Physical gas flows across Europe and security and diversity of gas supply in 2010

Background

The map published within this article was prepared by DECC statisticians to illustrate[1] physical gas flows at the European level using 2010 data published by the International Energy Agency (IEA) and aims to improve gas data transparency and quality. The first part of this article highlights patterns in European gas production and consumption, and looks at how European demand was met in 2010. The second part of this article looks at a diversity of supply index developed by DECC statisticians using the same data published by the IEA. This builds on previously published work on oil diversity of supply published in the March 2011 issue of Energy Trends[2].

European Gas Production

Total EU-27 gas production in 2010 was 201 billion cubic metres (bcm) with the Netherlands and the UK accounting for 44 per cent and 30 per cent of this total respectively. Production increased by 3 per cent compared to the previous year, with virtually all of this increase in the Netherlands where production increased by 11 per cent (10 bcm). Production in the rest of EU-27 countries decreased or remained constant. Of the EU-27 countries only the Netherlands and Denmark produced more gas than they consumed.

European Gas Consumption

Total EU-27 natural gas consumption was 545 bcm in 2010: the largest overall demand among countries of the EU-27 was in the UK, Germany and Italy which together accounted for over 50 per cent of this total. EU-27 consumption of natural gas increased by 8 per cent between 2009 and 2010 with demand increasing in all countries but Spain, in part due the relatively colder weather in January and December 2010.

Germany remained the largest net importer in Europe at 83 bcm followed by Italy at 75 bcm and France at 46 bcm. The UK was a net importer at 37 bcm.

Sources of Gas

Indigenous production accounted for 37 per cent of EU-27 consumption in 2010, with the production from Netherlands and UK respectively meeting 16 and 11 per cent of total EU demand.

The Russian Federation was the largest single supplier of gas to the EU-27, delivering around 124 bcm, or 23 per cent, of total EU-27 gas demand in 2010, 2 percentage points less than in 2009. The European pipeline infrastructure means that Central and Eastern European countries receive almost all of their natural gas supply from Russia. It should be noted that not all of this gas is Russian since Russia acts as a transit country for Kazakh and Turkmen gas to reach European markets. The UK does not receive any direct gas imports from Russia.

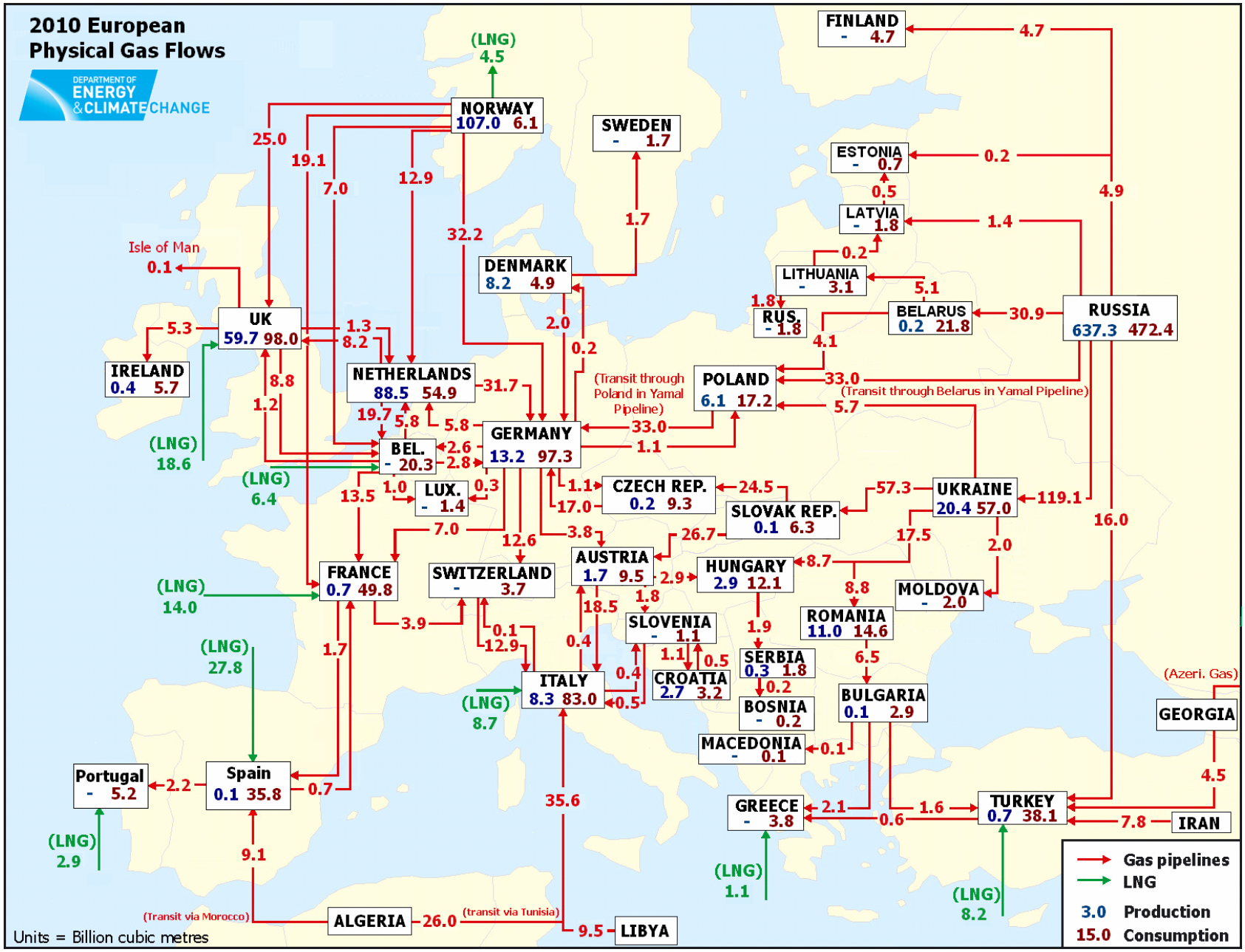
Norwegian exports to the EU-27 have remained constant between 2009 and 2010, around 100 bcm or 18 per cent of total EU-27 gas consumption; a quarter of Norwegian exports were directed to the UK in 2010, about the same as in 2009.

North African pipelines via Spain and Italy provided 45 bcm, or 8 per cent, of EU-27 demand. Algerian gas accounted for nearly 80 per cent of this total with Libya supplying the remainder.

EU-27 Imports of LNG increased by 44 per cent between 2009 and 2010, from 55 bcm to 80 bcm, as energy companies sought to take advantage of price differentials across the world. LNG met 15 per cent of EU-27 demand, and in particular 78 per cent of Spanish gas consumption. The largest suppliers of LNG were Qatar, Algeria and Nigeria.

[1] Please note that the analysis shows some differences with IEA data in order to provide a coherent view of gas flows. However, the supply for some countries may appear unbalanced as stock changes are not shown.

[2] www.decc.gov.uk/media/viewfile.ashx?filetype=4&filepath=Statistics/publications/trends/1511-trendsmarch11.pdf&minwidth=true


2010 European
Physical Gas Flows
DEPARTMENT OF ENERGY & CLIMATE CHANGE
NORWAY 107.0 6.1
(LNG) 4.5
SWEDEN - 1.7
FINLAND - 4.7
ESTONIA - 0.7
LATVIA - 1.8
LITHUANIA - 3.1
RUS. - 1.8
BELARUS 0.2 21.8
RUSSIA 637.3 472.4
Isle of Man 0.1
DENMARK 8.2 4.9
UK 59.7 98.0
IRELAND 0.4 5.7
NETHERLANDS 88.5 54.9
(Transit through Poland in Yamal Pipeline)
POLAND 6.1 17.2
(Transit through Belarus in Yamal Pipeline)
GERMANY 13.2 97.3
(LNG) 18.6
(LNG) 6.4
BEL. - 20.3
LUX. - 1.4
CZECH REP. 0.2 9.3
SLOVAK REP. 0.1 6.3
UKRAINE 20.4 57.0
FRANCE 0.7 49.8
SWITZERLAND - 3.7
AUSTRIA 1.7 9.5
HUNGARY 2.9 12.1
MOLDOVA - 2.0
ROMANIA 11.0 14.6
(LNG) 14.0
SLOVENIA - 1.1
SERBIA 0.3 1.8
BOSNIA - 0.2
CROATIA 2.7 3.2
BULGARIA 0.1 2.9
(Azeri. Gas)
GEORGIA
(LNG) 27.8
ITALY 8.3 83.0
(LNG) 8.7
MACEDONIA - 0.1
Portugal - 5.2
Spain 0.1 35.8
(LNG) 2.9
GREECE - 3.8
TURKEY 0.7 38.1
IRAN
(LNG) 1.1
(LNG) 8.2
(Transit via Morocco)
ALGERIA
(transit via Tunisia)
LIBYA
Gas pipelines
LNG
3.0 Production
15.0 Consumption
Units = Billion cubic metres

UK imports of LNG in 2010

UK imports of LNG increased by 84 per cent from 10.1 bcm to 18.6 bcm between 2009 and 2010, driven largely by LNG imports from Qatar which increased by more than 160 per cent to nearly 15 bcm (79 per cent of the UK LNG imports). Other LNG imports came from Trinidad and Tobago (8 per cent), Algeria (6 per cent) with the remaining 7 per cent originating from Norway, Nigeria, Yemen and Egypt.

Surge in Gas Demand

EU-27 demand for natural gas reached a new peak in 2010 at 545 bcm, an increase of 8 per cent compared to 2009 when consumption dropped significantly because of the economic slowdown.

A detailed breakdown of gas consumption by final consumers is not yet available for 2010. However, if the trends in the UK were to be repeated across the rest of the EU-27, it would mean that gas consumption increased in large part due to relatively colder weather in 2010. In the UK, demand by domestic consumers, which accounts for nearly two-thirds of final consumption, increased by 17 per cent.

The increase in gas demand is also reflected by a small switch in primary energy sources. Overall primary consumption of the EU-27 increased by 4 per cent to 1.7 billion tonnes of oil equivalent. While the proportion of oil in the total primary demand of the EU-27 decreased by 1.5 percentage point to 33.5 percent possibly as a result of increasing oil prices, the proportion of natural gas increased by 1 percentage point to 26.2 per cent.

Further data

For readers wanting a greater level of detail, the IEA have made available an interactive gas map, based on entry and exit points throughout Europe. This map is available free of charge at: www.iea.org/gtf/index.asp

Self-sufficiency and diversity of gas supply in 2010

Indigenous production and/or diversification of imports by country of origin are key elements of the security of supply of each country.

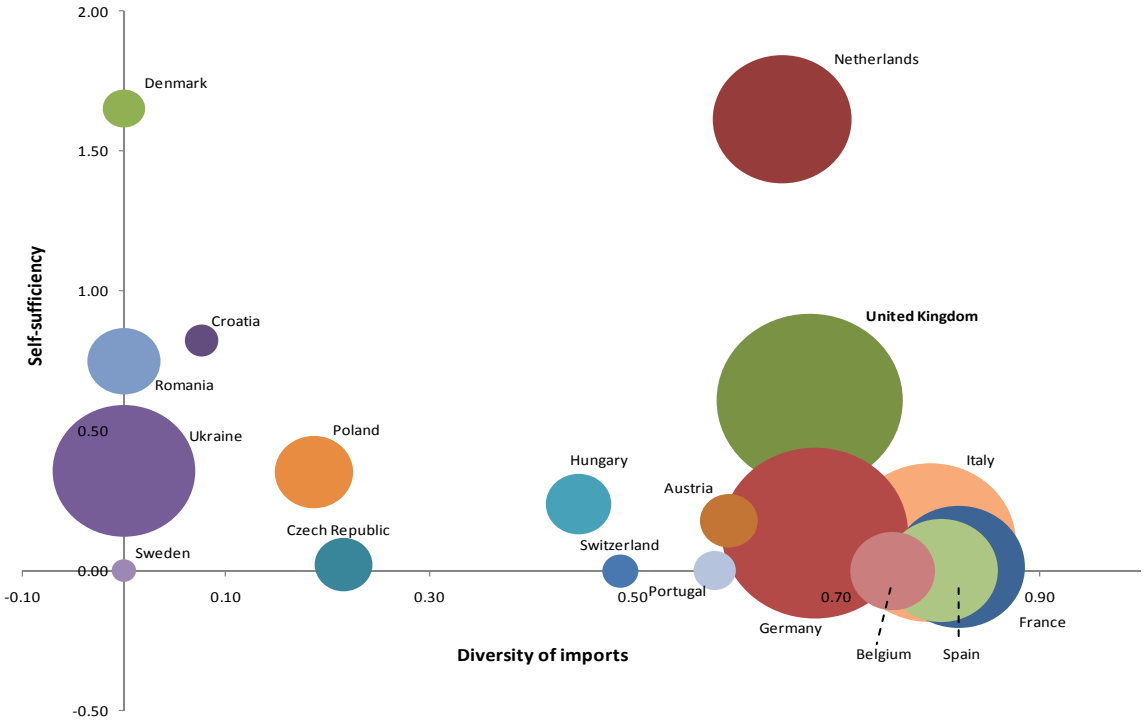
Indigenous production is a function of recoverable natural resources, available technologies and/or the cost of extraction. Among the EU-27, Denmark and the Netherlands are the only two self-sufficient countries, producing enough gas to meet their own demand and exporting the surplus. In the rest of the EU, only Romania (75 per cent) and the UK (61 per cent) produced half or more of their own consumption. As many as 17 members have little or no indigenous production.

Imports depend on infrastructure such as pipelines and LNG terminals. Land-locked countries have less flexibility as they rely entirely on networks of pipelines. Twelve EU members import all or the majority of their gas from Russia as the European pipeline infrastructure was built to move gas from east to west. The EU Regulation No. 994/2010 introduced several measures to safeguard security of supply, aimed in particular at enhancing flexibility by enabling reverse flows to move gas from west to east.

On the other hand, LNG terminals allow access to supplies from other sources, with EU members importing significant amounts from Qatar, Nigeria, Trinidad and Tobago and elsewhere. The UK for example also imported a cargo of LNG from Australia in 2009.

Chart 1 demonstrates the relationship between demand, indigenous production and the diversity of its gross imports for a selection of countries.

Chart 1: Self-sufficiency and diversity of supply, 2010



- *Norway has been omitted from the chart as its self-sufficiency index of 16.7 removes the chart's perspective and likewise Russia due to its huge demand.*

Source: DECC analysis of IEA data

The profiles show:

- Self-sufficiency: the proportion of a country's demand that could be met through indigenous production is shown on the vertical axis.
- A diversity score: the diversity of a country's gross imports is shown on the horizontal axis, using an index ranging between 0 and 1. Higher values equate to more diverse imports. It is derived from the Herfindahl index[3] using share of imports by countries of origin.
- Demand is represented by a sphere the area of which indicates the level of demand.

The chart shows that the Netherlands, on the top right corner, has a strong security of supply position, being self-sufficient with a good diversity score for imports. Denmark is also self-sufficient but imports only from Germany and therefore scores 0 on the diversity index.

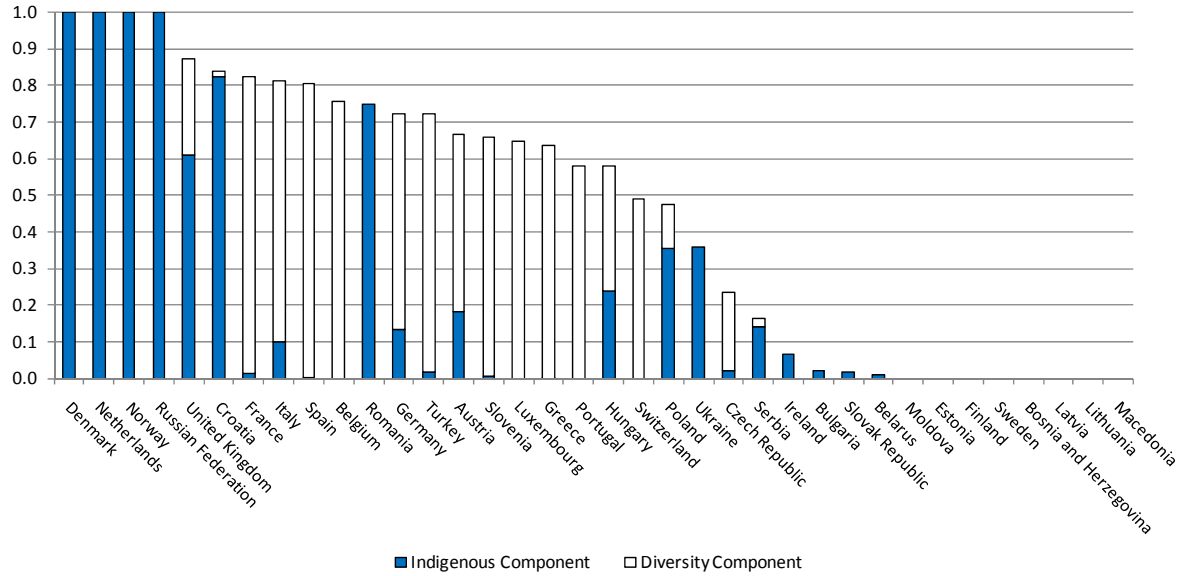
On the other hand, countries in the bottom left corner with little or no indigenous production and only one source of imports such as Sweden and Ukraine are more at risk from supply disruption. However, the impact of such disruption would vary widely according to demand. Sweden's small demand accounted for only 3 per cent of its primary energy consumption and as a result a cut in supply would have less impact than in a country like Ukraine, which met 38 per cent of its primary energy demand from gas.

Chart 1 also shows that the UK has a slightly lower diversity index than other countries such as Italy or France which also imports LNG. This is due to the large proportion of UK imports from Norway and Qatar.

[3] The diversity index score is derived by subtracting the Herfindahl index from 1.

Chart 2 shows the security of gas supply index of each country shown in the transit map, ranked according to their score.

Chart 2: Gas security and diversity index, 2010



Source: DECC analysis of IEA data

The overall index is derived from the self-sufficiency score of Chart 1 and the diversity score of each countries' imports. Self-sufficient countries are shown on the left hand side with a score of one. Countries with no indigenous production and low diversity scores are on the right hand side.

Chart 2 shows that UK had the third highest score in the EU-27 after the Netherlands and Denmark, both of whom were self-sufficient. Romania had a higher self-sufficiency score but imported all its gas from Russia. France, with virtually no indigenous production, had the fourth highest score in the EU-27 in 2010. Germany, despite producing 18% of its own gas, had a slightly lower score due to a lower diversity of imports.

Countries towards the other end of the list, such as Finland and the Baltic countries score zero on the index as they have no indigenous production and depend entirely on imports from Russia.

It should be noted that the diversity index and the security and diversity index make no distinction as to the relative reliability of supplies between LNG and pipelines or between supplies entering at multiple points rather than one or only a few. Sources of LNG imports can, for example, change very rapidly, in contrast to pipeline supplies.

On a final note, clearly gas stocks are also key to security of supply as they can provide a buffer in the event of a major disruption to indigenous production or to imports. Stocks do not feed into the current index as it focuses not on how countries meet their gas needs (including, of course, the filling of gas storage) but on how different countries rely on differing combinations of indigenous production and imports to obtain gas to meet those needs.

Sebastien McClay
Oil and Gas Statistics Team
Tel. 0300 068 5053
E-mail: Sebastien.McClay@decc.gsi.gov.uk

Laurent Ortmans
Oil and Gas Statistics Team
Tel. 0300 068 5052
E-mail: Laurent.Ortmans@decc.gsi.gov.uk