders a range of options. This set out how we could vary the goal-setting targets to produce comparisons of costs for the chosen outcomes. From these events, the preferred options were to keep the overall level of risk the same or to improve asset reliability/risk by 10%. We have continued to engage stakeholders on this topic in follow-up meetings.

“At the events in July, we presented stakeholders with a range of options of how we could vary the goal-setting targets to produce comparisons of costs for the chosen outcomes.”

Improving network resilience

We have listened to stakeholders' views on whether we should try to increase the resilience of the network proactively. For example, should we do this in response to climate change and the increased risk of flooding at our sites?

There were mixed views. Of the 18 responses, roughly a third support a proactive response while a third say we should be reactive. The remaining responses believe decisions should be taken on a case-by-case basis.

You told us:

“National Grid should manage impacts by using the best climate metrics that are available. They should then do a cost benefit analysis using this along with good information to make decisions. They should understand the core risk of environmental changes.”

“As a customer, you want to be confident that National Grid is doing the right thing, this would be best delivered with a proactive approach.”

“The decision to manage impacts should be based on risk analysis.”

Adding more value from the GT Network

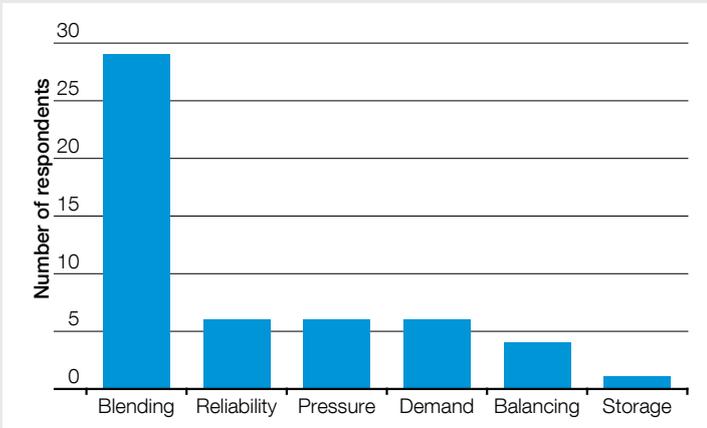
Stakeholders tell us we can do more to add more value to their business. Over half of the 52 responses received at the July 2018 events indicated gas blending or gas quality-related services as the highest importance. More than 30% of the remaining responses mentioned reliability, demand side response or pressure-related services.

We have started work on gas quality blending as a result of the feedback. This is being assessed for the RIIO-1 period as well as RIIO-2.

³ For example, where a pipeline crosses a motorway there is a risk that an issue with the pipeline results in the closure of the motorway causing transport disruption.

⁴ Options presented included reducing availability and reliability risk by 10%, keeping T2 costs the same as T1, 10% reduction in safety risk, 10% increase in environmental risk.

Figure 6.1: Potential services that stakeholders would value



Our activities and current performance

During RIIO-1, the gas system operator and gas transmission owner work together to maintain our assets and deliver a reliable and available network, giving stakeholders the unconstrained access⁵ they need. This includes periods of cold weather such as 1 March 2018 ‘Beast from the East’ (figure 6.2) and the local flooding in 2013 (figure 6.3 & 6.4).

Figure 6.2: Snow cover at a compressor site on 1 March 2018



Figure 6.3: Flooding at the Goxhill above ground installation in 2013



Figure 6.4: Flooding at the Gravesend Thames South above ground installation in 2013



⁵ In 2017/18 we effectively facilitated the delivery of 99.9% of gas requirements for customers.

We are improving the efficiency of our asset health work. For example, we are collecting more detailed asset condition data. We're also enhancing decision support tools and using a campaign approach to delivery.

We refine our maintenance programme constantly. This is in response to significant step changes in supply and demand patterns⁶, and examples of unplanned asset availability. This ensures that stakeholders can use the network as and when needed.

We are using new network configurations to avoid constraints. We have also signed commercial contracts to proactively reduce costs should any constraints happen.

Unconstrained access benefits consumers in several ways:

- Even under extreme weather conditions, gas is available to heat homes, for business and industrial users, and to generate electricity.
- Lower bills by supporting an efficient GB wholesale gas market with unrestricted access to diverse range of gas supplies.
- Supporting decarbonisation of the electricity market. This is achieved by flexible operation of gas-fired generation to enable greater use of less flexible low carbon generation.

“During RIIO-1 we have worked hard to maintain our assets... including during periods of cold weather such as 1 March 2018 ‘Beast from the East’ and the local flooding in 2013.”

Our direction of travel

We will continue to focus on four areas: the future capability of the network, asset health investment, potential resilience projects and our compressor investments to meet emissions legislation⁷. This will ensure our plan creates a network that meets the needs of future customers.

Here we explain a little more about our plans.

Network capability

We need to engage more with stakeholders to define network capability and to understand the level of capability required in the future. We intend to engage on this topic in 2019. We will then be able to build a business plan that delivers the capability required by stakeholders.

The south east of England faces some specific challenges which we want to address in our RIIO-2 plans. In this region there is an issue with the number of compressors that are non-compliant with tightening emissions legislation. There is also the need for significant asset health investment at the critically important Bacton gas terminal.

These two factors mean there is the opportunity to undertake a holistic approach to developing plans for this part of the network. Exploring the network options for the South East will form a key part of our 2019 stakeholder engagement.

Maintaining the network (asset health)

We have engaged with stakeholders and listened to their feedback. This has led us to focus on developing two asset health costed options. These alternative scenarios would deliver different outcomes for consumers on cost, safety, environment, reliability and transport risk:

- Maintaining the current level of asset health (measured through network risk).
- A 10% improvement to network availability, i.e. Reducing the risk of a service interruption.

⁶ Including the announcement of the closure of the Rough storage facility.

⁷ See Chapter 9 for information on compressor investments to meet emissions legislation.

In addition, we are working on defining the absolute level of risk that we should be aiming to achieve on our network. This is a key requirement of our regulator Ofgem as part of the RIIO-2 framework that was published in December 2018. Our current view is that the absolute level of risk on our network should improve over RIIO-2. We believe the level of risk reduction that is achieved by a 10% improvement to network availability aligns well with our views on the absolute level that should be on our network.

We will be explaining this in more detail through our engagement activities with stakeholders and with Ofgem to ensure we deliver the right level of risk that our stakeholders expect from our network assets.

Following the output of the work on network capability, our work on defining the absolute level of network risk and further refinement of unit costs, we will re-engage with stakeholders to confirm their preferred asset health programme

“We have engaged with stakeholders and listened to their feedback. This has led us to focus on developing two asset health costed options.”

Regional network resilience

We will engage with stakeholders and consumers to understand their attitude to more regional risks. We will also explore their views on whether we should be making proactive resilience investments to manage credible, high- impact low-probability events, eg protection of assets from local landslide risk. The alternative is a reactive, and potentially more expensive and disruptive approach should any of these risks materialise.

Investments can be split into two areas:

- Network resilience: Where economically justified, investing in specific regional parts of the network where large numbers of customers rely on a single pipeline route placing them at a higher risk of disruption.
- Environmental resilience investments: Investing in the network to increase resilience to climate-related events such as the flooding risk to operational sites.

“We will... explore views on whether we should be making proactive resilience investments.”

What it could cost

Delivering unconstrained network access involves teams from both the transmission owner and system operator across a range of time horizons, from planning timescales through to the on the day operation of the physical network, and associated commercial systems.

This chapter contains significant elements of the operational and capital costs of both the system operator and transmission owner parts of our business. They include provision of the Gas National Control Centre, IT systems, telemetry, utility bill costs for operational sites, tools, and vehicles for operational field force.

The largest cost element is the asset health programme which makes up around 50% of the costs. Our network is ageing and to maintain similar asset health risk levels in RIIO-2 we expect to undertake more asset interventions.



What it could cost

**T1
annual spend
£212m**

**Low
£250m**

**T2 annual
spend range**

**High
£350m**

Key drivers for the changing trend and range:

- Asset health costs are expected to increase from RIIO-1 to RIIO-2 due to ageing assets and the need for more interventions to maintain service levels.
- The low range represents maintaining asset health, ensuring compliance with relevant legislation, and delivery of a strategic asset replacement approach for the Bacton site.
- The high range includes higher asset health costs to increase asset reliability by 10%.

Initial planning assumptions

Our starting assumptions for this chapter include:

Supply and demand: We assume supply and demand are in line with the *Future Energy Scenarios (FES) 2018*.

GT Network – access and capability: Our starting point is based on the existing network. We expect this assumption to change as we engage stakeholders on defining the network capabilities they need for RIIO-2.

Legislation: We assume no change to legislation.

Brexit: We assume no material impacts from Brexit.

Network access: In some cases, our planned activities, such as asset health work, rely on being able to take parts of the network out of service (known as getting ‘network access’). This depends on the prevailing supply and demand patterns and the levels of service needed by customers for example, guaranteed pressures. We assume that the current level of network access continues.

Maintenance days: Where there are existing arrangements that provide for maintenance days, we assume this will continue into RIIO-2.

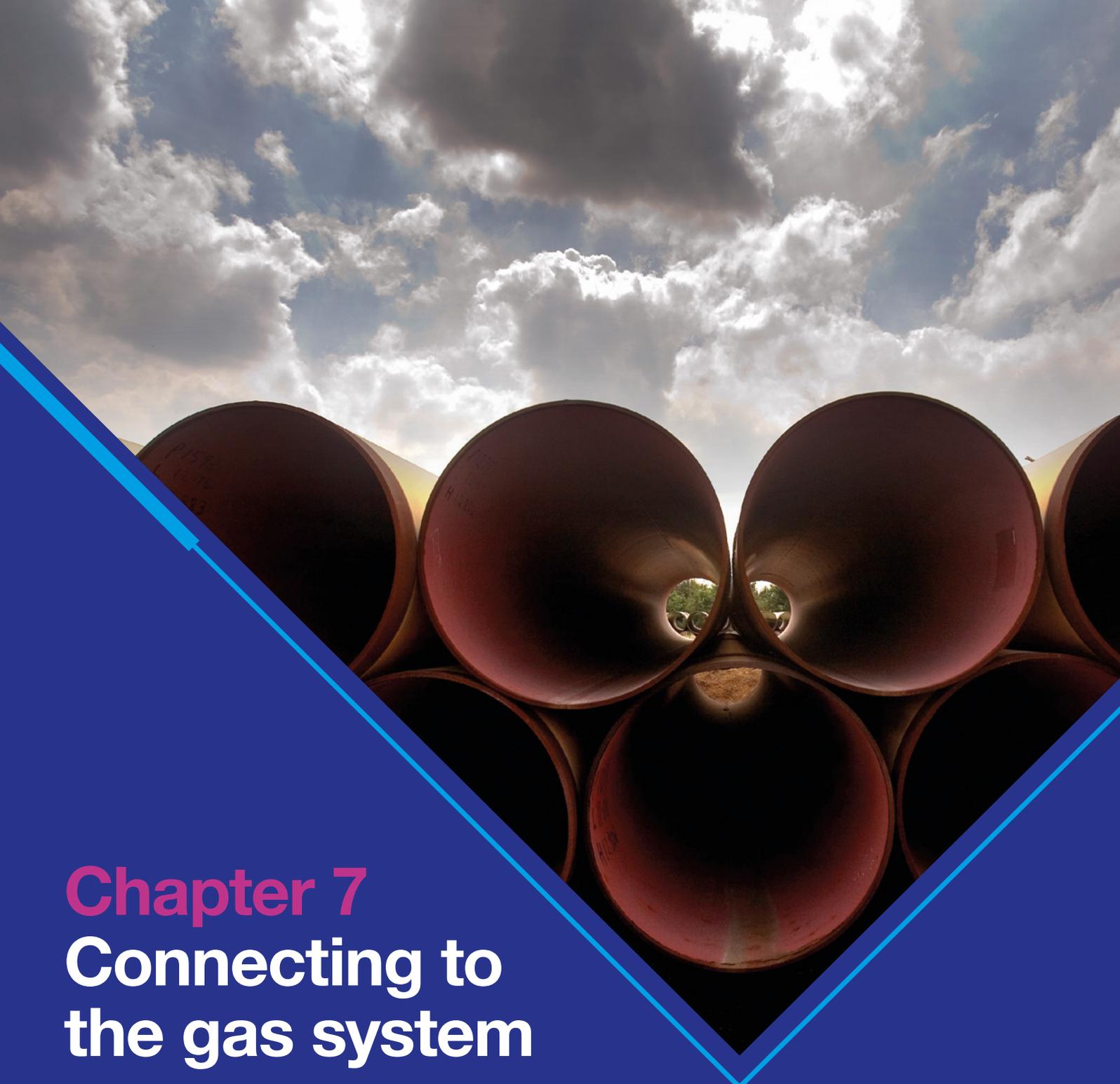


We welcome your views:

Chapter:
Taking gas on and off the system

Question:
10. An increased work programme to maintain the health of, and deliver the right capability from, the transmission network may be beneficial to keeping overall gas costs down for consumers. What are your views on this statement?

Submit your feedback online [here](#):



Chapter 7

Connecting to the gas system

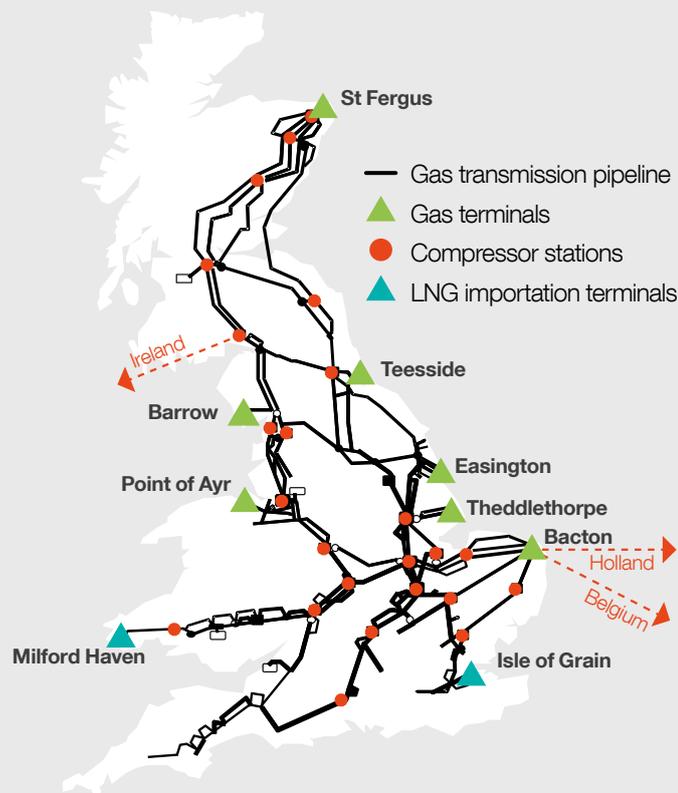
I want to connect to
the transmission system

**Gas
Transmission**

nationalgrid

7. I want to connect to the transmission system

Figure 7.1: Gas national transmission system



Customers pay for a physical connection to the network. In the current regulatory period, we have met all customer needs without expenditure on deeper reinforcement of our network. Deeper reinforcement would have to be triggered by firm customer commitment. This would be remunerated separately through a revenue driver mechanism. In RIIO-1, this mechanism has not been called upon.

“Our future focus is on improving the service to our existing customers. We also want to make our network more accessible to new entrants.”

Summary

Our network connects supplies from nine gas importation facilities to nearly 100 offtakes for distribution networks, power stations and interconnectors, as well as eight storage sites.

Managing connections is an important role. It’s a small part of our total spend, but it is essential for the competitive wholesale gas and electricity markets to work effectively.

We manage the process by connecting, modifying or disconnecting new and existing sources of gas supply and demand as customers’ requirements change.

Our future focus is on improving the service to our existing customers. We also want to make our network more accessible to new entrants. This includes biomethane entry customers and gas-powered vehicle refuelling station exit customers.

What our stakeholders tell us

After listening to your views, we have summarised what you told us, supported by specific comments:

- We have heard that our traditional processes for large users can be difficult to understand. They take too long and progress is not always transparent.

“You have taken steps to increase customer engagement, and have improved connections process, but could do more in terms of explaining the connection and capacity process.”

“Transparency should be the umbrella over this priority.”

- Our existing technical specifications and connection costs present barriers for new entrants developing smaller-scale projects.

“Workshops involving potential connectors should continue beyond project CLoCC. Getting together with, and providing an open environment to, customers and experts to seek ideas to address certain barriers. Such as dealing with varying gas quality and thermal value as supply sources change.”

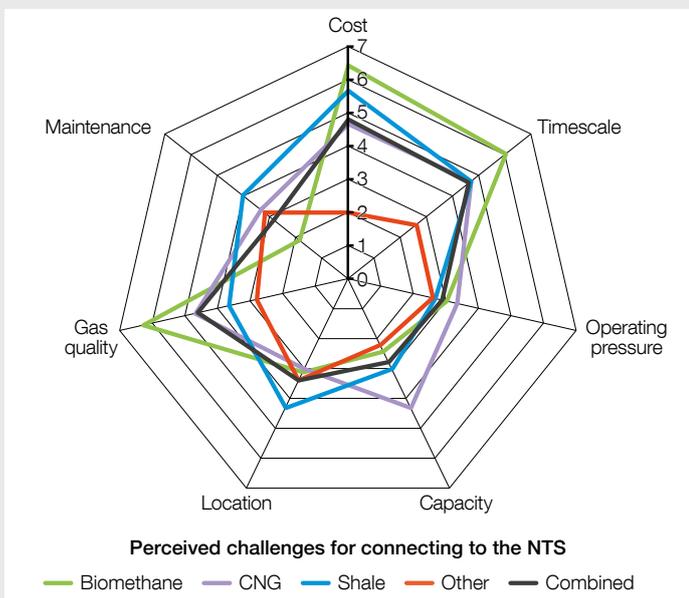
- If we don't change, connecting to our network will be prohibitive for certain projects. This would include biomethane entry connections and gas-powered vehicle refuelling station exit connections.

"The end customer will want to connect even where there is not currently the means for them to do so. National Grid should make gas more accessible."

"A service that could be improved would be the connection process for gas transport i.e. buses, HGVs. There should be a tailored service for new entrants."

In response to this feedback, we initiated [project Customer Low Cost Connections \(CLOCC\)](#). This project was National Grid's successful entry into the 2015 Gas National Innovation Competition (NIC). It aims to minimise the cost and time of new connections to the National Transmission System (NTS). Figure 7.2 shows data captured from customer feedback on the perceived challenges of connecting to the system. Project CLOCC is seeking to overcome these challenges.

Figure 7.2: Customer feedback on perceived challenges connecting to the NTS. Source: project CLOCC, March 2017



What our stakeholders tell us

Our activities and current performance

Our connection obligations are set out in the Unified Network Code. This approach is designed to achieve a level playing field for market participants.

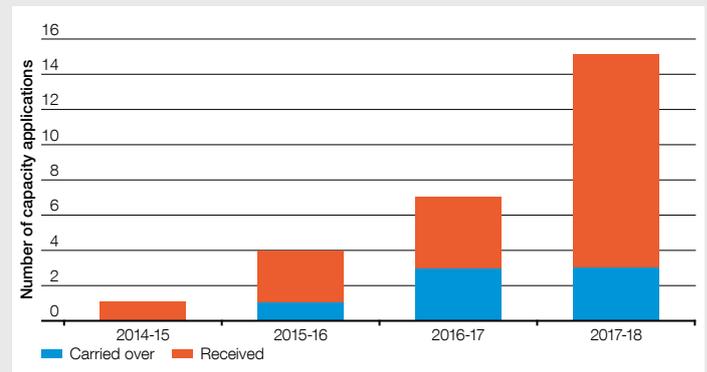
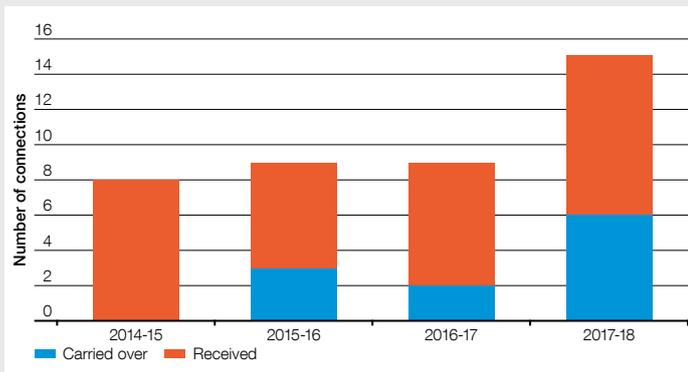
We follow established processes in this area. These are the [connection process](#), covering the physical connection to the system, and the reservation of [capacity process](#), covering firm rights to flow gas on and off the system.

We also report our current connections performance to Ofgem. This is done as a RIIO-1 output measure. We keep the market informed using key publications such as the *Gas Ten Year Statement*.

The volume of work we do reflects both the number and type of connection and capacity applications we receive. We are seeing increased workload. This is driven by:

- Interest from new entrants with smaller flow rates, such as biogas. We have listened to feedback and we are making changes to our connections process to support new entrants.
- Customers modifying arrangements to maximise value from existing sites or assets.
- Customers who would like to align gas connection and capacity reservations with electricity capacity market timelines.
- An increase in activity around disconnections and decommissioning.

Figure 7.3: Number of connection and capacity applications during RIIO-1



As at September 2018 we had 51 connection and 24 capacity customer projects in progress. These projects are at all stages of development. They range from pre-application discussions to feasibility, formal application submitted, offer made, design and build, and reconciliation.

51
connection and

24
capacity customer projects in progress as of September 2018.

When we assess applications, we evaluate the most efficient way to meet customers’ needs. Where possible, we meet customer capacity requirements by substituting capacity from one point of the system to another. This ensures we maximise use of the existing grid. It avoids the cost and time that would be involved in deeper system reinforcement to provide incremental capacity.

During RIIO-1, we have managed all changing customer requirements without needing incremental capacity investment. We have accommodated the equivalent capacity of several large power stations by substitution.

However, that position is changing. There are parts of our network where additional customer capacity requirements could no longer be met by substitution. It is not yet clear whether any deeper system reinforcement will be triggered. If this does happen, we will provide public notice to market participants through the capacity process.

Our direction of travel

Customer focus

We will continue to focus on delivering timely capacity and connections for our customers. We aim to respond better to customer needs and to improve the overall experience. We'll do this by tackling 'pinch points' in the process that you have told us about.

We receive feedback from various channels including customer satisfaction surveys and our Customer Journey work. We have been listening to your experience of taking projects through the journey of connecting to our system and will act on this feedback.

“We will continue to focus on delivering timely capacity and connections for our customers.”

Maximising use of the existing system

We will maximise how we use existing assets to benefit customers by substituting capacity where possible rather than by building incremental transmission capacity.

Embedding innovation: Customer Low Cost Connections (CLoCC)

We plan to make our network more accessible to new entrants such as biomethane entry customers and gas-powered vehicle refuelling station exit customers. We are working on a host of improvements identified as part of project CLoCC.

Key improvements we aim to deliver and embed into business as usual include:

- A web portal to streamline the Application to Offer process (for all sizes of connection).
- Application fees reduced from £109k to £13k.
- A quicker route through capacity reservation for pre-screened green light connection locations.
- Acceptance of higher oxygen content gas from biomethane producers.
- Standardised connection designs and immediate connection cost quotations.
- A pilot connection project under way, with others set to follow in 2019.

Application fees reduced from

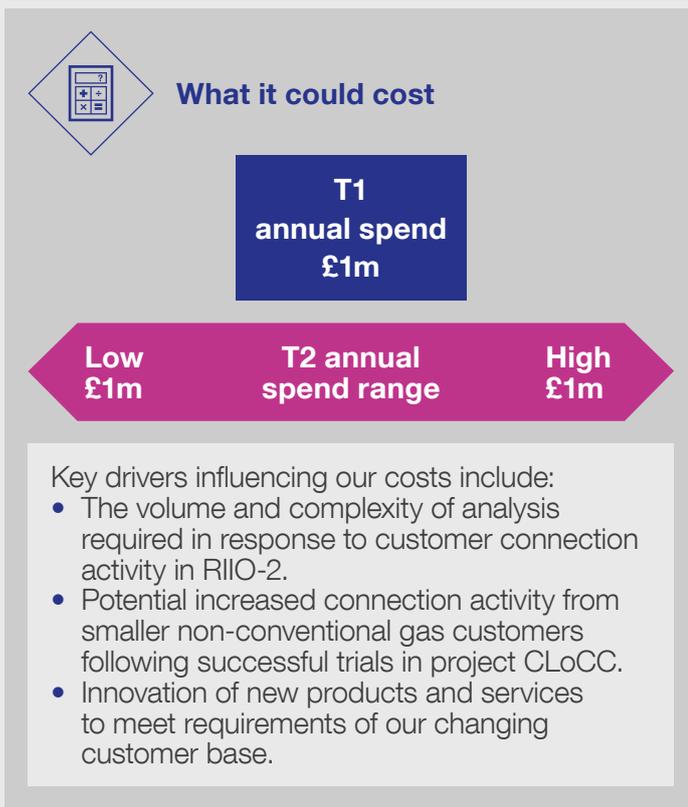
£109k
to **£13k**

“We are working on a host of improvements identified as part of project CLoCC.”

What it could cost

The data below shows the average annual estimated operating cost for us to run the connections process.

This largely covers the teams that manage the connection and capacity processes and day-to-day management of existing contracts. We estimate that, excluding inflation, our operating spend will change little between RIIO-1 and RIIO-2. Potential extra activity should be offset by more efficient processes, such as the portal.



Note that the data does not allow for load-related capital expenditure to reinforce the system or decommission assets which might be needed but only if triggered by customer commitments. Examples of when system reinforcement might be needed include if shale gas extraction ramps up in volume or if liquefied natural gas (LNG) terminals expand.

Initial planning assumptions

We have made some starting assumptions for the connections priority area:

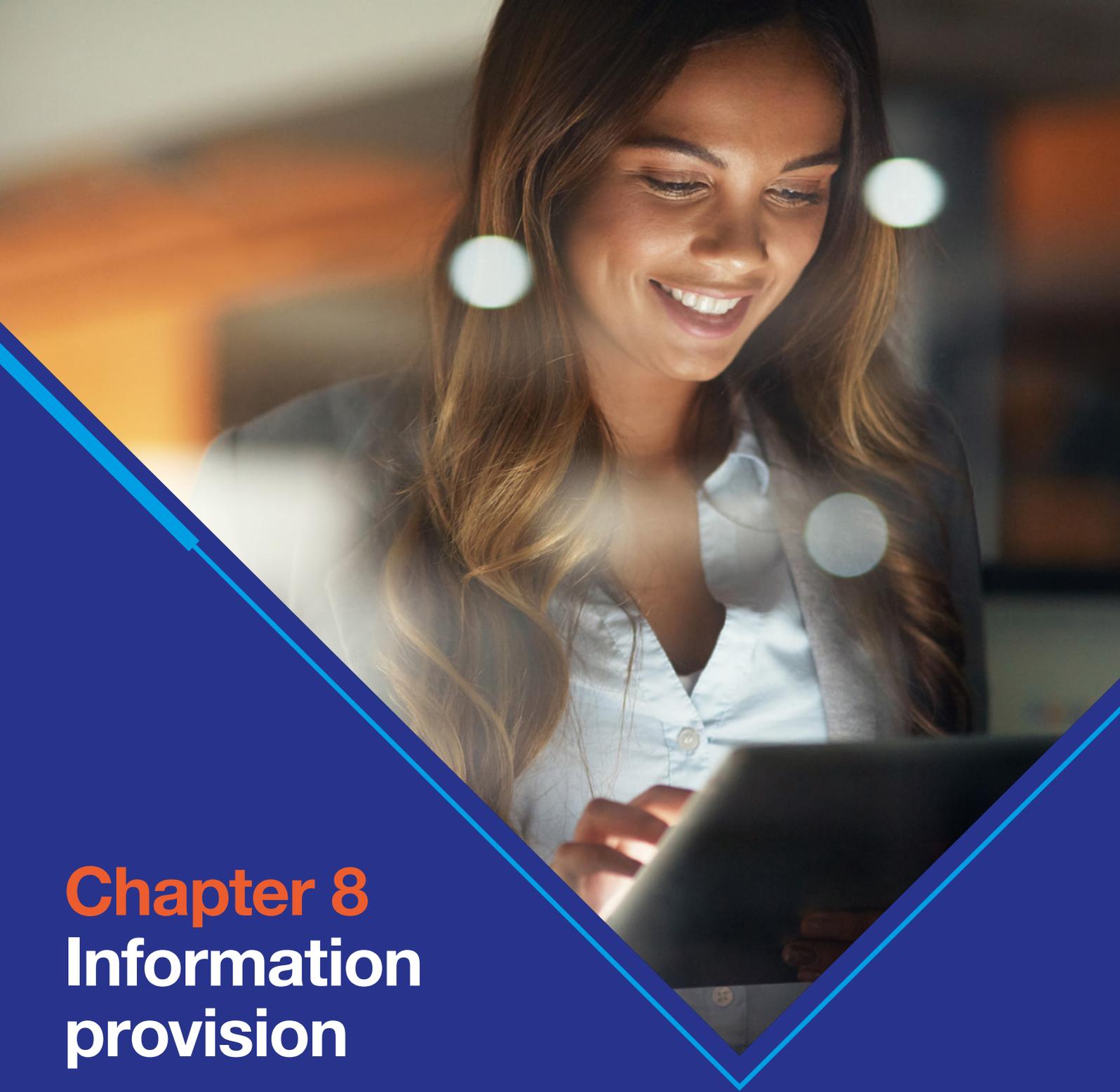
- **Number of connections:** Our initial assumption is that we can flex resources to process a variable number of customer connection requirements that might arise in the period.
- **Incremental capacity:** Future customer requirements are uncertain. We don't yet know if deeper network reinforcement involving capital expenditure will be needed. We assume our baseline plan would include no 'anticipatory' incremental network investment ahead of firm customer commitment.
- **Uncertainty mechanisms:** We assume that an in-period revenue adjustment mechanism should be included in RIIO-2. This would enable our allowed revenue to be adjusted to reflect the costs we incur if customer activity does require network reinforcement.

We welcome your views:

Chapter:
Connecting to the gas system

Question:
11. What views do you have on how we could further improve our connections service?

Submit your feedback online [here](#):



Chapter 8

Information provision

I want all the information I need to run my business and to understand what you do and why

**Gas
Transmission**

nationalgrid

8. I want all the information I need to run my business and to understand what you do and why

Summary

Our information and insights provide value for consumers by ensuring that the gas market runs smoothly. Our work in this area also promotes competition – allowing participants to plan, prepare and operate effectively.

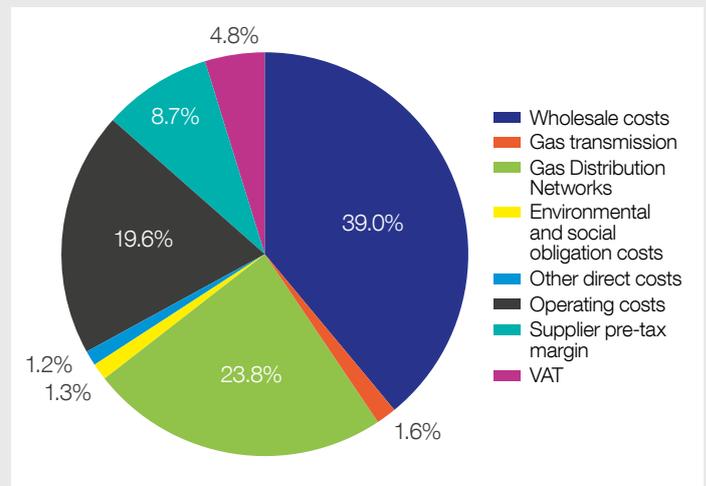
We have a central role in providing information. This is particularly true of information that has a potential impact on elements of the average consumer energy bill.

The operational data we share allows market participants to make informed decisions. This might be about how they trade in the market. It could be the effects on wholesale costs, or how they run their plant and equipment.

The chart below explains the breakdown of the typical domestic gas bill based on the 2016–2017 financial year. It shows that wholesale cost and operating costs contribute more than half of the total bill.

National Grid’s contribution to the network cost is less than 2% of the entire typical gas bill, and information provision is a small proportion of our costs. We believe the benefits to gas consumers of the information we provide are many times greater than the costs we incur to provide it.

Figure 8.1: Breakdown of a typical gas bill¹



What our stakeholders tell us

Our stakeholders tell us they value the information we provide. They see the data we supply as crucial in managing their commercial processes.

For the future, stakeholders would like to have more information, as well as continued improvements in data quality. They want to be able to extract the data they need as required.

During our engagement so far, it is clear that data, information and insights are some of the most important outputs that we produce.

The gas industry faces uncertainty and ongoing change. This means more effective information could be of growing use for our customers and stakeholders. It will help them to manage their activities and to make the right choices.

¹ Source: <https://www.ofgem.gov.uk/consumers/household-gas-and-electricity-guide/understand-your-gas-and-electricity-bills#thumbchart-c6544416133875424-n100629>

Direct stakeholder feedback:

“Data quality is significantly important to us as we have key business decisions being made off the back of it.”

“There are a number of additional areas we would value greater levels of data in, namely pressure, quality and demand.”

Our activities and current performance

The information we provide covers a broad range of areas and timescales. Our long-term insights present the possible future pathways. They describe the role of gas and the steps we could take to be ready for different outcomes.

Our ‘year ahead’ information aims to inform the energy industry and support its preparations. This improves the visibility of how participants could use the system and the cost of doing so.

The role of our ‘on day’ and ‘after the day’ information is to increase efficiency in the capacity and energy markets. It does this while providing fair and timely access to operational and market information.

Figure 8.2: Time horizon of information provision

After the day	2/3 days	1 year	10 yrs
Post event	Short term	Mid term	Long term
<ul style="list-style-type: none"> • What happened? • How did the market perform? • How did the network perform? 	<ul style="list-style-type: none"> • Transparency of market activities • Demand forecasts • Real-time data 	<ul style="list-style-type: none"> • Being transparent about our planned operations • Charging forecasts 	<ul style="list-style-type: none"> • Possible futures and planning for them

To find out more, visit our data and operations page [here](#) or explore any of the publications below.



Winter Outlook Report

October 2018

Our view of the gas and electricity systems for the winter ahead.



Summer Outlook Report

April 2018

Our view of the gas and electricity systems for the summer ahead.



Gas Ten Year Statement

November 2018

How we will plan and operate the gas network, with a ten-year view.



Gas Future Operability Planning

Quarterly

How the changing energy landscape will impact the operability of the gas system.



Future Energy Scenarios

July 2018

A range of plausible and credible pathways for the future of energy from today out to 2050.

We recognise that the information we provide plays an important role in enabling society's transition to a low carbon future and the shift to a 'whole energy system' approach.

We are supporting initiatives like the Energy Data Taskforce. It brings together industry and the public sector to reduce costs and promote competition, innovation and new business models. It does this by improving data availability and transparency.

We are undertaking a significant piece of work to engage with industry on ways to improve our operational data provision. We are also putting in place new streams of information where demand from stakeholders is clear. One example is the week-ahead pressure forecast launched in August 2018².

Our direction of travel

Facilitating an efficient gas market

The gas market we support continues to evolve. Information provision will therefore become even more important.

Greater uncertainty and variability in gas flow patterns and commercial drivers will affect stakeholders' ability to balance supply and demand. This makes timely and accurate industry information even more critical for the healthy functioning of a competitive wholesale GB gas market.

We are setting up a community approach. This will allow us to work together with stakeholders and to prioritise the information we publish. This work is currently focused on operational data (day ahead and within day).

We will strive to meet the growing needs of our stakeholders at minimal cost. We will do this by finding new ways to make our processes more efficient. This will enable us to continue delivering a value for money service.

Our priorities are:

- Continually improving efficiency in our processes.
- Focusing on and advocating for stakeholder needs.

Adding value for our stakeholders

We want to better understand our customers and their needs. This will ensure we provide a 'level playing field' without blockers. We expect to explore the type of information that is most valuable in the smooth running of the wholesale gas and electricity markets.

In the upcoming price control period it will be a priority for us to provide the right information in a way that is in the best interests of consumers.

We will do this by:

- Continuing to engage with our stakeholders to understand their data, information and insight requirements.
- Ensuring we meet customer expectations for the information they need.
- Exploring new data and information products.

Incentivising us to go further

A significant amount of the information we provide is required either by our gas transporter licence or the network code governing the industry.

We believe incentives are an effective way to encourage continual improvement. Information provision could be a particularly effective area to incentivise. Stakeholders tell us that reliability, availability and usability of the information we provide is vitally important to them. We must respond to their needs in a flexible way.

Aligning incentives to these areas could improve the way the gas market operates. This would benefit consumers too. We want to work with stakeholders to identify what these potential incentives should look like.

² <https://www.nationalgridgas.com/data-and-operations/transmission-operational-data#tab-4>



What it could cost

**T1
annual spend
£6m**

Low £6m **T2 annual spend range** **High £10m**

Key drivers for the changing trend and range:

- Ensuring our data and information is provided in a way that meets the needs of stakeholders.



We welcome your views:

Chapter:
Information provision

Question:
12. What information could we provide that would increase benefits for our customers and consumers?

Submit your feedback online [here](#):

Initial planning assumptions

Our starting assumptions for information provision include:

- **Market information:** The information we provide to the market will continue to play a crucial role in the healthy functioning of the wholesale energy markets. The obligations around certain information will stay the same as we start the RIIO-2 period.



Chapter 9

Communities and the environment

I want you to care for communities
and the environment

Gas
Transmission

nationalgrid

9. I want you to care for communities and the environment

Summary

We care about the communities we work in and the wider environment. This topic is important for National Grid, but also for consumers and society. Making a positive impact on the environment and communities is vital if we are to operate as a socially responsible business.

National Grid Group has set ambitious group-wide targets for environmental sustainability. These targets are outlined in the 'Our Contribution' document¹.

Targets include:

- By 2050, we will make an 80% reduction in our greenhouse gas emissions (from a 1990 baseline).
- By 2020, we will reduce capital carbon of our major construction projects by 50%.
- By 2020, we will reuse or recycle all our recovered assets.
- By 2020, we will recognise and enhance the natural capital value² of our natural assets on at least 50 of our sites.

The gas transmission business affects either the environment or local communities in several ways. Our approach in RIIO-2 will continue to be consistent with the UK Government's Clean Growth Strategy³ (October 2017). In this chapter we discuss:

- Air quality – ensuring our assets (particularly our compressor fleet) comply with tightening air quality emissions legislation.
- Business carbon footprint (BCF) – minimising our emission of greenhouse gases, such as methane and carbon dioxide. This includes from assets, buildings, vehicles and from the third parties that support our business. For example, this could be from generating power on our behalf or producing the materials we use.

- Redundant assets – where assets are no longer required, ensuring we act in line with legislation. We will minimise the risk to the environment of leaving assets in the ground or on sites.
- Legal obligations – continuing to meet our legal obligations to landowners in communities affected by the presence of our pipeline network.
- Societal and community objectives – working with and in local communities, particularly those affected by our assets or activities.

What our stakeholders tell us

We engaged stakeholders at four regional events⁴ in July 2018 and at specific environment events in London (July 2018) and Edinburgh (December 2018).

Air quality

Our RIIO-2 plan will focus on continued compliance with tightening emissions legislation. We have not therefore engaged stakeholders about whether we should meet our legal obligations.

Business carbon footprint

RIIO-1 includes an incentive on the volume of greenhouse gas emitted when we depressurise a compressor and vent the natural gas. During our engagement, stakeholders told us that the scope of this should be broadened to consider all types of emissions and not just the current limited scope.

"Would like to see more focus on methane emissions, such as there are in Europe."

¹ https://www.nationalgrid.com/sites/default/files/documents/NG_OurContribution_PDF_Brochure_2017%20%281%29.pdf

² Natural Capital Value is a financial representation of the benefits and services that nature provides to society and businesses, e.g. Visual screening, flood control, improved air quality, raw materials, recreation and clean water etc.

³ Clean growth means growing our national income while cutting greenhouse gas emissions. Achieving clean growth, while ensuring an affordable energy supply for businesses and consumers, is at the heart of the UK's Industrial Strategy.

⁴ During July 2018, we held four regional events in St Fergus, London, Chester and Bacton which were attended by over 50 stakeholders from a wide range of organisations to discuss their requirements for the future needs of the GT Network.

We asked stakeholders about how we should factor cost of carbon into our decision-making processes. Stakeholders supported our view that we should apply a consistent cost of carbon in these decisions using the Government’s central case carbon evaluation (mid-case).

“National Grid should just get on with it. Their strategy needs a consistent message; therefore they should only use one carbon price. They also need incentives to reduce emissions.”

“Yes, we should have one consistent carbon price, in order to make analysis of these figures easier. This should be a balance between the cost to consumers and highest price for the business, yet be ambitious in terms of reducing the impact on the environment. This should allow for benchmarking within the industry.”

Redundant assets

Stakeholders told us that for redundant assets, we should prioritise removal based on risk and maintain the residual redundant assets.

Stakeholders also suggested different approaches for buried pipelines compared with above-ground assets (e.g. compressors).

“National Grid need to prioritise high-risk projects and maintain remaining assets, as commercially the right answer is to leave it. Yet, they should take into account stakeholders and the impact on them, for example if redundant assets are an eyesore for local communities then it may be best to demolish the asset.”

“You need to think about the visual impacts of pipelines vs compressors. It makes sense to remove compressors to reduce the visual impact, but why would you dig up a pipe? Leaving assets visible on the surface has a greater impact on reputation.”

Society and community

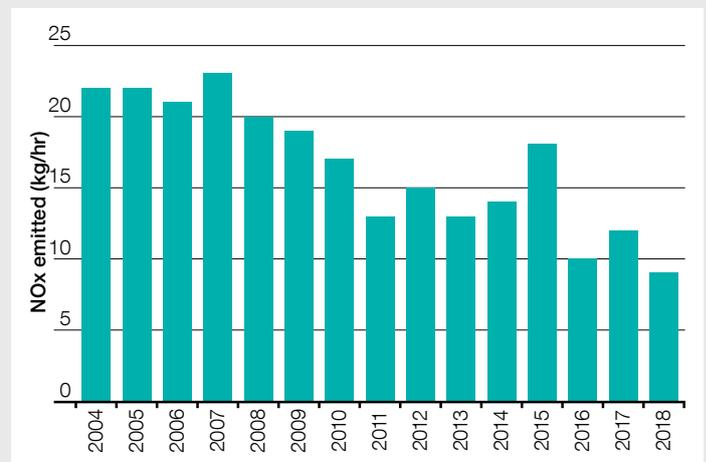
We asked stakeholders about our role in local communities. 60% of the responses told us that we should do more with local communities. 40% said to continue as we currently are.

Our activities and current performance
Air quality legislation (nitrogen oxide (NOx) and carbon monoxide (CO)).

High levels of NOx in the environment can impact health. There could be an increased risk of respiratory conditions, greater response to allergens and a decrease in lung function.

During RIIO-1, we invested in our compressor fleet to meet our obligations under local air quality legislation. This led to a reduction in the amount of NOx emitted for each hour of compressor running.

Figure 9.1: NOx emitted for each hour of compressor running (kg/hr)



We have more work to do. We plan to continue to deliver reductions in emissions during RIIO-2. To help us do this effectively we engaged with stakeholders during the latest iteration of European Directives on emissions.

This resulted in a five-year derogation to comply with specific emissions legislation for some of our assets. Our sites with the highest environmental impact are being addressed earliest.

This came from a need to deliver a cost-effective compressor replacement programme for our customers, while also remaining compliant with future legislation.

This success means capital works can take place more gradually. This ensures effective cost control for our customers to deliver lower emissions.

Redundant assets

Assets may become redundant because the needs of stakeholders or individual customers might change. We have identified 68 sites, asset groups or single assets that are redundant already or will be during RIIO-2.

We are doing more work than ever in this area as our assets age and customers change how they use the network.

In the run-up to, and during RIIO-2, more assets may become redundant because of customer decisions or as overall use of the network changes. We will continue to monitor redundant assets using our normal annual planning processes and when customers tell us of a change in system use.

Society and community

National Grid has a strong history of supporting local communities. One way we do this is by managing our non-operational land in innovative ways. We have applied a 'natural capital valuation' approach alongside engagement with local and national stakeholders to deliver societal value.

Legal obligations to landowners

We have contractual relationships with owners of the land that our pipelines pass through. As part of these contracts, we are liable for the impact of our pipelines. This could include where drainage or crop production is affected or where there is a restriction on undertaking quarrying activity.

We have well-established processes to validate and challenge the basis and amount of the compensation being sought for all claims. In each case, we will seek to adopt the most appropriate solution. This could include making annual payments, making full or final settlements, or carrying out investigation and repairs (e.g. for drainage issues).

Our direction of travel

We will develop a business plan that allows us to meet all relevant environmental legislation (including waste and emissions). It will also consider how we work with communities.

Air quality emissions legislation (NO_x and CO)

Tightening emissions legislation impacts 29 of our compressors. It also covers a small number of water bath heaters, boilers and standby gas generators. We need to be compliant with new legislation by 1 January 2030. We are developing a programme of work out to 2030 to achieve this.

There is a large volume of work needed. It will take time to deliver compressor investments and there is limited availability of network outages to accommodate this work. This means we can't wait until RIIO-3 (2026) to start the work. Significant activity is required during RIIO-2.

We will continue to refine this programme with stakeholders during RIIO-2 and beyond. For compressors planned to be addressed in RIIO-3, some of the initial costs are expected to occur in RIIO-2.

We will consider whether it would benefit consumers to request funding out to the compliance date of 1 January 2030 for the entire programme as part of the RIIO-2 price control.

We will use what stakeholders tell us about the required network capabilities⁵ as we develop our programme of work to be compliant on emissions. This will ensure we only invest where needed.

We have initial proposals to discuss with stakeholders in 2019. They are based on the options of decommissioning, accepting limited running hours or replacement with a new compliant unit.

We will continue to explore the options to complete this work, including whether solutions such as abatement are suitable on a site-by-site basis. Our final RIIO-2 business plan submission will be based on stakeholder feedback and more detailed cost benefit analysis.

⁵ See Chapter 6 for more detail

We will seek flexible regulatory arrangements covering various options for individual sites.

Reducing our business carbon footprint

We aim to reduce the greenhouse gas (GHG) emissions our business produces. We intend to do this on a carbon dioxide equivalence basis. This is because methane is about 25 times more damaging to the environment than carbon dioxide.

We have split our emissions into three categories:

- **Direct emissions from our assets.** The biggest of this is carbon dioxide emitted from combustion of gas in our gas fired compressors. It also includes methane emissions from activities such as venting during compressor depressurisation or pipeline venting. We want to improve the way we measure our methane emissions and establish if there are innovative techniques or investments we can use to quantify and reduce these emissions.
- **Indirect emissions from the ownership and operation of our assets.** This could include the indirect emissions from producing electricity used on our operational sites such as our electricity-driven compressors. We will explore if we can deploy renewable generation technologies to our sites to reduce our indirect GHG emissions.
- **Other emissions associated with our business.** This covers emissions where we have some or full control, for example, construction work or the production of steel and concrete that we use.

We will set a single consistent carbon price for each tonne of controllable carbon dioxide equivalent (CO₂e) emitted. This will give us clear carbon emissions data and support our decision-making.

By engaging stakeholders and working with our suppliers, we want to reduce our overall carbon footprint. This might involve looking at how we dispose of waste and replacing our fleet vehicles with low carbon alternatives.

Redundant assets

We aim to develop a programme to prioritise action on redundant assets that pose the greatest environmental and safety risks.

This programme will ensure we comply with our obligations under waste legislation. The law requires us to remove redundant above-ground assets but currently has an exemption for buried assets.

Our current preferred option is to demolish and dispose of above-ground assets and leave any buried pipelines safely in place. This will reduce the environmental impact of removing redundant pipelines from the ground.

For buried assets, we will investigate how these could be used in other ways. Through 2019 we will continue to work with stakeholders on our approach and the appropriate share of costs between current and future consumers.

Where existing contractual arrangements allow, we will seek to recover any costs to remove redundant assets from the relevant customer.

Society and community

We will strengthen how we manage non-operational land at our compressor sites. We'll do this in a way that delivers environmental value and benefits communities. We will identify ways to work with and fund local stakeholder groups to achieve maximum benefit.

We will also explore with stakeholders what our role should be in working with communities during RIIO-2.

Legal obligations to landowners

We will continue to work with landowners to meet our legal and contractual obligations relating to the presence of our pipeline network. This will cover issues such as loss of crop, impacts on drainage, loss of development or restrictions on extracting minerals.

What it could cost

Costs are dominated by the investments needed in the compressor fleet to meet emissions legislation. This makes up around 80% of the total costs of this priority.



What it could cost

**T1
annual spend
£44m**

**Low
£120m**

**T2 annual
spend range**

**High
£145m**

Key drivers for the changing trend and range:

- Costs in RIIO-2 are expected to be higher than in RIIO-1. Tighter emissions legislation means there are more non-compliant compressors needing intervention.
- In the high case above, work on compressors at Hatton and St Fergus is delayed from RIIO-1 into RIIO-2. All compressors affected by emissions legislation are replaced like-for-like across RIIO-2 and RIIO-3, with full compliance by December 2028.
- In the low case, we assume a like-for-like replacement in RIIO-2 with some derogation of units in RIIO-3, limiting required spend in RIIO-2.

Initial planning assumptions

Our starting assumptions include:

Supply and demand: We assume supply and demand are in line with the *Future Energy Scenarios (FES) 2018*.

GT Network – access and capability:

We assume that the network is in its current form. We fully expect this assumption to change as we engage stakeholders on defining the network capabilities they require for RIIO-2 and through agreeing solutions with the environmental regulators.

Legislation: We assume no material changes to legislation.

Compressor assumptions:

- To date, for individual compressors we have considered three options: building a new unit, using a 500-hour derogation, or decommissioning. In 2019, we will assess the suitability of innovation or abatement technology. We will carry out a full cost benefit analysis for each site. We will also explore the balance of commercial solutions and asset solutions to deliver the network capability our stakeholders need. We believe this is likely to reduce the overall costs for our compressor emissions compliance programme.
- The compressor costs in this chapter only cover costs driven by emissions compliance. Any other costs for compressors from other drivers (e.g. due to asset condition) are covered in the separate ‘Gas on/off’ chapter. This is because they are not driven by environmental legislation.

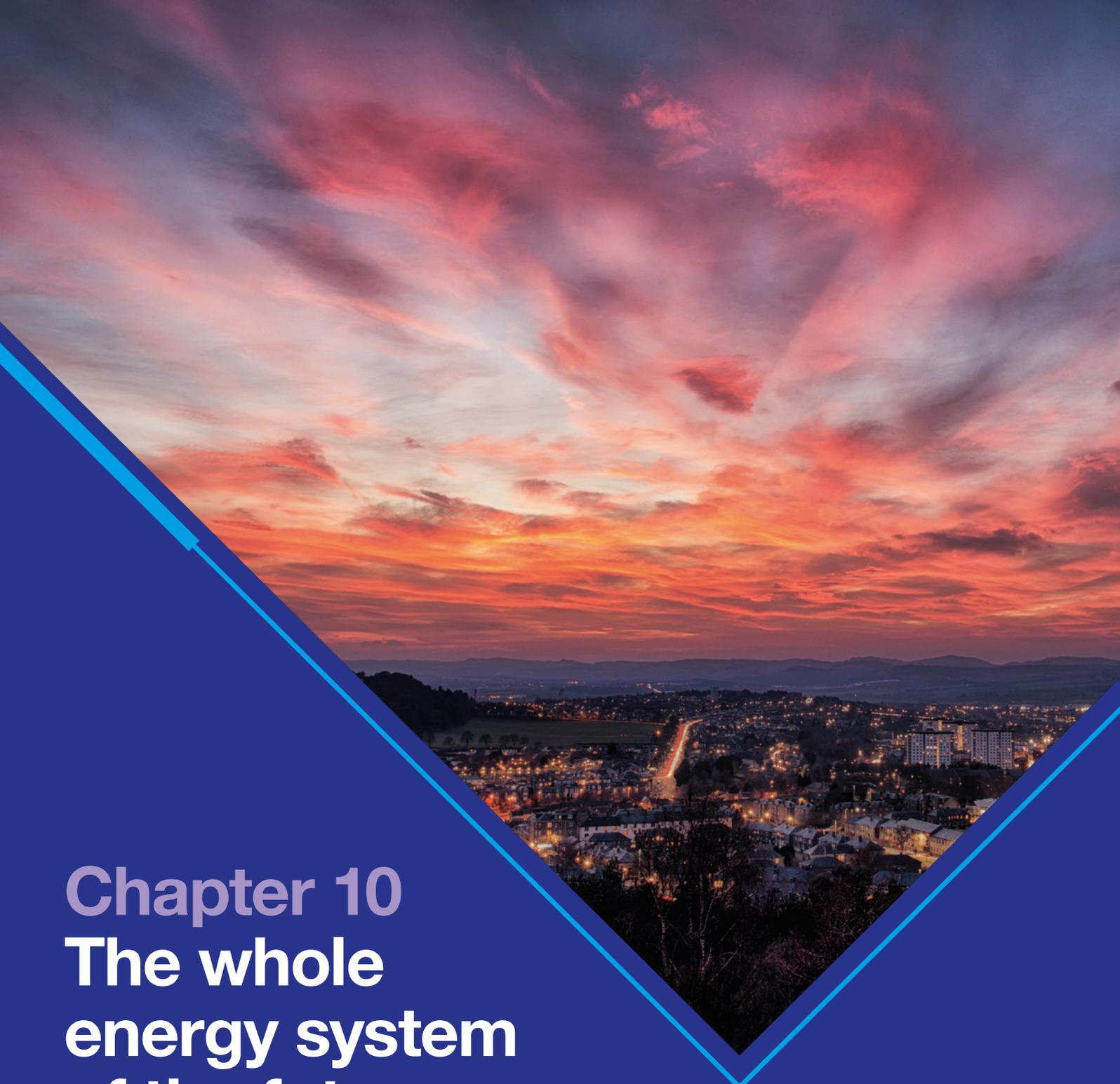


We welcome your views:

Chapter:
Communities and environment

Question:
13. We must take action to curb our harmful environmental emissions in line with legal deadlines. To what extent should we be more proactive in reducing our overall impact on the environment? For example, reducing methane emissions or going beyond minimum legislative requirements.

Submit your feedback online [here](#):



Chapter 10

The whole energy system of the future

I want you to facilitate the whole energy system of the future – innovating to meet the challenges ahead

Gas
Transmission

nationalgrid

10. I want you to facilitate the whole energy system of the future – innovating to meet the challenges ahead

Summary

Many stakeholders tell us that they support the principle of a whole system approach. However, across the industry there are differing views on exactly what this means and what the approach should be.

We support an integrated approach. That means optimising the way that gas, electricity, transmission and distribution work together, along with links with other sectors such as heat and transport. The aim is to deliver outcomes that benefit current and future consumers without favouring one energy source over another.

We recognise that gas transmission has a role to play in enabling consumers to use the future energy system. During RIIO-2, the gas industry needs to develop ways of working to enable the industry to deliver benefits to consumers.

Our network and the market processes we facilitate will be important in the energy transition. We believe our focus needs to be on:

- Setting out the measures we will take to facilitate the energy transition in a transparent, flexible and agile way. This will require investment in information systems, such as balancing and capacity systems.
- Determining what successful consumer outcomes look like for the whole energy system of the future and the improvements we can make. These could include:
 - new/different services we could provide.
 - new ways of collaborating across sectors.
- Helping to inform choices and keep options open for policy makers. For example, this could be in relation to decarbonisation of heat and green gas.
- Developing innovation projects to support the energy transition. For example, hydrogen innovation projects.

We won't have all the answers before RIIO-2 starts. There will need to be more collaboration and communication across industry. We do need to act now to set the right trajectory for RIIO-2 and beyond. This will ensure we have the right frameworks in place to benefit consumers.

What our stakeholders tell us

Stakeholders tell us that they want National Grid to facilitate the whole energy system of the future. They recognise that gas transmission must play an important role in doing this. There needs to be a more integrated, collaborative approach across sectors. Stakeholders also expect us to look for innovative ways to meet the challenges ahead, especially in decarbonising heat. We are seen to be well placed to have a say and influence policy. Some of the points raised include:

“National Grid should be incentivised to continue to facilitate the effective energy system of the future.”

“National Grid needs to be future fit, flexible and innovative.”

“Use existing infrastructure to supply hydrogen, no premature decommissioning that would compromise this opportunity.”

Our stakeholders also say: “National Grid could be more seamless between gas and electricity.” However, there are currently barriers to making this joined-up approach a reality. For example, there are restrictions on information that can be shared across gas and electricity networks under the Utility Act. During RIIO-2, we will be working with industry and the regulator to see how these barriers could be overcome.

Throughout 2019, we will continue to work with stakeholders to understand how we can meet the challenges ahead.

Our activities and current performance

- To facilitate the gas market, we make sure that we have the right information systems (IS), people and processes in place. This allows customers to use the market and have a role in the energy system. During RIIO-2, we will continue with this role so that new entrants can access the market as well as supporting existing customers. For example, we will do this by facilitating modifications to the Unified Network Code (UNC).
- During RIIO-1 we published stakeholder insights in The Future of Gas: How gas can support a low carbon future. We committed to work with industry and Ofgem to develop a long-term Gas Markets Plan (GMaP) to ensure that we develop the markets appropriately. We will be working with stakeholders to develop this plan in early 2019.
- The Network Innovation Allowance and Network Innovation Competition have enabled us to undertake many innovation projects that are producing benefits. We talk about some of this work elsewhere in the document. We have also played a key role in the ENA Gas Innovation Governance group, including taking the chair role in 2017. This has enabled us to undertake more collaborative projects.

As part of our collaboration with the Gas Distribution Network, we are involved in several innovation projects looking at the transportation of hydrogen as a means to 'greener gas' – a cleaner fuel that can help to decarbonise heat. An example is a feasibility study into 2% hydrogen blending at St Fergus and H2 pipeline and hub at Aberdeen.

Hydrogen and gas networks

Government recognises that heat is one of the main challenges for decarbonisation. Important future policy decisions can be expected in the mid-2020s. We recognise we have a role to play in informing this policy.

One of the options the industry is looking at is the use of hydrogen as an alternative fuel. At its point of use hydrogen is a clean fuel leaving only water as the by-product of combustion.

There are several different ways in which the GT Network in conjunction with hydrogen can support decarbonisation:

- (i) Supplying natural gas as a fuel source to produce hydrogen (e.g. through a process known as Steam Methane Reforming) with Carbon Capture & Storage technology.
- (ii) Incorporating a hydrogen-rich (greener) blend of gas into the existing transmission system.
- (iii) Repurposing parts of the existing GT Network for 100% hydrogen transportation.

We have recently launched a project to look at the feasibility of the GT Network being used for hydrogen. This project will look to build on some of the projects undertaken by the gas distribution networks to ensure a joined-up approach.

- However, there are barriers to taking a joined-up approach. Steps are needed to improve cross sector collaboration. For example, there were initially significant barriers to joint gas and electricity Network Innovation Competition projects. These were improved on in the 2017 innovation consultation.
 - We have used round-table events to engage industry and promote how we can work together to enable whole energy system outcomes for consumers. Senior representatives from Ofgem, BEIS, networks, innovators, and other energy industry experts took part in these events.
 - We recognise that one of the key areas we can support is the decarbonisation of heat. We are looking at the direction of travel for the future of heat. This includes studying the key inputs required to influence policy decisions in support of a whole energy system approach.
- We will help to inform choices and keep options open for policy makers. For example, this could involve areas such as decarbonisation of heat, and green gas, including hydrogen.
 - We will identify where we can improve consumer outcomes. This could be through new and different services we could provide or ways to collaborate across sectors. We will work with industry and the regulators to understand how to share information more effectively. We will work with the regulator to ensure that RIIO-2 has the right frameworks to support an integrated approach.
- Have the right IS systems to be able to support the continued use of the energy system now and in the future. A significant amount of our work in RIIO-2 will be to ensure we have a balancing and capacity system that is fit for future changes, investing in systems such as Gemini.

Our direction of travel

During 2019, we will continue our stakeholder and industry engagement. This will help to develop our business plan and propositions. Our propositions are split into three main areas:

- Have the right framework, resource and processes in place to be able to meet and facilitate the changes ahead for the future energy system.
 - We will use our knowledge and central role in the industry to coordinate and deliver actions now and during RIIO-2 where there is clear value to consumers.
 - We will seek to engage more with stakeholders and consumers. We need to be able to explain clearly what successful consumer outcomes for the whole energy system look like. For example, clearly understanding the trade-off between the consumer priorities around no disruption, low cost and high reliability.
 - We will identify new ways of working. These include changes to the gas and electricity frameworks to remove sector barriers and enable a more integrated approach.

Gemini:

We provide essential balancing and capacity processes and services. They make sure that the competitive wholesale gas market runs effectively.

This is currently facilitated through a platform called Gemini. During RIIO-2, this IT system will require a new platform as the existing system reaches the end of its life. We aim to develop a replacement solution that will adapt to future needs.

- Enable innovation to identify solutions that support the energy transition.
 - We will continue to build on and expand our portfolio of innovation projects. We will work collaboratively with other networks and the industry to investigate the best solutions to support the energy transition.
 - We will look to build on the successes of our existing innovation projects undertaken through the various innovation allowances.

What it could cost

Costs are split into two main categories. The first is the cost to implement and maintain the systems and services we provide to industry, plus the cost of our teams to do the work we outline in this chapter.

Approximately two-thirds of our spend is on investing in IT systems. We envisage investing a significant amount on a new platform for Gemini. This will enable us to continue our role supporting a competitive wholesale gas market.

The remaining part of our spend is focused on ensuring we have the right resource in place to deliver our outputs. Some of these costs allow us to continue our role in market facilitation and identifying new services and ways of collaborating across the industry.

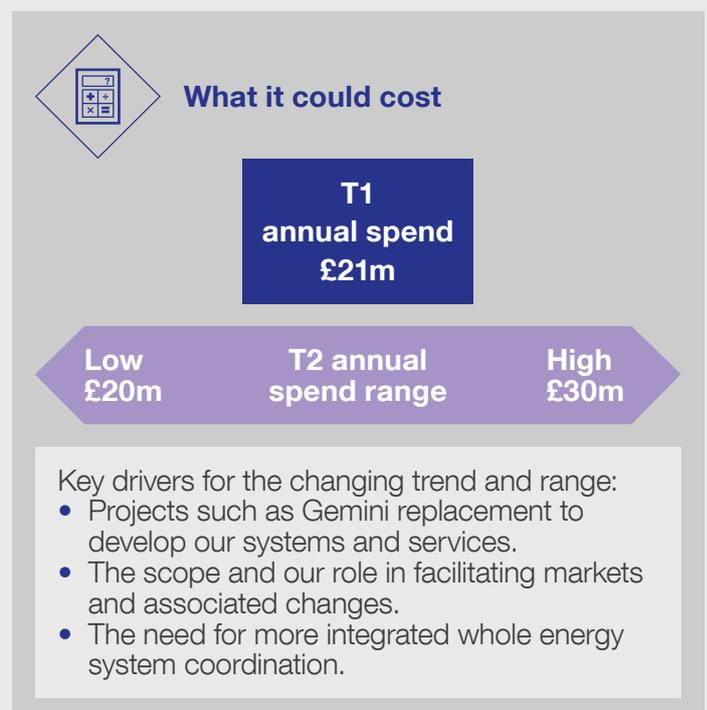
We also have an allocation of costs for the dual fuel teams that develop our Future Energy Scenarios. More detail can be found on the [FES](#) website.

We will ensure we have the right resources in place to progress innovation projects. These projects will enable the energy transition and make our business more efficient. The historical and future costs for the NIA/NIC costs are not included here because they are funded outside our controllable costs. Ofgem is currently considering the future regulatory treatment for this.

Initial planning assumptions

Our initial planning assumptions are:

- Whole system coordination: We assume we will need to participate in greater coordination across the gas industry and sectors including electricity, heat and transport. We are working with industry and stakeholders to define what will be needed in RIIO-2.
- Innovation: Innovation will play a key role in producing solutions across all sectors to achieve whole energy system outcomes that benefit stakeholders and consumers.



We welcome your views:

Chapter:
The whole energy system of the future

Question:
14. Where can National Grid Gas Transmission add most value through the RIIO-2 period to facilitate integrated energy systems of the future?

Submit your feedback online [here](#):



Chapter 11

Cyber and external threats

I want you to protect the transmission system from cyber and external threats

**Gas
Transmission**

nationalgrid

11. I want you to protect the transmission system from cyber and external threats

Summary

UK infrastructure faces many security threats. They are becoming more frequent, sophisticated and persistent in nature.

Threats include terrorism, criminality, espionage, actions by activists or extremists, vulnerabilities within systems and vulnerability from insider action. This chapter explains those threats and how we are responding.

Protecting the gas transmission system is critical to security and reliability of supply. It enables customers to use gas as and when they want to.

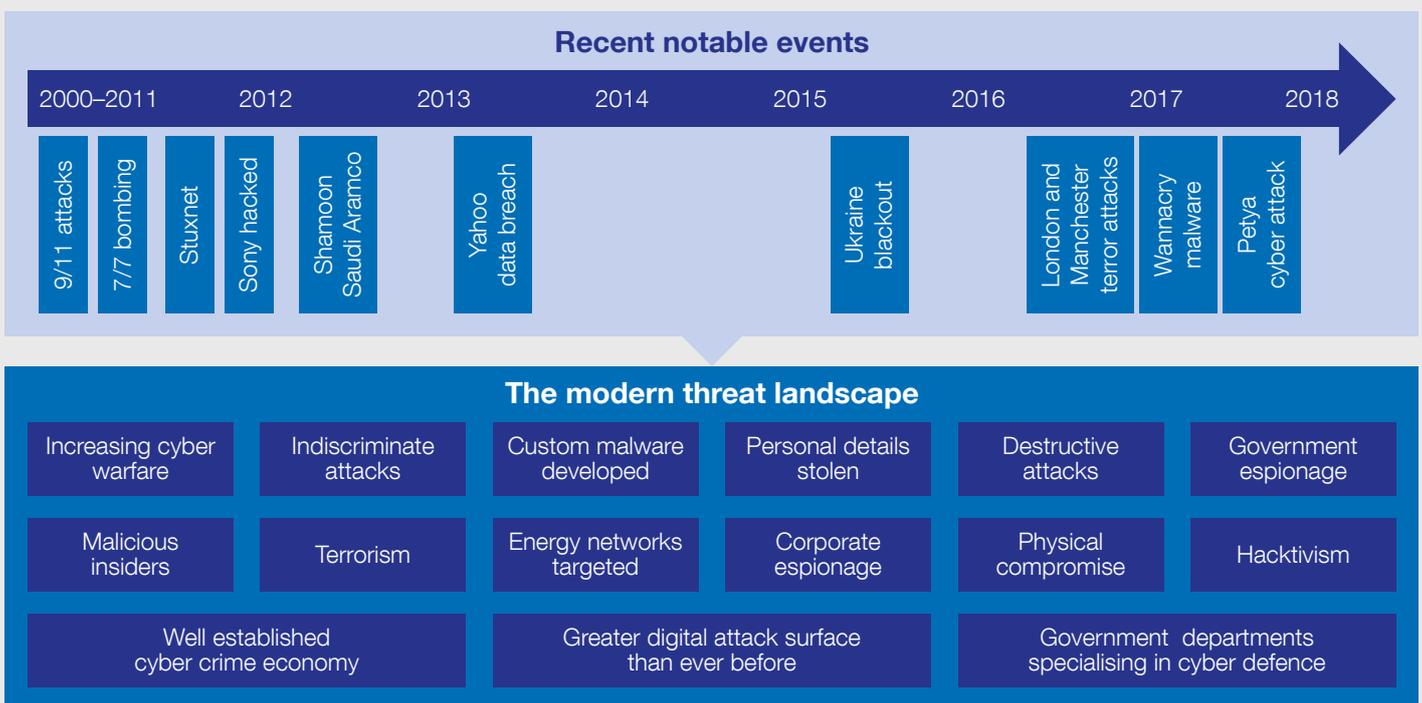
The UK Government is working with the Centre for Protection of National Infrastructure (CPNI) and the National Cyber Security Centre (NCSC) on this issue. It has set requirements for the levels of physical and cyber resilience that are in the national interest.

We work with these agencies to identify the most efficient way to meet these requirements. This requires operating and capital expenditure and will continue to do so in the future.

To protect national security, the Government restricts what we can say publicly about our current level of resilience and the specific measures we will take in the future to reduce vulnerability. For that reason, we have omitted specific details from this document.

“Protecting the gas transmission system is critical to security and reliability of supply.”

Figure 11.1: The modern threat landscape



What our stakeholders tell us

Stakeholders tell us that the way we manage security threats should be a priority. We understand this is because they identify with the increasing threat to society and their own businesses.

Stakeholders recognise that disruption to the GT Network and to their energy supplies would have direct, adverse consequences for them. Examples of what our stakeholders have told us:

“Cyber security for the transmission system is a national security issue.”

“Cyber security should be considered alongside physical security.”

“Outputs need to include cyber security and this needs to be funded.”

We must also consider the feedback from stakeholders about taking gas on and off the network where and when they want to. Any disruption to supply caused by external threats would have a significant impact on businesses and consumers’ day-to-day life. We speak about this more in Chapter 6.

Our activities and current performance

Background

Parts of the gas National Transmission System are classed as Critical National Infrastructure (CNI). This means that if they are compromised or not operating, it would have a major effect on essential services. There could be severe economic or social consequences and potential loss of life.

We look at this issue holistically. Our approach covers people, processes, site and data security. We understand that training, awareness and vigilance across our teams is just as important in reducing risks as headline expenditure on things like hardware and software.

Physical security

We review the need for physical security at our operational sites regularly. At each review the number of sites requiring extra protection is agreed with government.

Our RIIO-1 performance involves the ongoing delivery of this Physical Security Upgrade Programme. This work is mandated by government to protect the UK’s critical infrastructure. Our approach is in line with the information and guidance on physical security published by CPNI. You can read more on the [CPNI website](#).

“We understand that training, awareness and vigilance across our teams is just as important in reducing risks as headline expenditure.”

Evolving cyber threat

The frequency and risk of cyber-attacks is increasing. The threats we face are varied. They include malicious reconnaissance, theft of intellectual property and malware dropping, potentially to be used later.

The rising threat level is evidenced by events such as the Stuxnet malware which hit an Iranian power plant in 2010 and blackouts on the Ukrainian grid in December 2016 thought to be linked to similar malware.

What is the scale of the threat?

Malicious emails with harmful links or attachments containing malware are a common method of cyber-attack. Between 1 June 2018 and 31 December 2018, 283.9 million email attempts were made to National Grid employees. Of these, 225.1 million were considered ‘threat messages’ and stopped from reaching the recipient. A further 19.7 million unsolicited messages or ‘greymail’ was blocked. Only 39.1 million ‘clean’ emails were allowed through our screening process.

For further information on cyber threats see this [video](#) from the NCSC CYBERUK 18 conference.

NIS Regulations

The NIS Regulations came into effect in the UK on 10 May 2018. They aim to minimise the risk of cyber-attack and the resulting impact on UK CNI and the economy. This is in line with the NIS Directive aiming to raise overall levels of cyber security across the EU.

The NIS Regulations apply to a defined list of ‘Operators of Essential Services’ (OES). Each of these has a relevant ‘Competent Authority’ (CA) supporting and monitoring compliance. NGGT is a designated OES and within the energy sector the CA is a joint role. It is held by Ofgem and the Department for Business, Energy and Industrial Strategy (BEIS).

As the UK’s energy system changes, the danger from cyber threats is growing. This is in part due to the rapid digitisation of energy assets and the merging of IT systems with operational technology (OT) used for industrial processes and equipment.

During the RIIO-1 period, we have invested in enhancing cyber security controls and capabilities. The aim is to identify, defend against and recover from existing threats.

However, we know that the threat from cyber-attack is continuing to grow globally. In response, the Government is implementing the Network and Information Systems (NIS) Regulations to coordinate the mitigation needed.

“The frequency and risk of cyber-attacks is growing.”

Dealing with change

As the level, nature and response to external threats is uncertain, a re-opener mechanism has been used during the RIIO-1 period. This governs approval of our reasonable costs of complying with enhanced security requirements that had not yet been defined at the start of the period.

The May 2015 and May 2018 ‘re-openers’¹ have been used to adjust our RIIO-1 allowances in line with the evolving scope, volume of work and costs entailed. During RIIO-1 we have responded to cost challenges set by Ofgem and found more efficient ways to reduce costs.

¹ <https://www.ofgem.gov.uk/publications-and-updates/informal-consultation-riio-1-price-control-reopeners-may-2018>

Our direction of travel

We take our responsibilities as an Operator of Essential Services (OES) seriously. We will continue to take sensible measures to protect the integrity of the network in line with best practice and government requirements.

We intend to improve the safety and resilience of the transmission system. This will strengthen its ability to cope with and recover from malicious events that threaten GB energy supplies. This is what our stakeholders want and it supports consumers' desire to use gas as and when they want to.

We expect to extend our programme of cyber security resilience to reduce the risk of failure or compromise of our IT/Operational Technology estate. This is in line with the NIS Regulations.

We will also learn from the wider National Grid Group, where we own gas and electricity transmission and distribution networks across the north eastern United States.

Working closely with our US colleagues helps us to gain more powerful insights in our 24/7 analysis, and management of global security information and event data. We are competing to bring the best cyber talent in-house. We recognise that this is a new skill set needed in our workforce.

We will continue to put in place the enhanced physical security upgrades (capital expenditure) that are needed to protect our sites. Heading into RIIO-2 there will be higher ongoing maintenance activity. This relates to the increased security equipment that has previously been installed. We will also begin asset replacement for the older installations.

For the RIIO-2 period, we currently think that, where the scope of work is agreed in advance with the Government and Ofgem, funding should be included within our price control allowed revenue.

Where the scope is uncertain, or new requirements arise, we will seek to agree a suitable adjustment process. Finding the right way to work with the security agencies to monitor and adjust our delivery during RIIO-2 will ensure our effort and expenditure will benefit consumers even if circumstances change.

“Working closely with our US colleagues helps us to gain more powerful insights in our 24/7 analysis.”

“We are competing to bring the best cyber talent in-house. We recognise that this is a new skill set needed in our workforce.”

Our future costs for protecting the transmission system from cyber and external threats are uncertain because it depends on what threats emerge during the period. In the graphic below we have given the indicative cost of our known minimum response to the rising level and sophistication of external threats, especially cyber. To protect national security, the Government restricts what information we can share publicly about our current level of resilience and the specific measures we will take in the future to reduce vulnerability.



What it could cost

**T1
annual spend
£34m**

**T2 annual spend
£90m (known minimum)**

Key drivers for the changing trend and range:

- Increasing level and sophistication of external threats, especially cyber.
- The T2 indicative cost reflects known minimum response to mitigate increasing cyber threat.
- We are working with Ofgem and BEIS to confirm the scope of our work in response to new requirements of the NIS Regulations.



We welcome your views:

Chapter:
Cyber and external threats

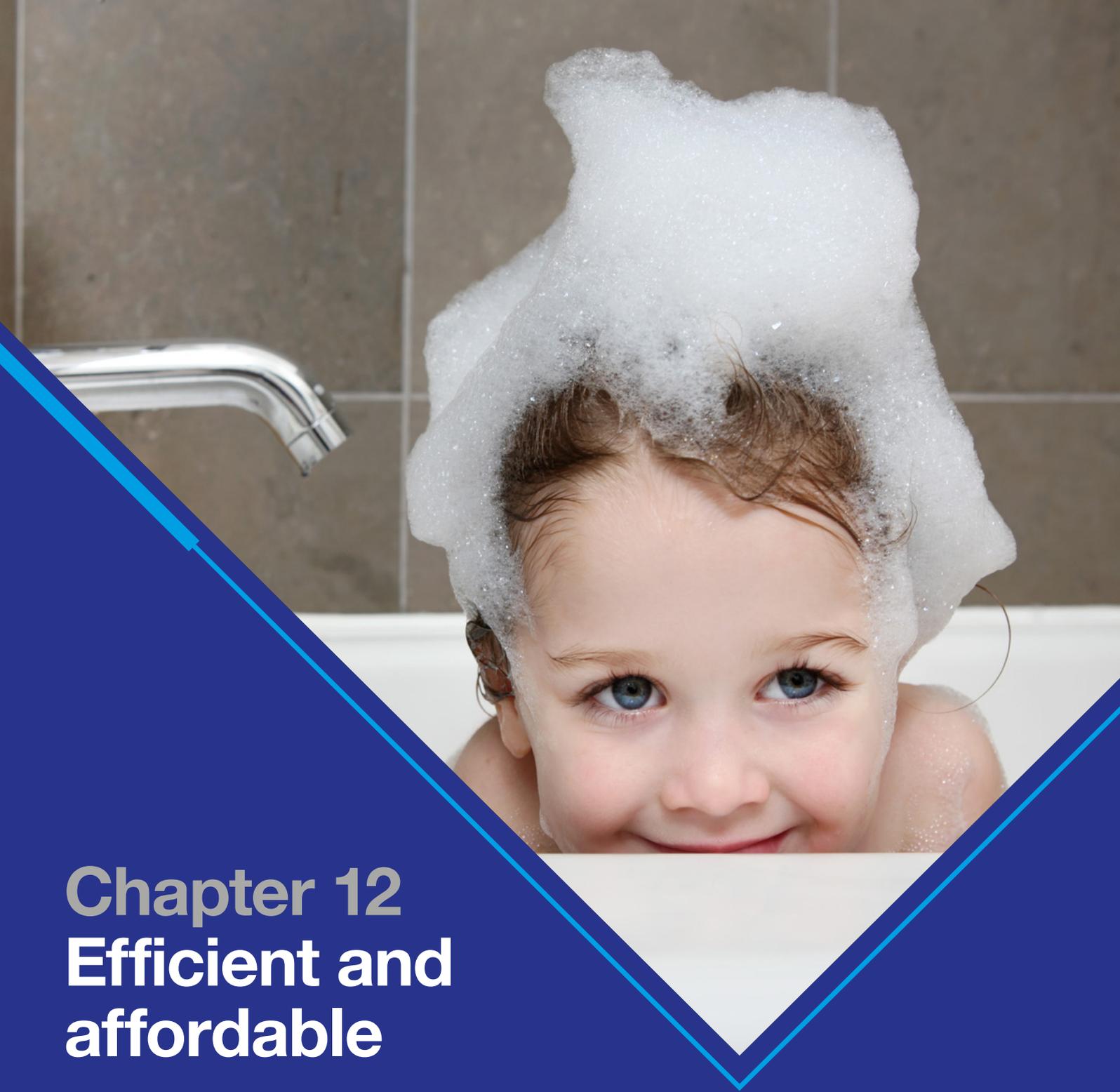
Question:
15. The detail of our cyber and physical security plans will be developed confidentially with Ofgem and the Government. How would you like to be kept updated?

Submit your feedback online [here](#):

Initial planning assumptions

We are basing our initial planning on the following assumptions:

- **External threats.** Our planning is informed by the current level of threat advised by the relevant authorities. The nature of threats and our required response is kept under regular review as circumstances change.
- **Physical security.** The sites where enhanced physical security measures are needed remain as prescribed to date by BEIS.
- **Uncertainty mechanisms.** We use the same critical factors and interpretation of the measures needed to mitigate threats as currently. We assume a RIIO-2 adjustment mechanism will be included to ensure consumers continue to benefit as the situation evolves.



Chapter 12

Efficient and affordable

I want you to be
efficient and affordable

**Gas
Transmission**

nationalgrid

12. I want you to be efficient and affordable

Summary

National Grid Gas Transmission delivers an essential service across Great Britain. One of our key priorities is keeping energy affordable. We strive to keep our impact on domestic and industrial consumer bills low and we work with our customers to keep energy affordable.

The services we provide add about £9¹ to the annual average domestic energy bill. In a time of rising energy bills, it is vital that we play our part in keeping costs down for all consumers, especially those who are vulnerable. Overall, we will continue to focus on carrying out our activities as efficiently as possible for the benefit of end-consumers.

We apply this principle across all our business activities and it informs how we will meet our stakeholder priorities.

What our stakeholders tell us

Stakeholders tell us that we have a part to play in keeping energy affordable for domestic and commercial consumers. They expect us to manage costs and risk in the interest of our direct customers and wider consumers.

We invest to make sure that our network provides the service that our stakeholders need and expect. Stakeholders see us as the experts managing the gas transmission system. They are also clear that we must do this economically and efficiently. More broadly, stakeholders want us to build both transparency and trust.

Direct stakeholder feedback:

“All the consumer cares about is the impact on their bill and security of supply.”

“I don’t know if we have the right to say the price is expensive or not, at the end of the day it comes down to trust.”

Consumers care about keeping their energy bills affordable. They see energy networks as dependable. This reflects well on how we have managed risk on consumers’ behalf in the past. We must continue to do so in future.

Our activities and current performance

The existing RIIO framework includes the ‘totex incentive mechanism’. This gives us a strong incentive to deliver target outcomes as efficiently as possible. We must achieve these outcomes within cost allowances set by Ofgem. However, we must not cut costs at the expense of customer service.

To make our performance transparent, we publish annual information on the outputs and forecast spend against our allowances.

Throughout RIIO-1, our outputs were strong across all the categories. To continue to deliver a safe and reliable network in RIIO-1 we have been investing more in our asset health and our asset management capabilities. This is vital in managing safety and the reliability risks of ageing assets. It is also in the longer-term interests of consumers.

‘Uncertainty Mechanisms’ are used to adjust our scope of work and allowances when circumstances change. In some cases, previously expected work has been deferred or is no longer needed.

In other cases, extra work has been added compared with the original baseline. Examples include upgrading the physical security of our sites and replacing a crucial section of pipeline beneath the river Humber.

Ofgem has scrutinised these changes to ensure they are in consumers’ interests and that the additional costs are appropriate.

We are engaging with Ofgem and our stakeholders to ensure there remains a strong totex incentive mechanism in RIIO-2. In our view this should include the right use of uncertainty mechanisms to safeguard both investor and consumer interests.

¹ Illustration based upon analysis of the average 2016/17 consumer bill, using Ofgem methodology.

Our direction of travel

Demonstrating efficiency and value for money in our plan

It is our responsibility to show how we are carrying out our activities at the right cost for consumers, providing value for money to all energy users. Many of the approaches, methods and models we use will be agreed with Ofgem.

We expect to prove value for money in our RIIO-2 business plan in several ways:

- We will listen to our stakeholders and take account of their views on where and how they think we could be more efficient.
- We will build in to 'business as usual' the cost efficiencies we have already achieved. This will ensure that consumers can continue to benefit.
- We will benchmark our asset unit costs against our historical and current costs. We'll include improvements that we are achieving over time. We will also compare our asset unit costs with evidence from independent experts. This will highlight where there is room for improvement.
- We will benchmark our business support expenditure against other organisations. This includes what we spend on human resources, finance, IT, regulatory compliance, procurement, insurance and property management.
- Where possible, we will continue to market test much of our spending through competitive tendering. This means we can test the market for the latest techniques and prices to achieve the best outcomes for consumers.
- We will carry out cost benefit analysis (CBA) and share what we find to explain our proposed spending plans. We want to be transparent about the alternative options we have considered and how we have maximised the benefits for consumers. For key areas of our plan, we aim to explore with stakeholders the merits of options such as different target levels for network reliability.
- We will show how we have optimised asset and non-asset solutions to meet consumer outcomes effectively. Asset solutions are where we install new assets or alter existing assets. Non-asset solutions are where we look to put in place commercial arrangements or change regulations.

Stakeholder challenge of our plan

Our goal is to deliver a truly stakeholder-led plan that delivers what our stakeholders want at an acceptable cost.

The stakeholder engagement process requires us to develop an overall package for RIIO-2 that reflects our stakeholders' views and represents value for money. The work we're doing will be reviewed by the [Stakeholder Group](#) and Ofgem's [Challenge Group](#).

Is our plan acceptable to customers and consumers?

We plan to survey domestic and commercial consumers on their willingness to pay e.g. for alternative service levels, such as reducing the risk of interruptions to gas supplies, that we could target in our RIIO-2 plan. This will better inform us about how much consumers value elements of what we do. We are also planning to survey consumers on whether they find our overall draft plan meets their needs. We will do this when we are closer to submitting our draft plan to Ofgem's Challenge Group.

Stakeholders tell us that volatility in our charges to direct customers could have adverse knock-on effects for wholesale energy prices. We will explore if there are ways for us to do things differently to bring benefits for consumers.

Clear output targets and fair adjustment mechanisms

Under RIIO, Ofgem identifies clear outputs that we need to deliver. These outputs help us to be efficient in what we do. There are two benefits to this approach. It holds us to account while also allowing us to get on and deliver target outputs at best value. We will engage with Ofgem and stakeholders to identify clear output measures for the future.

Some of these outputs may need to change during RIIO-2, for example if external circumstances change. Such changes can be handled by adjustment mechanisms like 're-openers' and 'uncertainty mechanisms'.

We have used these adjustment processes during RIIO-1. We will engage with Ofgem and stakeholders to agree the right mechanism to use in future.

Incentivised to always find a better way

A core principle of the RIIO framework is incentives. Across our total spending in RIIO-2 we expect to be incentivised to continually look for ways to deliver outputs more efficiently and at lower costs. Whenever we find a better way, the totex incentive mechanism ensures consumers start to benefit from our cost reductions during the current price control period, rather than waiting until the next price control.

We are engaging with Ofgem and our stakeholders to ensure there remains a strong totex incentive mechanism in RIIO-2.

Impact on consumer bills

As we develop our business plan, we will think hard about the potential impact on current and future bills. We calculate our consumer bill impact using Ofgem’s consumer bill methodology. This splits costs into segments including wholesale, environmental and network charges.

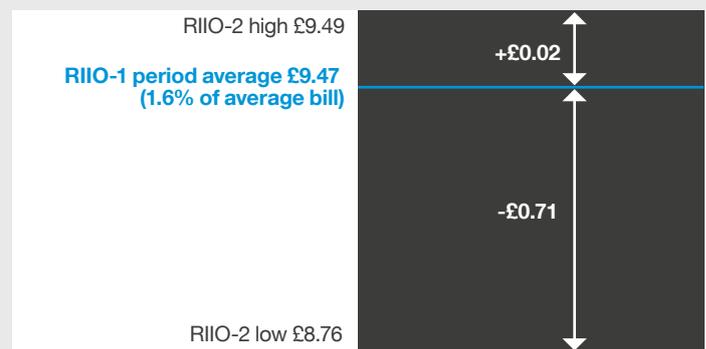
About half of our total revenue comes from the charges paid by our direct customers. This covers specific services as well as when they put gas onto the transmission system. This is considered part of wholesale market prices.

The remaining half of our total revenue is recovered as network charges when gas is taken off the system. This element is currently around £9² per year of the average domestic dual fuel bill.

Other things being equal, a plus or minus £100m per year variance in RIIO-2 totex could affect the gas transmission part of a typical domestic consumer bill by plus or minus 40 pence.

The impact of our provisional RIIO-2 totex range on consumer bills would be between a reduction of 71 pence and an increase of 2 pence on the average household gas bill. This is based upon a like-for-like comparison with RIIO-1 e.g. excluding output incentive revenue and not considering changes in finance parameters.

Figure 12.1 Indicative consumer bill impact



In this illustration we have not considered other factors that can have an impact on consumer bills such as cost of capital for RIIO-2 and future inflation.

For more information on the breakdown of an average consumer bill, please refer to our [website](#)³.

What it could cost

We deal with how we’re improving our processes in other chapters of this document. All these efforts contribute to the goal of being efficient and affordable.

However, we also need to factor in the other costs of running our business. Like any other large organisation this includes our business support activities such as human resources, finance, information technology and property management.

Being part of a larger group allows us to maximise efficiencies by using a shared services model where these core functions provide services to other National Grid companies.

² Illustration based upon analysis of the average 2016/17 consumer bill, using Ofgem methodology.

³ <https://www.nationalgridgas.com/about-us/breaking-down-your-bill>



What it could cost

T1 annual spend £68m

Low £60m **T2 annual spend range** **High £75m**

Key drivers for the changing trend and range:

- Organisational and other efficiencies from RIIO-1 have been embedded for RIIO-2.
- The extent of our support function costs will be influenced by the size of our overall RIIO-2 work plan.
- Our range is based on our current level of efficiency. As we develop the detail of our plan, we expect to share our ambition to deliver future efficiencies.

Initial planning assumptions

We are basing our initial planning on the following assumptions:

- **Efficiencies.** The efficiencies we have achieved during RIIO-1 will form the basis of our costs in RIIO-2. We will identify and commit to more efficiencies that we believe we can achieve during RIIO-2 when we submit our final business plan.



We welcome your views:

Chapter:
Efficient and affordable

Question:
16. What are your views on the methods we have proposed to demonstrate efficiency and value for money in our plan?

Submit your feedback online [here](#):



Appendices

Glossary
Assumptions

Glossary

Term	Definition
AGI	Above-Ground Installation.
ALARP	As Low as Reasonably Practical – a goal-seeking principle often used in health and safety legislation.
BEIS	Department for Business, Energy and Industrial Strategy.
Capex	Abbreviation for Capital Expenditure; for example, investment in building new transmission assets.
CLoCC	Customer Low Cost Connections. A project seeking to improve the experience of small and medium-sized customers (like biomethane producers) connecting to the gas transmission system.
CNI	Critical National Infrastructure.
CO	Carbon Monoxide.
COMAH	Control of Major Accident Hazard Regulations.
Consumer	All consumers connected to the Great Britain gas pipeline network, including domestic households, business and industrial users, and gas-fuelled power stations.
CPNI	Centre for the Protection of National Infrastructure.
Customer	Our customers are the people or entities who pay us for the products and services we provide e.g. Gas Distribution Networks, Shippers and directly-connected customers such as gas storage sites and gas-fuelled power stations.
ENA	Energy Networks Association.
FES	Future Energy Scenarios, a set of credible future energy pathways produced each year by National Grid.
GDN	Gas Distribution Network.
GMaP	Gas Markets Plan.
GNCC	Gas National Control Centre.
GT	Gas Transmission.
HSE	Health and Safety Executive.
LNG	Liquefied natural gas.
NCSC	National Cyber Security Centre.
NGGT	National Grid Gas Transmission.
NIS Regulations	Network and Information Systems Regulations 2018 – putting into UK law the requirements of an EU Directive aiming to improve preparedness for a cyber-attack.
NOx	Nitrogen Oxide gases that impact air pollution.
NTS	Gas National Transmission System.
OES	Operators of Essential Services as defined pursuant to the NIS Regulations.
Opex	Abbreviation for operating expenditure, for example expenditure on routine maintenance of existing assets.

Term	Definition
PSUP	Physical Security Upgrade Programme. A national programme initiated by the Secretary of State and now governed by BEIS. Its role is to deliver physical security upgrade solutions to critical sites.
Re-opener	A mechanism used in RIIO-1 to adjust allowed revenue part way through the period in light of new information or circumstances.
RIIO-1, RIIO-2	The first and second applicable periods for regulating network companies by a method known as Revenue = Incentives + Innovation + Outputs. For transmission companies the second period begins on 1 April 2021.
Stakeholders	Customers, consumers and other parties affected by our activities. Includes government and non-government organisations, regulatory bodies, consumer groups, academics and other interested parties.
T1, T2	Abbreviations for the first and second RIIO periods applicable to transmission companies
Totex	Abbreviation for total expenditure including operating expenditure (opex) and capital expenditure (capex).
UKCS	United Kingdom Continental Shelf.
UNC	Unified Network Code.

Assumptions

Topic	Initial planning assumption	Comment/next steps
GT Network – Future	Our view, shared by most stakeholders, is that there is a long-term future for gas and the GT Network to at least 2045.	This assumption is informed by the Future of Gas project and other internal analysis and external commentary. See Chapter 2 – Context.
GT Network – Access and capability	There is uncertainty over how customers will use the system in future, particularly the timing and location of where gas comes on and off the system. An appropriate balance needs to be struck between competing priorities of a low-cost network and customers' ability to move gas on and off the system unconstrained. See Chapter 6 – Gas on/off.	The physical size of our network and the commercial framework affects our ability to offer relatively unconstrained flow of gas over a wide and variable range of supply patterns. We will explore stakeholders' views on the costs and consequences of other options. This might include decommissioning certain assets, adding resilience elsewhere or exploring market-based solutions.
GT Network – Pipelines & AGI	Customer requirements in RIIO-2 are unlikely to alter the size of our core network in terms of pipeline route km and number of above-ground installations.	This expectation drives a base level of activity such as pipeline in line inspections and surveillance for third-party interference. See Chapter 5 – Safety.
GT Network – Compressors	We will need a programme of work on our gas compressors during RIIO-2 and beyond to comply with mandatory emissions legislation deadlines.	We will develop a strategy with input from our stakeholders and considering the potential future patterns of use of the network. See Chapter 9 – Environment.
GT Network – Value to society	The GT Network provides wider benefits to society. For example, it supports decarbonisation by flexing with gas-fired power stations to balance intermittent renewables. We should factor in these wider benefits when planning the development of the network.	We will undertake academic research to quantify the wider societal value of the GT Network including support for competitive wholesale gas and electricity markets. See Chapter 2 – Context.
Keeping options open	The GT Network is playing an important role in supporting decarbonisation. We should preserve a GT Network that keeps options open as insurance amid uncertainty about the way ahead for decarbonisation.	To expand the evidence base informing decisions, we will undertake external analysis on the value of the GT Network in enabling energy prices to remain affordable. See Chapter 2 – Context.
Supply and demand	We will anchor our analysis of network capability using the supply and demand scenarios and sensitivities in the Future Energy Scenarios 2018.	We will explain how we have used FES and which areas of our plan are impacted or not by uncertainty over future pathways.

Topic	Initial planning assumption	Comment/next steps
Ageing assets	We should target an appropriate level of asset health investment to mitigate the reliability risks from an ageing asset base.	We are using improved decision support tools and monetised risk modelling. We intend to consult stakeholders on the costs and consequences of different targets for service risk. E.g. keep the same or improve reliability by 10%.
Number of connections	Our initial assumption is that we can flex resources to process a variable number of customer connection needs that might arise in the period.	There is uncertainty about the level of customer activity that will come forward, for example from new entrants developing green gas schemes.
Incremental capacity	No 'anticipatory' incremental network investment would be included in our baseline plan, ahead of firm customer commitment (as at today's date there are no such firm commitments).	We propose that a revenue adjustment mechanism be included. If triggered our allowed revenue could be adjusted appropriately. See Chapter 7 – Connections.
Legislation	We assume no material changes in key industry legislation and best practice for compliance, including safety (COMAH, GS(M)R etc.), environmental (MCPD) and cyber (NIS Regulation).	Such key legislation drives our level of activity and costs, particularly in areas of safety Chapter 5, environment Chapter 9 and cyber Chapter 11.
External threats	We shall protect the system from cyber and physical threats in line with government requirements. The level of threat is per today's security services classification: threat from international terrorism = SEVERE, cyber threat as per 2017/18 NCSC guidance.	The level of work required in RIIO-2 could be higher if the threat changes or the interpretation of required mitigations changes. See Chapter 11 – External threats.
Physical security	The sites at which enhanced physical security measures are required remain as prescribed by BEIS.	Government and security services' advice will be reviewed and changed periodically. See Chapter 11 – External threats.
Market information	The information we provide to the market will continue to play a crucial role in the healthy running of the wholesale energy markets.	We will explore with stakeholders the type of information that is most valuable in making sure the wholesale gas and electricity markets run in the optimal way. See Chapter 8 – Information provision.
Network emergency coordination	National Grid continues to perform the role of Network Emergency Coordinator.	The costs for the NEC role will be factored into our RIIO-2 plan.
Finance parameters	Finance parameters (cost of debt, inflation indices etc.) have not yet been determined for RIIO-2. These parameters, together with our spending plans, will both influence the component of our costs which translates into future consumer bills.	These finance parameters will be reviewed with Ofgem during 2019 and we will update our assumptions accordingly for our draft business plan.

Assumptions

Topic	Initial planning assumption	Comment/next steps
Brexit	The form of Brexit has a neutral impact on our activities and costs.	There are uncertainties about our post-Brexit trading arrangements that could impact RIIO-2 activity, such as industry code change workload.
Price control allowed revenue	Where the scope of our RIIO-2 work is clear and we are best-placed to manage risks on behalf of consumers, we assume funding will be included in our baseline price control allowed revenue.	This principle represents established practice under the existing RIIO framework. National Grid is incentivised to manage efficient delivery on behalf of consumers.
Uncertainty mechanisms	In-period adjustment mechanisms would be appropriate to cope with changes in workload triggered by events outside our control. This might include incremental capacity requirements triggered by customers, and government response to security threats.	We think this is better for consumers than attempting to include uncertain work into the price control allowance. Various uncertainty mechanisms have been used in RIIO-1. We will develop further thinking on the detail to include in our draft business plan.
Mapping costs to stakeholder priorities	Costs are mapped to stakeholder priorities based on strongest relationship. This is the first time we have categorised cost data in this way to improve transparency of how costs relate to stakeholder priorities.	Some activities have at least secondary relevance for multiple priorities. We seek stakeholder views on whether this portrayal helps you to understand our plan.
Efficiencies	The efficiencies we have achieved throughout RIIO-1 will form the basis of our costs in RIIO-2.	We will work towards committing to additional efficiencies during the RIIO-2 period that we believe we can achieve when we submit our final business plan.

How to use this document

We want your feedback

Who is this consultation aimed at?

We are interested in the views of all stakeholders who are impacted by what we do and shaping the future of gas transmission. This includes the views of gas consumers, government and regulatory bodies, energy industry professionals and members of the public.

Tell us what you think

This consultation is open until 31 March 2019. You may give us feedback in the ways outlined below. We particularly seek your views in response to the specific questions we have posed. These are summarised on page 11. You may respond to all questions or just those relevant to your specific views.

Ways to feed back:

Make notes

We have provided space for you here to make notes. Type up your comments in the box provided, opposite, and send a copy of this document with your notes jennifer.pemberton@nationalgrid.com



Email

We have a dedicated email address specifically for your feedback to this document. We welcome your thoughts at:

jennifer.pemberton@nationalgrid.com



Alternatively, you can put your thoughts in writing and send to: Jennifer Pemberton, National Grid House, Warwick Technology Park, Gallows Hill, Warwick. CV34 6DA.

Online

You can go directly to the website and submit your comments [here](#).



**Please share
your thoughts:**

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