

The United Kingdom's 60-year engagement with LNG

BY JOHN HOLDING

Abstract

This article details the circumstances under which LNG was first delivered to the United Kingdom in 1959 and how the trade continued until 1982. The reasons for the interruption are explained which in due course led to the resumption of LNG imports utilizing new terminals from the early 2000s and which are in full use today.

Introduction: 1959 – the first UK LNG imports

The United Kingdom's LNG history dates back to February 1959 when an innovative terminal located on the north bank of the River Thames estuary at Canvey Island in Essex received the world's first ocean cargo of LNG. The carrier was the British-flagged MV Methane Pioneer, a converted US Liberty ship, which arrived with 32,000 bbls (ca. 1,700 tonnes) of LNG¹. The vessel had been refitted with two aluminum tanks insulated with balsa wood in a shipyard in Mobile, Alabama and was funded by the UK's Gas Council. The vessel was operated by a joint venture between Conoco and Union Stock Yards of Chicago; Constock International Methane. The LNG was loaded at Lake Charles, Louisiana and the voyage took 27 days to cross the Atlantic to the United Kingdom.

The motivation for the project from the British side was that during the 1950's it became apparent that there was a need to find new energy sources. The ever-increasing demand from industry and the domestic market for both gas and electricity required larger more efficient plants to be built which used coal and oil products to produce gas and generate electricity. The feedstocks were becoming more expensive and the supplies less reliable. Consequently, in 1959-1960 a total of seven such cargoes of LNG were transported to the UK and the regasified product was sent by pipeline to a local gas works. The natural gas was reformed into town gas (a carbon monoxide and hydrogen mixture) which was of low calorific value but was the standard at the time².

The success of this endeavor led to the first carrier specifically designed for LNG, the Methane Princess³, which entered service from Algeria to the UK and France in 1964. The vessel took on the first load of LNG (12,000 tonnes) at Arzew where the liquefaction plant was located being sourced from new gas fields at Hassi R'Mel in the Sahara Desert. Delivery arrived at Canvey Island in October 1964 – the first of 50 shipments of LNG each year continuing until 1982 after which the owner British Gas closed the site in 1994.

The LNG hiatus lasted for 20 years until new terminals were constructed and deliveries commenced from the international market. Today (year-end 2022) the United Kingdom is expected to have received record quantities of LNG⁴. The country is now well-equipped having three LNG receiving terminals including the larg-

est one in Europe, South Hook LNG, situated at Milford Haven in southwest Wales.

UK gas in context: manufacture of town gas – the original driver for LNG

The beginnings of gas use in the UK stem back to the early 19th century when town gas was manufactured from coal and used for public lighting, industrial and commercial processes and for heating. Coal had been in use since the 14th century in domestic hearths (fireplaces) but it expanded rapidly with the Industrial Revolution from the late 18th century when it was used to raise steam for power purposes. The world's first coal-fired power station, the Edison Electric Light Station, was built in London in 1882 with the promise of supplying light and warmth to London homes.

Coal was also converted (chemically 'reformed') to make manufactured gas, or town gas, but this peaked in the 1960s when it was quickly displaced by natural gas from the North Sea. UK coal production had reached its high point in 1900 at over 250 million tonnes per year but then declined steeply to below 50 million tonnes by in 1990 and today is barely 1 million tonnes alongside imports of approximately 5 million tonnes⁵.

Town gas became 'new technology' when the first piped gas supply was used for street lighting in Pall Mall London (1807) and was followed by similar application in provincial towns across the country as well as in commercial and industrial activities. However, it wasn't until the development of the Bunsen Burner in 1855 that gas was used for a range of direct and indirect heating purposes in domestic settings for heating and cooking. The rapid establishment of private or municipal-owned town gas plants, or gas works, became the norm along with the huge gas holders that are even still to be seen today.

The opportunity to switch to gas from coal was seen as an obvious choice given the air pollution (evident at ground level with the choking smogs of the Victorian and early 20th centuries). Gas was seen as clean, safe and controllable.

The ascent of natural gas production and utilization: North Sea developments and the demand shift to gas use for power generation (the 'Dash for Gas' -1990s)

Whilst Algerian LNG supply was initiated in 1964, the following year witnessed the first discovery of offshore

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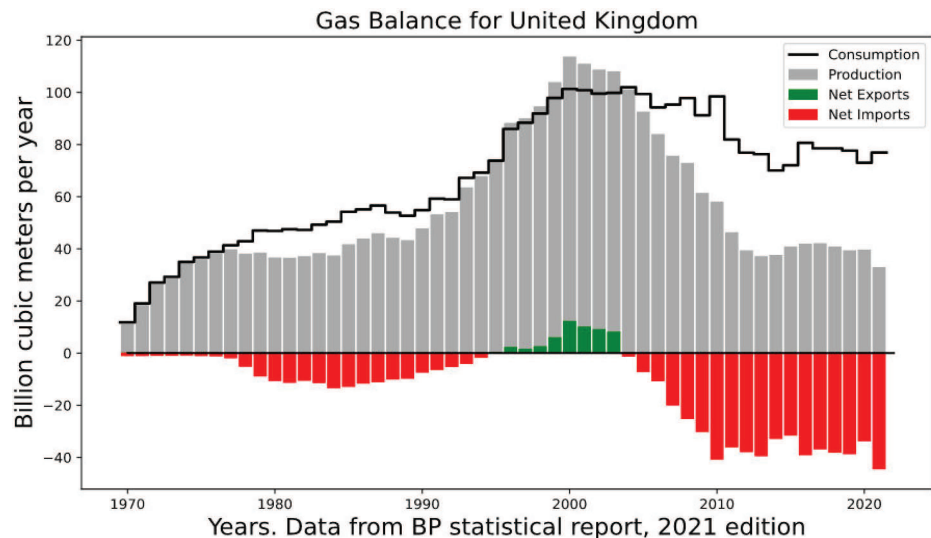
natural gas by BP in the West Sole field off the coast of East Anglia. This was developed commercially in 1967 and the field started to transmit gas by a pipeline to Easington on the northeast coast of England. This event triggered a huge exploration and development of the UK North Sea, firstly in the shallower waters of the southern sector to be followed from 1975 by oil and gas discoveries and field development in the much deeper and remoter central and northern areas between the UK and Norway. Astonishingly, by the mid-1990s Britain had become a net exporter of gas. However, this major supply expansion peaked in 2000 and started a decline thereafter.

The era of the 1960's are regarded as the start of the UK's total commitment to natural gas, whether sourced domestically from the North Sea or by import from overseas as LNG or by pipelines from Norway and the near continent. From 1967 until 1972 manufactured town gas was replaced across the whole of the UK by natural gas under a major conversion project affecting all homes, institutions and commercial and industrial premises. Basically, the gas burners had to be modified for the different composition and combustion properties of natural gas versus town gas.

Gas demand grew further as a result of government policy during Margaret Thatcher's three tenures as Prime Minister (1979-1990). Thatcher initiated a far-reaching and aggressive privatization of state entities which notably included that of the National Coal Board resulting in the coal miners' strike of 1984-1985 against the large-scale closure of collieries. British Gas was privatized in 1986 and the National Coal Board a year later followed by the regional electricity companies in 1990. These actions resulted in the so-called 'Dash for Gas' when the newly privatized electricity generating companies shifted towards using natural gas when regulatory changes allowed gas to be used as a fuel for power generation. Moreover, high interest rates at the time favored gas turbine power stations which were quick to build and the use of new technology, specifically combined cycle gas turbine generators (CCGT) offered higher relative efficiencies. North Sea gas production was rising at the time – the future for gas looked attractive and by 2002 the new CCGT power stations made up 28% of UK electricity generating capacity. Separately, domestic gas boilers and home central heating had expanded in the Thatcher years alongside the original use of gas - that is, town gas used for cooking and water heaters/geysers. A secure supply of natural gas was needed for the long term.

2000 and beyond: a new era for LNG in the UK

The chart shows the widening gap between UK gas production and consumption from 2004 which had to be filled by imports (shown in the red bars) coming either from gas pipelines or LNG deliveries. A new era for LNG in the UK had dawned.



Firstly, in the case of gas by pipeline, four terminals already serve the UK with natural gas from abroad;

- Norwegian North Sea gas imports arrive at (1) St Fergus in Scotland (from 2001, after the 1978 Frigg gas line was expanded) and (2) at Easington in northeast England (from 2006). Combined delivery capacity of 37.5 BCM/annum represents approximately 45% of UK's current gas demand making Norway the UK's top supplier.
- The Interconnector (1998), a bi-directional gas pipeline connects Zeebrugge (Belgium) to Bacton in eastern England with an import capacity of 25.5 BCM/annum
- The BBL line (Balgzand Bacton Line), a bi-directional gas pipeline (2006) connects North Holland also with Bacton allowing 15 BCM/annum to be imported.

The implication of the total gas capacity of these four pipelines is that the UK could in theory be supplied with 78 BCM/annum – virtually its total current demand (see the Consumption line on the chart). Clearly, given the two-way flows permitted in the lines from Belgium and Holland these particularly represent options to satisfy UK demand and surplus supply whilst the two Norwegian lines are more 'base load' supplies subject to volume nominations under the respective contracts.

Secondly, with respect to LNG receiving terminals the UK currently has three in operation (a fourth one utilizing FSRU technology at Teesside GasPort – north of the Easington gas pipeline terminal – was operational from 2007 but suspended in 2015⁶). With respect to the UK's fully operational terminals, two are located on the north bank of Milford Haven in southwest Wales and one is on the south bank of the River Thames estuary

in Kent (downstream from the original Canvey Island terminal mentioned at the outset herein).

- **South Hook LNG** in Milford Haven southwest Wales is the largest LNG terminal in Europe providing approximately 25% of the UK's current gas requirements (ca. 19 billion cubic metres per annum). The terminal was established in 2004 and is operated by QatarEnergy (with a 67.5% stake), Total Energies (8.35%) and ExxonMobil (24.15%). The first delivery of LNG was in 2009 from Qatar and the 500th cargo from Qatar was delivered to South Hook on 24 March 2016.
- **Grain LNG** located on the Isle of Grain in the Thames estuary was commissioned in 2005 and has 1 million cubic metres of storage (to become 1.2 million cubic metres by 2025) with the capacity to process approximately 15 million tonnes of LNG per annum and deliver 25% of UK gas demand. In 2020 the terminal welcomed its 500th LNG carrier. Terminal capacity is currently allocated to BP/Sonatrach, Centrica and Total through term contracts along with other supplies coming from the spot market. The terminal is owned by National Grid, the UK's electricity and gas system networks operator and is a public company.
- **Dragon LNG Terminal** is the smallest of Britain's three LNG terminals. It can handle approximately 7.6 billion cubic metres, around 10% of UK needs. It's located upriver from the larger South Hook terminal. The Dragon LNG terminal is under shared ownership between Shell (a 50% share) and Ancala LNG Ltd (50%). Petronas shares capacity rights with Shell (50% each).

Longer term outlook for UK LNG

Not just for the UK, but globally and not just for LNG, the longer term use of natural gas is problematic given that it is a fossil fuel albeit the least harmful to the climate compared with coal and oil. Continued use of natural gas implies that its emissions are abated or mitigated and whilst several options are already available widescale take-up appears sluggish such that Net Zero by 2050 is surely in question; the IEA considers it a *formidable goal* in their June 2021 'Roadmap for the Global Energy Sector'⁷. The next UNFCCC COP (COP28 to be held in December in 2023 in the United Arab Emirates) may or may not address the issue of fossil fuel emissions⁸ and it is unclear if any consensus for global action will be agreed - given COP27's outcomes.

Reverting specifically to LNG use in the UK, the energy source is in direct competition with imported pipe-

line gas; this state of affairs certainly assists security of supply and might have an impact on prices depending on demand-side trends and on the depletion of North Sea gas reserves. At the end of the day LNG has to be competitive in the UK gas market.

Yet, a backward glance to the mid-20th century recalls that LNG was imported for the purpose of reforming it into town gas to produce a mixture of Carbon Monoxide and Hydrogen. This is interesting in that Hydrogen is a current contender to replace the direct use of natural gas because there are no greenhouse gas emissions from burning hydrogen – only water vapor. Meanwhile carbon monoxide has uses as a chemical feedstock in the manufacture of methanol and phosgene – an intermediary in the manufacture of dyes, pesticides, plastics, polyurethanes, isocyanates, and pharmaceuticals.

The UK's engagement with LNG has surpassed 60 years - - - and still counting

Footnotes

¹ Refer to "A Short History of LNG Shipping 1959-2009" by Peter G. Noble - available at <https://higherlogicdownload.s3.amazonaws.com/SNAME/1dcdb863-8881-4263-af8d-530101f64412/UploadedFiles/c3352777fcaa4c4daa8f125c0a7c03e9.pdf>

² Town Gas was produced by Steam Methane Reforming which converts natural gas (methane) to carbon monoxide and hydrogen in a reversible reaction: $\text{CH}_4 + \text{H}_2\text{O} \rightleftharpoons \text{CO} + 3\text{H}_2$

³ Methane Princess plus its sister ship Methane Progress, purpose-built LNG carriers, were constructed in the UK and commissioned in 1964 to carry LNG from Arzew (Algeria) to Canvey Island on the River Thames. Each had a carrying capacity of 27,000 cubic metres (ca. 12,000 tonnes)

⁴ Author's assessment (January 2023) based on UK Government's *National statistics Energy Trends: UK Gas* (Last updated 3 January 2023) available at [Energy Trends: UK gas - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/statistics/energy-trends-uk-gas)

⁵ *The death of UK coal in five charts - Our World in Data*. Available at [The death of UK coal in five charts - Our World in Data](https://ourworldindata.org/the-death-of-uk-coal-in-five-charts)

⁶ FSRU (Floating Storage and Regasification Units) act in all aspects similar to a land-based terminal and, in addition to transporting LNG, purpose-built FSRUs have the onboard capability to vaporize LNG and deliver the natural gas through specially designed offshore and near-shore receiving facilities. Teesside GasPort was the world's first dockside floating regasification facility located near Middlesbrough in the United Kingdom and it operated from 2007 to 2015 for its customer Exceleerate Energy of Texas, USA

⁷ *Net zero by 2050: a roadmap for the global energy sector - A special report by the International Energy Agency for UNFCCC*

⁸ The Daily Telegraph (London, 13 January 2023, p.12) reported that the UAE had appointed Sultan Ahmed Al-Jaber – CEO of ADNOC and Minister for Industry – as the President of COP28.