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# Future UK Gas Security: Upstream Security of Supply

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## About the UK Gas Security Forum

This briefing reports the findings of the first UK Gas Security Forum, which brings together a range of stakeholders from government, business, think-tanks and academia to consider the impact of Brexit on the UK gas industry. The aim of the Forum is to inform the Brexit negotiations and the formulation of a Post-Brexit UK Gas Security Strategy. The Forum builds on previous research funded by UKERC on: *The UK's Global Gas Challenge* (Bradshaw et al. 2014) and *The Future role of natural gas in the UK* (McGlade et al. 2016). The approach adopted combines a supply chain analysis of energy security with a whole system approach, that places gas security within the wider context of the decarbonisation of the UK energy system. In keeping with the wider framing of UK energy policy within the energy trilemma, it is assumed that a future UK gas strategy must deliver secure, affordable and sustainable energy services to end users.

## Why gas matters

Natural gas plays a critical role in the UK's energy system, providing twice as much energy as electricity. According to recent data (BEIS 2017), in 2016 natural gas accounted for nearly 40% of total UK inland energy consumption and was used to generate 41.7% of the electricity consumed in the UK. Total gas demand is split roughly three ways between: electricity generation (33.4%), domestic use (34.9%) and the energy industry, other industry and services (31.7%). Over 80% of UK households rely on natural gas for their heating. Thus, the future security and affordability of the UK's gas supply is a matter of significant political and socio-economic significance.

## The 'Brexit interregnum'

Brexit is coming at a time when there are already major challenges facing the future of natural gas in the UK energy mix. Back at the turn of the century the UK was self-sufficient in natural gas, today it imports almost half the gas that is consumed.

Furthermore, the infrastructure that supports the industry is aging and its business fundamentals are being challenged by the growth of renewable electricity generation and EU gas market reforms. Thus, even if Brexit was not happening, critical decisions need to be made about investment in the future of gas in the UK. This includes both new capacity and also the closing of existing capacity. The energy industry is capital intensive with investments paying back over decades; consequently, it is particularly vulnerable to uncertainty and a lack of clarity on the direction of long-term policies. Thus, Brexit may result in a failure to adjust Government policy to changing market conditions. The most immediate impact of Brexit has been to increase the level of uncertainty that investors face at a time when critical decisions must be made; decisions that will have significant implications into the 2020s and beyond (Lowe 2017). In short, until the outcomes of the current negotiations are known, investors face a 'Brexit interregnum' when it is very difficult to make decisions that have long-term consequences.

## A Supply Chain Approach to Gas Security

The academic and policy literature on energy security has tended to be overly focused on upstream security of supply—where the gas comes from (which is the focus of this briefing). The supply chain approach was adopted in our previous research to provide a more holistic analysis of gas security, as well as a link to the wider energy system issues. Figure 1 summarises the findings of our research back in 2014. The aim of the Forum is to update our earlier analysis to assess the challenges and opportunities presented by Brexit, as well as the requirements for a post-Brexit UK Gas Security Strategy.

The first Forum meeting focused on Upstream Security of Supply, the second will consider critical infrastructures in the Midstream, and third will focus on the Downstream and future security of demand. A daylong conference, in February 2018, will then consider the impact of Brexit and the key challenges that should be addressed in a future UK Gas Security Strategy.

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	Geopolitics	Dimensions	Issues
Upstream	Security of Supply	<ul style="list-style-type: none"> <li>⌘ Resource Base</li> <li>⌘ Technology</li> <li>⌘ Investment</li> </ul>	<ul style="list-style-type: none"> <li>⌘ UKCS</li> <li>⌘ NCS</li> <li>⌘ Europe – Russia/North Africa</li> <li>⌘ LNG Supply</li> <li>⌘ Unconventional Gas</li> </ul>
Midstream	Security of Transport (Transit)	<ul style="list-style-type: none"> <li>⌘ Processing</li> <li>⌘ Transportation</li> <li>⌘ Storage</li> </ul>	<ul style="list-style-type: none"> <li>⌘ LNG Terminals</li> <li>⌘ Interconnectors and Third Package</li> <li>⌘ National Transmission System</li> <li>⌘ Storage</li> <li>⌘ National Balancing Point/Hubs</li> </ul>
Downstream	Security of Demand	<ul style="list-style-type: none"> <li>⌘ Power Generation</li> <li>⌘ Industrial Use</li> <li>⌘ Domestic Use</li> </ul>	<ul style="list-style-type: none"> <li>⌘ Role of Gas in UK energy strategy</li> <li>⌘ Intermittency and Capacity Markets</li> <li>⌘ Future Gas Demand</li> <li>⌘ Carbon Floor Price &amp; ETS</li> <li>⌘ Carbon Capture &amp; Storage</li> </ul>

Figure 1: Supply Chain Analysis of UK Gas Security

### Defining Energy Security

Energy security has spawned a substantial academic and policy literature seeking to define and measure it. The International Energy Agency (IEA 2017) defines energy security as: “the uninterrupted availability of energy sources at affordable prices.” Here we adopt former DECC’s (2012) distinction between physical security of supply and price security of supply. For former DECC: “energy security is about ensuring that we have access to the energy services that we need (physical security) at prices that would avoid excessive volatility (price security).” Thus, Brexit might not have an impact on the UK’s physical ability to import the gas that it needs, but it might impact on how much UK customers might have to pay to secure that gas. In fact, the most immediate impact of Brexit has been the fall in sterling and we pay for our imported gas in US dollars and Euros (IPA Advisory (2017)). Consequently, the cost of gas has recently risen for UK consumers.

These actions do not currently challenge the UK’s interests and, because of its geography and prudent investment, it has easily met the EU’s security of supply test (the so-called N-1 test). In fact, the Forum questioned whether this test is sufficiently rigorous to meet the needs of the UK when it leaves the EU? More recently the European Commission has introduced a new security of gas supply regulation that defines the ‘solidarity principle’ whereby: “in the event of a severe gas crisis, neighbouring member states will help out to ensure gas supply to households and essential services remain.” If the UK were outside the EU’s internal energy market it might not benefit from such measures, rather the EU’s actions might challenge UK gas security if it were cut-off from EU supplies.

### The EU’s Energy Security Strategy

In response to the Russia-Ukraine gas disputes in 2005 and 2009 and the prospect of increasing energy import dependence, in 2014 the European Commission published its *Energy Security Strategy* that included five long-term actions to address security of supply disruptions:

- ⌘ Increasing energy efficiency and reaching the proposed 2030 energy and climate goals;
- ⌘ Increasing energy production in the EU and diversifying supplier countries and routes;
- ⌘ Completing the internal energy market (for electricity and gas) and building missing infrastructure links to respond quickly to supply disruptions and redirect energy across the EU to where it is needed;
- ⌘ Speaking with one voice on external policy; and
- ⌘ Strengthening emergency and solidarity mechanisms and protecting critical infrastructure.

### UK Upstream gas security

Figure 2 shows a familiar story, following the discovery of oil and gas on the UK continental shelf (UKCS), the country embarked on a dash for gas, first in the domestic and industrial sectors, then post 1990 in power generation.

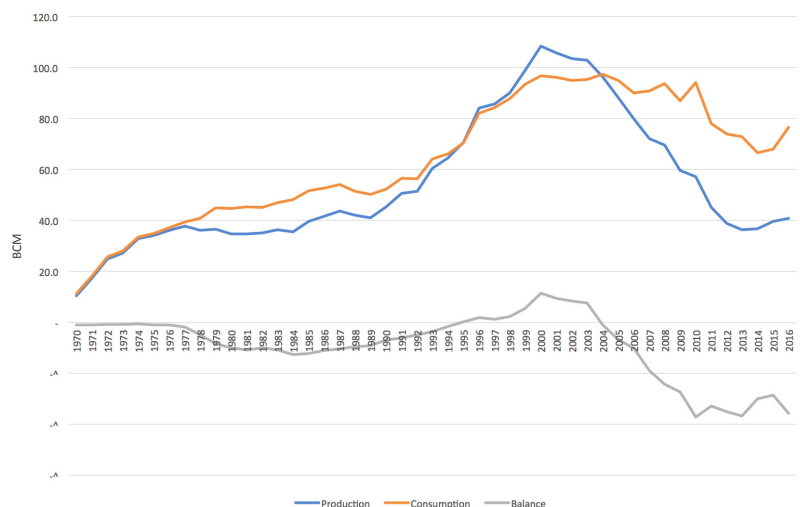


Figure 2: The UK’s Gas Balance 1990-2016 (Source BP 2017)

Natural gas production on the UKCS peaked in 2000, and while gas demand plateaued and then declined, the inevitable consequence has been an increase in import dependence.

According to BEIS (2017), in 2016 domestic gas production was 63% lower than in 2000, and the UK imported 47% of the gas that it used. Fortunately, the gas industry has invested in a substantial import infrastructure that means that today there are no physical capacity constraints on meeting the UK's gas import needs today. However, this assumes that critical infrastructures remain in place and there is a supply of the commodity behind it.

There are three sources of natural gas imports into the UK: pipeline gas from the Norwegian continental shelf (NCS), pipeline gas imports via two interconnectors originating in Belgium (IUK) and the Netherlands (BBL), and Liquefied Natural Gas (LNG) via three terminals—two at Milford Haven in Wales and one at the Isle of Grain in Kent. There is also a smaller floating storage regasification unit (FSRU) on Teesside that is currently decommissioned. However, it is reported that the Swiss commodities trading company Trafigura is to invest \$30 million on bringing it back into operation by mid-2018.

Figure 3 shows the changing balance between these sources of supply. In 2016, Norwegian pipeline gas accounted for 65% of total gas imports, pipelines from Belgium and the Netherlands, 9% and 3% respectively, and LNG accounted for the remaining 23% (92% of which came from Qatar). Thus, 77% of the UK's gas imports came from elsewhere in the EU internal energy market, that includes Norway via its membership of EFTA and the EEA, but only 12% came from other EU member states.

The two interconnectors link the UK to the northwest European gas market and while some of the pipelines from the NCS come straight to the UK, Norway also has pipeline links to Germany, Belgium and the Netherlands. Thus, a key question is how will Brexit impact on Norway's willingness (and ability) to supply the UK with the gas it needs?

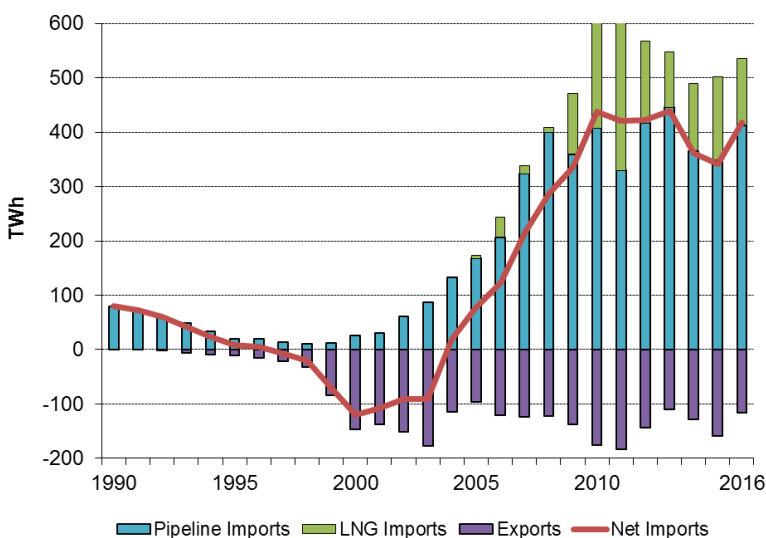


Figure 3: The UK's Gas Balance (Source: BEIS 2017)

The UK has played a key leadership role in promoting gas market liberalisation in the EU and it now benefits from participating in a functioning gas market in northwest European gas market with two significant trading hubs: the UK's National Balancing Point (NBP) and the Dutch Title Transfer Facility (TTF). The future of the NBP and the role of the interconnectors is discussed in more detail in the second briefing, but it should be noted that TTF is now gaining ascendance as the European benchmark price (Bros 2017).

It is through its LNG imports that the UK is increasingly connected to changes in the global gas market. Post-2011, in the aftermath of Fukushima disaster in Japan, relatively little LNG came to the UK, and Europe more generally. More recently, the start of new projects in Australia and the beginnings of exports from the United States has heralded the beginnings of a period of oversupply that may last well into the 2020s. This suggests that there may be more affordable LNG for import to the UK. This is significant given the recent announcement by Centrica Storage, in June this year, that the Rough offshore storage will close for technical reasons. The three LNG terminals represent significant storage capacity, but only if there is gas in their tanks!

A final complication is that seismic problems at Groningen have resulted in the Dutch Government placing a cap on its future gas production. Despite this, the northwest European market remains well supplied and it remains to be seen how its established pipeline gas suppliers—Russia's Gazprom and Norway's Statoil—will respond to the increased availability of LNG for Europe. All the signs suggest that during the coming few years as the UK exits the EU there will sufficient and affordable supplies of natural gas to meet its import requirements. What happens in the 2020s depends on production from the UKCS, prospects for onshore production and the level of future gas demand.

### Running on empty

The UKCS has been hard hit by the downturn in oil prices. Significant progress has been made in reducing costs and improving efficiency, but it is now a mature basin in the early throes of decommissioning. The Oil and Gas Authority's (2017) short-term median projection to 2022 suggest a total production of 29.7 bcm, compared to 41 bcm in 2016. Thereafter, the rate of decline is 5% a year, which could result in a level of gas import dependency of 63% in 2025 and 71% by 2030. The only other possibilities in terms of future UK gas production lie onshore with biogas and shale gas. Biogas is growing quickly, from a low base, but is unlikely to make a significant difference in the short-term, and shale gas is only in the earliest stage of exploration and is attracting significant public opposition.

## Exports and interconnection

To complicate things further, the UK also exports gas to Belgium via the IUK and to Ireland (both Northern Ireland and the Republic of Ireland) via the Moffat Interconnector. The export capability of IUK allows gas from the North Sea and from the LNG terminals to access the continent when market conditions dictate. Traditionally, Ireland has relied almost entirely on the UK (93% in 2015) for its gas supplies. However, the start-up of the Corrib gas field off the northwest coast of Ireland reduced imports by a third in 2016. Production at Corrib is expected to peak in the next 2 years, at which point it will account for 60% of Irish supply; however, it will then fall back in the 2020s and import dependence will again become a concern. Post-Brexit Ireland could find itself cut-off from the EU's internal energy market and unable to meet the EU's security of supply requirements. Thus, Irish energy security concerns are likely to impact the early Brexit negotiations.

## Brexit and UK Security of Gas Supply

On the face of it there seems no reason for concern over the short- to medium (next 5 years) term when it comes to upstream security of gas supply. The UK has more than

sufficient physical gas import infrastructure and current market conditions in northwest Europe and in the global LNG market suggest that gas will be affordable well into the 2020s. But all this depends on the UK being integrated into a single northwest European gas market with no additional impediments or costs on market access post-Brexit. Such an outcome is also in the interests of EU27 as the UK's import infrastructure and market leadership contributes to the EU's gas security. However, as domestic production falls in the 2020s and import dependence climbs there are a set of issues that must be considered in a future UK gas security strategy:

- ⌘ Future gas trading relations with Norway;
- ⌘ The terms of the UK's future involvement in the northwest European gas market;
- ⌘ Developments in the global LNG market that impact on the availability and affordability of LNG imports to the UK to match seasonal demand;
- ⌘ Future gas production on the UKCS;
- ⌘ Prospects for domestic onshore production from biogas and shale gas; and,
- ⌘ The efficacy of the current N-1 assessment of gas security.

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## References

Bradshaw, M., Bridge, G., Bouzarovski, S., Watson, J. and Dutton, J. (2014) *The UK's Global Gas Challenge*. UKERC: London. Available at: <http://www.ukerc.ac.uk/publications/the-uk-s-global-gas-challenge.html>

Bros, T. (2017) *Brexit's impact on gas markets*. Oxford: OIES. Available at: <https://www.oxfordenergy.org/publications/brexit-impact-gas-markets-brexit-security-supply-uk-ireland/>

BEIS (2017) *UK Energy in Brief 2017*. BEIS: London. Available at: <https://www.gov.uk/government/statistics/uk-energy-in-brief-2017>

DECC (2012) *Energy Security Strategy*. DECC: London. Available at: [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/65643/7101-energy-security-strategy.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/65643/7101-energy-security-strategy.pdf)

European Commission (2017) *Commission welcomes new rules to secure gas supplies in Europe*. Brussels: European Commission. Available at: [http://europa.eu/rapid/press-release\\_IP-17-766\\_en.htm](http://europa.eu/rapid/press-release_IP-17-766_en.htm)

IPA Advisory (2017) *Post-Brexit Implications for the UK Gas Industry*. London: IPA Advisory Limited.

IEA (2017) *What is Energy Security?* Paris: IEA. Available at: <https://www.iea.org/topics/energysecurity/subtopics/whatisenergysecurity/>

Lowe, P. (2017) *Brexit and energy: Time to make some hard choices*. London: Centre for European Reform. Available at: [http://www.cer.eu/sites/default/files/pbrief\\_energy\\_lowe\\_25.9.17.pdf](http://www.cer.eu/sites/default/files/pbrief_energy_lowe_25.9.17.pdf)

McGlade, C., Pye, S., Watson, J., Bradshaw, M. and Ekins, P. (2016) *The future role of natural gas in the UK*. London: UKERC. Available at: <http://www.ukerc.ac.uk/publications/the-future-role-of-natural-gas-in-the-uk.html>

Oil and Gas Authority (2017) *UKCS Oil and Gas Projections*. London: OGA. Available at: <https://www.ogauthority.co.uk/media/3391/oga-production-projections-february-2017.pdf>