Gas System Operator

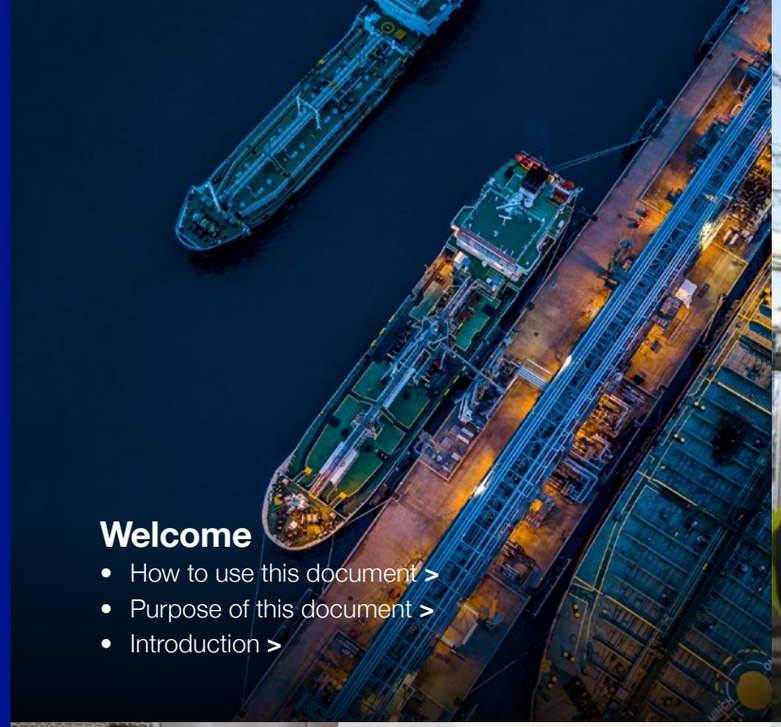
Stakeholder feedback

Gas Future Operability Planning October 2019

nationalgrid

Gas Future Operability Planning 2019

How to use this interactive document

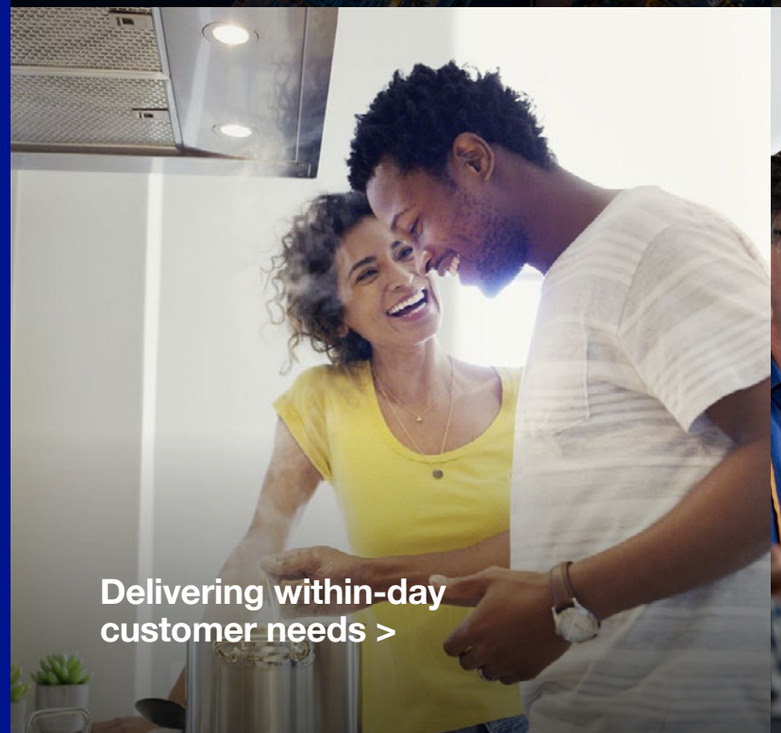


Welcome

- How to use this document >
- Purpose of this document >
- Introduction >

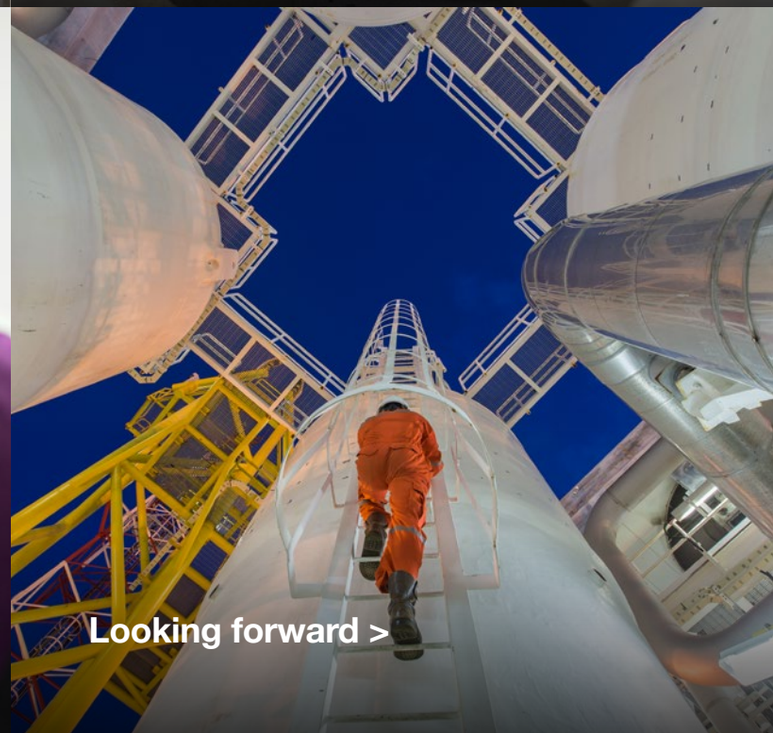
Future gas-fired generation demand >

Future gas supply patterns >



Delivering within-day customer needs >

Engagement >



Looking forward >

Welcome

How to use this document

The Gas Future Operability Planning (GFOP) is a quarterly publication delivered by the National Grid Gas System Operator.

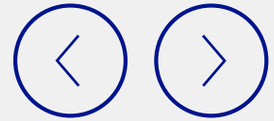
GFOP aims to shape the debate on how the changing energy landscape could impact the operability of the gas transmission system.

To help you find the information you need quickly and easily we have published this GFOP as an interactive document.

How to utilise the interactive document:

Home

This will take you to the welcome page.



Arrows

Click on the arrows to move backwards or forwards a page.

‘Hover over’ content

Words underlined will reveal their definition when you hover over them with your cursor.

‘Hover over’ information

An information icon will reveal further information when you hover over them with your cursor.

Enlarge/reduce

Hover over the magnifying icon to make charts bigger or smaller.

WWW.

Hyperlinks

Hyperlinks are highlighted in light blue throughout. You can click on them to access further information.

Welcome

Purpose of this document

Your feedback is important to us. The purpose of this document is to provide a summary of your feedback from the past 18 months. Here, we focus on our previous GFOP publications to provide:

Document purpose

Your feedback

Key messages

Potential next steps

Welcome
Purpose of this document

A high level visual of all GFOP publications can be seen below. You can click on a GFOP front cover to be taken to the full document.

GB gas transmission: November 2016

The first issue introduced Gas Future Operability Planning and how we planned to use it as a means to engage with our customers and stakeholders to understand your changing needs.

A changing energy landscape: November 2017

The second issue of GFOP focused on four current and future operability challenges to the National Transmission System (NTS).

1. Increasing gas and electricity interactions.
2. Decreasing UK Continental Shelf supplies.
3. Diverse and decentralised gas supplies.
4. Maintaining a balanced network.

Future gas-fired generation demand: March 2018

We shared how gas-fired generation demand could change over the next ten years.

Future gas supply patterns: June 2018

We illustrated the changing supply mix coming onto the NTS.

Delivering within-day customer needs now and into the future: February and March 2019

We explored what influences within-day behaviour and how this could change.

Welcome

Our customer and stakeholder priorities

Purpose:

We used the November 2017 GFOP publication 'A changing energy landscape' to gather insights and evidence from our customers and stakeholders on the key drivers of change that could result in operability challenges on the NTS.

We identified these drivers of change by analysing a wide range of supply and demand patterns forecasted in the 2017 **Future Energy Scenarios** out to 2050.

We shared these drivers of change with our customers and stakeholders and sought your views on our projections of future operability challenges.

Steps taken: Based upon our customer and stakeholder priorities, we completed detailed studies and published the results on three identified operability challenges:

1. Future gas-fired generation demand
2. Future gas supply patterns
3. Delivering within-day customer needs

Figure 1
Key drivers of change that could result in future operability challenges on the NTS

Driver of change	Contractual pressures may not be met…	2025	2030	2040	2050
Within-day supply patterns	South East	Consumer Power			
		Two Degrees			
		High Electrification			
		Decarbonised Gas			
Decreasing UK Continental Shelf (UKCS)	Scotland North West DN offtakes				Two Degrees
	Scotland		High Electrification		
				Consumer Power	
Changing supply mix	South East	Decarbonised Gas			
Gas-fired generation demand	South South East	Consumer Power			
	North West DN offtakes Eastern Direct Connects	High Electrification			
	North West DN offtakes Eastern Direct Connects	Consumer Power			
	South West	Decarbonised Gas			

Key messages: In the chart above, you can see that the South East is impacted by three of the four key drivers of change. Therefore, we completed a special focus on South East operability challenges in each of the March 2018 – 2019 GFOP publications.

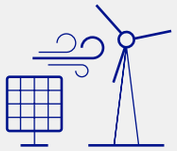
Future gas-fired generation demand

Summary

Purpose:

This March 2018 publication explored the role of gas-fired power plants in the UK's future power generation mix, focusing on increasing gas and electricity interactions.

Our analysis forecast the behaviour of gas-fired generation from 2017 to 2027, based upon the current (2017) Future Energy Scenario data.

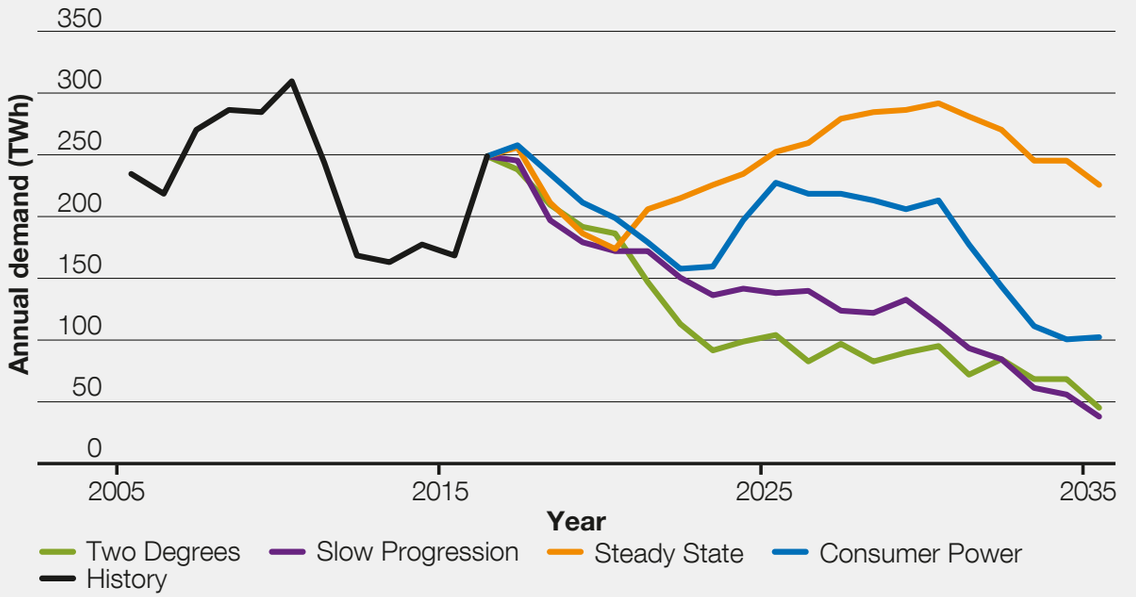


1. As the UK transitions towards a decarbonised energy future, gas-fired power generation will continue to play a vital role in supporting power generation to support intermittent renewable power generation such as wind and solar.

2. When and how often gas-fired power stations run on any given day will become increasingly variable in all future scenarios considered.

3. Depending on the energy pathway, National Grid could see a significant increase in decentralised gas-fired generation demand.

Figure 2
Annual gas-fired generation demand for each Future Energy Scenario



Key messages: We showed that continued change and uncertainty in the behaviour of gas-fired generation could lead to regional operability challenges, including increased risk of customer agreed contractual pressures not being met at specific offtakes in the future.

Future gas-fired generation demand
Your feedback

Based upon the results of this study, we asked for your views on:

1. **What do you believe will happen to gas-fired generation demand notifications in the future?**

1. You told us…

2. **What key factors influence how you take gas off the network?**

2. You told us…

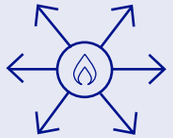
3. **What are the potential impacts of increasing gas-fired power stations connected to the distribution network?**

3. You told us…

When considering the future, you told us:

- As renewable power generation increases, power prices will become more volatile. This reduces the economics behind baseload gas-fired power stations, and may increase commercially driven peaking plant operation.
- Development of batteries and interconnectors could impact when gas-fired power stations are utilised.
- The current fleet of gas-fired power stations are ageing. This impacts their efficiency and thus the economics of utilising gas-fired power generation.

Options for next steps:



Undertake study to further explore the flexibility requirements for distribution networks (DNs).

Explore impacts of gas-fired power station re-notification frequency and magnitude increasing further in the future.

Future gas supply patterns
Summary

Purpose:

This June 2018 publication highlighted how the pattern of gas supply in Great Britain has changed dramatically over the past 17 years.

The UK has transitioned from being self-sufficient in gas in 2,000, to being dependent on imported gas for around 50 per cent of our needs by 2017, with the potential to reach 83 per cent dependency by 2035.

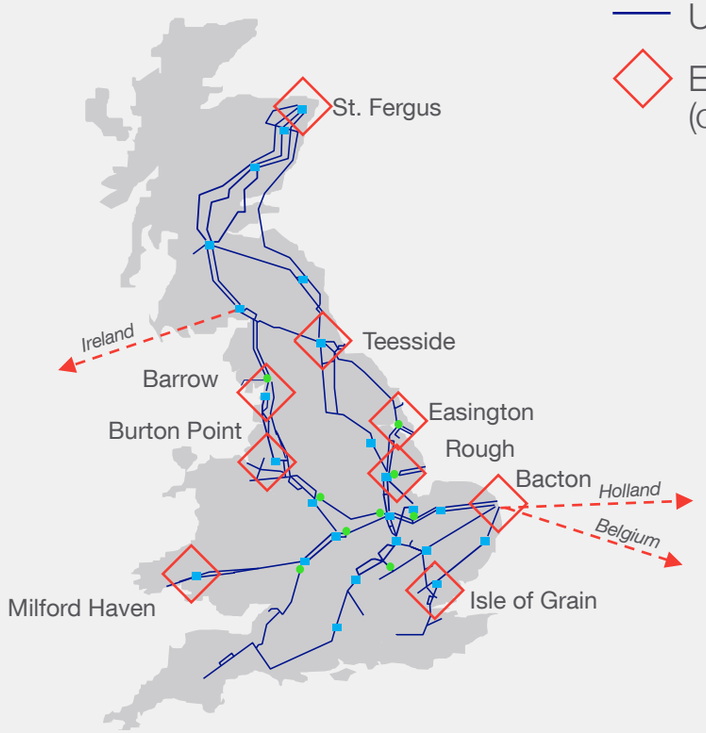
Supply from our UK Continental Shelf (UKCS) declined from 95 bcm in 2,000 to 38 bcm in 2017. This has been replaced with gas from the Norwegian Continental Shelf (NCS), Continental Europe, and the world market delivered as liquefied natural gas (LNG). As the UKCS continues to decline, we expect continued variability in future gas supply patterns looking forward.

In some Future Energy Scenarios, we consider the development of other gas sources including:

- shale gas
- biomethane
- hydrogen
- bio-substitute natural gas (bioSNG).

Some of these new supply sources may connect either to the NTS or to the distribution networks, or both.

Figure 3
UK gas Terminal and transmission infrastructure



Key:

UK transmission infrastructure

Entry point
(click for more information)

Key messages: We now see higher levels of seasonal and day-to-day variability in supply patterns in comparison to the past, making it more challenging for us to: design the system in anticipation of future needs, schedule maintenance and construction activities, and utilise our compressors within their original design parameters.

Future gas supply patterns
Your feedback

Based upon the results of this study, we asked for your views on:

1. **What key factors influence where you bring gas onto the network?**

1. You told us…

2. **Will where you bring gas onto the network become more variable seasonally and/or day to day in the future?**

2. You told us…

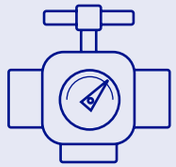
3. **What key factors influence how you take gas off the network?**

3. You told us…

When considering the future, you told us:

- Long-term predictability could change significantly due to decarbonisation efforts (i.e potential for increasing hydrogen, biomethane, bioSNG). Therefore, National Grid should consider this when developing the network.
- The new gas charging regime under EU TAR code will have an impact on where across GB gas will be brought on and off the network.

Options for next steps:



Insight pieces into increasing low-carbon gas in the network.

Delivering within-day customer needs
Summary

Purpose:

In this March 2019 publication, we set out to better understand what influences how gas is brought on and off the network and how this could change in the future.

Through our role as Gas System Operator (GSO), we observe that, throughout a gas day, supply and demand are rarely in balance. This means that our linepack levels fluctuate.

With this insight, we forecast the future outlook in order to test our physical network's capability to continue to meet future within-day needs.

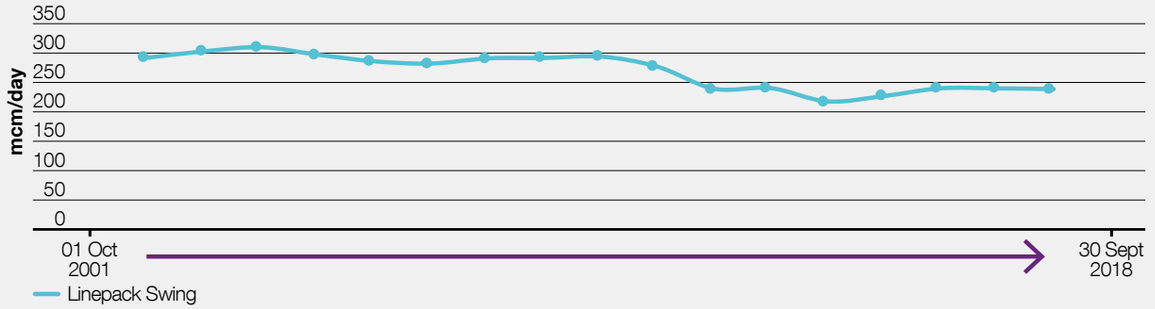
This publication was produced over three instalments in four months with particular focus on different customer and stakeholder needs.

Key messages: There are several underlying trends in within-day supply and demand behaviour that are leading to greater fluctuations in linepack.

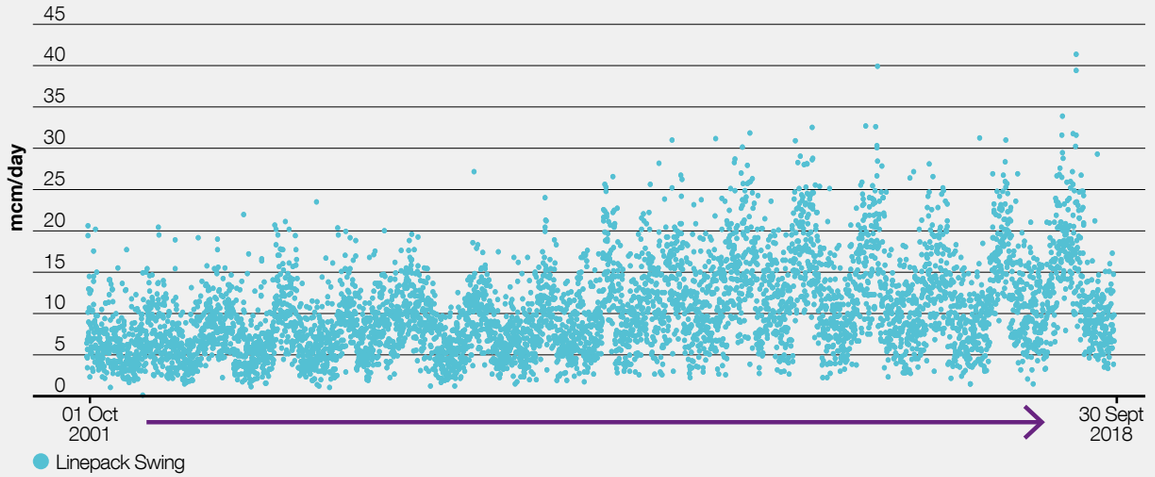
This makes it increasingly challenging for us to manage NTS pressures to ensure they remain within safe and contracted tolerances for our customers.

Figure 4
Declining annual demand with increasing linepack swing

Average annual demand level



Linepack swing on the NTS



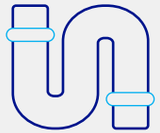
Delivering within-day customer needs

Your feedback

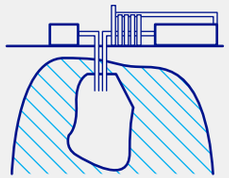
Instalment 1: Understanding within-day behaviour

We asked for your views on within-day behaviour.
You told us: the following are the potential drivers of change to within-day flow behaviour:

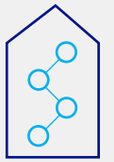
Industrials



UKCS/Norway

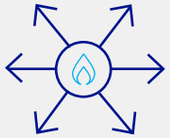


Storage

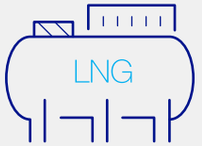


Interconnectors

Gas-fired power stations



Distribution networks



Liquefied natural gas (LNG)

Delivering within-day customer needs

Your feedback

Instalment 2: Understanding within-day behaviour

In this publication, we used your insights gathered from the bilateral meetings during Instalment 1 to forecast how within-day supply and demand behaviour could evolve by 2025, and how the resulting impact on levels of linepack swing could be managed.

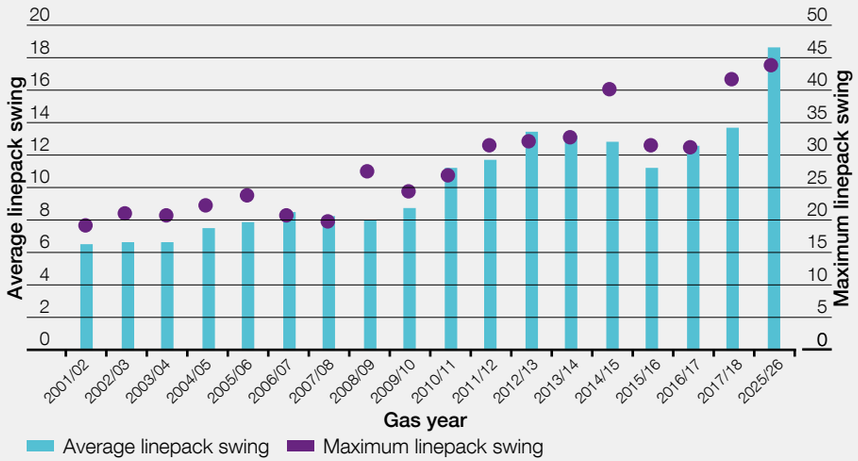
We gave you the opportunity to challenge our forecasts. Using our network analysis software, we forecast for 2025 how gas may be brought on and off the network within-day (see figure 5).

We forecast that despite reducing gas demand, the amount of linepack swing we manage will continue to increase.

We also forecast:

- Gas-fired power stations responding to more volatile within-day electricity price signals could become more variable in their demand levels. In 2025/26, the range between highest and lowest gas power generation daily demand could be over 100 mcm/day in the South East.
- Increases in small-scale gas-fired power stations connected to distribution networks could lead to increased intraday needs for gas above flat rate (1/24th).
- UKCS is forecast to decline to an average of 55 mcm/day in 2025/26. This will increase supply-driven linepack swing as alternative sources are typically less constant in delivery rate.
- As LNG operation is expected to increase, the daily level of supply-driven linepack swing managed will increase by up to 24 mcm/day in winter 2025 compared to 5 mcm/day currently.
- With interconnector imports expected to increase, the daily levels of supply-driven linepack swing that need to be accommodated (especially in winter) will increase.
- We expect storage operation to become less frequent. When operating, we expect within-day delivery rates to become less constant.

Figure 5
Forecast of linepack swing on the NTS



Delivering within-day customer needs

Your feedback

Instalment 3: South East focus study

You told us… you need within-day flexibility so that you can…

1. Respond to market signals (NBP, TTF, electricity prices).
2. Carry out maintenance during the day and meet your customer nominations later in the gas day.
3. Carry out operations in the most cost efficient manner, e.g.:
   - run your compression in the most cost effective way
   - bring gas on and off the NTS when transmission pressures are optimum for you.

We recognise these drive market and operational efficiency which ultimately maximises consumer benefit.

We concluded:

- We know that our physical network's ability to transfer gas in and out of the South East plays a crucial role in enabling customers to bring gas on and off the network in a manner that suits your commercial and operational needs.
- A sudden change in the amount of gas brought on or off the network can create significant operational challenges in meeting customer needs in the South East, especially if this occurs when national linepack levels are already declining or increasing.
- Overall, we have seen demand decreasing whilst the level of swing in linepack has increased. This means that we now see higher within-day imbalances and use our assets in a different way than designed in order to move gas where and when it is needed by our customers.

Options for next steps:

Further study to determine the impact of increasing linepack swing on our network. This has been an ongoing challenge for us.

Engagement

In 2018, we enhanced our website to improve user experience and introduced a new segment on the website titled ‘Operability Insight’. This section contains our latest thinking on the operational issues we are facing and a high-level summary of future publications. We have now seen a 700 per cent increase in the number of publication downloads.

After the introduction of these changes to our website, we have also seen the number of subscribers to the GFOP distribution list increase from:

1,030
in March 2018 to

2,427
by December 2018.

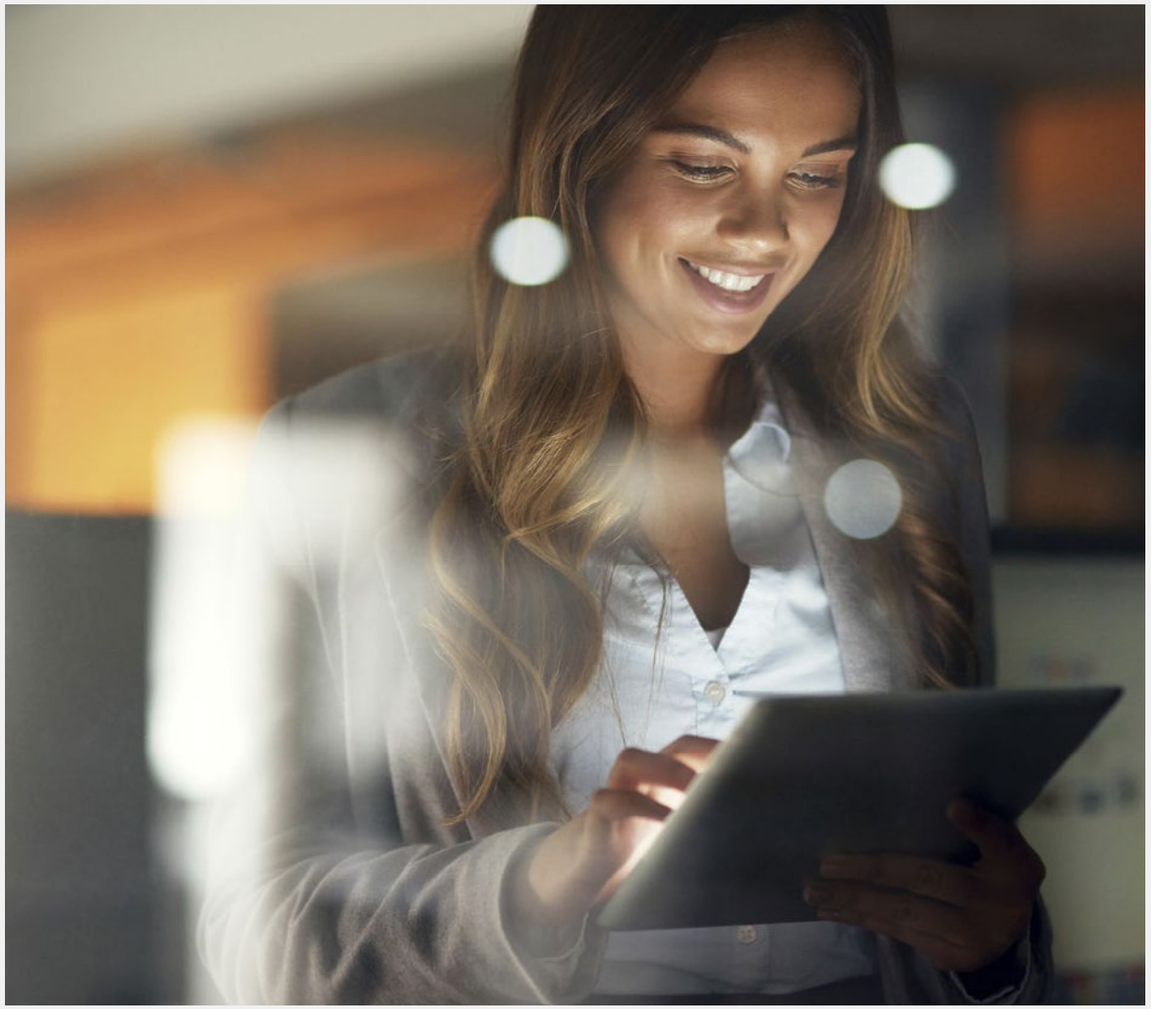
Over the last year, we have had:

103 attendees

on our webinars and have met with 40 customers and stakeholders via bilateral meetings.

For all future GFOPs we would like to continue to engage with you via a mix of:

1. bilateral meetings
2. GFOP publications
3. webinars
4. attending Gas Ops Forums and other forums.



Engagement

We want to continue to progress our engagement with you, please do tell us what is working for you and how we can improve GFOP going forward.

To get in contact with us, you can mail our box account box.gfop@nationalgrid.com. Or get in touch with any of the team:

Jon Dutton
Gas Network Strategy Manager
Jon.Dutton@nationalgrid.com

Karen Healy
Gas Network Strategy Analyst
Karen.Healy@nationalgrid.com

Susannah Ferris
Gas Network Analyst
Susannah.Ferris@nationalgrid.com

Adeolu Adesanya
Lead Economics Analyst
Adeolu.Adesanya@nationalgrid.com

Looking forward
Next steps:

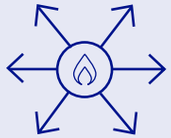
Through the RIIO-2 workstream we are reviewing how the capability of our network aligns to your future requirements.

If you'd like to know more about our network capability analysis, please visit our RIIO-2 website here.

Our upcoming GFOP and Gas Ten Year Statement (GTYS) stakeholder engagement plan is outlined below:

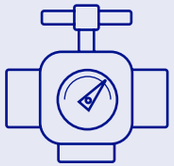
October 2019	• Publish GFOP: Stakeholder feedback and next steps • Present GFOP: Stakeholder feedback at Gas Ops Forum • Bilateral meetings upon request
November 2019	• Publish GTYS: Gas Ten Year Statement, with inclusion of operability challenges/potential GFOP focus areas
December 2019	• Webinar on GTYS • Bilateral meetings opportunity on operability challenges from GTYS
Each quarter of 2020	• Publications – topics TBC

Throughout this slide deck we have identified a number of potential areas to focus future GFOPs on:



Undertake study to further explore the flexibility requirements for DNs.

Explore impacts of gas-fired power station re-notification frequency and magnitude increasing further in the future.



Insight pieces into increasing low-carbon gas in the network, considering decarbonisation targets.

Further study to determine the impact of increasing linepack swing on our network.

If there are any of the above that you'd like us to prioritise, or if you have any other suggestions, please get in touch and let us know: box.gfop@nationalgrid.com

Glossary

Bcm
Billion cubic metres.

Biomethane
Biogas that has been further processed to make it suitable for injection into gas transmission or distribution networks.
Biogas: A naturally occurring gas that is produced from organic material and has similar characteristics to natural gas. We use biogas to refer to gas that is not of pipeline quality.

Bio-substitute natural gas (bioSNG)
Biomethane which is created by larger, more industrial, processes.

Hydrogen
The smallest, lightest and most abundant element in the universe. In gaseous form it is odourless, colourless and produces zero carbon emissions at point of use.

Linepack
The amount of gas within the transmission system at any time. We determine NTS linepack by calculating the volume of gas within the NTS pipelines using a network model and instantaneous measurements.

Linepack swing
The range between minimum and maximum linepack in the NTS within a gas day.

NTS
Gas National Transmission System.

Shale gas
Natural gas that is found in shale rock.

Variable
Patterns likely to change on a day, multiple days, seasons or years.

nationalgrid