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Gas Future Operability Planning in five minutes

GB gas transmission

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The role of the *Gas Future Operability Planning (GFOP)* 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 Gas Ten Year Statement (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 National Transmission System (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.

Introduction

Currently we do not have a clear vehicle in which all market participants can discuss and quantify future gas transmission network needs, future operational challenges and uncertainties. The *GFOP* document will fill that gap and complement the *GTYS* and our other Future of Energy suite of documents[1]. We need to 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.

Roadmap for the *GFOP* next steps

Nov 2016 *GFOP* & *GTYS* published

Dec Start our feedback process

Q1 2017 *GFOP* consultation event

Mar Follow up to *GFOP* consultation event

Jul FES launch

Q2/Q3 Run analysis

Nov 2017 *GFOP* & *GTYS* published

We are here

We are currently part way through our *GFOP* 2016/17 analysis. We are analysing the impact of increasing volumes and volatility of CCGT generation on the NTS. We are now testing the effectiveness of the *GFOP* as a vehicle for communicating these results to you.

[1] www2.nationalgrid.com/uk/industry-information/future-of-energy

Key messages

1. **Changing energy landscape –** our customers' requirements of the National Transmission System (NTS) are changing in response to variations in the electricity and commercial gas market. Our assessment of the future will provide a detailed quantitative understanding of how your changing requirements may affect the capability and operability of the NTS.

Customer requirements

You have said you want to take gas more quickly at shorter notice. You want additional flexibility in how you take gas.

Our more commercially responsive customers are balancing later in the day which means more gas is needed within-day.

Day-to-day market

Long-term capacity auctions no longer provide clear signals from the market.

Increasingly rapid rates of change in the geographical distribution of supply and demand levels within-day and day-to-day.

Within-day market

Increasing magnitude of within-day gas system stock swings and they are, on average, treble the size of a decade ago with the largest swing of 38.5mcm occurring in February 2015.

Future of gas

Gas plays a vital role today in providing secure energy supplies to our homes, businesses and industry. On an annual basis, gas provides 2.5 times as much energy (TWhs) as electricity which includes ~70% of heat.

Gas will be crucial to continuing to provide a secure energy supply at best value for consumers while we transition to a low carbon future.

Future gas transmission

We are committed to adapting our existing NTS infrastructure, operational processes and commercial agreements to ensure they remain the most efficient and reliable means of transporting gas from supply terminal to offtake.

Gas transmission innovation

We will continue to innovate and evolve the NTS as the UK progresses towards the 2050 targets. We are at the forefront of developing green gas solutions that aim to deliver value for money using the existing assets – for example project CLoCC (customer low cost connections).

Key messages

2. Future operability requirements – our initial *GFOP* analysis has focused on understanding the potential impact of increasing volumes and volatility of CCGT generation on the NTS, under a range of futures as described by our Future Energy Scenarios. In order to model the impact we have had to make assumptions about the power market, demand and supply within-day profiling.

We have looked at CCGT within-day demand in isolation and in combination with other within-day variables to assess the impact on NTS operability and capability. Further work is required to look at more of the within-day variables in combination.

38 GW CCGT

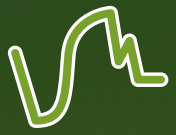
By 2040 between 15 and 38 GW of new combined cycle gas turbine (CCGT) capacity is expected to connect to the NTS.

34% of electricity from renewable sources by 2020

The way CCGTs operate is expected to become more unpredictable as their requirement to generate will correlate more with variable renewable generation (wind, solar etc.).

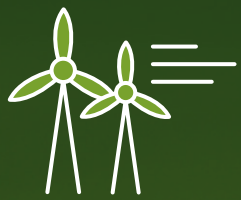
CCGTs for balancing

CCGTs will be used more in combination with other electricity system balancing tools (interconnectors, storage, other generators and demand-side response).



17.5 mcm of swing could be accountable to CCGTs by 2030

The volume of gas system swing attributable to CCGT operation could more than double by 2030. However CCGT swing alone is unlikely to cause system operability challenges. We will consider the full operability challenge and other variables impacting on gas system stock level swing over the next 12 months.



6 and 11 pm = biggest CCGT swing impact

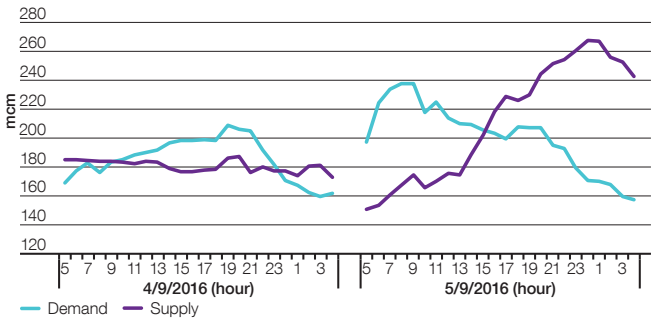
The biggest impact on the NTS to CCGT swing is between 6 and 11 pm when wind generation increases rapidly at the end of the gas day, coinciding with the reduction in total generation demand after the daily peak. It could also be possible for the converse to happen during the morning peak, although this would be, at least partially, offset by the pattern of solar output.

Key statistics – 5 September 2016

To illustrate some of the current operational challenges we are experiencing on the NTS we have included a summary of a recent challenging day on the network.

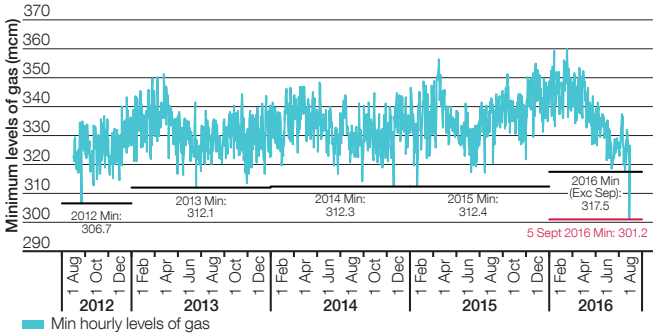
Supply and demand mismatch

At the start of the day (5:00am) there was a 50 mcm shortfall between gas coming into the NTS and gas going out of the NTS. National demand was around 200 mcm.



Gas levels

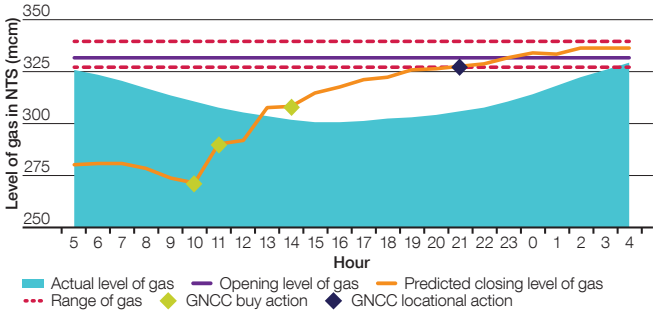
The supply and demand mismatch resulted in the NTS experiencing the lowest level of gas in the system since 2012.



System Operator actions

With less gas in the system our customers experienced lower pressures than normal.

For the first time since early 2012 we had to take commercial locational energy actions to ensure we met all of our contractual obligations.

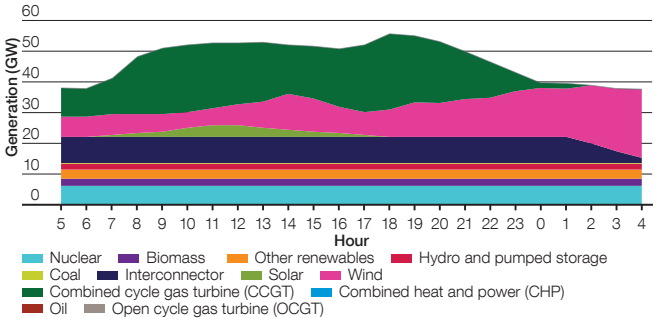


Key statistics — future gas transmission CCGT analysis

The following charts illustrate some of the results from our initial GFOP analysis.

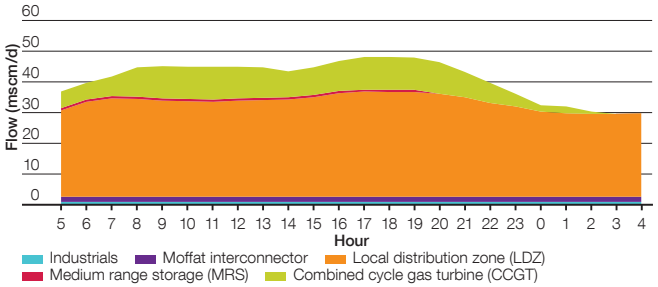
2023 Consumer Power hourly electricity generation profiles on a High CCGT swing day

The highest levels of CCGT swing is generated when the output of wind generation increased rapidly at the end of the gas day, coinciding with the reduction in total gas generation demand after the daily peak. The converse could also be possible.



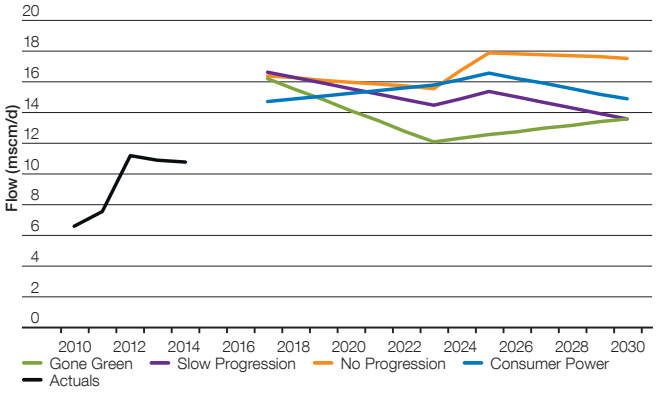
2023 Consumer Power hourly demand flows on a High CCGT swing day

We already see a significant contribution to gas system stock swings as CCGT demand profiles tend to coincide with the daily demand from Distribution Networks. Our analysis shows this has the potential to increase further if fluctuations in renewable generation continue to grow in magnitude and coincide with the start or end of the daily swing.



Actual and modelled peak volume of CCGT swing

The levels of CCGT demand swing are substantially higher than those we have seen historically, across all four Future Energy Scenarios (FES). This is due to the increase in variability associated with a higher volume of CCGTs connecting to the NTS in the future and our assumptions which flex the scenarios.



Other documents from the System Operator

GFOP is one document within our Future of Energy publications. We aim to inform the whole energy debate through addressing specific issues in each document. These are the planned publication dates for 2016/17.

Future Energy Scenarios
July 2016

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

Winter Outlook Report
October 2016

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

Electricity Ten Year Statement
November 2016

The likely future transmission requirements on the electricity system.

Gas Ten Year Statement
November 2016

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

System Operability Framework
November 2016

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

Gas Future Operability Planning
November 2016

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

Network Options Assessment
January 2017

The options available to meet reinforcement requirements on the electricity system.

Summer Outlook Report
April 2017

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

Winter Review
May 2017

A comparison between the past winter's actual energy demand and supply and our forecast.

Winter Consultation
June 2017

An opportunity to share your views on energy demand and supply for the winter ahead.

Continuing the conversation

Get involved in the debate on the future of energy and join our LinkedIn group
'Future of Energy by National Grid.'

Email us with your views on *GFOP* or any of our Future of Energy publications at:
.box.gfop@nationalgrid.com
and one of our experts will get in touch.

Access our full *GFOP* document here:
http://nationalgrid.com/gfop

Keep up to date on key issues relating to National Grid via our Connecting website:
www.nationalgridconnecting.com

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