The Future of Gas: How gas can support a low carbon future

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Briefing for the Gas Retired Employee Association - "Old Flames"

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The Future of Gas Conclusions Event

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Gas plays a key role today…

- **Gas demand in the UK increased by 12.5% in 2016**
- **In 2016 42% of electricity was generated from gas**
- **8 out of 10 homes use gas for heating**
- **The demand for gas is not going down – around 60,000 new consumers connect each year**
- **Global gas demand is forecast to rise by 50% between now and 2040**

884TWh	2016/17: Total gas demand
284TWh	2016/17: Total electricity demand

Climate Change Act 2008
The act requires the UK to have reduced carbon emissions by at least 80% by 2050 from 1990 Levels, whilst maintaining security of supply and providing energy at lowest cost

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…but its future role is uncertain…

Understand customer & stakeholder views to set out what the future holds for gas

Understand the potential future impacts on our network and the gas market

Develop policy recommendations to support government and regulators

Consider innovative solutions to future challenges

We engaged stakeholders extensively

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November 2016:
'Future of Gas: A Transmission Perspective'[8] document and Customer Seminar[9] launched the Future of Gas programme.

February and March 2017:
Workshops[10] on what the future could hold, including barriers, risks and challenges – themed around heat, supply, industrial demand, gas and electricity interactions.

July 2017:
'Future of Gas: Progress Report'[11] provided an insight into our discussions with stakeholders. It explained that gas has a vital role to play in the decarbonised UK future.

September 2017:
Workshop[12] to seek feedback on our progress; this confirmed broad agreement with our beliefs about the future and captured opinions on this emerging thinking to help us to shape the next phase of our work.

October 2017:
Building on the detail in the July 2017 Progress Report, we published three website articles[13] that set out three views of what the future of energy might look like and the roles that gas and the gas network could play.

October and November 2017:
We ran workshops at the National Grid Future Energy Scenarios[14] events and as part of National Grid's programme to consider "Shaping the Future of Gas Transmission"[15], exploring elements of the future of gas, the implications of the Clean Growth Strategy, and the future role of the NTS.

November 2017:
Sponsored a discussion facilitated by Baringa Partners, and alongside Eurogas and ENTSOG (the European Network of Transmission System Operators for Gas) reflecting on the future of gas in Europe[16].

Pursuing a wide range of internal and external viewpoints

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Circa 150 different organisations involved

FOG Steering Group		
NCOG	Corporate Affairs	GTO Network Engineering
Regulation	SO Strategy	Group Strategy
GTO Strategy	RIIO T2	

FOG Senior Steering Group		
Fintan Slye (SO)	Pauline Walsh (GTO)	Phil Sheppard (Regulation)
Chris Bennett (Regulation)	Alan Foster	

Three sensitivities were developed to test future requirements

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Decarbonised Gas

- No wholesale switch to electric heating
- Some cities heating provided by hydrogen rather than natural gas.
- Hydrogen created from natural gas allowing carbon to be captured
- CCS essential
- Hydrogen also used for transport and a large deployment of gas fired generation
- CCS supporting a high roll out of renewable capacity without nuclear generation

High Electrification

- Electrification of heat
- Decarbonisation of transport with electric vehicles and hydrogen fuel cells
- A very high roll out of renewable generation
- Electricity would provide the majority of heating needs of residential and commercial
- Peak heat demand is supplemented by gas boilers
- Some high temperature industrial processes still require gas.
- Considerable government support and intervention required

Two Degrees

- Core Future Energy scenario
- Carbon target met through a balanced approach across electricity, transport and heating
- CCUS enabled gas generation is deployed along with nuclear and renewable technologies
- Electrification of heat although supported by green gas
- Reduces the requirement of total electrification to hit 2050 target

In testing the extremes; gas was important in all sensitivities

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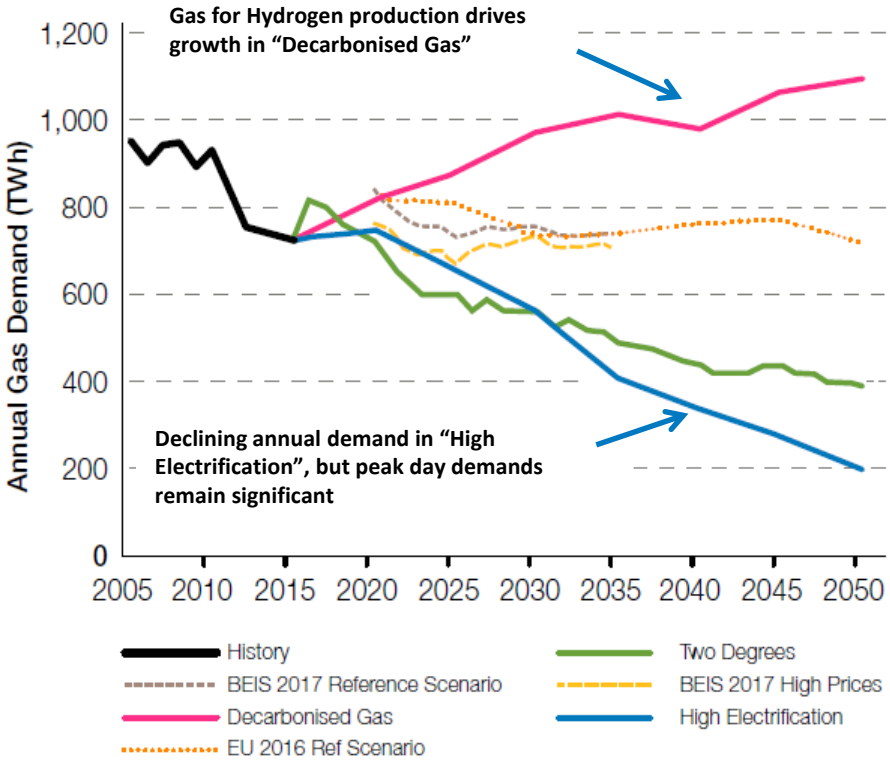
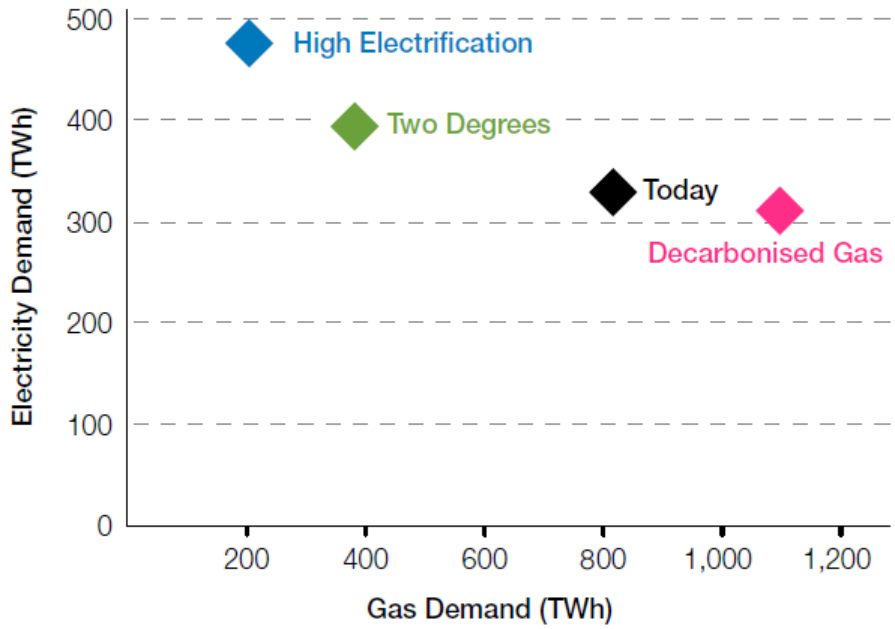
Annual Gas Demand to 2050



Gas vs Electricity Demand



What would you need to believe?

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Our Decarbonised Gas Sensitivity

2017: Preparation

- Hydrogen trials and research continue
- Analysis and collaboration
- Government / Ofgem support innovation projects
- Projects start to come forward (Acorn, Norway)

2020s Experimentation

- Government support low carbon heat and CCS
- Shift support from nuclear to decarbonised gas
- 2025 – first SMR hub in Teesside; combined with CCS allows the first city to move to Hydrogen

2030s: Transition

- First regional Hydrogen pipeline
- Disruption for customers is proving manageable
- CCS –first project focussed on power generation

2040s: Decarbonisation

- Patchwork of hydrogen cities, connected via Hydrogen pipelines; urban heat now primarily from hydrogen
- CCS – mainly along the coasts to reduce costs
- Rural users reduce carbon emissions via some biomethane/ bioSNG in the network
- Hydrogen fuel cells becoming popular for HGVs, buses and vans.

2050

- Hydrogen supplies 28% of heat in the UK, across major cities
- Electricity is mainly from renewables CCS enabled gas plant providing significant backup
- Gas demand is up 30% with 55% converted to Hydrogen.
- HGVs, buses and vans are solely Hydrogen fuel cell powered

Even in a High Electrification sensitivity, CCUS is necessary to meet 2050 targets

We have presented a series of key themes

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Decarbonisation of Heat
Demonstrates why gas is the ideal solution for decarbonising residential and commercial heat

Decarbonisation of Transport
Discusses why decarbonising transport through gas (and electricity) should be an early priority

Decarbonisation of Industry
Demonstrates why decarbonising the gas sector is the best option for much of GB industry

Whole Energy System
Establishes why the ability to work across all energy systems will become much more important

Future Networks & Markets
Discusses the products and services needed to facilitate the networks and markets of the future

Carbon Capture Usage & Storage
Maintains that CCUS plays a critical role if decarbonisation is to occur at the lowest possible cost

We will set out:

The challenge & potential solutions

What National Grid will do

No regrets actions
Signposts/triggered actions

A potential timeline for policy decisions and actions

Our public policy recommendations

Highlights from the key themes (1/2)

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	Decarbonisation of Heat	Decarbonisation of Transport	Decarbonisation of Industry
Challenge / Solutions	✓*This is the most difficult area to decarbonise as consumers are leading and scale of challenge is enormous.*	✓*Transport accounts for 40% of UK energy consumption and 26% of GHG emissions*	✓*Gas is used in a range of industrial processes, but there is currently no viable, affordable, low carbon alternative*
	✓*Likely to see a combination emerge, but gas has distinct advantages in cost and level of disruption.*	✓*Again a combination, with gas the preferred solution for heavy vehicles and maritime; Hydrogen coming later*	✓*Where electrification is not an option, a mix of biofuels, green gases and CHP, with CCUS playing a key role*
What National Grid will do?	**Be active in decarbonising gas and continue to enable innovation** • exploring the creation and storage of biogases • exploring hydrogen market models • studying impact of hydrogen on our assets • develop our view of decarb. gas in FES 18 • developing necessary new frameworks • plus signposts and triggered actions	**We believe in the opportunity that gas presents so we plan to be active in its development** • taking a lead on providing the necessary empirical information to policy makers • identification of the optimised locations for fuelling stations • proving the potential for Project CLoCC • participating in European forums • continuing our investment in small vessel loading facilities and road trucking facilities at Grain LNG	**We plan to work more closely with industrial consumers to understand their needs** • to understand how they are impacted by the different decarbonisation approaches • consider their views on potential gas quality changes • understand the implications of charging proposals • develop a flexible asset strategy to support the future use of the NTS
Public policy recommendations	• that Gov't provides **clarity on its preferred heat pathway** asap • a UK-wide **heat oversight body** be established to ensure overall efficiency, cost effectiveness and fairness • continue to support investment into further the **role of green gases** • **options are kept open** with regards to the future of the NTS	• coordinated action to encourage gas, including **incentives & tax arrangements** • **cities should lead the way** in developing the role of hydrogen in public transport • **certainty about fuel duty** on gas-based fuels; ensure the fuel duty differential favours gas • **future road charging models and LEZ's** to favour low carbon alternatives	• **decisions about the role of gas are made holistically** alongside the impact on industry & the wider UK economy • to **appoint a lead official** with cross departmental coverage • Gov't considers what can be done to **encourage CHP** and remove barriers to its development

Highlights from the key themes (2/2)

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	Whole Energy System	Future Networks & Markets
Challenge / Solutions	✓Decarbonisation, decentralisation and global markets are changing where our energy comes from, resulting in increased interactions, leading to increased volatility	✓*As import dependency increases, alongside new gas sources, the NTS and the GB market framework may be required to operate quite differently than it has in the past.*
	✓To work across all energy systems through a more integrated, flexible approach. National Grid is well placed to make this happen across gas and electricity	✓*To make the NTS more accessible, ensuring that the GB market remains attractive and deliver products and services fit for the future; including innovative approaches*
What National Grid will do?	**As our stakeholders have requested, we will enhance our whole energy system thinking to enable better holistic decision making** • investigate the best way to utilise the within day storage that the gas system offers • continue to assess the impacts of increasing gas and electricity interactions on operability through GFOP • increase our whole system modelling capabilities • continue to progress a low carbon gas sector deal with UK Government • work with Ofgem to consider where barriers to whole system thinking can be removed	**We will facilitate the network and market of the future, through ensuring that market change and investment considers the long term future of gas** • provide products, services and a network which facilitate our role in balancing the network safely • understand the health of our assets, what investments are needed and whether in the longer term we need to decommission or repurpose any assets in response to changing flows • agree a long term gas market change plan with industry and Ofgem to ensure we are developing the markets appropriately • continue our involvement in the review of gas quality & GS(M)R
Public policy recommendations	UK Government takes **a more holistic approach** to managing the whole energy system, through: • **appointing a lead official** to cover cross-departmental issues relating to the role of decarbonised gas in the whole energy system; and • government and Ofgem work with the energy industry to identify key areas where **barriers to working more closely together can be removed**	• UK Government develops a decarbonisation of gas strategy • we still take 'low-regret' steps to incrementally increase penetration of decarbonised gas • those negotiating Brexit arrangements consider any unintended negative consequences of making the arrangements between the UK and EU more difficult • Government & Ofgem work alongside industry to consider gas standards including hydrogen and carbon transportation • a clear commitment and ambitious deployment pathway for CCUS, with funding for specific projects in this parliament

The Future of Gas programme key messages

We believe that the UK can lead the world in decarbonisation. Gas and Electricity need to be critical partners in a low carbon world. In order to do this we need to:

- **maintain a competitive GB gas market** which attracts gas from diverse, affordable sources as traditional UK sources decline
- **partner gas with renewable generation** to balance the electricity network
- make increasing **use of excess renewable generation**, when available, to produce hydrogen
- **continue to provide energy** across GB through cost-effective seasonal agility and supporting daily demand peaks at low cost
- continue to **provide UK industry** with an affordable source of heat and an important feedstock for manufacturing processes
- **invest in a more flexible GB gas grid**, which will be capable of flowing pure hydrogen, natural gas, and blends of gases in different areas
- **produce hydrogen at scale**, using natural gas **alongside CCUS** for the decarbonisation of heat, industry, power and transport
- **decarbonise heavy vehicles using a mix of biogases and natural gas** in the short term, making significant inroads into air quality improvements
- **develop world-leading carbon transportation and storage facilities**, leveraging more than 100 years of carbon storage capacity and a world-class oil and gas industry to help store it


Thank You

Backup

Timeline for themes…

To be updated

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November 2016
The Future of Gas:
A Transmission Perspective

July 2017
The Future of Gas
Progress Report

March 2018
Future of Gas:
The role of gas in a low carbon economy