



Executive Summary

Our National Transmission System (NTS) Network Development Process (NDP) is underpinned by understanding:

- how our customers want to use our system, now and in the future
- how supply and demand patterns could evolve
- how legislative change could affect our system
- how asset health will affect our system development.

This year's Gas Ten Year Statement (GTYS) focuses on these key themes because we think they will have the most significant impact on how we plan and operate our network over the next ten years.

Customer requirements

The way our customers use our NTS has changed over the last ten years. Based on what our customers are telling us they are likely to need in the near future, we may not be able to meet these needs using our current system capability and operational strategies. Using our NDP we must develop new ways to plan and operate our system so we can meet these changing requirements.

The main changes in our customers' requirements are:

- customers are using the new Planning and Advanced Reservation of Capacity Agreement (PARCA) arrangements to reserve capacity before making final investment decisions on their projects
- customers ask for higher ramp rates and shorter notice periods, particularly in response to changes in the electricity market

- Gas Distribution Network Operators (DNO) want NTS flexibility to meet their customers' requirements in a world where demand is falling. We are developing new planning and operational tools to meet their requests
- long-term auctions no longer indicate a shipper's intention to flow. Diversity and extent of supplies can mean great variation in flow on the NTS from one day to the next.

In response to our changing customer needs and their impact on NTS System Flexibility, we have commissioned the GasFlexTool. This new tool will help us to better understand how future customer requirements on the system will evolve and to plan accordingly. We are embedding this tool in our processes and are now seeing the first results (Chapter 3).



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Future Energy Scenarios

As part of our Future Energy Scenarios (FES) process, we have developed four supply and demand scenarios. These are based on assumptions about prosperity and green ambition. In all four scenarios, security of supply is maintained for both gas and electricity.

Some important issues emerging from the 2015 FES need to be considered in the context of the capability of the gas network:

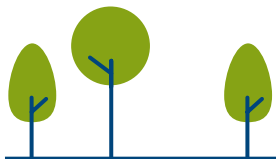
- **Increasing operability changes in the electricity industry** – our gas NTS must be flexible and capable of dealing with changing supply and demand. Traditionally, most gas-fired electricity generation has connected to the NTS, but in future more generators could connect directly to the gas Distribution Networks (DN). This will change the network interface and make gas forecasting and balancing on the NTS more challenging. We know the NTS will need to be more flexible. We are working to understand how we can make our NTS more resilient to future operational changes
- **Supply source uncertainty** – future NTS developments must be designed to adapt to changing gas supply locations and types
 - There are more unconventional sources of gas supply connecting at distribution level, which may mean over-supply in the Distribution Networks (DN) during the summer
 - Decline in the St Fergus flows means we must be able to move more gas south to north. The system has limited capability to do this and based on current network operation, capability and agreements, there will need to be system reinforcement to support Scotland to meet pressure and demand. We are talking to customers and stakeholders so we can operate efficiently together. The results of these discussions will be fed into the NDP so we can reassess the network capability and refine any reinforcement works that are needed.
- **Electricity Market Reform (EMR)** – Contracts for gas-fired generation were issued after the first round of electricity Capacity Market auctions. We are talking to developers so we are ready for the second round of auctions.



Legislative change

Change in legislation is a major trigger for investment in our network.

- The Industrial Emissions Directive (IED) will have a big impact on our compressor fleet and how we operate it. Over the past 18 months we have talked with stakeholders about the best options for our network. The options proposed for most sites were a mixture of retaining units on limited use (500 hours per year operation from 2016), limited life time (17,500 hours operation then decommission by 2023) and/or replacing with similar units that provide the capability we need. There are more details on a site-by-site basis in Chapter 5
- Running the IED stakeholder engagement programme meant we were able to present recommended options to Ofgem. This showed how we would comply with the IED and meet future stakeholder requirements, with a value of £420m (outturn) within RII0-T1. This compares to a like-for-like investment programme of approximately £900m
- We submitted our final proposals to Ofgem in May and on 30 September Ofgem published their decision to reject our request for additional funding to finance our proposed investment solutions
- In our view rejecting all of our investment proposals is not in the interests of consumers and users of the gas transmission network, as it creates significant regulatory uncertainty in relation to this critical IED investment programme
- We are working with Ofgem and finalising our investment decisions on the back of this decision
- As we have been considering the options about IED and its impact on the system, we have also been closely following the development of the Medium Combustion Plant Directive (MCP). The MCP sets out emission limit values for facilities that burn fuel with rated thermal output of 1–50MW and will impact 26 compressor units from our fleet. For gas compressors that are essential to the safety and security of the NTS we have been given until 2030 to comply with MCP. This extended period gives us more time to explore innovative solutions so we can comply with the directive in 2030. This pushes any system Need Case beyond the horizon of this GTYS edition. We will report on our strategy as it develops in future editions of GTYS.



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Asset health

Asset health is a key network output measure agreed with our customers, stakeholders and Ofgem as part of RIIO. Because the NTS is ageing, asset health is a key trigger for the NDP.

- Over the next year we will review some of our major strategic sites where asset health is a key driver. Rather than replace on a like-for-like basis, we will assess the ongoing and future requirements of each site so we can make the appropriate investments.

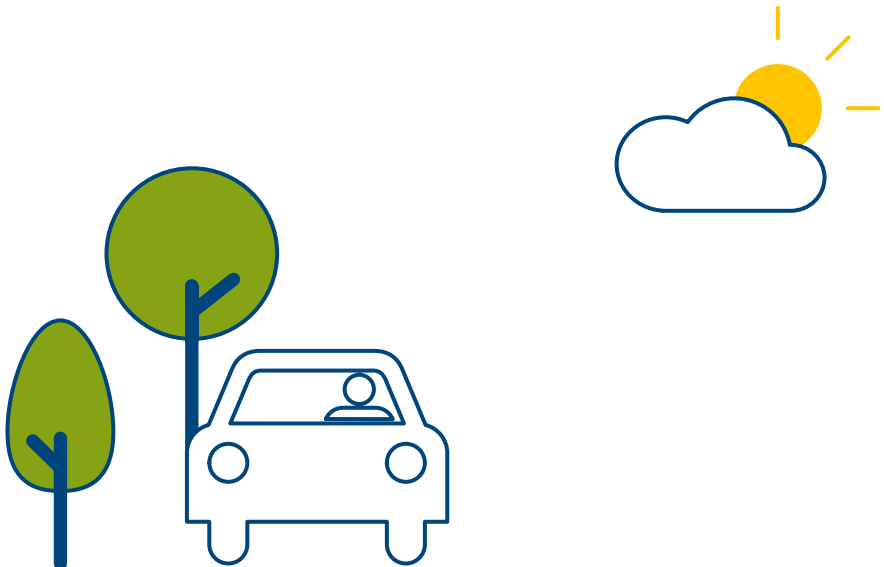
Customer and stakeholder engagement

Next year we will continue talking to you about IED, MCP and System Flexibility and tell you more about our progress with the GasFlexTool. We will arrange an industry-wide session to discuss developing a Gas System Operability Framework (GSOF). We would like to know if you would value a GSOF and what it could look like.

We will continue to develop the Gas Ten Year Statement (GTYS), taking your feedback into account to make sure that this document is valuable to you. We welcome your views on the content and scope of this year's edition.

Please let us know if you would like us to change anything or include more information in future editions. We are happy to receive feedback by any method including:

- customer seminars
- operational forums
- bilateral stakeholder meetings
- our GTYS mailbox: **Box.SystemOperator.GTYS@nationalgrid.com**
- our online survey at: **<https://www.surveymonkey.com/r/GTYS2015>**



Chapter one



Introduction



Introduction

Welcome to our 2015 Gas Ten Year Statement (GTYS).

We write the GTYS to provide you with a better understanding of how we intend to plan and operate the National Transmission System (NTS) over the next ten years.

We update you on current and future challenges which impact the way we plan and operate the NTS. We also discuss what we're doing to address them as System Operator (SO) and Transmission Owner (TO). We are keen to engage with you to get your feedback on what we're doing and how we're doing it.

GTYS is published at the end of the annual planning cycle. We use GTYS to provide information on an annual basis to help you to identify connection and capacity opportunities on the NTS. We summarise key projects and changes to our internal processes that may impact you.

1.1 What do we do?

Our role

We are the System Operator and Transmission Owner of the gas National Transmission System (NTS) in Great Britain. As System Operator our primary responsibility is to transport gas from supply points to exit offtake points safely, efficiently and reliably. We manage the day-to-day operation of the network including balancing supply and demand, maintaining system pressures and ensuring gas quality standards are met. As Transmission Owner we must make sure all of our assets on the NTS are fit for purpose and safe to operate. We develop and implement effective maintenance plans and asset replacement schedules to keep the gas flowing.

Our network

The NTS plays a vital part in the secure transportation of gas and facilitation of the competitive gas market. We have a network of 7,600km pipelines, presently operated at pressures of up to 94 bar, which transport gas

from coastal terminals and storage facilities to exit offtake points from the system (Appendix 1). At the exit offtake points, gas is transferred to eight Distribution Networks (DNs) for onward transportation to domestic and industrial customers, or to directly connected customers including storage sites, power stations, large industrial consumers and interconnectors (pipelines to other countries).

Our regulatory framework

The RIIO (Revenue = Incentives +Innovation+Outputs) regulatory framework was implemented by Ofgem in 2013/14. RIIO uses incentives to drive innovation to develop and deliver more sustainable energy. We are currently within the RIIO-T1 period (2013–21); under this framework we have set outputs which have been agreed with our stakeholders (for more information, please see Our Performance publication¹). We deliver these outputs in return for an agreed revenue allowance from Ofgem.

¹<http://www.talkingnetworkstx.com/our-performance.aspx>

1.2 Future Energy Scenarios

We published our latest Future Energy Scenarios (FES) publication in July 2015². We have created a credible range of scenarios, developed following industry feedback, which focus on the energy trilemma (sustainability, affordability and security of supply). The figure below summarises the four 2015 scenarios.

Our 2015 FES publication gives details of annual and peak gas supply for each of our four scenarios. The GTYS expands on the FES by adding locational information and highlighting implications for the future planning and operation of the NTS.

Figure 1.1
Here are the political, economic, social, technological and environmental factors accounted for in our four 2015 Future Energy Scenarios



²<http://fes.nationalgrid.com/>



Introduction

1.3 Emerging themes

Three key themes have emerged over the last 12 to 24 months:

- customer requirements
- legislative change
- asset health.

This year's GTYS focuses on these key themes and outlines what impact they will have on how we operate and develop our network over the next ten years.

These themes are all considered against a backdrop of the Future Energy Scenarios (FES) and run through each chapter to show their impact on our day-to-day network operation and at each stage of our NDP.

Customer requirements

Customer behaviour is changing. The NTS has to be able to respond in a more dynamic way; we call it system (or network) flexibility. Often it's not a case of one customer changing how they use the system, it's the combined impact of multiple changing customer behaviours. This makes it ever more challenging to plan and operate the system.

During 2014/15 you told us that system flexibility was really important and that you wanted us to discuss it with the wider industry. So we held an external stakeholder engagement event in London on 14 May 2015 to start an industry-wide discussion on this topic. We outline the key areas of discussion from the event and what we are planning to do next in Chapter 3.

Last winter we saw a record number of high linepack swing days. This highlighted the importance of making sure that our system is flexible and capable of dealing with significant within-day changes.

We are currently analysing how future operational scenarios may play out so we can develop operational strategies that we may need out to 2020 and beyond. We aim to develop and propose system flexibility output

measures that are clearly defined and can quantify both the impact of these issues and the benefits of the solutions. This work is discussed in more detail in chapters 2, 3 and 4.

Legislative change

Legislative change has a big impact on how we plan and operate our network.

In last year's GTYS we outlined the key elements of the Industrial Emissions Directive (IED) and how our network could be affected. In February 2015, we published our initial consultation stakeholder feedback document. Based on your feedback we developed an optimised strategy for our affected compressor fleet and submitted this to Ofgem in May 2015.

We discuss the impact of legislative change, including IED, in Chapters 2, 3, 4 and 5.

Asset health

The NTS comprises 7,600 km of pipeline, 24 compressor sites with 75 compressor units, 20 control valves and 530 above-ground installations (AGIs).

It's vital that we comply with all safety legislation that applies to operating the NTS while also maintaining the current level of network risk through maintenance and replacement. With so many assets on the system, including many that are ageing, we have a growing asset health issue. An ageing network needs more maintenance but we have to balance this with the changing needs on our network.

Our gas supplies have become more diverse and no longer follow the traditional north to south flows. The variability of power generation is expected to increase as renewable generation grows.

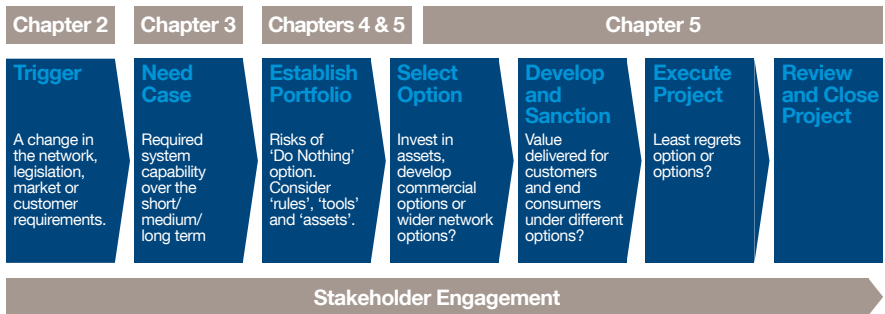
The impact of asset health on our network is covered in Chapters 2 and 5.

1.4 Network Development Process

We have changed the GTYS structure so that our investment decision process is more transparent. The 2015 GTYS is based on the initial stages of our Network Development Process (NDP).

Our NDP defines the method for decision making, optioneering, development, sanction, delivery and closure for all our projects (Figure 1.2). The goal is to deliver projects that have the lowest whole-life cost, are fit for purpose and meet stakeholder and RIIO requirements.

Figure 1.2
The Network Development Process



In GTYS, we focus on the first three stages of our NDP (Trigger, Need Case and Establish Portfolio) as these outline our internal decision-making process. The final three stages relate to physical asset build and non-physical solutions such as commercial options. These are briefly discussed in Chapter 5.

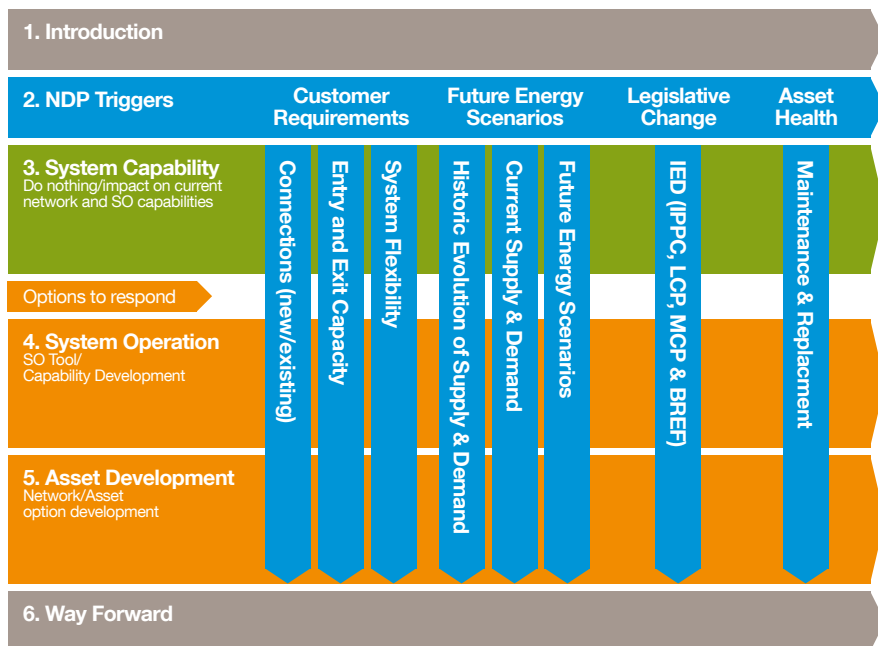
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1.5 GTYS chapter structure

Our new chapter structure (Figure 1.3) gives you a clearer overview of what happens at each stage of the NDP and how the stages link together to provide the most robust, cost-effective solution(s).

Along with our FES the impact of the three key themes are discussed throughout this year's GTYS.

Figure 1.3
2015 GTYS structure



Chapter 2. Network development inputs

There are many inputs that 'trigger' our NDP. For every trigger we assess the needs of our network to ensure it remains fit for purpose. We're in a period of great change, which may result in significant modifications to the way we currently plan and operate the NTS. We anticipate that we will have a wider range of triggers to our NDP in future.

This chapter covers four key triggers: customer requirements, the FES, legislation and asset health. We discuss these triggers and how they impact the current and future use of the NTS.

Chapter 3. System capability

This section outlines the current system capability of the NTS. System capability defines the maximum and minimum ability of our current network infrastructure to transport gas safely and effectively. We explore the Need Case stage of our NDP. This is where we assess our system capability requirements.

We provide information about system flexibility, entry and exit capacity, pressures, and the impact of the IED.

Chapter 4. System operation

This chapter explores part of the 'Establish Portfolio' stage of the NDP. We develop a portfolio of non-asset and asset solutions to meet the Need Case requirements. In this chapter we detail the specific ongoing and planned developments to our System Operator capabilities (rules and tools).

These developments make sure that we can keep planning to operate a fit-for-purpose network safely and efficiently, to deliver value for our customers and stakeholders.

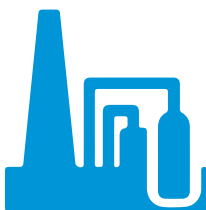
Chapter 5. Asset development

Here we consider the 'Establish Portfolio' stage with our asset solutions.

It sets out NTS reinforcement projects that have been sanctioned, projects under construction in 2015/16 and potential investment options for later years as a result of the IED. It also covers our asset health review. These are all assessed against the scenarios and sensitivities in our FES publication.

Chapter 6. Way forward

We're committed to meeting your needs and want you to help shape our GTYS and NDP. This chapter discusses our plans over the coming year and tells you how you can get involved.



530

Number of above-ground installations in the NTS network

Introduction

1.6 Other publications and information sources

We published the 2015 Future Energy Scenarios (FES) in July. They form the basis of the 2015 GTYS and many of our other related publications (see Figure 1.4).

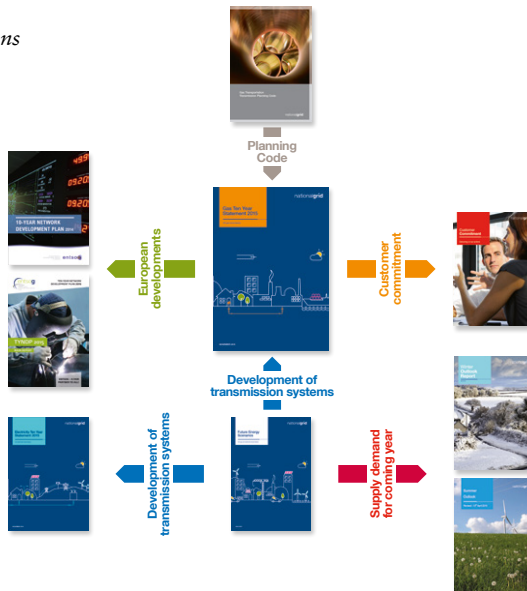
You may also be interested in the following sources of information:

- our Talking Networks site discusses the impact of the Industrial Emissions Directive on our compressor fleet³
- our Talking Networks site includes a new area to provide you with information on

the development of our strategy for System Flexibility⁴

- our industry information page includes the Gas Transportation Transmission Planning Code, which was published in April 2015⁵
- our information page for Gas Connections and application form⁶
- our information page for Planning and Advanced Reservation of Capacity Agreement (PARCA) and application form⁷.

Figure 1.4
Related publications



³<http://www.talkingnetworkstx.com/IED-welcome.aspx>

⁴<http://www.talkingnetworkstx.com/System-Flexibility.aspx>

⁵<http://www2.nationalgrid.com/UK/Industry-information/Developing-our-network/Gas-Transportation-Transmission-Planning-Code/>

⁶<http://www2.nationalgrid.com/uk/services/gas-transmission-connections/connect/>

⁷<http://www2.nationalgrid.com/UK/Services/Gas-transmission-connections/PARCA-Framework/>

1.7 How to use this document

How to use this document

We've colour coded each chapter, to help you find relevant content quickly and easily. And we've highlighted the main messages at the start of each section (see Figure 1.5). We'll use the same approach in our 2015 Electricity Ten Year Statement.

We'd love to hear your views on content and structure of the 2015 GTYS. If you'd like to get in touch, please email us at **Box. SystemOperator.GTYS@nationalgrid.com**.

Figure 1.5
How to use this document

Main heading
Clearly defined headings introduce the main topic dealt with on a particular page.

Subheadings
The main text is divided into sections by easily identifiable headings so that you can locate a particular piece of information.

Narrative
Including rich descriptions of the changing requirements of the system and what we are doing in response, as well as relevant breakout boxes and case studies.

Table
Provides data to support the analysis and provide key information.

Figure
Provides charts to support the data and analysis, enabling trends to be quickly identified.

The screenshot shows a document page titled 'Gas Ten Year Statement 2015' with page number 80. The main heading is 'System Flexibility'. Below it is a sub-heading '3.4.1 System Flexibility Scenarios'. The text discusses the development and operation of the NTS, mentioning energy use patterns and the impact of new gas supply. A table titled 'Table 3.1 GasFlex 2015 Summary' is present, with columns for 'Scenario' and 'Description'. The scenarios listed are CO2 Pricing, Supply Pricing, Storage Pricing, and High Intermittency Pricing. To the right of the text is a line chart titled 'Figure 3.8: Total NTS demand using ranges drawn by a very high wind (based on historical data and cold weather assumption)'. The chart shows 'Intermittency capacity (MW)' on the y-axis (0 to 100) and time on the x-axis (from 11/11 to 01/01). Three data series are shown: 'Historic' (black line), 'Supply' (red area), and 'CO2' (blue area). The chart shows a significant peak in demand during the winter months, reaching nearly 100 MW. Below the chart is a caption: 'Figure 3.8 shows that the maximum NTS flexible range for the CO2 pricing approach is more than double the current level by the end of the next decade. The output from the CO2 is based on the output of high CO2 flexible capacity and high supply with in day operation. The supply relation assumption is based on recent behaviour of specific supply points on the highest flexibility using day view observed on the NTS. The high CO2 pricing is assumed to be driven by wind intermittency. Hence, high wind historical data has been used, together with CO2 weather correlation. Figure 3.9 shows the CO2 contribution to the flexible NTS using these assumptions for each FES.' At the bottom of the page, there is a footnote: 'Footnotes Used for citations and further commentary.'

