Diversity of supply of natural gas in Europe, 2024

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Key headlines

European gas demand stabilised following successive declines, with overall European natural gas demand remaining flat in 2024 compared to 2023. Demand in the UK dropped 2.3 per cent, mainly due to reduced use in electricity generation.

Norway accounted for 59 per cent of total European natural gas production and remains Europe, and the UKs, principal source of imports. Liquified natural gas (LNG) imports to Europe decreased by 17 per cent in 2024 compared to 2023, and the US remained the largest LNG supplier to both Europe and the UK. European pipeline imports from Russia increased by 6.7 per cent in 2024 but remained well below pre-conflict levels, accounting for 8.7 per cent of gross supply. The UK last imported Russia gas in March 2022.

UK trading patterns in 2024 returned to levels seen before the Russia-Ukraine conflict, with UK exports of natural gas to Europe down by 23 per cent in 2024 on 2023. UK production fell by 10 per cent to its lowest level since 1973, continuing a long-term decline in the mature North Sea basin.

Background

Europe, including the UK, use natural gas for electricity generation, domestic (household) heating and cooking, and other purposes such as industrial processes. This article sets out how countries in Europe meet their natural gas demand via production and imports.

This article uses Energy Trends and International Energy Agency (IEA) data. European IEA member states reflect the majority of Europe but excludes Andorra, Kosovo, Liechtenstein, Monaco, San Marino, and Vatican City which are not included in the article. Cyprus, Iceland, and Montenegro did not produce or consume natural gas so are also not included in the article.

Methods

Three indicators have been used to undertake this analysis.

Self-sufficiency

Production is the process of extracting natural gas from the earth. Self-sufficiency is a measure of a country's ability to meet its demand through production. This is calculated as production divided by demand where:

- Self-sufficiency equals 0, there was no natural gas production
- Self-sufficiency is between 0 and 1, production met some demand
- Self-sufficiency equals 1, production equalled demand
- Self-sufficiency greater than 1, production exceeded demand

Generally higher self-sufficiency means more secure natural gas supply.

Diversity index

The diversity index is a measure of the number of import sources, weighted by the country of origin's political stability[1].

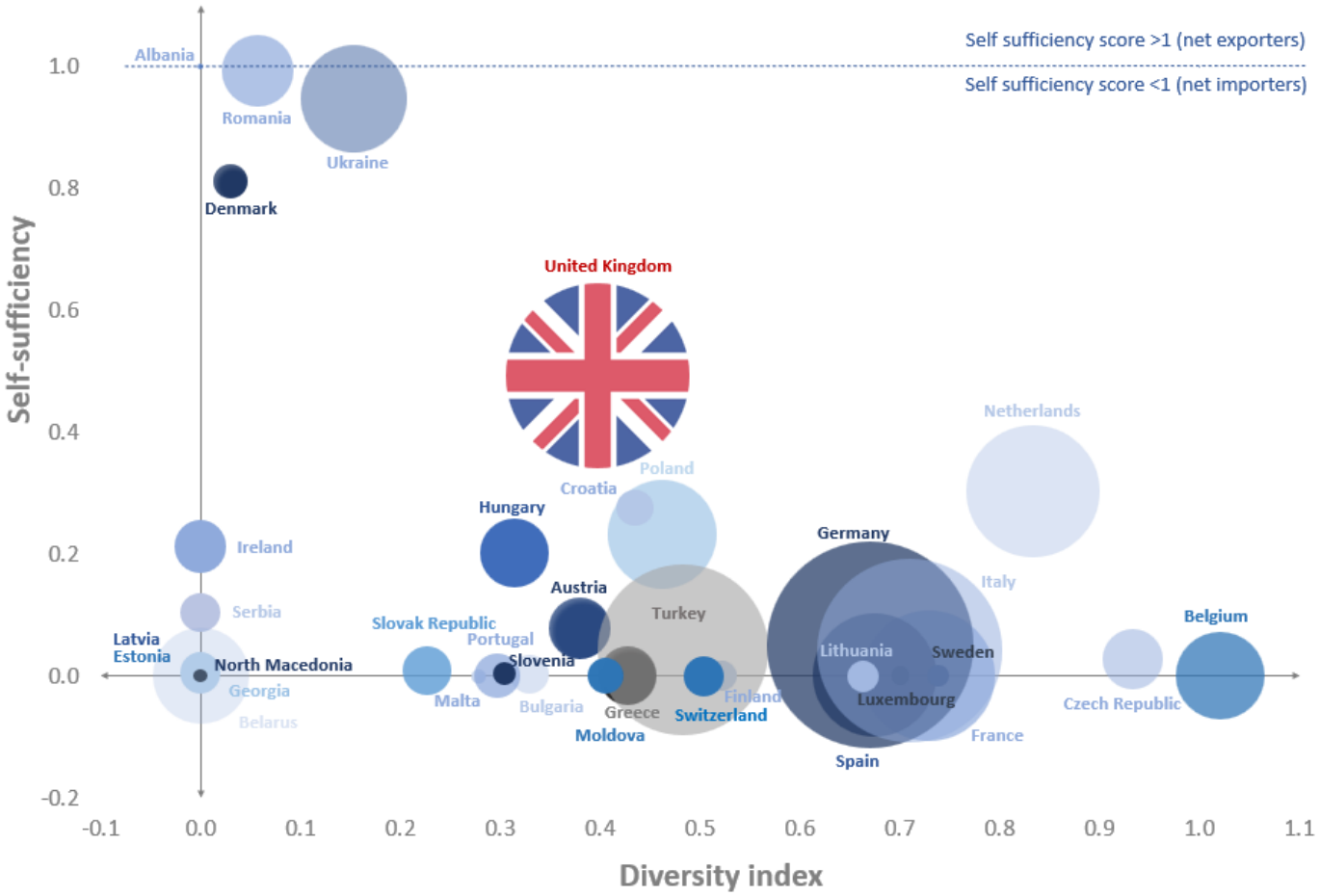
This means that a country with many import sources of high political stability will have a high diversity index. Conversely, a country with few import sources of low political stability will have a low diversity index. In general, a diverse source of imports means gas supply is more secure. This is further improved if the source countries are politically stable.

Supply index

The supply index is the sum of self-sufficiency and diversity index. A higher supply index can be indicative of higher security in terms of a country's sources of gas. A supply index of 0 indicates that a country has no production and only one import source.

[1] Data sourced from World Bank governance indicators. See Appendix 1 for underlying data and Appendix 2 for method.

Chart 1: Self-sufficiency and diversity index for European countries, 2024



Norway is excluded from the graph because it's self-sufficiency is substantially larger than other countries (27). See Appendix 1 for underlying data.

Chart 1 shows the relationship between self-sufficiency and diversity index. The size of each bubble represents natural gas demand in each country.

Self-sufficiency

Norway is the largest producer of natural gas in Europe, and in the top 10 globally. In 2024, Norway produced more than 27 times the amount of natural gas it consumed, accounting for 59 per cent of total European natural gas production. Europe has an average self-sufficiency score of 0.84, this is driven by Norway with almost all other countries below the average (the average self-sufficiency score falls to 0.15 when Norway is excluded).

Albania continued to be self-sufficient in 2024, producing the same amount of gas that it consumed. Of the European countries who use natural gas, Albania's demand is the smallest.

The UK had a self-sufficiency score of 0.49 meaning that just under half of gas demand could have been met by production in 2024.This was down from 0.54 in 2023 as production in the UK fell 10 per cent to the lowest level since 1973, continuing a long-term downward trend, in line with declining output from the North Sea basin.

Of the 39 countries included in this analysis, 13 had a self-sufficiency score of 0 meaning they did not produce any gas and were reliant on imports to meet supply.

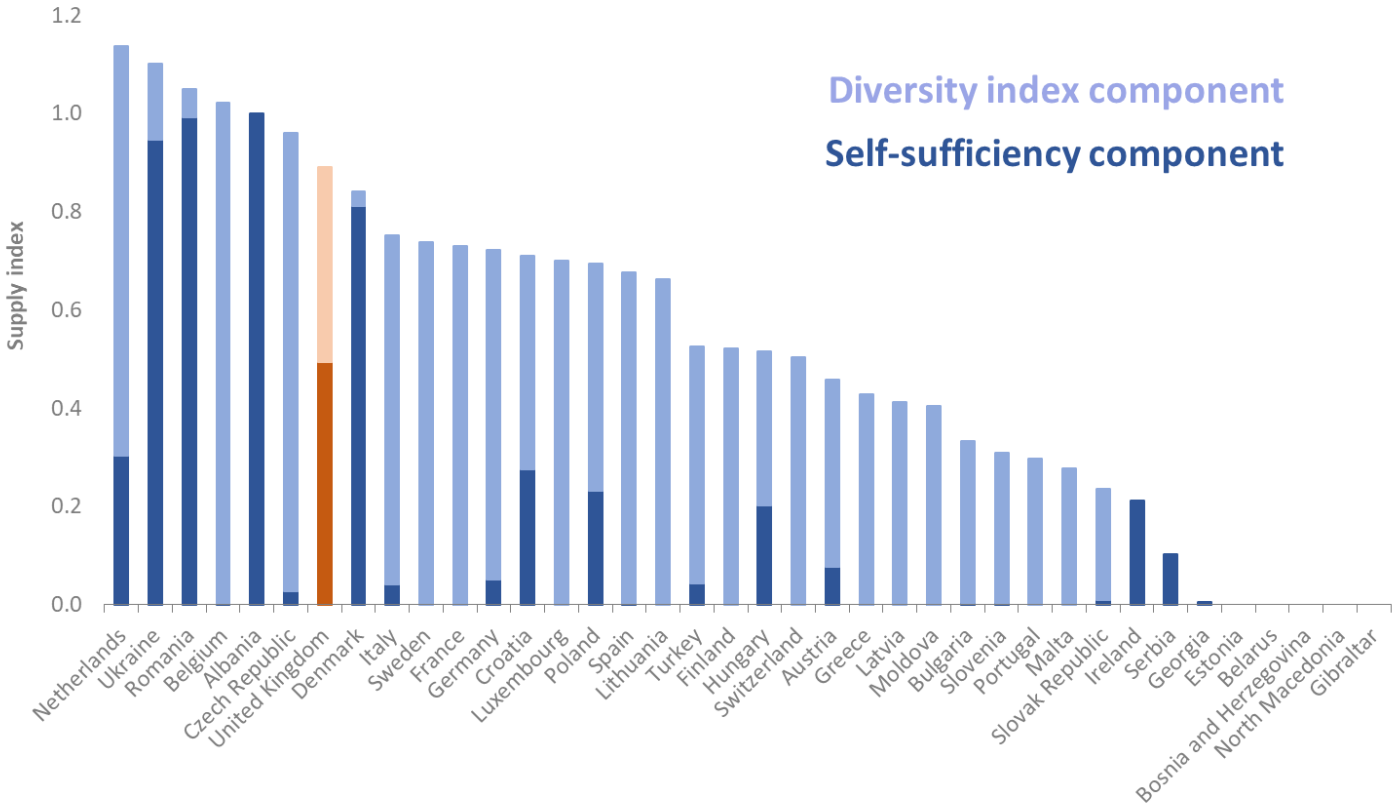
Diversity

Most countries use imports to meet demand. In 2024, the average diversity index of European countries was 0.38. The proximity of Western European countries to the sea facilitates shipments of liquified natural gas (LNG) from a wider range of countries than would be possible with pipelines alone, which contributes to their tendency to have higher diversity indexes. In 2024, the UK's diversity score was 0.40, down from 0.46 in 2023, whilst the UK's number of import sources remained the same, the proportion of imports from large sources increased.

Demand

Germany remained the largest natural gas consumer in Europe (78 bcm), followed by the UK, Italy and Turkey; these four countries accounted for over half of total European natural gas demand in 2024. Overall European demand for natural gas was flat in 2024 compared to 2023 in contrast to the previous year's declines. UK gas demand decreased by 2.2 per cent, due to a decline in gas demand for electricity generation.

Chart 2: Supply index for European countries, 2024



Norway is excluded from the graph because it is self-sufficiency is substantially larger than other countries (27), see Appendix 1 for underlying data.

Chart 2 shows the supply index for European countries in 2024. The self-sufficiency score and diversity index have been stacked, indicating the relative contribution of these components to the security of supply ranking.

Ukraine

In 2024, Ukraine's self-sufficiency continued to rise, reaching 0.95, due to a large increase in indigenous production compared to a moderate increase in demand. Ukraine's diversity index decreased as imports were sourced from fewer countries. Ukraine had the third highest supply index behind Norway and the Netherlands. This analysis does not consider other factors which could be considered when evaluating supply.

Supply index

In 2024, Norway had the highest supply index of European countries at 27.71. The average European supply index was 1.22, bolstered by Norwegian production, and falling to 0.52 when excluding Norway, reflecting most countries' reliance on imports to meet demand. Thirteen countries produced no natural gas, so their supply index equalled their diversity index. Of these countries, Bosnia and Herzegovina, Gibraltar, North Macedonia, Belarus, and Estonia had only one import source, resulting in a supply index of zero.

With a supply index of 0.89, the UK had the eight highest European supply index behind Norway, the Netherlands, Ukraine, Romania, Belgium, Albania, and the Czech Republic. This was down from 1.00 in 2023. The UK is Europe's second largest producer of natural gas; however, it is substantially smaller than Norway, producing 76 per cent less gas than Norway in 2024.

Sources of European gross gas supply

Most European natural gas imports arrive via pipeline for which infrastructure is well-established. In 2024, imports by pipeline made up 70 and 75 per cent of total imports to Europe and the UK respectively. Pipeline infrastructure means it is often convenient to import gas from neighbouring countries. Countries can also import natural gas as shipments of LNG which is gas that has been cooled to a liquefied state, making it easier to store and transport. It can then be regasified at import terminals, before being transferred to the pipeline system. The UK has the second largest LNG regasification infrastructure in Europe, behind Spain, with three import terminals - Dragon, the Isle of Grain, and South Hook.

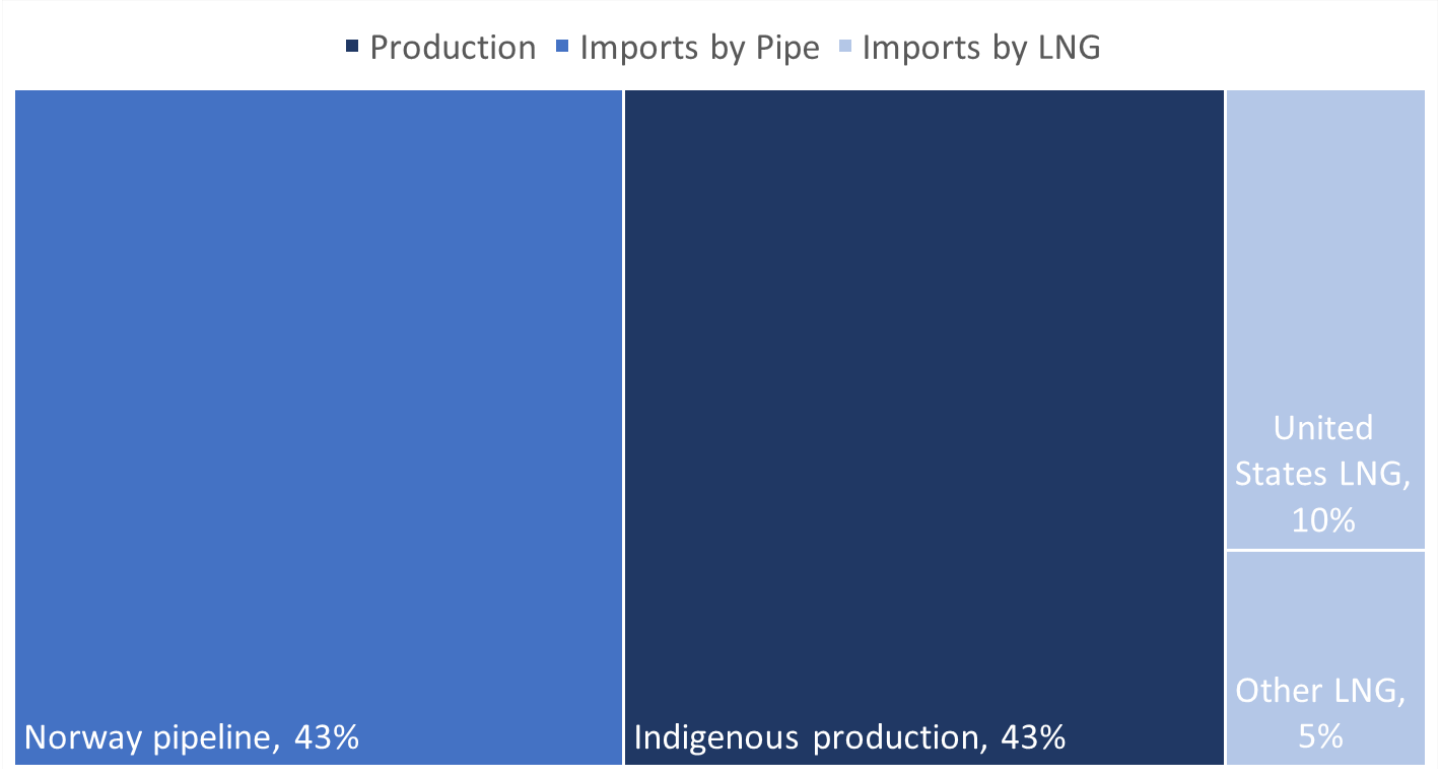
The top import sources for European countries have remained relatively unchanged since 2021, with 13 countries ranking within the top 15 sources each year from 2021 to 2024. Of these, Norway, Russia, Algeria, and the United States have consistently ranked within the top five sources of European imports although the proportion of European supply met by Russian gas has fallen sharply since 2021 when Russian imports comprised 24 per cent of gross supply.

European pipeline imports from Russia[2] fell by almost 50 per cent in 2023 compared to 2022 as many European countries moved away from Russian gas following the invasion of Ukraine. Imports from Russia increased by 7 per cent in 2024 compared to 2023 and Russia remained the second largest pipeline import source to Europe behind Norway, down from the largest in 2022, accounting for 9 per cent of gross supply.

LNG imports decreased by 17 per cent in 2024 compared to 2023, imports of LNG from the US made up 9 per cent of gross supply. Imports of gas to Europe from the UK decreased by 14 per cent in 2023 compared to record highs in 2022 slightly higher than pre-conflict averages.

[2] Russia acts as a transit country for gas from Kazakhstan and Turkmenistan, so it should be noted that the origin of this gas is not necessarily all Russian.

Chart 3: Sources of UK gross gas supply, 2024



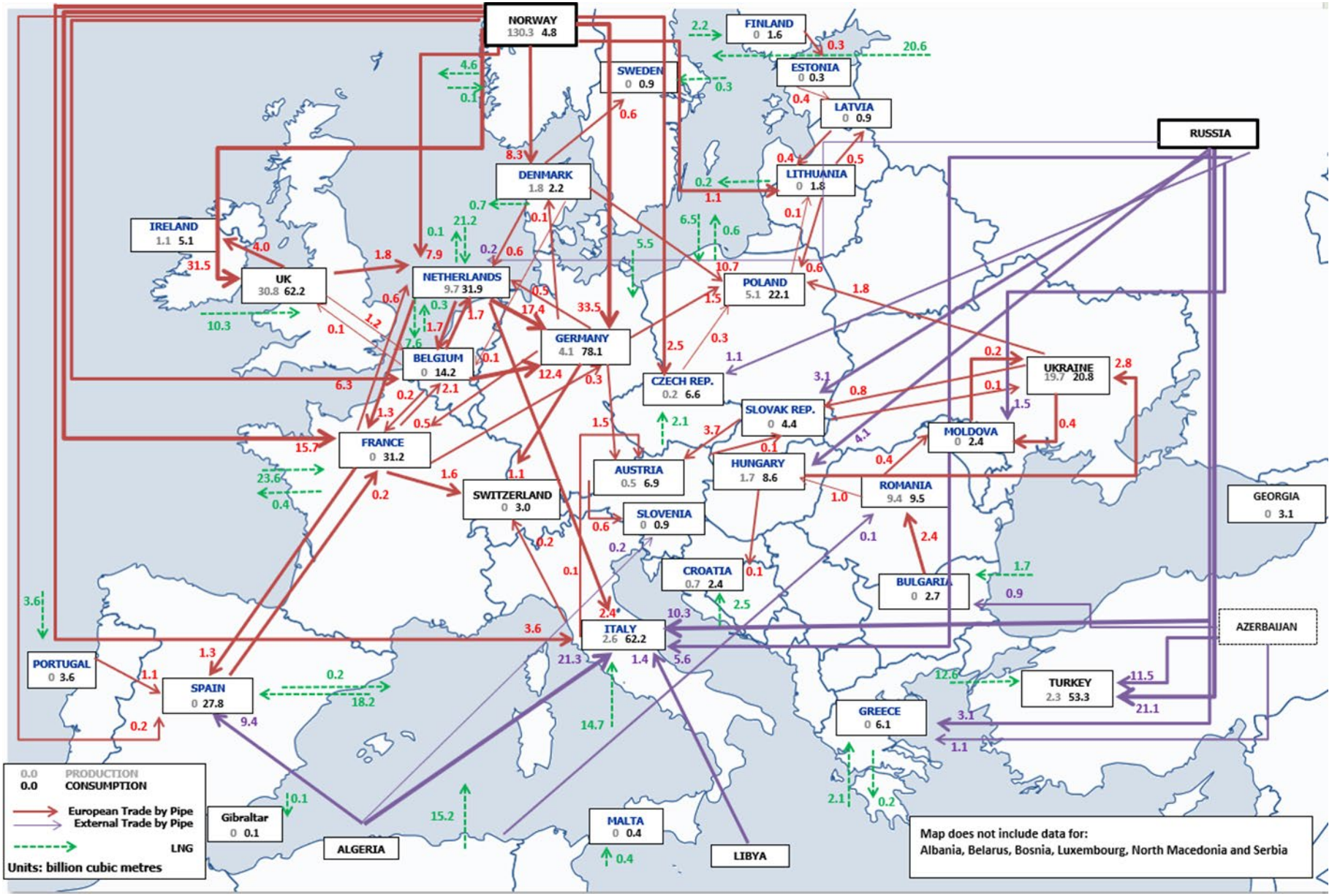
Rounded data do not equal 100 per cent, Countries included in 'Other LNG' include Qatar, Trinidad and Tobago, Algeria, Angola, Peru, Norway, Nigeria, Equatorial Guinea and Egypt

Chart 3 shows gas supply sources for the UK in 2024. In 2024, UK trading patterns returned to close to pre-conflict levels. Norway remained the UK's largest import source, accounting for 43 per cent of gross supply. Norway accounted for almost 100 per cent of all pipeline imports as Belgian and Dutch interconnectors were mainly used for exports.

Imports of LNG from the US accounted for 68 per cent of total UK LNG imports in 2024, up from 61 per cent in 2023. The US remained the largest source of LNG to the UK, having overtaken Qatar in 2022. Qatari LNG imports accounted for 8 per cent of total LNG imports and despite being the second largest source, this was the lowest proportion seen in over a decade. In total, the UK sourced LNG from 10 different countries in 2024, stable on 2023. Following sanction announcements and industry self-sanctioning, the last cargo of Russian LNG imported to the UK was received in March 2022.

Map 1:

Map 1 illustrates the diversity of import supply, as well as the complexities of inter-EU gas trade.



Appendix 1: Underlying data for charts

Table 1: Underlying data for Chart 1 and Chart 2, source: IEA (http://data.iea.org/)

Country	Self-sufficiency	Diversity index	Supply index	Demand (mcm)
Albania	1.00	0.00	1.00	53
Austria	0.08	0.38	0.46	6,936
Belarus	0.00	0.00	0.00	16,857
Belgium	0.00	1.02	1.02	14,182
Bosnia and Herzegovina	0.00	0.00	0.00	224
Bulgaria	0.00	0.33	0.33	2,742
Croatia	0.28	0.44	0.71	2,366
Czech Republic	0.03	0.93	0.96	6,647
Denmark	0.81	0.03	0.84	2,221
Estonia	0.00	0.00	0.00	345
Finland	0.00	0.52	0.52	1,629
France	0.00	0.73	0.73	31,213
Georgia	0.00	0.00	0.00	3,061
Germany	0.05	0.67	0.72	78,093
Gibraltar	0.00	0.00	0.00	97
Greece	0.00	0.43	0.43	6,093
Hungary	0.20	0.31	0.52	8,579
Ireland	0.21	0.00	0.21	5,086
Italy	0.04	0.71	0.75	62,225
Latvia	0.00	0.41	0.41	853
Lithuania	0.00	0.66	0.66	1,821
Luxembourg	0.00	0.70	0.70	587
Malta	0.00	0.28	0.28	373
Netherlands	0.30	0.83	1.14	31,894
Norway	27.00	0.71	27.71	4,825
Poland	0.23	0.46	0.69	22,123
Portugal	0.00	0.30	0.30	3,634
Republic of Moldova	0.00	0.41	0.41	2,375
Republic of North Macedonia	0.00	0.00	0.00	336
Republic of Türkiye	0.04	0.48	0.53	53,262
Romania	0.99	0.06	1.05	9,471
Serbia	0.10	0.00	0.10	2,862
Slovak Republic	0.01	0.23	0.24	4,397
Slovenia	0.00	0.30	0.31	877
Spain	0.00	0.68	0.68	27,808
Sweden	0.00	0.74	0.74	892
Switzerland	0.00	0.50	0.50	2,975
Ukraine	0.95	0.15	1.10	20,820
United Kingdom	0.49	0.40	0.89	62,422
Average	**0.84**	**0.38**	**1.22**	**12,904**

Appendix 2: Methodology

Self-sufficiency

Data for natural gas was extracted from the IEA database. Self-sufficiency was determined from data on production and demand (production (mcm) ÷ demand (mcm)).

Diversity index

The diversity index used here is a product of a standard diversity index and an index for political stability. As a basic index for measuring diversity, we used the Shannon-Wiener diversity index:

$$\sum_{i=1}^{n} -x_i ln(x_i)$$

Where x is the proportion of total natural gas supply represented by the i^{th} source country and n represents the final source country. A value below 1 signifies a country that is dependent on a small range of import sources, a value above 1 represents a country with a wider range of import sources. The minimum value of zero denotes a country that has one imported fuel source or relies entirely on production (or a country with no imports). The Shannon-Wiener was chosen here because it places weight on the diversity of contributions from smaller countries and reduces the impact of larger nations.

Political stability was determined using data from the World Bank worldwide governance indicators. Specifically, the index reflects perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically motivated violence and terrorism. These data were standardised between 0 and 1.

Source: World Bank http://info.worldbank.org/governance/wgi/index.aspx#home

Shannon-Wiener and political stability indices were multiplied and summed:

$$\sum_{i=1}^{n} -x_i ln(x_i) b_i$$

Where b is an index of political stability of producing country. This is called the SWNI (Shannon-Weiner-Neumann index), in line with previous work. Each SWNI index was normalised between 0 and 1, in order to have a standardised index. This was done by working out a maximum diversity score, by assuming maximum diversity was equivalent to importing products in line with proportional contributions of exporting countries (e.g. if a single country were responsible for exporting 50 per cent of all natural gas, and five other countries were responsible for 10 per cent each, we assumed maximum import diversity at a ratio of 5:1:1:1:1:1). This maximum diversity score then acted as our upper score of 1, with all other scores divided by this maximum to standardise the data.

Other sources of gas

Sometimes, due to a variety of reasons, countries may report an import of natural gas from a “Non-Specified/ Other” source country. Border Point Data was used to reallocate imports for Austria, Hungary, Poland, Republic of Moldova, Slovak Republic, and Ukraine, which is available at https://www.iea.org/data-and-statistics/data-product/gas-trade-flows#gas-trade-flows. This data is collected by the IEA and shows monthly gas flows in Europe.

This publication is available from: https://www.gov.uk/government/collections/energy-trends

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