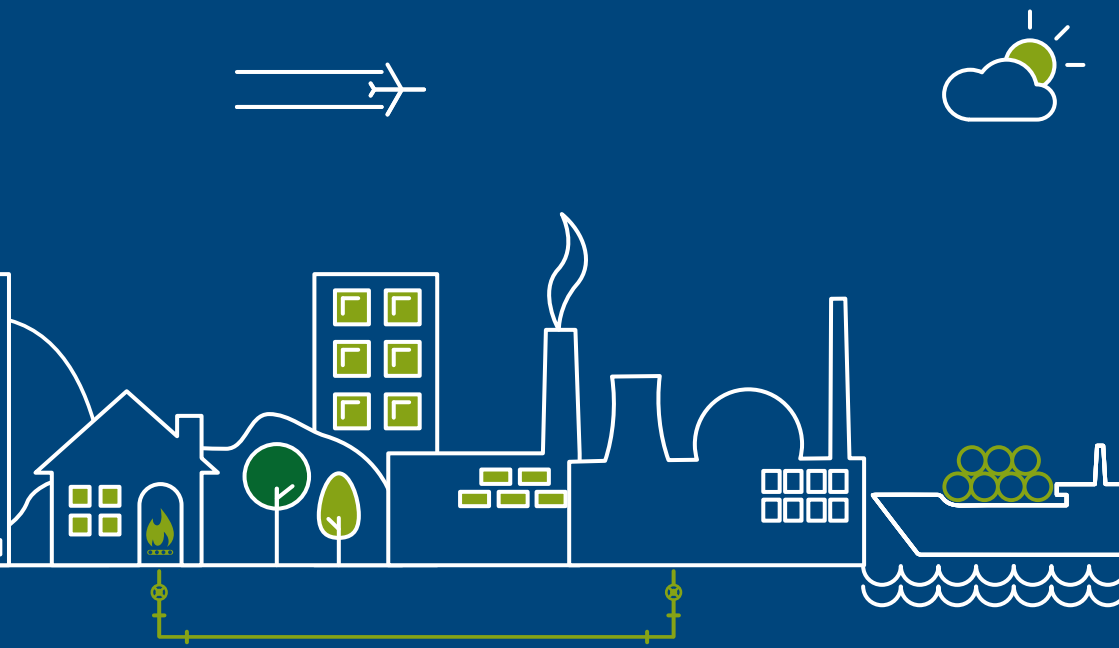
nationalgrid

Gas Future Operability Planning 2017

A changing energy landscape



NOVEMBER 2017

How to use this interactive document

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

Home
This will take you to the contents page. You can click on the titles to navigate to a section.

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

A to Z
You will find a link to the glossary on each page.

Hyperlinks
Hyperlinks are underlined and highlighted in the chapter colour throughout the report. You can click on them to access further information.

The gas landscape has changed considerably in the past 15 years. With developments in technology, evolving business models and changing consumer behaviour, we expect this to continue. National Grid has an important role to play in working with our stakeholders to ensure we have a safe, secure and reliable energy future.

The current and future direction of energy policy and the shape, size and mix of the future energy network in Great Britain (GB) is uncertain. In all scenarios, gas networks are an important part of the future energy picture. Therefore, it is important for us to understand how the use of our network might change in both the short and long term. There are some important choices to make about our priorities for investment and focus for innovation in order to provide long-term value for GB gas consumers and to ensure we continue to meet your needs.

This year's *GFOP* will consist of four quarterly publications released over the course of 2017/18. ***GFOP 2017 – A changing energy landscape*** is the first of these and introduces a number of current and future operability challenges affecting the National Transmission System. Our subsequent documents will provide a more detailed assessment of these challenges.

I hope that you find this document useful as a catalyst for wider debate. Please share it widely and encourage anyone with an interest in the future challenges facing gas transmission to get in touch and become part of the debate. Details of how to do so are included at the end of this document.

Andy Malins,
Head of Network Capability and Operations, Gas

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Chapter one

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1.1 What is *Gas Future Operability Planning*?

An energy system with high levels of distributed and renewable generation has become a reality. The aim of our *Gas Future Operability Planning (GFOP)* document is to describe how this changing energy landscape and your changing requirements may affect the future capability and operability of the National Transmission System (NTS) out to 2050.

The energy landscape in which we all operate continues to change. We have a key role as the GB gas System Operator and Transmission Owner in securing our energy future. The way we plan and operate the NTS needs to be more flexible to allow us to quickly respond and adapt to both current and future changes.

The market does not currently have a vehicle in which all participants can discuss and quantify future gas transmission network needs and operational challenges. The *GFOP* fills that gap (see Figure 1.1) and complements the *Gas Ten Year Statement (GTYS)*[1].

The *GFOP* assesses a range of views of the future through the lens of the *Future Energy Scenarios (FES)*[2] and *Future of Gas (FOG)*[3] sensitivities. It aims to set the direction for solutions, not prescribe them, across codes, services and assets. We will work with all interested parties to make sure that the right commercial options (rules), operational arrangements (tools) and physical investments (assets) are considered across the NTS.

[1] http://www.nationalgrid.com/gtys

[2] http://fes.nationalgrid.com/

[3] http://www.futureofgas.uk

Figure 1.1
The role of the Gas Future Operability Planning *document*

Scenarios
We use our Future Energy Scenarios as the starting point for all our future network planning.

Assumptions
We need to make assumptions about the more uncertain elements of the future and which areas to focus on first e.g. areas of greatest uncertainty or impact on the future of gas, our network and customers.

Analysis
We then complete our network analysis based on the scenarios and assumptions we have made.

Network Impact
We then assess the impact and document what this could mean for our network and our customers, what problems we may encounter and what possible solutions there may be. Anything we decide to take further action on will be detailed in the GTYS.

Actions
What action we need to take now in our investments or processes etc.

The *GFOP* will allow you to:
- tell us what you think might happen
- tell us how your use of the NTS might change
- challenge our assumptions
- provide evidence for other areas we should look at
- explore options/opportunities for collaborative working.

The *GFOP* will then help us to:
- understand the impact
- identify and quantify operability risk
- quantify capability requirements
- discuss potential options (rules, tools and assets)
- provide a starting point for innovation and collaboration.

The *GFOP* will allow us to more clearly articulate:
- what operability issues we have identified
- their extent – localised or national
- when they are likely to occur
- what capability is required
- what potential options we are aware of
- what the consequences could be on our service.

In *GTYS* we will outline:
- how we are responding to these impacts
- what options we are taking forward
- what changes we are making to our decision-making processes
- what changes we are making to our operational processes and what the consequences could be on our service.

Executive summary

1.2 Our 2017 *Future Energy Scenarios*

Gas is critical to security of energy supply. As we continue to transition to a low carbon future, gas will have a long-term role as a flexible, reliable and secure energy source which is cost-effective for consumers.

We published our latest *FES* in July 2017. We created a credible range of scenarios, following industry feedback, which focus on the energy trilemma (sustainability, affordability and security of supply).

While the Future Energy Scenarios are our core energy pathways, the *Future of Gas (FOG)* programme has developed two sensitivities that set out the role gas could play in meeting the 2050 carbon emission target.

Figure 1.2 summarises our four scenarios: **Consumer Power**, **Two Degrees**, **Steady State** and **Slow Progression**. It also describes our two sensitivities: **High Electrification** and **Decarbonised Gas**.

Figure 1.2
2017 scenarios and sensitivities

Consumer Power

In a **Consumer Power** world there is high economic growth and more money available to spend. Consumers have little inclination to become environmentally friendly. Their behaviour and appetite for the latest gadgets is what drives innovation and technological advancements. Market-led investments mean spending is focused on sources of smaller generation that produce short- to medium-term financial returns.

Steady State

In **Steady State** business as usual prevails and the focus is on ensuring security of supply at a low cost for consumers. This is the least affluent of the scenarios and the least green. There is little money or appetite for investing in long-term low carbon technologies, therefore innovation slows.

Slow Progression

In **Slow Progression** low economic growth and affordability compete with the desire to become greener and decrease carbon emissions. With limited money available, the focus is on cost-efficient longer-term environmental policies. Effective policy intervention leads to a mixture of renewable and low carbon technologies and high levels of distributed generation.

Two Degrees

Two Degrees has the highest level of prosperity. Increased investment ensures the delivery of high levels of low carbon energy. Consumers make conscious choices to be greener and can afford technology to support them. With highly effective policy interventions in place, this is the only scenario where all UK carbon reduction targets are achieved.

High Electrification adopts an ambitious approach to the electrification of heat, decarbonisation of transport and roll-out of renewable generation. Through considerable government support and intervention, electricity meets the majority of residential and commercial heating needs. Peak heat demand is supplemented by gas boilers and some industrial processes still require gas.

In a **Decarbonised Gas** world, the 2050 carbon reduction target is met without a major switch to electric heating. Heating in some cities is provided by burning hydrogen which is created from natural gas. Carbon capture and storage (CCS) is essential, both in hydrogen production and at gas-fired power stations. With CCS supporting a high roll-out of renewable capacity, there is no need for nuclear generation.

Executive summary

1.3 *GFOP 2017 – A changing energy landscape*

Since our first *GFOP* edition last November, the *FES* and *FOG* stakeholder engagement programmes have captured your views on both current and future operability challenges.

Workshops showed a broad consensus on the key operability challenges and opportunities facing gas and the NTS:

- maintaining a balanced network
- increasing gas and electricity interactions
- diverse and decentralised gas supplies.

This document uses our scenarios and sensitivities to introduce these challenges by highlighting potential implications to the future planning and operation of the network out to 2050.

Figures 1.3 and 1.4 shows gas and electricity demand for all our scenarios and sensitivities. Across our four scenarios, **Two Degrees** and **Consumer Power** represent the lowest gas demand and highest overall energy demand respectively. In **High Electrification**, annual gas demand is at its lowest by 2050. Contrastingly, in **Decarbonised Gas**, demand by 2050 is comparable with its highest ever levels, last seen in the early 2000s.

We have therefore focused on the future operability challenges we could face in a **Two Degrees**, **Consumer Power**, **High Electrification** and **Decarbonised Gas** world. This ensures we capture a range of gas and electricity demands.

Figure 1.3
Annual gas demand for all scenarios and sensitivities

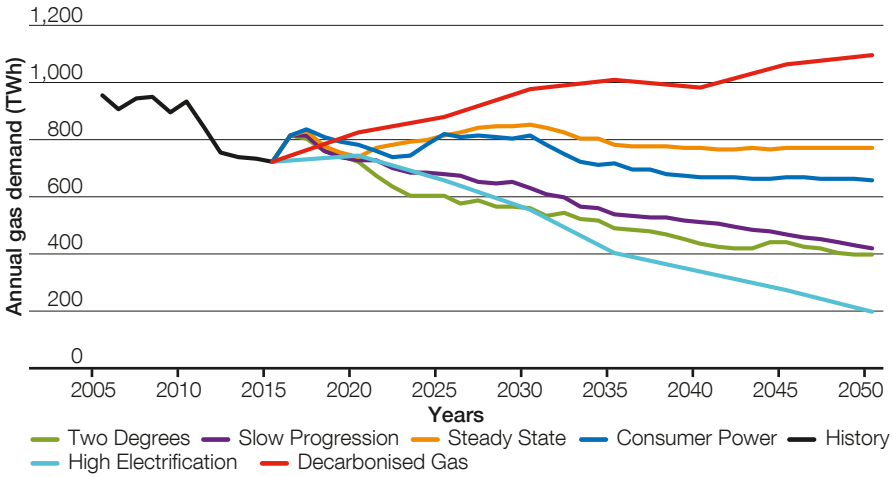
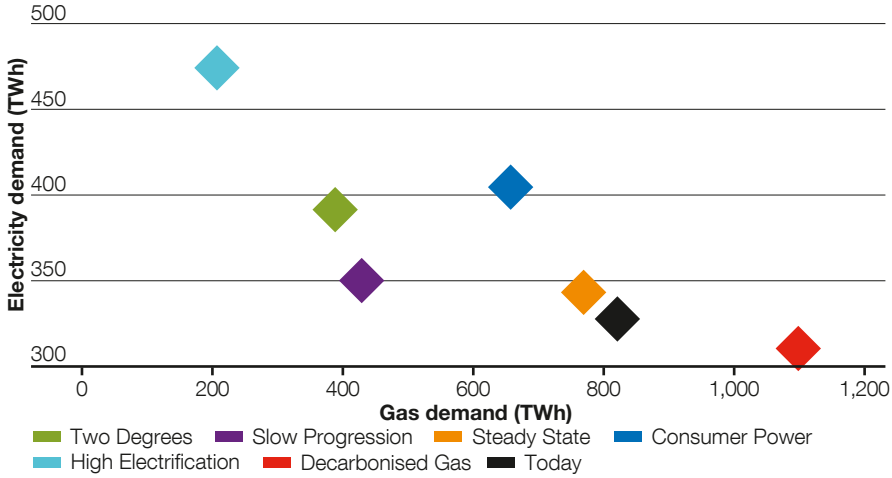


Figure 1.4
Gas demand vs electricity demand for all scenarios and sensitivities in 2050



Executive summary

1.4 Key messages

The *GFOP* introduces the challenges we could face in ensuring we continue to maintain a resilient, safe and secure NTS out to 2050. It will act as a platform for debate. Your input on the most important elements of the future energy landscape will determine how we prioritise what challenges we focus on.

Maintaining a balanced system

- The magnitude of within-day gas system stock swings has almost doubled over the past two decades. Average stock swing in 2016/17 was 11.5mcm/day compared to only 6.5mcm/day in 2001/02.
- There is a notable trend for our more commercially responsive customers to reconcile their positions later in the gas day.
- To date these trends have not caused significant impacts to our customers. However, we need to understand them in more detail to ensure that our network and commercial regime remains fit for purpose into the future. We will be developing this understanding over the course of 2017/18 and will present our findings in one of our quarterly publications.

Gas and electricity interactions

- As wind and solar capacity connecting to the electricity grid increases, gas-fired power stations may be required to operate more flexibly to bridge the power generation gap.
- We will assess and quantify the risks and opportunities of increasing gas and electricity interactions on operability in our next quarterly publication.

Changing gas supply mix

- Since 2000, declining production from the UK Continental Shelf (UKCS) has led to our dependency on imports to satisfy gas demand to grow to 55%. By 2050, this is expected to increase to above 75% in three of our four scenarios.
- Out to 2050, the remainder of our energy needs could be met through developments in shale, biomethane and bio-substitute natural gas (bioSNG) production.

Future operability challenges from our Future Energy Scenarios out to 2050

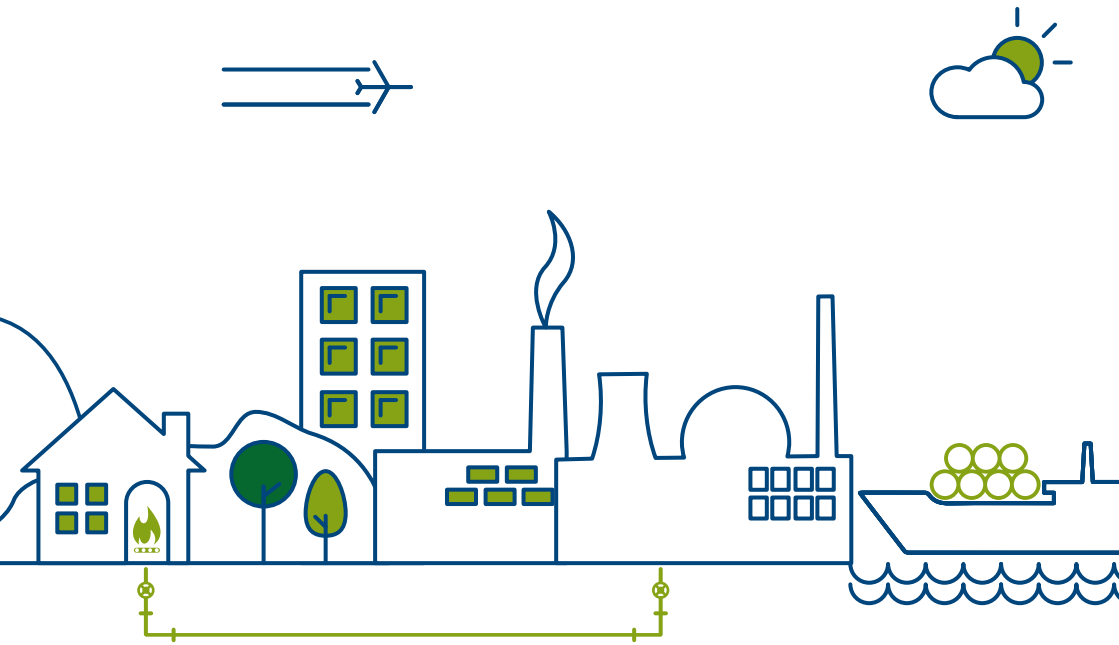
- Our assessment of the future has highlighted potential operability challenges that require innovative solutions.
- From 2025, within-day supply pattern volatility at import terminals could result in contracted pressures not being met.
- Declining UKCS production and increasing Irish export demand leads to difficulties in meeting contracted pressures across Scotland. Supply and demand patterns in **Decarbonised Gas** can maintain contracted pressures in Scotland.
- Gas-fired power station demand from new and existing sites may cause contractual pressures to be missed across multiple regions.
- In our Future Energy Scenarios, shale gas production in the north helps to alleviate some of these operability challenges. In reality successful development is not guaranteed. This creates uncertainty around the duration and permanence of these issues.

Next steps

- In the coming months, we will host webinars/events to get your feedback on the operability challenges introduced in this document. We will also be engaging with you at industry forums.

Figure 1.5
Future operability challenges we may face out to 2050 for each scenario

	NTS contractual pressures may not be met…	because of…	at…	2017	2025	2030	2040	2050
Section 2.1 Maintaining a balanced system	in the south-east	within-day supply pattern volatility at import terminals	summer, winter and peak demand		Consumer Power			
					Two Degrees			
					High Electrification			
					Decarbonised Gas			
Section 2.2 Meeting contractual pressures in Scotland	across Scotland and North West DN offtakes	low St Fergus supplies, no shale development and increasing Irish export demand	peak demand		Two Degrees			
			summer, winter and peak demand					Two Degrees
	across Scotland	low St Fergus supplies, no shale development and increasing Irish export demand	summer, winter and peak demand			High Electrification		
		increasing Irish export and gas-fired power station demand	winter and peak demand		Consumer Power			
			summer, winter and peak demand				Consumer Power	
Section 2.3 Changing supply mix	in the south-east	high levels of imports at the Bacton and Isle of Grain terminals	peak demand		Decarbonised Gas			
Section 2.4 Gas and electricity interactions	in the south and south-east	high demand from new and existing gas-fired power stations in the south and south-east	peak demand		Consumer Power			
	at Eastern and North West Distribution Network offtakes and eastern Direct Connects	increasing gas-fired power station demand and gas stock level swings in the north-east	peak demand		High Electrification			
			summer, winter and peak demand		Consumer Power		High Electrification	
	in the extremities of the south-west	high gas-fired power station demand in the south-west from new and existing sites	peak demand		Decarbonised Gas			



Chapter two

A changing energy landscape

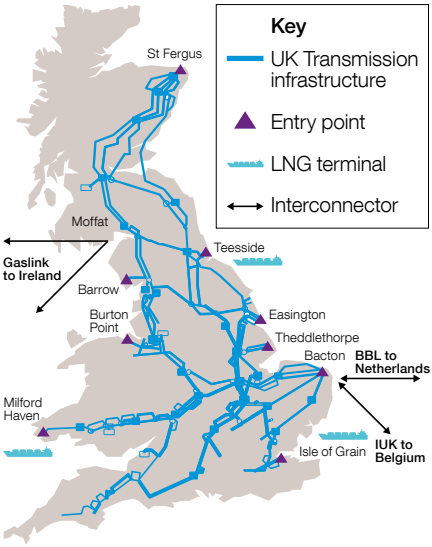
The shape, size and mix of the future energy network in Great Britain is uncertain. It is important for us to understand how the use of our network might change in the short and long term.

2.1 Maintaining a balanced system

The National Transmission System (NTS) is made up of 7,600km of pipelines. It is operated at pressures of up to 94bar and transports gas from coastal terminals and storage facilities to exit offtake points from the system (see Figure 2.1).

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).

Figure 2.1
Current NTS map



Our role as System Operator

As GB gas transmission System Operator it is our responsibility 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.

What is gas stock level and system balancing?

We need to ensure total gas supply equals, or is close to, total demand on a daily basis at a national level. It is the primary responsibility of gas shippers to balance daily supply and demand. As residual balancer of the GB gas market, we take actions on the network if this is not being achieved. Given that the obligation is only to balance by the end of the gas day, we see fluctuations in the gas stock level within our network of pipes as supply and demand follow different profiles.

How we correct system imbalances and manage gas stock levels

We manage gas system stock on a national and zonal level. We need to ensure that NTS pressures remain within defined operational and safety limits. These pressure limits are determined by the maximum operating pressures of our assets and the minimum contractual pressures that we have agreed with our customers. We use forecasts provided by our customers to inform the need to take balancing actions on the network.

A changing energy landscape

2.1.2 Managing gas stock level

The capacity of the network to store gas means that our ability to meet localised demand is affected by the distribution of gas across the network. Within-day supply and demand pattern volatility provides a daily operability challenge, impacting our ability to efficiently and effectively move gas around the NTS.

There is a notable trend that our more commercially responsive customers are bringing more gas onto the network in the final third of the day – also known as 'back-loading' (see Figure 2.2). This has led to a significant increase in the range between minimum and maximum stock level in the NTS seen within a gas day (see Table 2.1 and Figure 2.3).

Figure 2.2
Percentage of days between 1 Oct 2012 and 30 Sept 2015 that more or less gas was supplied in the final third of the gas day

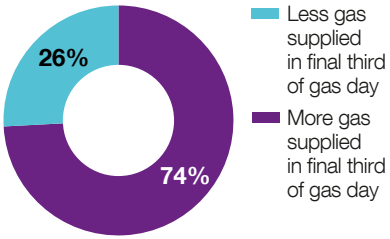
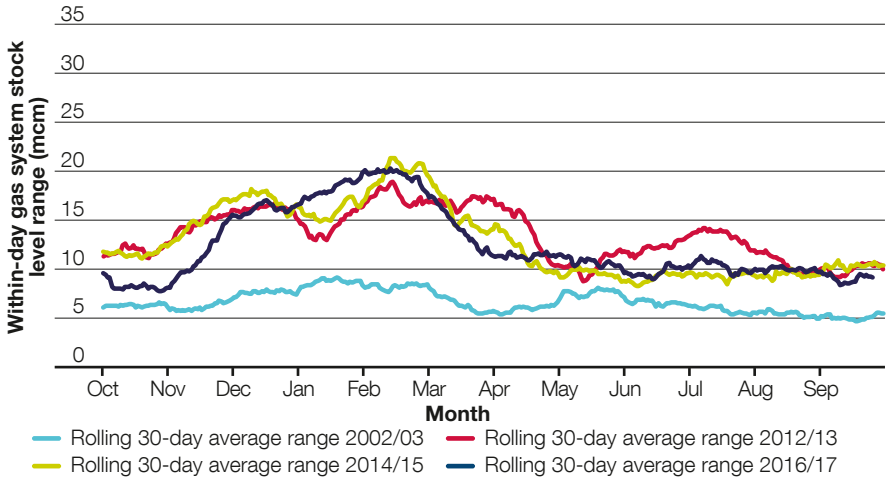


Table 2.1
Number of instances where within-day gas system stock swing has fallen within a particular range

	2002/03	2005/06	2007/08	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
10–15mcm	24	61	78	167	175	216	199	203	127	138
15–20mcm	4	16	11	63	70	107	114	90	51	80
20–25mcm	–	–	–	16	13	29	47	42	15	34
25–30mcm	–	–	–	3	3	6	8	10	3	9
30–35mcm	–	–	–	–	–	–	–	2	–	2
>35mcm	–	–	–	–	–	–	–	1	–	–

Figure 2.3
Rolling 30-day average range of NTS gas system stock levels



A changing energy landscape

To assess the future impact of these trends, we have incorporated the recent changes made to the Transmission Planning Code[4] into our analysis by applying recent historic within-day profiles to supply and demand points. Across all scenarios, if these supply profiles continue at the Bacton import terminal, we may struggle to meet minimum contracted pressures at nearby offtakes from 2025 onwards at all demand levels.

In **Consumer Power** and **High Electrification**, an increase in demand from both new and existing gas-fired power stations causes gas stock level swings in the North East of the network. This results in multiple offtake pressure issues which will be discussed in detail in Section 2.4.

Gaining a better understanding of the different components of gas system stock swings will allow us to quantify what level poses more of an operational challenge to the NTS. We will be developing this understanding over the course of 2017/18 and will present our findings in one of our quarterly *GFOP* publications.

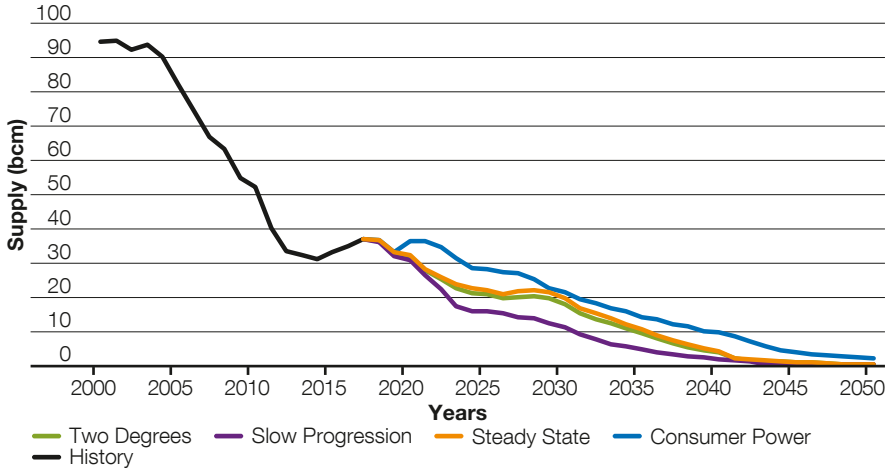
[4] https://www.nationalgrid.com/uk/gas/charging-and-methodologies

2.2 Meeting contractual pressures in Scotland

From the mid-1990s to 2000s, supply patterns were dominated by the UKCS. Gas mainly entered the system at terminals in the north and travelled southward. The system was thus built to move gas from the north to south.

From the mid-2000s onwards, as the UKCS declined, new imports and medium-range storage sites were added to meet demand. A continued decline in production from the UKCS is expected across all Future Energy Scenarios (see Figure 2.4).

Figure 2.4
Annual supply pattern for the UKCS

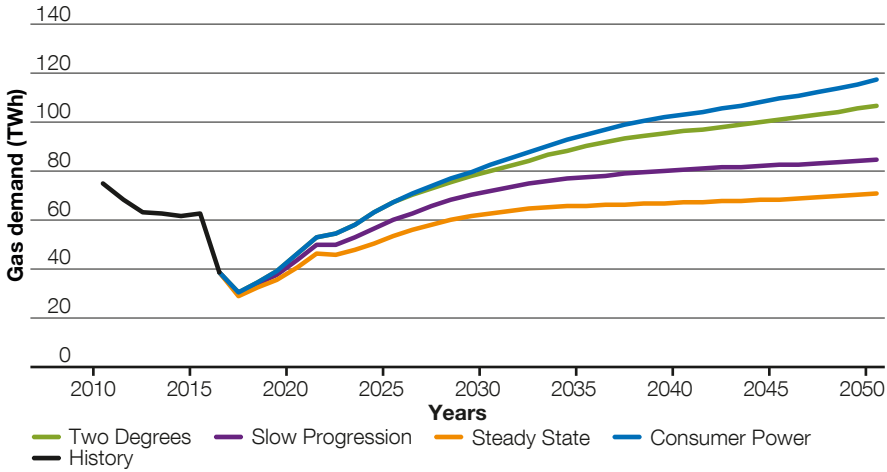


A changing energy landscape

Reduced UKCS production results in a decrease in supply at St Fergus, the only entry point in Scotland. In the past, gas export demand at the Irish interconnector has been satisfied by supply flows from St Fergus.

Our scenarios expect demand from Ireland to continue to increase out to 2050 (see Figure 2.5). A combination of increasing Irish demand and declining St Fergus supply causes net gas flow in Scotland to reduce significantly.

Figure 2.5
Annual gas demand from the NTS to Ireland



In **Two Degrees** and **High Electrification**, there is little investment in gas. Therefore, maximising supply from the UKCS or developing shale gas production in the north is not incentivised.

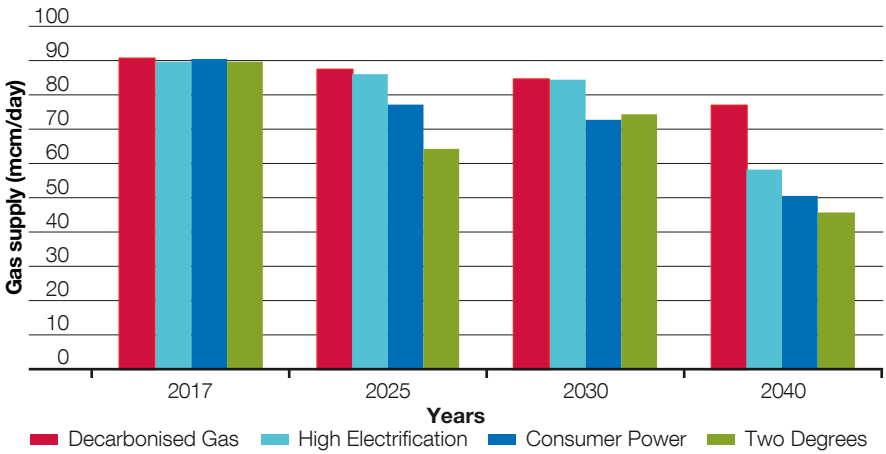
From 2025, in **Two Degrees**, low net gas flow results in an inability to operate key compressors needed to meet contractual pressures across Scotland at peak demand. From 2040 onwards, these pressures can also not be maintained at summer and winter demand levels.

From 2030 onwards, at all demand levels, Scottish contractual pressures are unsupported in **High Electrification**.

In **Consumer Power**, government policies are focused on gas which maximises UKCS and shale production. Despite this, high Irish export and an increase in gas-fired power station demand from new and existing sites results in net flows in Scotland being too low for existing large compressors units to be used. Consequently, at winter and peak gas demand levels, contracted pressures are missed across Scotland from 2025 onwards. Pressures can also not be maintained at summer demand levels by 2040.

St Fergus in a **Decarbonised Gas** world sees the highest supplies when compared to any other scenario (see Figure 2.6). This is supplemented by high levels of shale gas production at entry locations in the north. This results in net gas flows in Scotland being high enough to operate key compressors and meet contracted pressures across Scotland out to 2050.

Figure 2.6
Peak day supply at the St Fergus terminal



A changing energy landscape

We have seen in **Two Degrees**, **Consumer Power** and **High Electrification** that from 2030 our network struggles to meet contracted pressures in Scotland. However, supply and demand patterns similar to those seen in **Decarbonised Gas** will allow us to meet contracted pressures out to 2050. We are working to understand:

- how our system needs to adapt to meet future supply and demand patterns
- how the use of our assets may change in the future
- whether an asset-based solution will be needed to meet pressure obligations in Scotland.

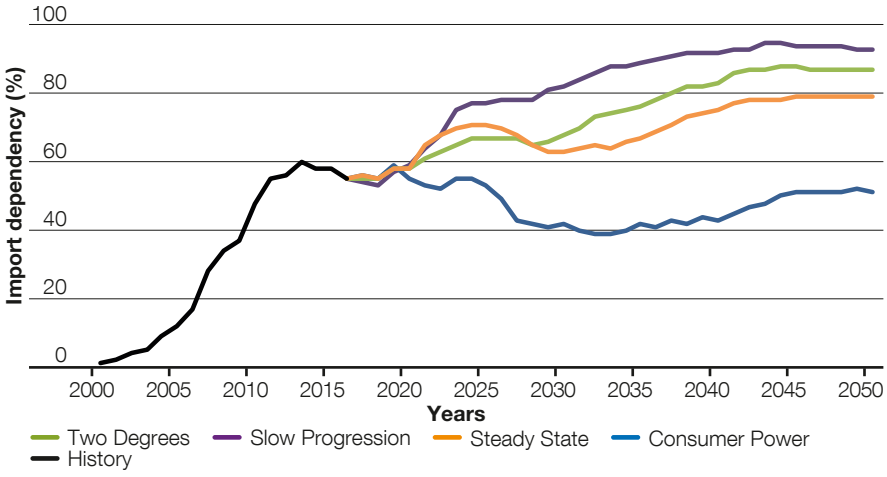
The *GTYS* discusses the challenge of securing Scotland under our 1-in-20 obligation. It also explains the issues we face with ageing assets and how we are improving our ability to assess risk and prioritise network investments. Your continued input will help us find the most effective and economic solutions.

2.3 Changing supply mix

As we progress towards meeting the 2050 carbon emission target, gas will have an important role to play in delivering the most cost-effective decarbonised future. We have seen in Section 2.2 that UKCS production could reduce to zero by 2048. Supply must therefore come from alternative sources.

Since 2000, our dependency on imports to satisfy gas demand has grown to 55%. We are now dependent on gas from Norway, continental Europe, and the world market (delivered as liquefied natural gas [LNG]) to meet more than half our needs. By 2050, this is expected to increase to above 75% in three of our four scenarios (see Figure 2.7).

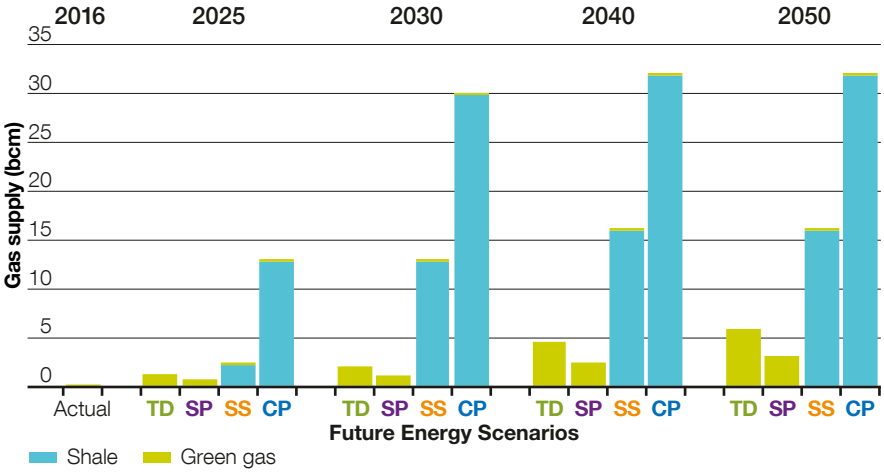
Figure 2.7
Gas supply import dependency



A changing energy landscape

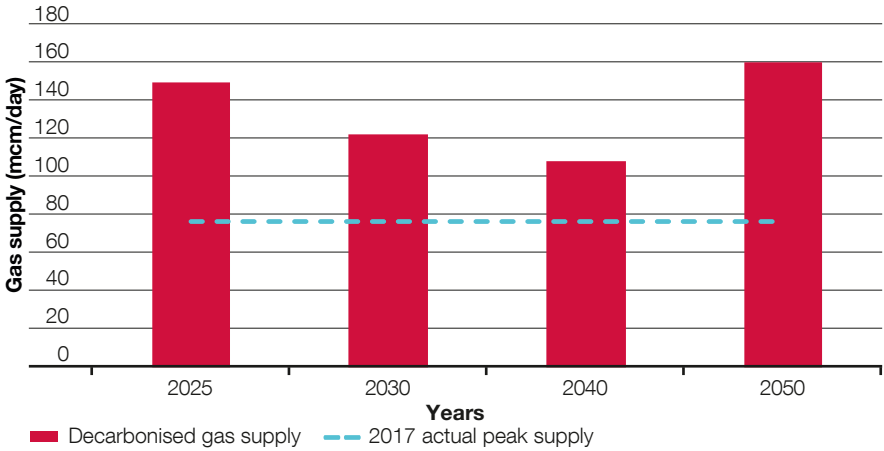
Out to 2050, the remainder of our energy needs could be met through developments in shale and green gas (biomethane and bio-substitute natural gas (bioSNG)) production (see Figure 2.8).

Figure 2.8
Annual shale and green gas supply



By 2050, gas demand in **Decarbonised Gas** is at its highest ever levels. 55% of this gas is used to generate hydrogen. To meet this demand, a substantial amount of LNG and continental gas enters at the Isle of Grain and Bacton terminals respectively. Figure 2.9 compares total Bacton and Isle of Grain peak supply with the highest total supply in 2017 at these terminals. Between 2025 and 2030, at peak demand levels, an operability solution is needed to transport gas away from these terminals without breaching pressure limits in the south-east. Within-day supply and demand volatility makes this increasingly challenging.

Figure 2.9
Total peak supply at Bacton and Isle of Grain terminals for ***Decarbonised Gas***



A changing energy landscape

In **Consumer Power** and **Decarbonised Gas**, support for shale development is high. As discussed in Section 2.1, in a **Consumer Power** world, an increase in northern gas-fired power station demand and swings in gas stock level results in offtake pressures being unsupported from 2025 to 2030. By 2030, this is alleviated as an increase in shale gas production in the north-west helps to meet this demand. As seen in section 2.2, the advantage of shale development in **Decarbonised Gas** occurring in the north-west helps to support pressures across Scotland.

As Great Britain's gas supply mix continues to change, we are working to gain a better understanding of:

- the impact on capacity availability at other NTS supply points as UKCS supplies decrease
- the risk levels in relation to single supply points of failure as our supply sources become less diverse
- the changes needed to allow new gas supplies to connect directly to the NTS.

2.4 Gas and electricity interactions

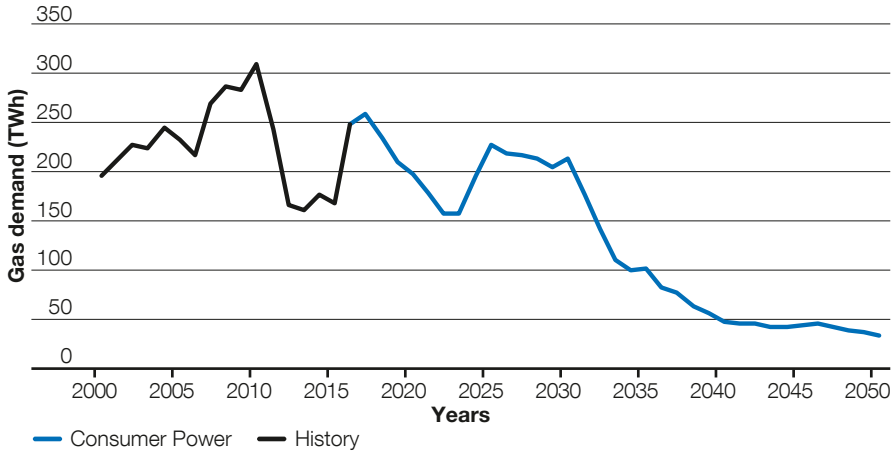
As we continue to move to a more decentralised and decarbonised energy future, the electricity system will need to be more flexible. Gas-fired power stations currently play an important role in balancing the electricity system alongside other balancing tools (interconnectors, pumped storage etc.). This role will increase as levels of renewable generation grow. Increasingly inconsistent gas-fired generation could lead to challenges in maintaining contracted pressures across the network.

In **Consumer Power**, as coal plants close and nuclear plants begin to decommission, we see a spike in gas-fired generation between 2022 and 2030 (see Figure 2.10). This demand is driven by both existing and new gas-fired power station sites. Between 2025 and 2030, at peak demand levels, high gas-fired power station demand in the south and south-east of the NTS causes pressures at regional extremities to breach safe operating limits.

In addition, demand from gas-fired power stations in the north-east of the network results in Eastern DN, North West DN and Direct Connect offtake pressures being unsupported at all demand levels.

As discussed in Section 2.3, the challenge posed by North East gas-fired generation demand in **Consumer Power** is alleviated by an increase in shale gas production. In **High Electrification**, gas-fired generation demand in the north-east and no shale production results in greater challenges. From 2025 to 2030, Eastern DN, North West DN and Direct Connect offtake pressures are unsupported at peak demand. From 2030 onwards, these pressures can also not be maintained at summer and winter demand levels. Post 2040, overall gas demand has declined to a level where this is no longer an issue.

Figure 2.10
Annual gas-fired generation for ***Consumer Power***



A changing energy landscape

Mass deployment of carbon capture and storage (CCS) facilitates high gas-fired generation across the network in **Decarbonised Gas**. As demand increases from both existing and newly connected gas-fired power stations, efficiently transporting gas from supply points to meet offtake pressures becomes increasingly challenging. From 2025 to 2040, high gas-fired power station demand in the south-west results in contractual pressure breaches in the extremities of the region at peak demand level.

In our *FES*, a portion of the increased gas-fired power station demand may come from new sites. In some cases, this may require system reinforcements to ensure we can meet our customers' connection or capacity requirements. The *GTYS* explains the process of connecting to our network and how it allows us to manage new connections.

In our next quarterly *GFOP* 2017 publication, we will assess the impacts of increasing gas and electricity interactions on operability in more detail.

Chapter three

Have your say

We want to continue to develop the *GFOP* to meet your needs. We have a wide array of topics we want to assess and would like your help to prioritise our work to be most useful to the industry.

Going forward the *GFOP* will be published quarterly and will focus on topics that are important to you. We want the *GFOP* publications to be concise, frequent and relevant to the industry. After each publication we will host webinars/events to get your feedback and views on what we should investigate next.

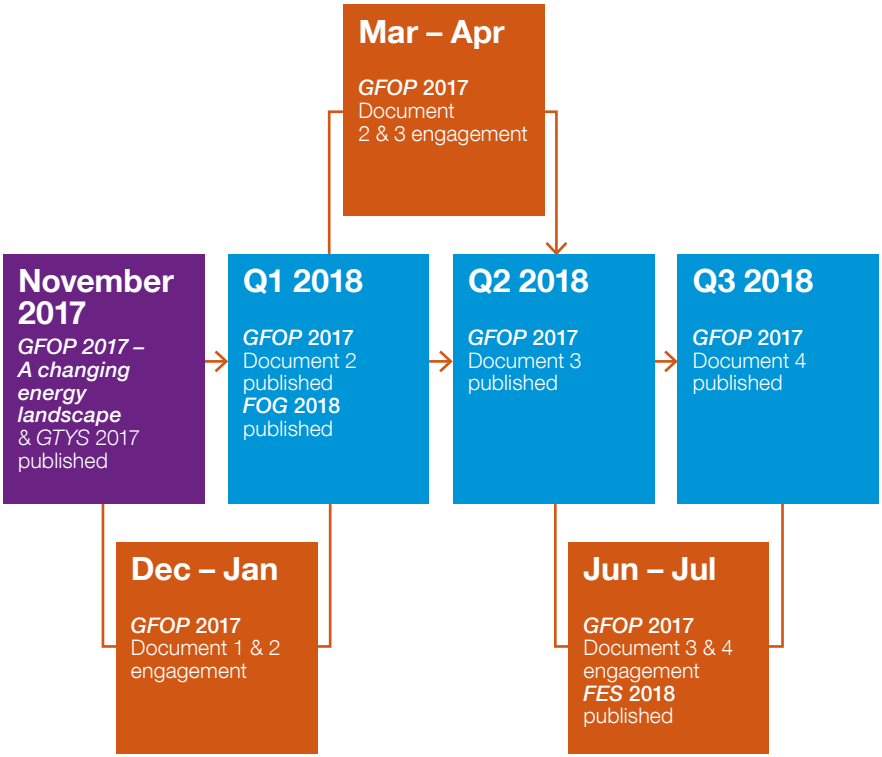
We have introduced a number of future operability challenges that we would welcome your views on:

- managing gas stock level
- meeting contractual pressures in Scotland
- increasing reliance on gas imports
- diverse and decentralised gas supplies
- gas and electricity interactions.

We want to focus on what you, our customers and stakeholders, believe are the most important elements of the future energy landscape. We are therefore keen to get your input.

Figure 3.1 outlines what we will be doing over the next year. In the coming months, we will be talking to some of you at the Gas Futures Group, Gas Transmission Working Group and the Operational Forum. We will also be engaging with you as part of the May 2018 RIIO reopeners and the Future of Gas programme. If you would like to get involved in our stakeholder events or want to share your views please get in touch via box.gfop@nationalgrid.com.

Figure 3.1
Road map for the GFOP



Chapter four

Appendix 1 **Glossary**

Word	Acronym	Description
Advanced Reservation of Capacity Agreement	ARCA	This was an agreement between National Grid and a shipper relating to future NTS pipeline capacity for large sites in order that shippers can reserve NTS Exit Capacity in the long term. This has been replaced by the PARCA process. (See also PARCA)
Aggregate System Entry Point	ASEP	A System Entry point where there is more than one, or adjacent Connected Delivery Facilities; the term is often used to refer to gas supply terminals.
Annual power demand		The electrical power demand in any one fiscal year. Different definitions of annual demand are used for different purposes.
Annual Quantity	AQ	The AQ of a Supply Point is its annual consumption over a 365-day year.
Anticipated Normal Operating Pressure	ANOP	A pressure that we may make available at an offtake to a large consumer connected to the NTS under normal operating conditions. ANOPs are specified within the NExA agreement for the site.
Assured Offtake Pressure	AOP	A minimum pressure at an offtake from the NTS to a DN that is required to support the downstream network. AOPs are agreed and revised through the annual OCS process.
Average cold spell	ACS	Average cold spell: defined as a particular combination of weather elements which gives rise to a level of winter peak demand which has a 50% chance of being exceeded as a result of weather variation alone. There are different definitions of ACS peak demand for different purposes.
Balgzand–Bacton Line	BBL	A gas pipeline between Balgzand in the Netherlands and Bacton in the UK. http://www.bblcompany.com. This pipeline is currently uni-directional and flows from the Netherlands to the UK only.
Bar		The unit of pressure that is approximately equal to atmospheric pressure (0.987 standard atmospheres). Where bar is suffixed with the letter g, such as in barg or mbarg, the pressure being referred to is gauge pressure, i.e. relative to atmospheric pressure. One millibar (mbarg) equals 0.001 bar.
Baseload electricity price		The costs of electricity purchased to meet minimum demand at a constant rate.
BAT Reference Documents	BREF	BAT Reference Documents draw conclusions on what the BAT is for each sector to comply with the requirements of IED. The BAT conclusions drawn as a result of the BREF documents will then form the reference for setting permit conditions.
Best Available Technique	BAT	A term used in relation to Industrial Emissions Directive (IED) 2010. In this context BAT is defined as Best Available Technique and means applying the most effective methods of operation for providing the basis for emission limit values and other permit conditions designed to prevent and, where that is not practicable, to reduce emissions and the impact on the environment as a whole.
Billion cubic metres	bcm	Unit or measurement of volume, used in the gas industry. 1 bcm = 1,000,000,000 cubic metres.
Biomethane		Biomethane is a naturally occurring gas that is produced from organic material and has similar characteristics to natural gas. http://www.biomethane.org.uk/
Boil-off		A small amount of gas which continually boils off from LNG storage tanks. This helps to keep the tanks cold.
Calorific value	CV	The ratio of energy to volume measured in megajoules per cubic metre (MJ/m^3), which for a gas is measured and expressed under standard conditions of temperature and pressure.
Capacity		Capacity holdings give NTS Users the right to bring gas onto or take gas off the NTS (up to levels of capacity held) on any day of the gas year. Capacity rights can be procured in the long term or through shorter-term processes, up to the gas day itself.

Word	Acronym	Description
Capacity Market	CM	The Capacity Market is designed to ensure security of electricity supply. This is achieved by providing a payment for reliable sources of capacity, alongside their electricity revenues, ensuring they deliver energy when needed.
Carbon capture and storage	CCS	Carbon (CO_2) capture and storage (CCS) is a process by which the CO_2 produced in the combustion of fossil fuels is captured, transported to a storage location and isolated from the atmosphere. Capture of CO_2 can be applied to large emission sources like power plants used for electricity generation and industrial processes. The CO_2 is then compressed and transported for long-term storage in geological formations or for use in industrial processes.
Carbon dioxide	CO_2	Carbon dioxide (CO_2) is the main greenhouse gas and the vast majority of CO_2 emissions come from the burning of fossil fuels (coal, natural gas and oil).
Carbon dioxide equivalent	CO_2e	A term used relating to climate change that accounts for the 'basket' of greenhouse gases and their relative effect on climate change compared to carbon dioxide. For example UK emissions are roughly 600m tonnes CO_2e. This constitutes roughly 450m tonnes CO_2 and less than the 150m tonnes remaining of more potent greenhouse gases such as methane, which has 21 times more effect as a greenhouse gas, hence its contribution to CO_2e will be 21 times its mass.
Combined Cycle Gas Turbine	CCGT	Gas turbine that uses the combustion of natural gas or diesel to drive a gas turbine generator to generate electricity. The residual heat from this process is used to produce steam in a heat recovery boiler which in turn, drives a steam turbine generator to generate more electricity. (See also OCGT)
Combined Heat and Power	CHP	A system whereby both heat and electricity are generated simultaneously as part of one process. Covers a range of technologies that achieve this.
Comité Europeén de Normalisation	CEN	European committee for standardisation concerned with the development, maintenance and distribution of standards and specifications.
Composite Weather Variable	CWV	A measure of weather incorporating the effects of both temperature and wind speed. We have adopted the new industry wide CWV equations that took effect on 1 October 2015.
Compressed natural gas	CNG	Compressed natural gas is made by compressing natural gas to less than 1 per cent of the volume it occupies at standard atmospheric pressure.
Compressor station		An installation that uses gas turbine or electricity-driven compressors to boost pressures in the pipeline system. Used to increase transmission capacity and move gas through the network.
Connected System Exit Point	CSEP	A point at which natural gas is supplied from the NTS to a connected system containing more than one supply point. For example a connection to a pipeline system operated by another Gas Transporter.
Constrained LNG	CLNG	A service available at some LNG storage facilities whereby Shippers agree to hold a minimum inventory in the facility and flow under certain demand conditions at National Grid's request. In exchange Shippers receive a transportation credit from National Grid.
Consumer Power Scenario	CP	A National Grid scenario defined in the *Future Energy Scenarios (FES)* document whereby the focus is on a market-driven world, with limited government intervention. High levels of prosperity allow for high investment and innovation. New technologies are prevalent and focus on the desires of consumers over and above reducing greenhouse gas emissions.
Contract for Difference	CfD	Contract between the Low Carbon Contracts Company (LCCC) and a low carbon electricity generator designed to reduce its exposure to volatile wholesale prices.
Cubic metre	m^3	The unit of volume, expressed under standard conditions of temperature and pressure, approximately equal to 35.37 cubic feet. One million cubic metres (mcm) are equal to 106 cubic metres, one billion cubic metres (bcm) equals 109 cubic metres.

Appendix 1 **Glossary**

Word	Acronym	Description
Daily Flow Notification	DFN	A communication between a Delivery Facility Operator (DFO) and National Grid, indicating hourly and end-of-day entry flows from that facility.
Daily Metered Supply Point	DM	A Supply Point fitted with equipment, for example a datalogger, which enables meter readings to be taken on a daily basis.
Delivery Facility Operator	DFO	The operator of a reception terminal or storage facility, who processes and meters gas deliveries from offshore pipelines or storage facilities before transferring the gas to the NTS.
Department of Business, Energy & Industrial Strategy	BEIS	This is a newly formed UK government department that replaces DECC.
Department of Energy & Climate Change	DECC	Formerly a UK government department: the Department of Energy & Climate Change (DECC) became part of the Department for Business, Energy & Industrial Strategy (BEIS) in July 2016.
Development Consent Order	DCO	A statutory Order under the Planning Act (2008) which provides consent for a development project. Significant new pipelines require a DCO to be obtained, and the construction of new compressor stations may also require DCOs if a new high voltage (HV) electricity connection is required.
Directly Connected (offtake)	DC	Direct connection to the NTS typically to power stations and large industrial users, i.e. the connection is not via supply provided from a Distribution Network.
Distribution Network	DN	A gas transportation system that delivers gas to industrial, commercial and domestic consumers within a defined geographical boundary. There are currently eight DNs, each consisting of one or more Local Distribution Zones (LDZs). DNs typically operate at lower pressures than the NTS.
Distribution Network Operator	DNO	Distribution Network Operators own and operate the Distribution Networks that are supplied by the NTS.
Distribution system		A network of mains operating at three pressure tiers: intermediate (2 to 7 barg), medium (75 mbarg to 2 barg) and low (less than 75 mbarg).
Diurnal storage		Gas stored for the purpose of meeting, among other things, within-day variations in demand. Gas can be stored in special installations, such as in the form of gas system stock within transmission, i.e. >7 barg, pipeline systems.
Electricity Market Reform	EMR	A government policy to incentivise investment in secure, low-carbon electricity, improve the security of Great Britain's electricity supply, and improve affordability for consumers. The Energy Act 2013 introduced a number of mechanisms. In particular: • a Capacity Market, which will help ensure security of electricity supply at the least cost to the consumer • Contracts for Difference, which will provide long-term revenue stabilisation for new low carbon initiatives. Both will be administered by delivery partners of the Department of Business, Energy and Industrial Strategy (BEIS). This includes National Grid Electricity Transmission (NGET).
Electricity Ten Year Statement	*ETYS*	The *ETYS* illustrates the potential future development of the National Electricity Transmission System (NETS) over a ten-year (minimum) period and is published on an annual basis.

Word	Acronym	Description
Emission Limit Value	ELV	Pollution from larger industrial installations is regulated under the Pollution Prevention and Control regime. This implements the EU Directive on Integrated Pollution Prevention and Control (IPPC) (2008/1/EC). Each installation subject to IPPC is required to have a permit containing emission limit values and other conditions based on the application of Best Available Techniques (BAT) and set to minimise emissions of pollutants likely to be emitted in significant quantities to air, water or land. Permit conditions also have to address energy efficiency, waste minimisation, prevention of accidental emissions and site restoration.
Energy Networks Association	ENA	The Energy Networks Association is an industry association funded by gas or transmission and distribution licence holders.
Environmental Impact Assessment	EIA	Environmental study of proposed development works as required under EU regulation and the Town and Country Planning (Environmental Impact Assessment) Regulations 2011. These regulations apply the EU directive "on the assessment of the effects of certain public and private projects on the environment" (usually referred to as the Environmental Impact Assessment Directive) to the planning system in England.
European Network of Transmission System Operators for Gas	ENTSOG	Organisation to facilitate cooperation between national gas Transmission System Operators (TSOs) across Europe to ensure the development of a pan-European transmission system in line with European Union energy goals.
Exit Zone		A geographical area (within an LDZ) that consists of a group of supply points that, on a peak day, receive gas from the same NTS offtake.
Front End Engineering Design	FEED	The FEED is basic engineering which comes after the Conceptual design or Feasibility study. The FEED design focuses on the technical requirements as well as an approximate budget investment cost for the project.
Future Energy Scenarios	*FES*	The *FES* is an annual publication discussing a range of credible futures developed in conjunction with the energy industry. The four Future Energy Scenarios cover the period from now to 2050, and are used to frame discussions and perform stress tests. They form the starting point for all transmission network and investment planning, and are used to identify future operability challenges and potential solutions.
Gas Deficit Warning		The purpose of a Gas Deficit Warning is to alert the industry to a requirement to provide a within-day market response to a physical supply / demand imbalance.
Gas Safety (Management) Regulations 1996	GS(M)R	Regulations which apply to the conveyance of natural gas (methane) through pipes to domestic and other consumers and cover four main areas: (a) the safe management of gas flow through a network, particularly those parts supplying domestic consumers, and a duty to minimise the risk of a gas supply emergency (b) arrangements for dealing with supply emergencies (c) arrangements for dealing with reported gas escapes and gas incidents (d) gas composition. Gas Transporters are required to submit a safety case to the HSE detailing the arrangements in place to ensure compliance with GS(M)R requirements.
Gas Supply Year		A twelve-month period commencing 1 October, also referred to as a Gas Year.
Gas System Stock Level or Linepack		The volume of gas within the National or Local Transmission System at any time.
Gas Ten Year Statement	*GTYS*	The *Gas Ten Year Statement* is published annually in accordance with National Grid Gas plc's obligations in Special Condition 7A of the Gas Transporters Licence relating to the National Transmission System and to comply with Uniform Network Code (UNC) requirements.

Appendix 1 **Glossary**

Word	Acronym	Description
Gas Transporter		Formerly Public Gas Transporter (PGT), GTs, such as National Grid, are licensed by the Gas and Electricity Markets Authority (GEMA) to transport gas to consumers.
Gasholder		A vessel used to store gas for the purposes of providing diurnal storage.
Gigawatt	GW	1,000,000,000 watts, a measure of power.
Gigawatt hour	GWh	1,000,000,000 watt hours, a unit of energy.
Gram of carbon dioxide per kilowatt hour	gCO_2/kWh	Measurement of CO_2 equivalent emissions per kWh of energy used or produced.
Great Britain	GB	A geographical, social and economic grouping of countries that contains England, Scotland and Wales.
Industrial Emissions Directive	IED	The Industrial Emissions Directive came into force on 6 January 2011. IED recasts seven existing Directives related to industrial emissions into a single clear, coherent legislative instrument. The recast includes IPPC, LCP, the Waste Incineration Directive, the Solvents Emissions Directive and three Directives on Titanium Dioxide.
Integrated Gas Management Control System	IGMS	Used by National Grid System Operation to control and monitor the Gas Transmission system, and also to provide market information to interested stakeholders within the gas industry.
Integrated Pollution Prevention & Control Directive 1999	IPPC	Emissions from our installations are subject to EU-wide legislation; the predominant legislation is the Integrated Pollution Prevention & Control (IPPC) Directive 1999, the Large Combustion Plant Directive (LCPD) 2001 and the Industrial Emissions Directive (IED) 2010. The requirements of these directives have now been incorporated into the Environmental Permitting (England and Wales) (Amendment) Regulations 2013 (with similar regulations applying in Scotland). IPPC aims to reduce emissions from industrial installations and contributes to meeting various environment policy targets and compliance with EU directives. Since 31 October 2000, new installations are required to apply for an IPPC permit. Existing installations were required to apply for an IPPC permit over a phased timetable until October 2007.
Interconnector		A pipeline transporting gas to another country. The Irish Interconnector transports gas across the Irish Sea to both the Republic of Ireland and Northern Ireland. The Belgian Interconnector (IUK) transports gas between Bacton and Zeebrugge. The Belgian Interconnector is capable of flowing gas in either direction. The Dutch Interconnector (BBL) transports gas between Balgzand in the Netherlands and Bacton. It is currently capable of flowing only from the Netherlands to the UK.
Interconnector (UK)	IUK	A bi-directional gas pipeline between Bacton in the UK and Zeebrugge Belgium. http://www.interconnector.com
International Energy Agency	IEA	An intergovernmental organisation that acts as energy policy advisor to 28 member countries.
Kilowatt Hour	kWh	A unit of energy used by the gas industry. Approximately equal to 0.0341 therms. One megawatt hour (MWh) equals 1000 kWh, one gigawatt hour (GWh) equals 1000 MWh, and one terawatt hour (TWh) equals 1000 GWh.
Large Combustion Plant Directive 2001	LCP	The Large Combustion Plant Directive is a European Union Directive which introduced measures to control the emissions of sulphur dioxide, oxides of nitrogen and dust from large combustion plant, including power stations.

Word	Acronym	Description
Linepack or Gas System Stock Level		The volume of gas within the National or Local Transmission System at any time.
Liquefied natural gas	LNG	LNG is formed by chilling gas to -161°C so that it occupies 600 times less space than in its gaseous form.
Liquefied Natural Gas Storage	LNGS	The storage of liquefied natural gas.
Load duration curve (1-in-50 severe)		The 1-in-50 severe load duration curve is that curve which, in a long series of years, with connected load held at the levels appropriate to the year in question, would be such that the volume of demand above any given demand threshold (represented by the area under the curve and above the threshold) would be exceeded in one out of fifty years.
Load duration curve (average)		The average load duration curve is that curve which, in a long series of winters, with connected load held at the levels appropriate to the year in question, the average volume of demand above any given threshold, is represented by the area under the curve and above the threshold.
Local Distribution Zone	LDZ	A gas distribution zone connecting end users to the (gas) National Transmission System.
Local Transmission System	LTS	A pipeline system operating at >7 barg that transports gas from NTS / LDZ offtakes to distribution system low pressure pipelines. Some large users may take their gas direct from the LTS.
Long-Term System Entry Capacity	LTSEC	NTS Entry Capacity available on a long-term basis (up to 17 years into the future) via an auction process. This is also known as Quarterly System Entry Capacity (QSEC).
Margins Notice		The purpose of the Margins Notice is to provide the industry with a day-ahead signal that there may be the need for a market response to a potential physical supply / demand imbalance.
Maximum Operating Pressure	MOP	These are safe pressure limits at which we can operate our pipelines.
Medium Combustion Plant (Directive)	MCP	The Medium Combustion Plant (MCP) directive will apply limits on emissions to air from sites below 50 MW thermal input. MCP is likely to come into force by 2020.
Medium-range storage	MRS	Typically, these storage facilities have very fast injection and withdrawal rates that lend themselves to fast day-to-day turn rounds as market prices and demand dictate.
Megawatt hour	MWh	1,000,000 watts, a measure of power usage or consumption in 1 hour.
Million cubic metres	mcm	Unit or measurement of volume, used in the gas industry. 1 mcm = 1,000,000 cubic metres.
National balancing point	NBP	The wholesale gas market in Britain has one price for gas irrespective of where the gas comes from. This is called the national balancing point (NBP) price of gas and is usually quoted in price per therm of gas.
National Transmission System	NTS	A high-pressure gas transportation system consisting of compressor stations, pipelines, multijunction sites and offtakes. NTS pipelines transport gas from terminals to NTS offtakes and are designed to operate up to pressures of 94 bar(g).

Appendix 1 **Glossary**

Word	Acronym	Description
National Transmission System Offtake		An installation defining the boundary between NTS and LTS or a very large consumer. The offtake installation includes equipment for metering, pressure regulation, odourisation equipment etc.
Network Development Process	NDP	NDP defines the method for decision making, optioneering, development, sanction, delivery and closure for all National Grid gas projects. The aim of the NDP is to deliver projects that have the lowest whole-life cost, are fit for purpose and meet stakeholder and RIIO requirements.
Network Exit Agreement	NExA	A NExA is signed by a gas shipper or Distribution Network Operator prior to any gas being taken off the system. Within the NExA the gas transporter sets out the technical and operational conditions of the offtake such as the maximum permitted flow rate, the assured offtake pressure and ongoing charges.
Network Gas Supply Emergency	NGSE	A NGSE occurs when National Grid is unable to maintain a supply–demand balance on the NTS using its normal system balancing tools. A NGSE could be caused by a major loss of supplies to the system as a result of the failure of a gas terminal or as the result of damage to a NTS pipeline affecting the ability of the system to transport gas to consumers. In such an event the Network Emergency Co-ordinator (NEC) would be requested to declare a NGSE. This would enable National Grid to use additional balancing tools to restore a supply–demand balance. Options include requesting additional gas supplies be delivered to the NTS or requiring gas consumers, starting with the largest industrial consumers, to stop using gas. These tools will be used, under the authorisation of the NEC, to try to maintain supplies as long as possible to domestic gas consumers.
Network Options Assessment	*NOA*	The *NOA* builds upon the future capacity requirements in our *Electricity Ten Year Statement (ETYS)* and presents the network investment recommendations that we believe will meet these requirements across the GB electricity transmission network.
Nitrous oxide	NOx	A group of chemical compounds, some of which are contributors to pollution, acid rain or are classified as greenhouse gases.
Non-Daily Metered	NDM	A meter that is read monthly or at longer intervals. For the purposes of daily balancing, the consumption is apportioned, using an agreed formula, and for supply points consuming more than 73.2 MWh pa, reconciled individually when the meter is read.
Odourisation		The process by which the distinctive odour is added to gas supplies to make it easier to detect leaks.
Office of Gas and Electricity Markets	Ofgem	The UK's independent National Regulatory Authority, a non-ministerial government department. Their principal objective is to protect the interests of existing and future electricity and gas consumers.
Offtake Capacity Statement	OCS	This is the process by which Distribution Network Operators apply for Exit (Flex) Capacity on an annual basis. This allows the DNOs to request changes to the Exit (Flex) Capacity holdings and also request increases in assured offtake pressures.
Oil & Gas UK		Oil & Gas UK is a representative body for the UK offshore oil and gas industry. It is a not-for-profit organisation, established in April 2007. http://www.oilandgasuk.co.uk
On-the-day Commodity Market	OCM	This market constitutes the balancing market for GB and enables anonymous financially cleared on-the-day trading between market participants.
Open Cycle Gas Turbine	OCGT	Gas turbines in which air is first compressed in the compressor element before fuel is injected and burned in the combustor. (See also CCGT)
Operating margins	OM	Gas used by National Grid Transmission to maintain system pressures under certain circumstances, including periods immediately after a supply loss or demand forecast change, before other measures become effective and in the event of plant failure, such as pipe breaks and compressor trips.

Word	Acronym	Description
Own Use Gas		Gas used by National Grid to operate the transportation system. Includes gas used for compressor fuel, heating and venting.
Peak day demand, Electricity		The maximum power demand in any one fiscal year. Peak demand typically occurs at around 17:30hrs on a week-day between December and February. Different definitions of peak demand are used for different purposes.
Peak day demand, Gas		The 1-in-20 peak day demand is the level of demand that, in a long series of winters, with connected load held at levels appropriate to the winter in question, would be exceeded in one out of 20 winters, with each winter counted only once.
Per annum	pa	Per year
Planning and Advanced Reservation of Capacity Agreement	PARCA	A solution developed in line with the enduring incremental capacity release solutions which have been developed following the implementation of the Planning Act (2008). PARCAs were implemented on 1 February 2015 and replace the functions of PCAs and ARCAs. (See also ARCA & PCA)
Planning Consent Agreement	PCA	Planning Consent Agreements were made in relation to NTS Entry and Exit Capacity requests and comprised a bilateral agreement between National Grid and developers, DNOs or Shippers whereby National Grid assessed the Need Case for NTS reinforcement and would undertake any necessary planning activities ahead of a formal capacity signal from the customer. Where a Need Case was identified, the customer would underwrite National Grid NTS to undertake the required statutory Planning Act activities such as strategic optioneering, Environmental Impact Assessment, statutory and local community consultations, preparation of the Development Consent Order (DCO) and application. This has now been replaced by the PARCA process. (See PARCA)
Power Market model		This model is used to provide outputs that simulate credible power market conditions based on a variety of factors such as energy prices, generation type and availability, supply and demand etc.
Project customer low cost connections	CLoCC	National Grid secured £4.8m of Ofgem funding to design and build an innovative solution to reduce the time and cost of connecting to the NTS for new and existing customers. For more information on the project visit the website: http://projectclocc.com
Projected Closing Linepack	PCLP	Linepack is the volume of gas stored within the NTS. Throughout a gas day linepack levels fluctuate due to imbalances between supply and demand over the day. National Grid, as residual balancer of the UK gas market, need to ensure an end-of-day market balance where total supply equals, or is close to, total demand. The Projected Closing Linepack (PCLP) metric is used as an indicator of end-of-day market balance. (See also Linepack or Gas System Stocks)
Quarterly System Entry Capacity	QSEC	NTS entry capacity available on a long-term basis (up to 17 years into the future) via an auction process. Also known as Long Term System Entry Capacity (LTSEC).
RIIO-T1		RIIO relates to the current Ofgem price control period which runs from 1 April 2013 to 31 March 2021. For National Grid Transmission this is referred to as RIIO-T1.
Safety Monitors		Safety Monitors in terms of space and deliverability are minimum storage requirements determined to be necessary to protect loads that cannot be isolated from the network and also to support the process of isolating large loads from the network. The resultant storage stocks or monitors are designed to ensure that sufficient gas is held in storage to underpin the safe operation of the gas transportation system under severe conditions. There is now just a single safety monitor for space and one for deliverability. These are determined by National Grid to meet its Uniform Network Code requirements and the terms of its safety case. Total shipper gas stocks should not fall below the relevant monitor level (which declines as the winter progresses). National Grid is required to take action (which may include use of emergency procedures) in order to prevent storage stocks reducing below this level.

Appendix 1 **Glossary**

Word	Acronym	Description
Scottish Environment Protection Agency	SEPA	The environmental regulator for Scotland.
Seasonal Normal Composite Weather Variable	SNCWV	The seasonal normal value of the CWV is the smoothed average of the values of the applicable CWV for that day in a significant number of previous years. (See also CWV)
Shale gas		Shale gas is natural gas that is found is shale rock. It is extracted by injecting water, sand and chemicals into the shale rock to create cracks or fractures so that the shale gas can be extracted. *https://www.gov.uk/government/publications/about-shale-gas-and-hydraulic-fracturing-fracking*
Shearwater Elgin Area Line	SEAL	The offshore pipeline from the Central North Sea (CNS) to Bacton.
Shipper or Uniform Network Code (Shipper) User		A company with a Shipper Licence that is able to buy gas from a producer, sell it to a supplier and employ a GT to transport gas to consumers.
Shrinkage		Gas that is input to the system but is not delivered to consumers or injected into storage. It is either Own Use Gas or Unaccounted for Gas.
Slow Progression scenario	SP	A National Grid scenario defined in the *Future Energy Scenarios (FES)* document whereby the 2020 renewable energy target for 2020 is not met. Although regulation and targets are similar to the Gone Green scenario there is less economic growth which prevents delivery of environmental policy and targets.
Steady State scenario	SS	Compared to Two Degrees there is less money available and less emphasis on sustainability. There is slower economic recovery and Government policy and regulation remains the same as today, and no new targets are introduced. The 2020 renewable energy target for 2020 is unlikely to be met.
Strategic Options Report	SOR	Output of the PCA, ARCA and PARCA statutory Planning Act activities reporting to the customer on the findings of optioneering analysis by National Grid in relation to the customer request for NTS Entry or Exit Capacity.
Substitution		Capacity substitution is the process of moving unsold capacity from one or more system points to another, where demand for that capacity exceeds the available capacity quantities for the relevant period. This avoids the construction of new assets or material increases in operational risk.
Supplier		A company with a supplier's licence contracts with a shipper to buy gas, which is then sold to consumers. A supplier may also be licensed as a shipper.
Supply Hourly Quantity	SHQ	The quantity of supply on an hourly basis.
Supply Offtake Quantity	SOQ	The maximum daily consumption at a Supply Point.
Supply Point		A group of one or more meter points at a site.
System Operability		The ability to maintain system stability and all of the asset ratings and operational parameters within pre-defined limits safely, economically and sustainably.
System Operator	SO	An entity entrusted with transporting energy in the form of natural gas or power on a regional or national level, using fixed infrastructure. Unlike a TSO, the SO may not necessarily own the assets concerned. For example, National Grid operates the electricity transmission system in Scotland, which is owned by Scottish Hydro Electricity Transmission and Scottish Power.
Terawatt hour	TWh	1,000,000,000,000 watt hours, a unit of energy.

Word	Acronym	Description
Therm		An imperial unit of energy. Largely replaced by the metric equivalent: the kilowatt hour (kWh). 1 therm equals 29.3071 kWh.
Transmission Entry Capacity	TEC	The maximum amount of active power deliverable by a power station at its grid entry point (which can be either onshore or offshore). This will be the maximum power deliverable by all of the generating units within the power station, minus any auxiliary loads.
Transmission Planning Code	TPC	The Transmission Planning Code describes National Grid's approach to planning and developing the NTS in accordance with its duties as a gas transporter and other statutory obligations relating to safety and environmental matters. The document is subject to approval by the Gas and Electricity Markets Authority (GEMA).
Transmission System Operator	TSO	An entity entrusted with transporting energy in the form of natural gas or power on a regional or national level, using fixed infrastructure.
Two Degrees scenario	TD	A National Grid scenario defined in the *Future Energy Scenarios (FES)* document whereby the focus is on long-term environmental goals, high levels of prosperity and advanced European harmonisation that ensure that the 2050 carbon reduction target is achieved.
Unaccounted for Gas	UAG	Gas 'lost' during transportation. Includes leakage, theft and losses due to the method of calculating the Calorific Value.
Uniform Network Code	UNC	The Uniform Network Code is the legal and commercial framework that governs the arrangements between the Gas Transporters and Shippers operating in the UK gas market. The UNC comprises different documents including the Transportation Principal Document (TPD) and Offtake Arrangements Document (OAD).
United Kingdom Continental Shelf	UKCS	The UK Continental Shelf (UKCS) comprises those areas of the sea bed and subsoil beyond the territorial sea over which the UK exercises sovereign rights of exploration and exploitation of natural resources.
United Kingdom of Great Britain and Northern Ireland	UK	A geographical, social and economic grouping of countries that contains England, Scotland, Wales and Northern Ireland.
Variable Speed Drives	VSD	Compressor technology where the drive speed can be varied with changes in capacity requirement. Variable speed drive compressors compared to constant speed compressors are more energy efficient and operate more quietly by varying speed to match the workload.
Weather-corrected demand		The actual demand figure that has been adjusted to take account of the difference between the actual weather and the seasonal normal weather.

Continuing the conversation

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