



Who holds all the gas aces? Vladimir Putin or Ursula von der Leyen?

A new analysis based on Ea Energy Analysis's electricity market model surprisingly shows that the 27 EU countries and the UK can do without Russian gas in just a year. Will that knowledge give rise to more aggressive sanctions against Russia?

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As part of the sanctions war between the EU and Russia, Putin decided to shut off the gas being supplied to Poland and Bulgaria at the end of April, allegedly because they will not pay for the gas in rubles.

Much has been speculated about Putin's motives behind the demand for a ruble payment: Is it a pure power play, is it to strengthen the Russian currency, or is it simply because payments in euro and dollars are sanctioned? If it is the latter, then he doesn't really have the current deposits at his disposal, and he will go to great lengths to get any payment. Understanding Putin's motivation is therefore important if one wants to guess how far he will actually go with his threats of completely shutting off the gas being supply to Europe.

However, motive research and assessment of probability is not the goal of this article. Here we will try to assess Europe's opportunities for action by implementing a total stop of imports of Russian gas within just one year. Initially, we are investigating the potential from initiatives that can be implemented without consumers having to compromise on comfort – by, for example, turning down the heat – and without companies having to scale down their production.

Europe's (EU + UK) gas balance 2019

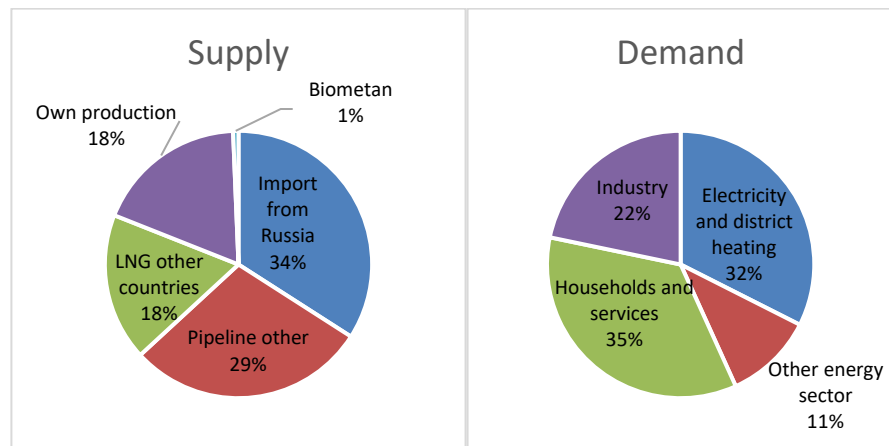


Figure 1: EU27 + UK uses a total of almost 458 BCM of natural gas annually. The figure shows where the gas comes from and how gas is used. Sources: EUROSTAT and the UK Department for Business, Energy and Industrial Strategy. Data is from 2019, as 2021 data was not yet available, and 2020 consumption was affected by Covid19.

In the analysis, we consider the old EU28, i.e., the current EU countries plus the UK, as these countries are still closely linked in terms of energy.

Supply

Own production

The old EU28 countries' domestic gas production has been declining for many years, falling by about five billion m³ per year. The largest production field, Groningen (in the Netherlands), is about to be closed as continued extraction endangers collapses in cities and villages on the surface. High gas prices and the danger of an actual supply crisis will generally encourage increased domestic production, but the appetite for action is limited in the short term. However, production from for instance Groningen can be increased in case of emergency, if local acceptance can be garnered. Overall, we assume that EU27+UK domestic production is reduced by 5% compared to the 2020 level.

Pipeline gas

Both the European Commission and the IEA estimate that it is possible to import an extra 10 billion m³ annually via gas pipeline connections to Norway, North Africa, and Turkey (Azerbaijan). We consider this to be a reasonable assumption.

LNG

The European countries have a total of 24 LNG terminals, including the three terminals in the UK. In addition, Turkey has four terminals. At a large number of these terminals, utilisation rates are low, and the quantities added can potentially be increased. Thus, it is not the immediate reception capacity in Europe that is the bottleneck, but rather the capacity of the export terminals in Australia, Qatar, the United States, and a number of other countries. Another question is whether there is sufficient non-Russian cargo capacity for the increased volumes, which may need to be transported over greater distances.

The global LNG market amounted to approximately 500 billion m³ in 2021, and demand, especially in Asia, is increasing. Most recently, in *the Shell LNG Outlook 2022*, it is estimated that capacity utilisation in the largest exporting countries is approaching 100%. Increased LNG demand in Europe will thus squeeze an already squeezed Asian market.

The European Commission expects 50 billion m³ additional LNG imports, while the IEA estimates that 20 billion m³ is likely. We estimate that an additional LNG import of 25 billion m³ can be realistic.

Green gas

About 15 billion m³ biogas¹ is produced in the EU, of which, however, only about 3 billion m³ is in pipelines. Most of the gas is used for direct electricity and heat generation. It is assumed that a combination of increased biogas production and more efficient use of existing biogas production can contribute an additional 2 billion m³.

Demand

In the very short term, the potential for planning and implementing new investments in energy efficiency measures in households and industry is considered to be limited. An assessment of demand-side measures, therefore, focuses on the possibility of switching to other fuels. The need to implement behavioural savings then emerges as the main result of the analysis.

Electricity and district heating

Ea's electricity market model contains a database of existing electricity and CHP capacity in most European countries. By conducting analyses with very high gas prices, the model is forced to prioritise other plants over the gas-fired ones, which are given a greater role as peak and reserve loads.

The model calculations show that in a normal climate year, up to two-thirds of gas-based electricity production in the Central and Northern European electricity market can potentially be transferred to power plants fired with coal, oil, and biomass. The calculation assumes that older power plants, which today serve as reserve plants, such as Kyndby Power Station on Zealand, are transferred to intermediate or basic loads. Furthermore, a smooth exchange of electricity across all national borders is assumed. Both prerequisites can be challenged in practice. In addition, there is the possibility of fuel switching to oil at up to a quarter of European gas power plants, which according to the IEA is technically possible.

Overall, in practice, it is realistic that half of the gas consumption for electricity and district heating production can be eliminated by switching to coal and oil in particular, which corresponds to a reduction in gas usage of 72 billion m³.

¹ Here counted as Natural Gas Equivalents

Other energy sector	<p>We do not have immediate evidence to assess the possibilities for consumption reductions in the short term but estimate that 5% efficiency measures as a consequence of high gas prices are realistic.</p>
Households and service	<p>In addition to “real” savings, in the short term, the opportunities in the household and service sectors are limited to a shift to other fuels. There are more than 80 million gas installations in the EU, but it is unclear what proportion use gas as the main source of space heating.</p> <p>It is estimated here by a rough approximation that 10% of the gas consumption in the sector (8 million gas installations) over a year could be converted to, or supplemented with, heat pumps, biomass boilers or fireplaces, solar heating, or direct electric heating. A switch to direct electric heating increases electricity consumption, however, and is unlikely to contribute to a short-term decline in European gas consumption.</p> <p>In total, a reduction of 16 billion m³ has been estimated.</p>
Industry	<p>The capabilities of industrial enterprises to quickly convert to electricity, oil, coal, or wood pellets are difficult to determine. A very large part of the industrial gas consumption in the EU27+UK is at German enterprises and is used in chemical and petrochemical processes, the iron and steel industry, for mineralogical processes and in food companies. A rough and possibly ambitious estimate is that 15% of the gas consumption here can be reduced within the next 12 months by conversions to oil, coal or wood pellets.</p>
Result	<p>The result of the analysis can be seen in the Figure 2, where the implementation of all measures leaves a gas shortage of 15 billion m³, corresponding to 6.5% of the remaining gas consumption in households and industry.</p>

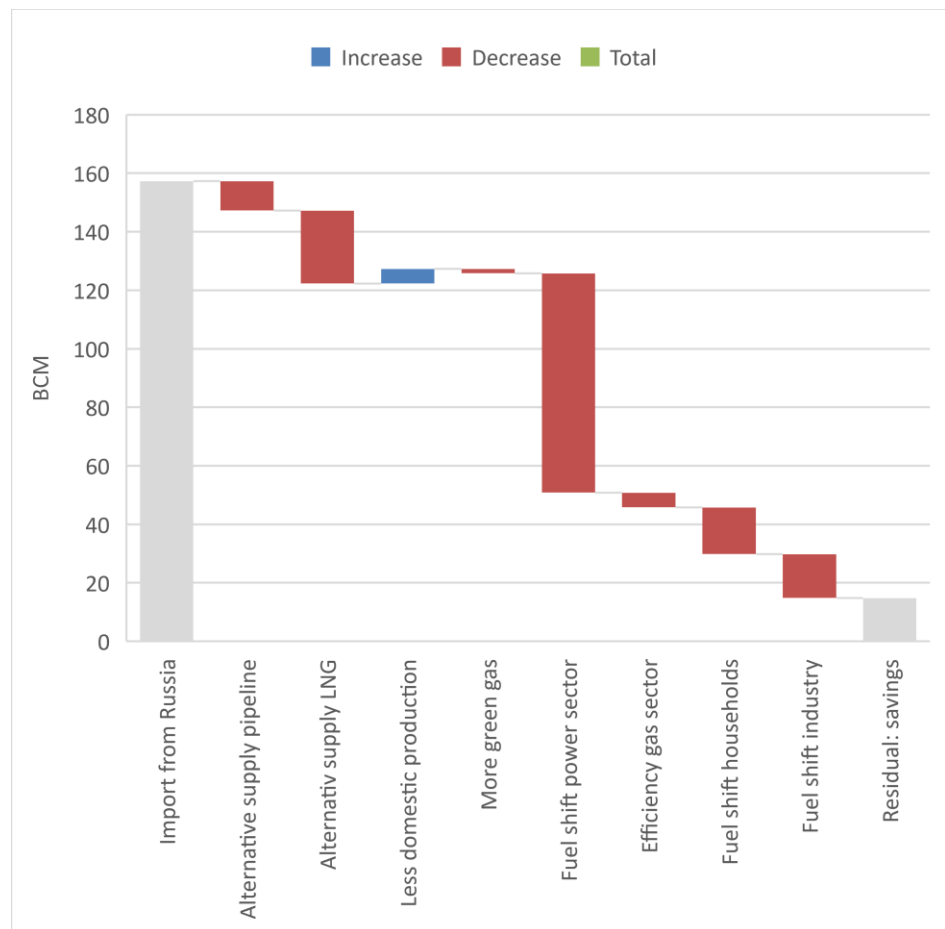


Figure 2: Effect of measures to reduce Russian gas imports. Europe imports almost 160 billion m³ natural gas. The implementation of all measures leaves a gas shortage of 15 billion m³, corresponding to 6.5% of the remaining gas consumption in households and industry.

Uncertainties

In addition to the conditions already described, climatic conditions can have a significant impact on gas consumption (cold or dry year), just as challenges with corrosion problems at French nuclear power plants risk increasing the demand for gas for power generation by up to 4-5 billion m³ in the coming year.

Conclusion

Surprisingly, the analysis shows that it should be possible for Europe to make itself independent of Russian gas in just one year by a coordinated effort, where all sectors and countries contribute, and with a low risk of actual rationing. It is considered possible that the European gas network can be converted over the course of one year to supply all remaining customers from primarily coastal LNG gas plants. This has not been analysed, however. Although, in the calculation, there is a shortage of 15 billion m³ gas, equal to 6.5% of the gas consumption in households, services and industry, after significant fuel changes have been carried out. This remaining 6.5% can be

found by behavioural changes, by hastily implemented investments in energy efficiency improvements and, ultimately, by rationing of industrial enterprises. Alternatively, the Netherlands will still be able to increase production in the Groningen gas field for a year or two.

The vast majority of the effort concerns fuel shifts in the electricity sector, which unfortunately has a negative climate footprint in the short term.

Overall, we find that carbon emissions in the EU27+UK are increasing by around 60 million tonnes. This covers the fact that some of the gas reduction measures – energy efficiency, more renewable energy – reduce carbon emissions, while conversions from gas to oil and coal have the opposite effect. Fortunately, it is to be expected that the conversion measures can be phased out over a short time horizon in line with the acceleration of expansion with wind and solar, and by expanding gas supplies from other countries in the following five-year period. The EU may choose to tighten its climate targets towards 2050 to compensate for the extra carbon emissions resulting from the halt to using Russian gas.

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