CLINGENDAEL
INTERNATIONAL
ENERGY
PROGRAMME

CIEP

BRIEFING PAPER

DEVELOPMENTS IN GAS SUPPLIES TO EUROPE

LUCA FRANZA

CIEP Briefing Paper

Developments in Gas Supplies to Europe

A March 2016 update

Luca Franza

According to estimates by Eurogas[1], natural gas consumption in the European Union (EU-28, hereinafter referred to as 'EU') has reached 438 Bcm in 2015, up from 409 Bcm in 2014 (+7%).[2] As is suggested by Eurogas itself, the main factor behind demand recovery has been relatively colder weather.[3] Final data on consumption in 2015 will only be disclosed later this year, but if the direction pointed to by the Eurogas estimates is broadly confirmed[4], this would be the first increase in EU gas consumption since 2010. Last year's expected recovery would indeed follow a period of falling gas demand (-100 Bcm since 2010, -50 Bcm in 2014 alone)[5] – whose causes have been widely reported and notably include mild weather, weak or negative economic growth, and competition from coal and renewables. Even if final figures on imports in 2015 are not yet available, higher consumption and a fall in EU domestic production[6] – compounded by the cap on production from the Groningen field – must have resulted in higher imports of gas from outside the EU relative to 2014. The aim of this briefing paper is to sketch the current profile of gas supplies and flows into the EU.

In 2014, the EU imported around 285 Bcm of gas (250 Bcm by land and 35 Bcm as LNG) and produced around 125 Bcm domestically (92 Bcm in The Netherlands and in the United Kingdom alone). Russia supplied roughly 30% of the gas consumed in Europe (or 40% of imported gas). This translates into 124 Bcm of Russian gas exports to the EU in 2014, all of which was transported by pipeline. In 2015, Russian imports reached 135.8 Bcm according to Gazprom delivery statistics.

---

[1] http://www.eurogas.org/uploads/media/Eurogas_Press_Release__Gas_supply_in_2015_responds_to_increased_consumer_demand.pdf

[2] These figures are corrected to subtract Swiss demand, included in the Eurogas estimates.

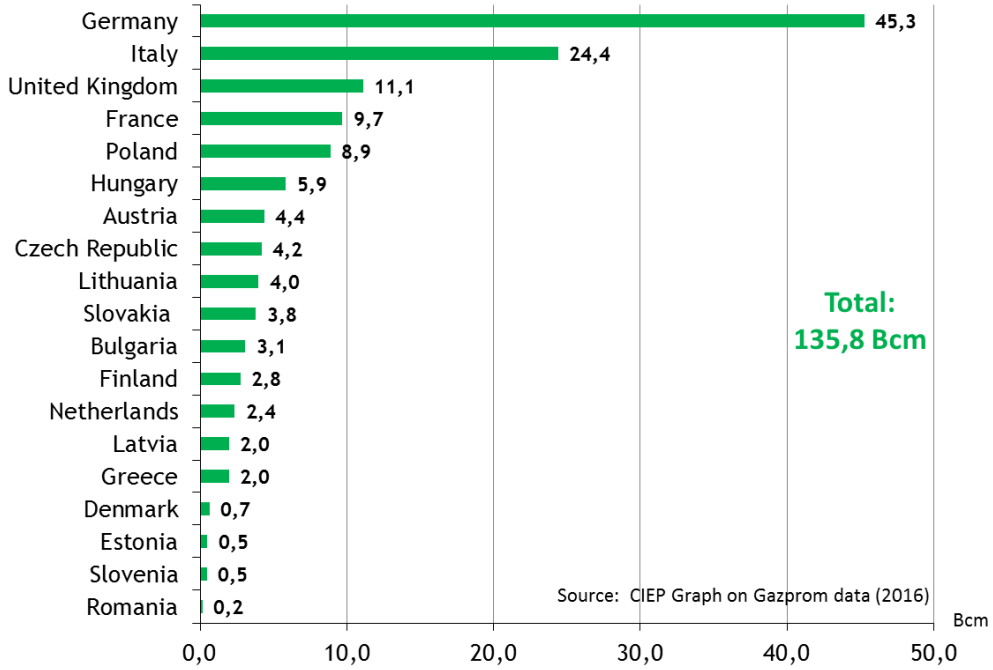
[3] This was compounded by a drop in hydropower production in Germany and Italy

[4] The months of November and December have however been mild and this was not yet captured by the Eurogas estimates, which were published in October

[5] European gas demand, LNG flows and hub prices', Timera Energy, July 2015.

[6] According to Statistics Netherlands, year-on-year indigenous gas production in The Netherlands fell by 35% in September 2015 (with a montly production of only 2.8 Bcm. According to figures provided by Gazprom in early 2016, Dutch production in 2015 was 15 Bcm lower than in 2014. The Netherlands is the largest gas producer in the EU and other producers (the only other significant one being the United Kingdom) lack significant upward capacity.

In line with historical trends, the main importers were Germany (45 Bcm) and Italy (24 Bcm) – together accounting for almost half of the EU's imports of Russian gas.



Graph 1: Russian gas exports to the EU per country of destination, Gazprom Delivery Statistics for the year 2015.

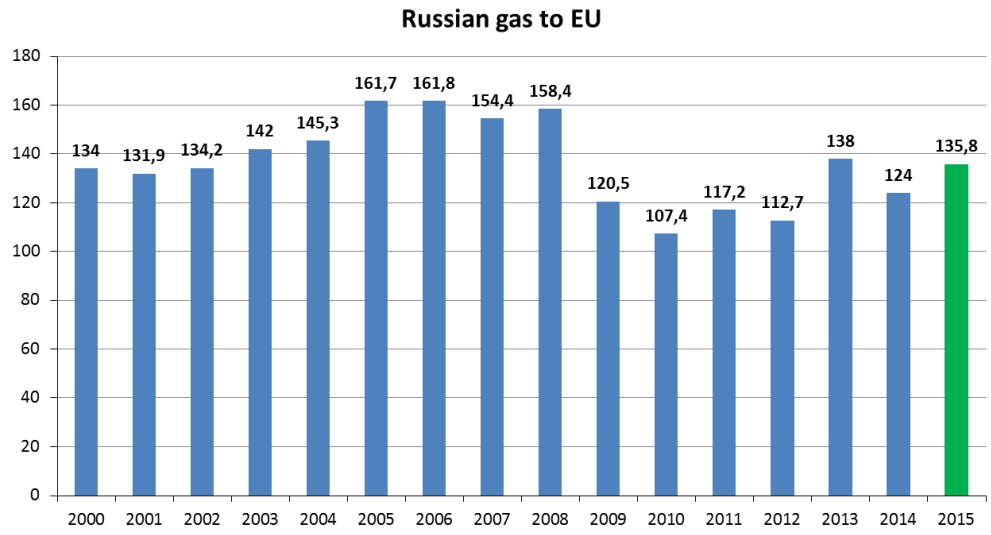
With regard to Graph 1, it should be kept in mind that figures on Russian sales to the UK also include non-Russian gas that Gazprom purchases on the NBP. Russia is gradually moving towards acquiring trading positions on European hubs (it is estimated that around 10% of Russian volumes sold in the European market are sold on hubs). Gazprom has also launched auctions and the Saint Petersburg Mercantile Exchange (SPIMEX) in 2015.

Relative dependence on Russian gas diverges widely across the EU, with higher figures in Eastern Europe. Only a few EU Member States – with an aggregate demand of approximately 20 Bcm[7] – appear to be fully dependent on Russian gas.

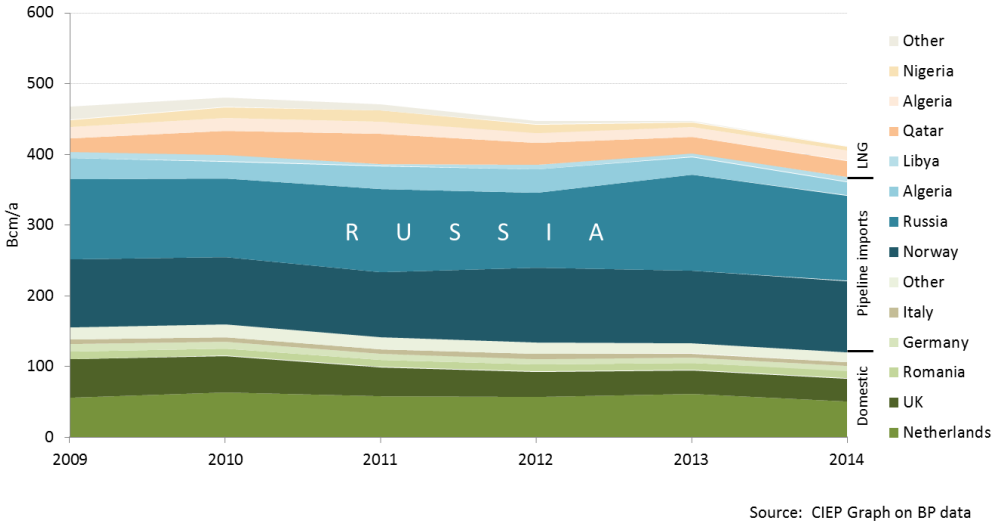
When Turkey is excluded from Gazprom's delivery statistics, the trend that is visible since a 'perfect storm'[8] hit European gas markets around 2008-2009 is one of eroding demand for Russian gas (Graph 2).

In 2014, Russian gas exports to the EU were still 30-40 Bcm below pre-crisis levels. The primary reason behind lower imports of Russian gas is lower EU demand for gas (in fact, Russia has broadly maintained its market share over the period, as is visible in Graph 3). However, in certain years (notably 2011 and 2012), EU buyers have specifically minimized purchase from long-term contracts with Russia in favour of cheaper hub supplies.

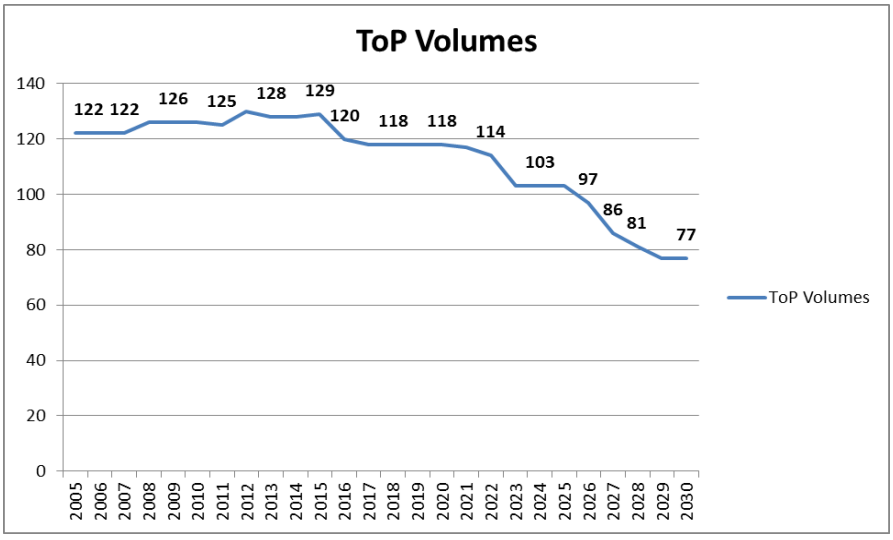
[7] Speech by Gertjan Lankhorst at Brookings, Washington, October 2015.
[8] The combined effect of lower electricity and gas demand due to the economic crisis, low CO_2 prices, low coal prices, subsidized RES and oversupply of LNG worldwide.



Graph 2: Russian gas exports (Bcm) to the EU, historical evolution (figures exclude Turkey), graph from Tatiana Mitrova based on data provided by the Russian Central Bank (adapted by CIEP)



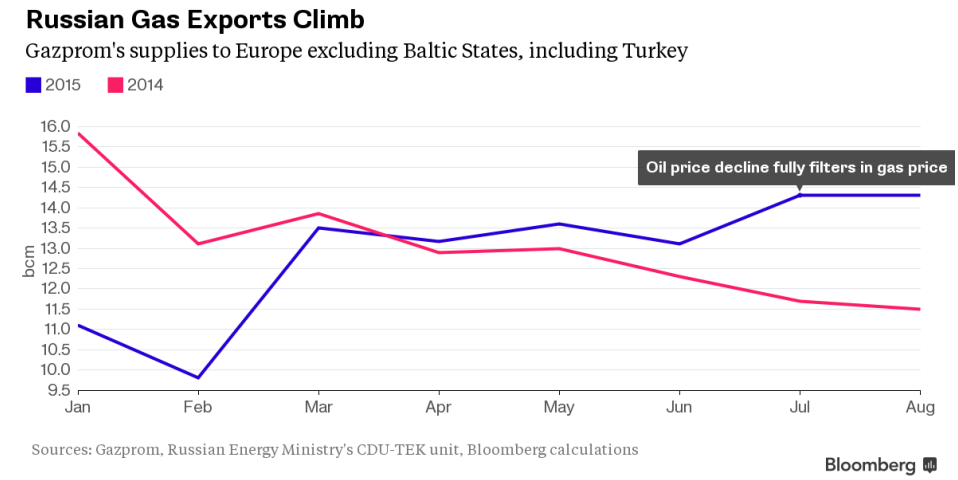
Graph 3: Supplies to the EU by source (2009-2014). CIEP graph based on BP Statistical Review historical data and Gazprom delivery statistics



Graph 4: Take-or-Pay (ToP) volumes in Russian long-term contracts with Europe, CIEP graph

As revealed by Graph 4, the volumes of Russian imports in 2014 still appear to be more or less in line with the estimated[9] sum of the MCQs (Minimum Contracted Quantities) in long-term contracts with Russia. This has somewhat changed since 2015 as the price of oil-indexed gas supplies has fallen. This did not happen before because of a time lag embedded in pricing formulae that delays the translation of lower oil prices into lower oil-indexed gas prices[10].

In 2015 Gazprom started the year with falling exports. However, Russian gas exports to the EU recovered in spring, when they regained competitiveness vis-à-vis hub-indexed supplies.



Graph 4: Russian gas exports to Europe, 2014 compared with Jan-Aug 2015, Bloomberg

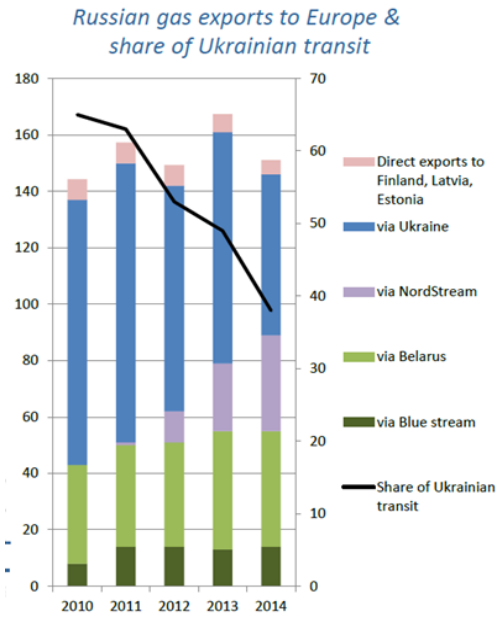
The average price of Russian supplies to the EU fell to 6.5$/MMBtu in August 2015 and it was reported as low as 5$/MMBtu in early 2016.[11] Gazprom delivery statistics for 2015 show that Russian gas exports to Europe (which in Gazprom's statistics includes Turkey and excludes the Baltic Republics) increased by 8% relative to 2014.

According to these figures, Germany purchased as much as 45.3 bcm of Russian gas last year, an all-time high.[12] While waiting for oil-indexed prices to fall in the second and third quarters of 2015, European buyers increased their purchase of Norwegian gas (Norway briefly became Europe's top gas supplier). They also increasingly drew on storage and purchased higher volumes of LNG in the first part of the year, which was also made possible by the erosion of the price differential with Asia that had previously prompted the bulk of flexible LNG to prefer Eastern destinations. In July and August, the abovementioned ramp-up in the purchase of Russian gas was accompanied by injection into storage and a fall in LNG flows into the EU.

In terms of routing (more in the next section), Russian gas imports into Europe through Ukraine appeared to have increased relative to 2014, although from a

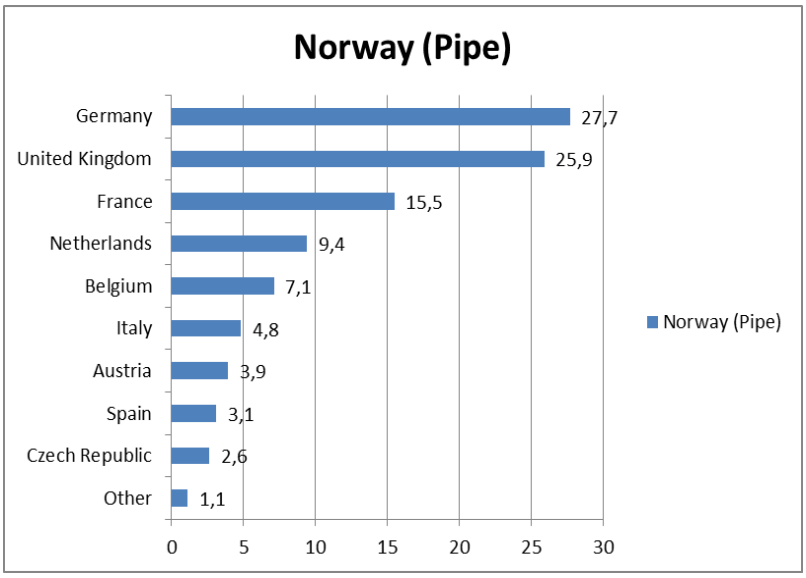
[9] Take-or-Pay thresholds are confidential, so Minimum Contracted Quantities (MCQs) can only be estimated (usually with the assumption that they are 70-80% of the Annual Contracted Quantity or ACQ).
[10] http://www.reuters.com/article/russia-gazprom-exports-idUSL5N10E3AO20150803
[11] WGI (World Gas Intelligence), 27 January 2016.
[12] *Idem*

historical perspective the long-term trend is one of declining transit through Ukraine – compensated by additional transit through Nord Stream (Graph 5).



Graph 5: Russian gas exports (Bcm) to Europe (including Turkey) and share of Ukraine transit, IEA

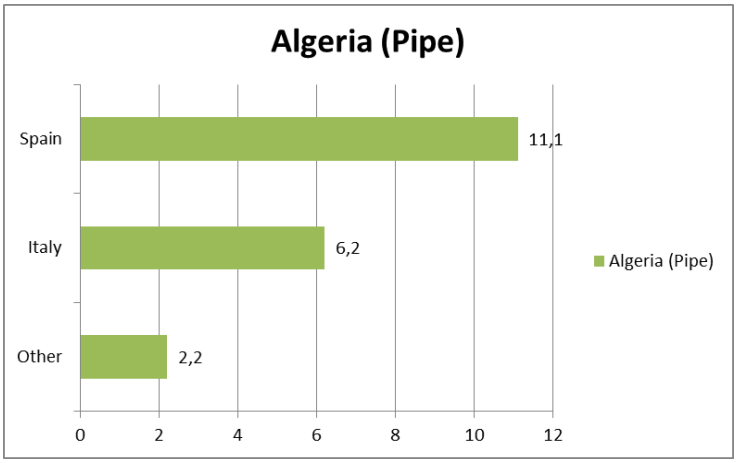
The second largest supplier is Norway, which exported 101 Bcm of pipeline gas and 2.6 Bcm of LNG to the EU in 2014. Norwegian gas is usually considered 'must-flow' gas just like EU domestic production, as the country produces up to an annual target set by the government. Norway was the only external producer that voluntarily embraced hub indexation for its exports to the EU after. Norwegian gas is mostly sold in Northwest Europe (with Germany and the UK accounting for more than half of EU's imports of Norwegian gas), but it also represents a source of diversification for Southern and Central European countries that are mostly dependent on Russian and Algerian gas (Italy, Austria, Spain and the Czech Republic).



Graph 6: Norwegian pipeline gas exports (Bcm) to the EU per country of destination in 2014, BP Statistical Review, June 2015.

Spain is also the main importer of Norwegian LNG in the EU (1.3 Bcm), the other notable ones being The Netherlands (to make up for lower Groningen production) and Lithuania (to reduce dependency on Russian gas).

North Africa is an important source of gas supply for Southern European countries only. In 2014, Algerian exports to the EU amounted to 20 Bcm of pipeline gas (see Graph 3) and 10 Bcm of LNG (overwhelmingly directed to Spain and France). Libya exported 6 Bcm of pipeline gas to Italy. There are indications of falling Algerian exports and slightly growing Libyan exports to the EU in 2015. Against the background of a security of supply debate dominated by concerns on Russian gas, it is worth noticing that Algerian pipeline exports to the EU, particularly Italy, fell dramatically over the last years. As recently as in 2012, Algeria was Italy's established top gas supplier (22 Bcm), well ahead of Russia (14 Bcm).



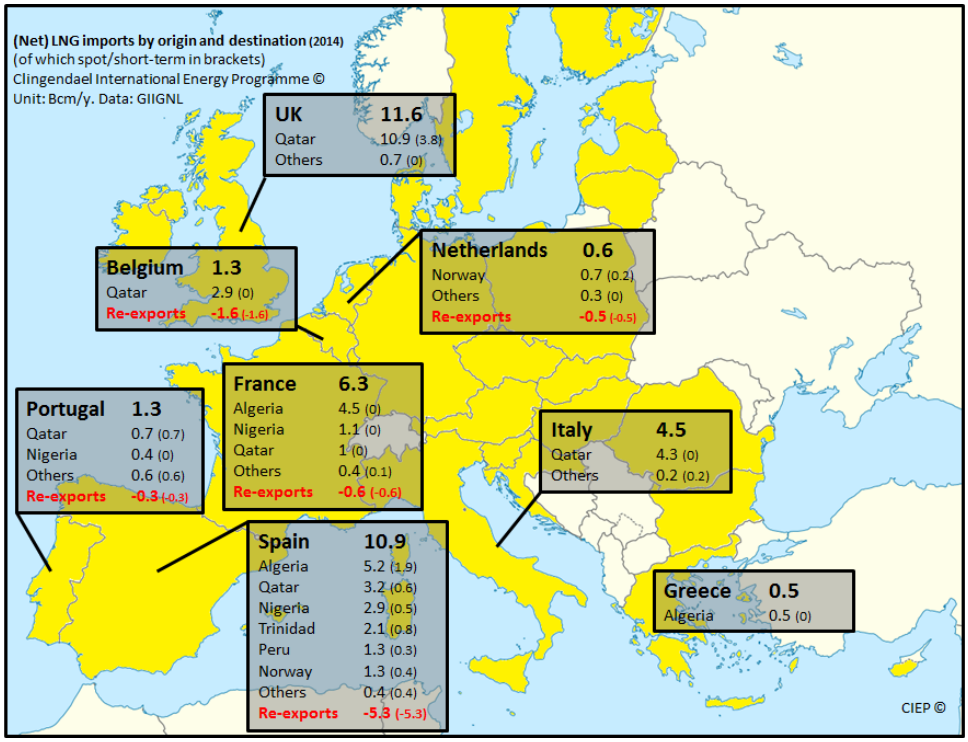
Graph 7: Algerian pipeline gas exports (Bcm) to the EU per country of destination in 2014, BP Statistical Review, June 2015.

The situation had completely flipped by 2014, when Italy imported almost 22 Bcm of gas from Russia and only 6 Bcm of gas from Algeria (Graph 7). Lower exports to Italy betray Algeria's difficulty in meeting its contractual obligations due to soaring domestic demand. In fact, Eni and Sonatrach have recently agreed in a contract renegotiation that traded volumes should stay at half Eni's 20 Bcm/y contract level.[13] This state of affairs has not created public outcry nor caused particular concerns among policy-makers because Italian gas demand has been very weak in the years, and Italian buyers have managed to extract better pricing terms from Northern European suppliers and Russia. However, it shows the limitations of Algeria's plans to increase exports to Europe in future.

Since 2011, Europe has seen falling LNG import volumes in a context of sluggish gas demand and a wider price spread between Europe and Asia following the Fukushima incident. The trend has been reversed between 2014 and 2015, as the price differential with Asia almost disappeared (declining from 7$/MMBtu in Q1 2014 to 0.7$/MMbtu in Q1.2015[14]). Higher LNG imports into Europe are also a result of European gas demand recovery and lower Dutch production. According to preliminary estimates, net LNG imports in 2015 have increased by 23% relative

[13] WGI, 12 August 2015.
[14] Cedigaz, 2015.

to 2014. This takes into account reduced re-exports from countries that still have destination clauses in their LNG supply contracts, notably Spain and Belgium.

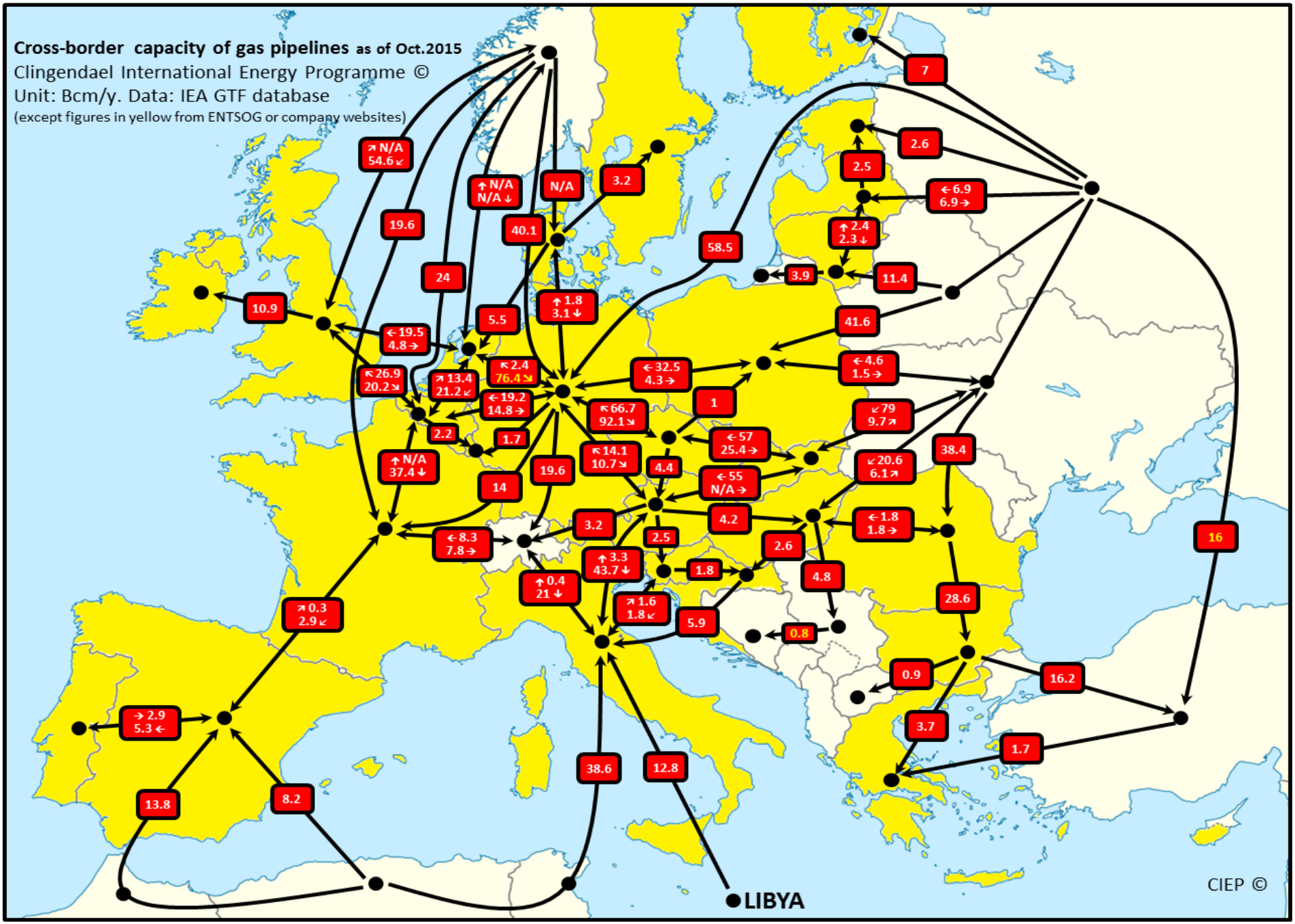


Map 1: Net LNG imports by origin and destination in 2014. Data by GIINL, map by CIEP.

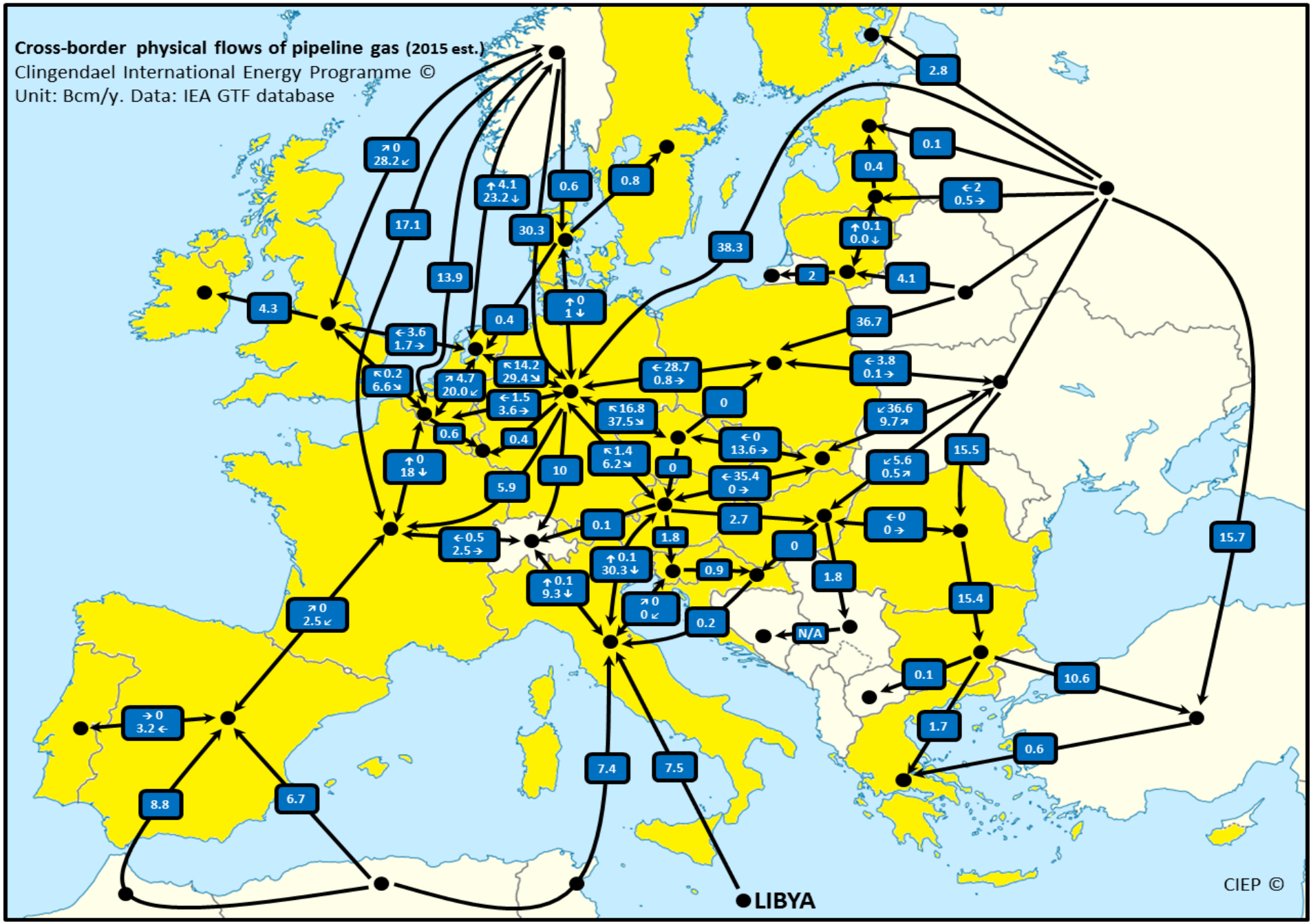
The main importers of LNG in the EU are the United Kingdom and Spain, followed by France and Italy. Qatar is by far the largest supplier of LNG to the EU (supplying 22 Bcm out of a total of 37 Bcm in 2014), followed by Algeria and Nigeria.

The Ukrainian crisis (with ensuing debates on diversification and security of supply) and the announcement of new pipeline projects (Turk Stream and Nord Stream-2) on the part of Russia channelled a great deal of attention towards the routing of gas supplies to Europe. This section provides a factual update on gas supply patterns and flows in the EU. The maps included in this brief are built on the IEA's GTF (Gas Trade Flows) database, which – as of January 2016 – contains data on flows up to October 2015. 2015 figures are CIEP estimates calculated on the basis of historical trends for consumption in November and December relative to the rest of the year.

Map 2: Cross-border capacity of gas pipelines in Europe. Data by IEA, map by CIEP.



Map 3: Cross-border physical flows of pipeline gas, 2015 estimates. Data by IEA, map by CIEP.



Map 2 above shows cross-border capacity across Europe's gas pipeline network. It is worth noticing that these numbers do not account for possible bottlenecks located upstream of the border points. Map 3 shows estimates for cross-border flows in 2015.

As is visible from the map, Russia ships its gas to the EU through the following routes:

- The Soviet-built, Ukraine-bound 'Brotherhood' pipeline, whose principal entry point into the EU is located at Vel'ké Kapušany in Slovakia. Cross-border capacity between Ukraine and Slovakia have recently been reduced from 118 Bcm to 79 Bcm, due to underutilization in the last two years. Russian gas molecules that flow through Vel'ké Kapušany mostly continue their journey towards the Austrian hub of Baumgarten, where the largest off-taker is Italy. Additionally, the Brotherood pipeline has spurs into Hungary, through Beregdaróc (20.6 Bcm); Poland, through Drozdowicze (4.6 Bcm) and Northwestern Romania, through Mediesu Aurit (3.3 Bcm). Russian gas volumes that enter Hungary are partly destined for this market and partly for Serbia and Bosnia Herzegovina, while the other two spurs mentioned above are designed to supply local markets only. Austria, Slovakia and the Czech Republic (countries that were traditionally exposed to Ukrainian transit), are increasingly receiving Russian gas via Germany.

- The 'Trans-Balkan' or 'Western' line that carries Russian gas through Ukraine into Romania, Bulgaria and Greece (and then to Turkey and the Former Yugoslav Republic of Macedonia outside the EU). The pipeline's entry point into the EU is located at Isaccea in Eastern Romania (35.1 Bcm). When Turk Stream was announced in December 2014, there was consensus that the flow of this pipeline would be reversed to ship additional (or rerouted) Russian volumes to South-eastern and Central European countries, thus eliminating Ukrainian transit risk. This project is subject to progress on Turk Stream, which seems to be stalling since Turkey downed a Russian jet in November 2015.

- The Yamal pipeline, travelling to Poland through Belarus, whose most important entry point is located at Kondratki. Whereas aggregate cross-border capacity between Belarus and Poland measured on IEA data exceeds 41 Bcm, actual transport capacity appears somewhat lower (the nameplate capacity of the Yamal pipeline is around 33 Bcm). The pipeline is also used to supply the German market (and probably other markets further West).

- The offshore Nord-Stream pipeline, connecting Russia directly to Germany, with a capacity of 55 Bcm (although the IEA reports a technical capacity of approximately 58 Bcm at the Greifswald entry point on Germany's North Sea shore). Gas shipped through Nord-Stream does not only serve the German market, but also other Western European markets (via the NEL pipeline) as well as Central-Eastern European ones (via the OPAL pipeline) – and increasingly so thanks to the realization of additional West-East transmission capacity in recent years. Southern

Germany also gets Russian gas that lands at Greifswald via the Czech system (which explains the seemingly high volumes 'exchanged' by Germany and the Czech Republic as shown in Map 3).

- Direct links to Finland and the Baltic Republics for supplies to local markets as well as the Russian exclave of Kaliningrad through Lithuania

  On aggregate – as of October 2015 – the cross-border capacity of Russian gas pipelines to the EU exceeds 210 Bcm, of which more than 140 Bcm are bound to Ukraine. Russia is already maximizing its transportation capacity bypassing Ukraine, if we consider that Nord Stream cannot be fully utilized due to the lack of a 100% exemption to the Third-Party Access (TPA) rule for OPAL, one of the two connecting pipelines of Nord Stream. A recent development is also the realization of substantial reverse flow capacity (around 17 Bcm) to Ukraine from Poland, Hungary and Slovakia. As shown by Map 3, Ukraine imported substantial volumes of (Russian) gas via the EU, notably Slovakia.

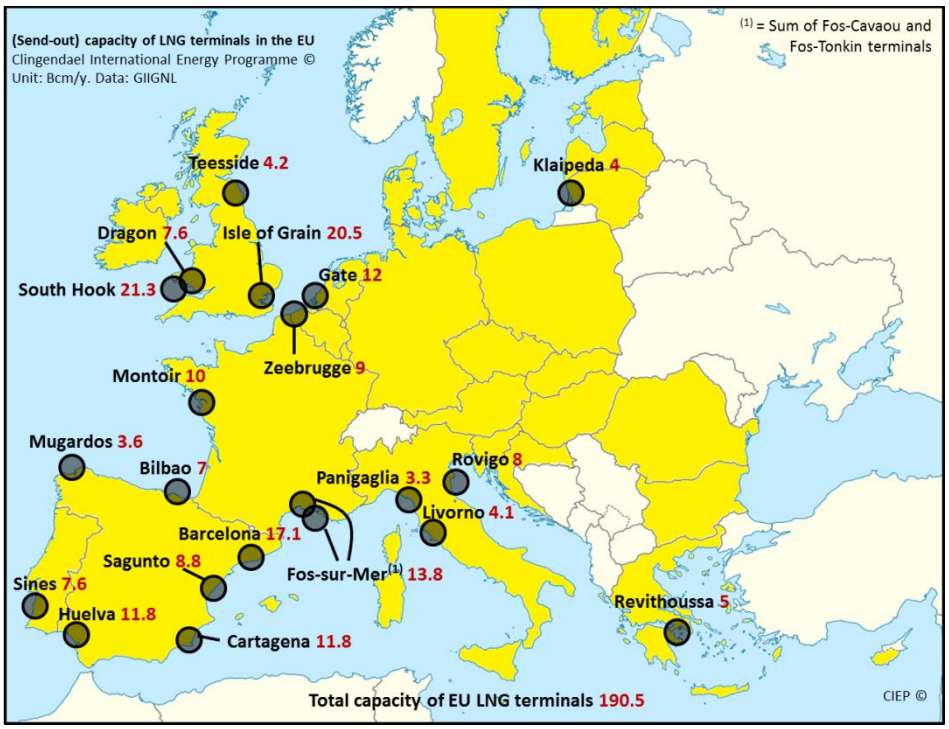
  A comparative observation of Maps 2 and 3 above also suggests that additional volumes shipped through an expanded Nord Stream could technically reach Italy (on the basis of abundant cross-border capacity available between Germany and Switzerland and between Germany and Austria, and thence into Italy) and Central-Eastern Europe (Austria, Czech Republic, Slovakia, Slovenia, Croatia and Hungary). On the other hand, South-eastern Europe remains relatively isolated. Among other factors (including legal limitations to Russia's ability to use all of its capacity), whether Nord Stream-2 would enable a complete elimination of Ukrainian transit for Russian gas exports to the EU depends on the realisation of new interconnectors in South-eastern Europe and on how much of the gas shipped through Nord Stream-2 will be used in Northwest Europe to make up for lower production in the UK and The Netherlands. In case of substantially growing import demand in Germany and surrounding markets, the remaining capacity of Nord Stream-2 could in fact not be enough to allow for a complete elimination of Ukrainian transit for Russian supplies to other markets, notably Italy (which is still receiving all of its 24 Bcm of Russian gas imports via Ukraine).

  Another observation is that any prospective volume entering the EU via Turkey (which would apply to Turkmen, Azeri, Iraqi, Iranian and East Mediterranean gas) would require substantial investment in new infrastructure in the South-eastern corner of Europe (bearing in mind that TAP – already covered by an FID and long-term contracts – will add 10 Bcm of [expandable] transport capacity via Greece and Italy by 2020).

  Norway has direct pipeline links to the United Kingdom (cross-border capacity of 54.6 Bcm) of which the most important is Langeled; France (cross-border capacity of 19.6 Bcm) – through Franpipe; Belgium (cross-border capacity of 24 Bcm) – through Zeepipe; and Germany (cross-border capacity of 40.1 Bcm), in addition to The Netherlands and Denmark – for which the IEA database does not specify

cross-border capacity. In the case of The Netherlands, the lack of a figure for cross-border capacity in the IEA GTF database is probably due to the fact that the entries used by Dutch transmission owner GTS at Emden (the German landing point for Norwegian pipelines) and Bunde/Oude Statenzijl (on the German-Dutch border) are limited by a cluster capacity of 1517.9 GwH/d or 56.8 Bcm/y (as indicated by ENTSOG), thus making it impossible to provide figures for single entry points[15].

Algerian gas can be transported to the Iberian peninsula through Medgaz, a direct link with Spain (cross-border capacity of 8.2 Bcm) and through the MEG (Maghreb-Europe Gas) pipeline transiting Morocco. The cross-border capacity between Morocco and Spain is 13.8 Bcm. Moreover, it can be transported to Italy through the Enrico Mattei/Transmed pipeline via Tunisia. The cross-border capacity between the latter country and Italy is 38.6 Bcm. Italy is also the landing point and market for Green Stream, the only Libyan gas pipeline to the EU. The capacity of this pipeline measured at the landing point in Italy is 12.8 Bcm. Spain has the capacity to ship Algerian gas further into Portugal, and Italy can ship North African gas into Slovenia and Croatia. However, it is impossible to ship substantial volumes of North African gas further north due to limited transmission capacity across the Pyrenees and the Alps.

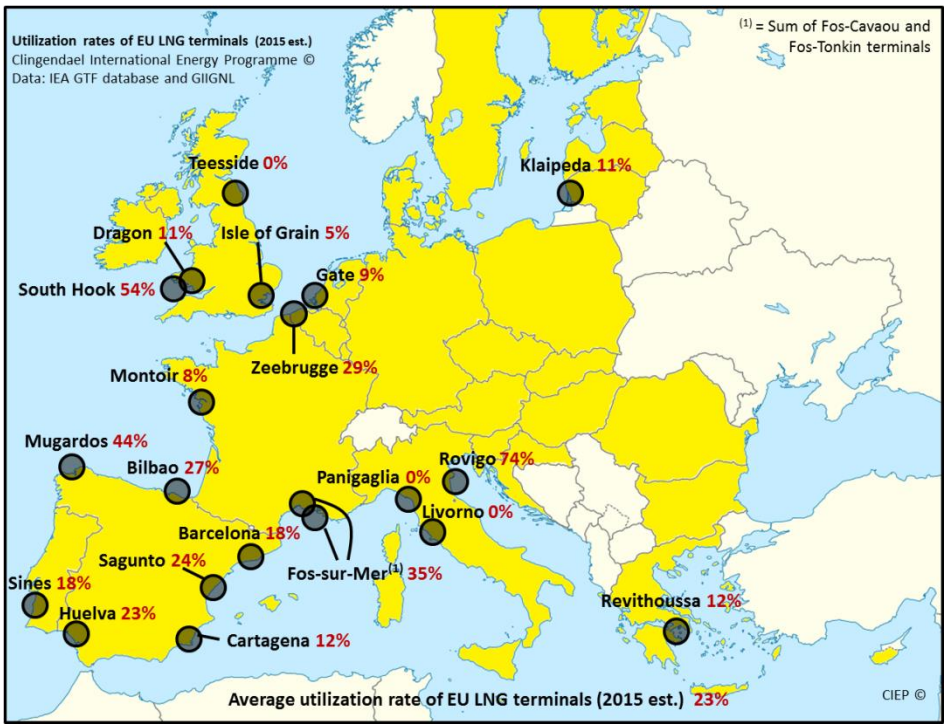


Map 4: Send-out capacity of LNG terminals in the EU. Data by GIIGNL, map by CIEP.

Map 4 above shows the current send-out capacity of LNG (regasification) terminals in the EU, while Map 5 below shows their utilisation rates. On average, only 23% of the EU's regasification capacity was utilised in 2015. The EU's capacity

[15] The IEA GTF database provides data for every single entry (and exit) point, not a sum of all entry (and exit) points of two countries.

to absorb additional volumes of LNG is limited by internal infrastructural bottlenecks (notably limited West-East transmission capacity). By comparing Map 4 with Map 2 above, it can be seen that a lot of regasification capacity in the Iberian Peninsula and France is stranded, i.e. isolated relative to the rest of the EU market. This means that gas that reaches Western European shores is currently unable to travel further east within the EU. This is a widely acknowledged obstacle to diversification away from Russian gas in land-locked countries in Central-Eastern Europe or in South-East European countries that lack regasification capacity.



Map 5: Utilization rates of EU LNG terminals. Data by GIIGNL, map by CIEP.

CLINGENDAEL INTERNATIONAL ENERGY PROGRAMME | CIEP

VISITING ADDRESS
Clingendael 12
2597 VH The Hague
The Netherlands

POSTAL ADDRESS
P.O. Box 93080
2509 AB The Hague
The Netherlands

TEL +31 (0)70-374 67 00
www.clingendaelenergy.com
ciep@clingendaelenergy.com