

Natural gas reserves: a false hope

Natural gas will become the next scarce energy source after oil, in part because the reserves have been over-estimated and extraction will not be able to grow enough.

Around a fifth of end energy consumption around the world comes from natural gas. It is popular because natural gas is considered to be more environmentally friendly than other fossil fuels. It burns without soot and emits 40 % less carbon dioxide than coal and 30 % less than oil for the same amount of energy. If the pipe infrastructure is in place it is as convenient for consumers as electricity and has a variety of uses: in power plants for electricity, for heating purposes, for decentralised combined heat and power plant and even as a vehicle fuel.

Is natural gas therefore the cleaner transition fuel into the age of renewable? A lot of evidence suggests that this point of view is shortsighted, for anyone using natural gas becomes dependent on it. Complex pipeline systems are required for transportation and distribution, and for transcontinental transportation, expensive fleets and terminals are increasingly

being set up for transportation in liquid form (LNG, liquefied natural gas). Long-term supply agreements between the extracting countries and the consuming countries are also required in order to be supplied reliably.

Europe's gas extraction is declining

And yet existing, stable supply arrangements could falter, as apart from increasing demand in the traditional consumer regions (North America, Europe and South-East Asia), up-and-coming economic powers such as India and China are joining in too. At the same time, extraction is declining in the main consumer countries and the main extraction countries' own demands are rising. Scarcity is thus just a matter of time. In almost all European countries gas extraction has passed its peak – except in Norway, which is not able to compensate for the decline in extraction from the other countries, however. Even in Great Britain, extraction has dropped by 40 % since the year 2000. The "Interconnector Pipeline", which connects Great Britain to the European mainland and was originally built to export Scottish natural gas, has thus now long been used for imports instead.

And even in Norway the end of the natural gas boom is close at hand. Despite the opening up of new fields, the extraction peak will already have been

Gas extraction in Russia's old large fields is declining. The country is already importing natural gas from the Caucasus in order to be able to meet its export obligations towards Europe.

Photos (2): dpa



passed there by 2015. The exact point at which this happens will mainly be determined by the productivity of the fields "Troll" and "Ormen-Lange". While natural gas extraction thus sinks by more than half in Western Europe in the next twenty years, gas demand will probably continue to rise. It has risen by 10 % since the year 2000.

Pipelines from the east are bringing hope: North Stream (Baltic pipeline), South Stream and Nabucco are the names of the new umbilical cords of the West European gas suppliers. But this hope could turn out to be false in three ways. Firstly, even the pipelines planned so far, which are in part not even in the construction phase, will not be enough to meet the predicted shortfall: there would have to be two to three times as many. Secondly, gas supplies through these few pipelines are anything but certain. This is because not all the fields required for this have been opened up, and other buyers from Asia are declaring that they have demand of their own. Thirdly, costly planning and construction of the complex infrastructure are consuming billions and will require many years of lead time, which can even then be further delayed through political conflicts with transit and neighbouring countries, or by social conflicts in the countries themselves.

It is forecast that in 2020 Europe will have a shortfall of 200 billion m³ of natural gas. According to the demand forecast by the International Energy Agency (IEA), the figure is 250 billion even. A pipeline such as Nabucco would only be able to supply around 30 billion m³ of this. And yet, even this amount would first have to be extracted from the gas fields. It is still not clear which reserves are to fill all the pipelines already planned, as the gas extracting countries are starting a future price-driving element of competition amongst their customers. Russia thus inaugurated its first gas liquefaction terminal in February, with which it will be able to supply mainly North America and Asia by ship, and with which it wishes to become less dependent on its European customers.

There is scarcity in Russia

At the same time, gas is becoming scarce in Russia itself. Back in January in the gas dispute with Russia, the Ukraine accused Gazprom of delaying supplies to the West to cover the fact that Russia didn't actually have enough reserves available. "The Russian Federation and Gazprom do not have enough gas to feed through to European customers, and are thus delaying a resolution of the conflict with the Ukraine," claimed Bodhan Sokolowski, charged by the Ukrainian President to oversee the energy security of the country.

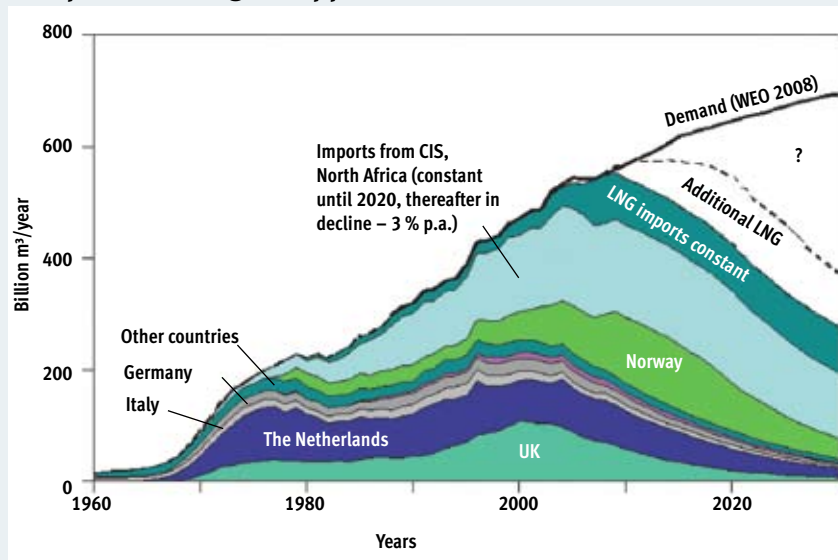
This is perfectly plausible, for although Russia is now the largest natural gas extracting country in the world and has the largest reserves according to official figures, most of the large online fields have already passed their extraction peaks. The newly opened up fields which are constantly going online are able to slow down the decline in extraction, but they can't cover a growing demand.

Once before, in 2007, Russian extraction sank to the level in 2003. The result was an acute gas shortage even in Russia. Across the country there were numerous power stations which apparently couldn't get enough supplies from Gazprom. And for other companies too, only gas rations were available. The Russian energy expert and former Deputy Energy Minister Wladimir Milow reckons the extraction and supply problems at Gazprom are so big that he fears there will be a gas deficit, forecast at 100 billion m³. This equates to the volume which Germany annually obtains from Russia, for example. Germany depends on Russia for 35 % of its gas demand, which is thus its most important supplier: a quarter comes from Norway and almost a fifth from the Netherlands. Only 15 % comes from its own reserves – mainly on the North Sea coast.

Despite this, in the last few years Gazprom has invested less money in gas extraction than in buying shares in companies which have got nothing to do with natural gas. At the same time, the gas infrastructure is wearing out. The average age of the Russian pipelines is 33 years, and this has recently led to a growing number of accidents, leaks and explosions. In order to make the necessary expansion to Russian gas extraction, large investments would have to be made in still untapped gas fields north of the polar circle, in the sea and to the east, where mainly small reserves are to be found away from the transportation network.

An example is the Jamal peninsula in the North Polar Sea: the several billion m³ of natural gas reserves here could in theory supply the whole world

Europe's natural gas supplies



In order to adequately cover the demand assumed in this scenario, twice as much would have to be imported in ten years' time as currently. Here we assume that gas imports stay constant until 2020. This scenario is not a forecast, but it does show where supply shortages may occur if there is not a significant increase in import capacities. Increasing imports of liquefied natural gas (LNG) is also planned. As this has only played a small role up to now, however, even an annual increase of 5 % would only have a small effect on Europe's supply situation.

Sources: OECD 2008, DTI 2009, NPD 2009, BP 2008
Scenario and graphic: Ludwig-Bölkow-Systemtechnik GmbH 2009



New fleets for the transportation of liquefied natural gas (LNG) are increasingly being built. Tankers may improve supplies to certain places, but can't solve the problem of dwindling extraction volumes.

for ten years. But the thawing, then refreezing ground, causes extraction technology, pipelines, roads and employees' houses to simply subside away.

Russia is importing gas for exports

Russia is meanwhile increasingly bringing foreign investors into the country, which is also a sign that, as with oil, the times of cheap, easily available natural gas are coming to an end. The remaining, expensive reserves, are now to be opened up by any means available. At the same time, Russia is already importing natural gas from the Caucasus in order to be able to meet its export obligations. In 2007, Gazprom signed a supply contract with Turkmenistan, after lengthy preparation work by President Putin. Gas supplies to Europe are thus secure, declared the now First Minister at the time.

A series of problems makes it unlikely that gas exports to Europe will be significantly increased in the next few years. Gas extraction in the old large fields is declining, and new fields require a lot of effort to be opened up. Home demand is increasing, as is the level of competition with Asiatic consumer countries.

Shortages even within a few years

Of the natural gas reserves available on current estimates, over half lie in Russia, Iran and Qatar. Hope for the future lies largely in a single large gas field in the Gulf of Arabia, whose northern half ("South Pars") lies in Iran and whose southern half ("North Field") lies in Qatar. Estimates on the available gas reserves there are highly questionable and are probably much

too high. When the southern part was discovered back in 1971, the reserves were projected for an area of several thousand square kilometres based on just a few test boreholes. Later boreholes within the supposed field came up negative. Sceptics believe that in the end no more than one third of the originally expected natural gas reserves will be extracted.

But even if you take the official figures for the reserves, there are still technical, economic and political hurdles. The worldwide extraction of natural gas should thus have peaked by 2025, say the experts at Ludwig-Bölkow-Systemtechnik GmbH, Germany. If, however, demand continues to rise and transportation problems aren't solved more quickly, then Europe and other regions of the world can expect to see shortages even within the next few years.

Unconventional solutions

The tapping of so-called "unconventional" natural gas reserves will also probably not change much here. The talk is of mine gas, which is present in low concentrations

and at low pressures in porous rock. The extraction of this gas requires a greater amount of work and is accordingly costly. In the USA the decline in conventional gas extraction has been balanced out this way for several years, but it is unclear for how long this will still be possible and whether the process can be transferred across to other extraction regions. Above all, it doesn't solve the main problem: the dependence on an ever-scarcer and ever-more costly resource – natural gas.

More visionary and also more interesting from the political perspective of security, however, seems to be an idea from the German parliamentary party Bündnis 90/Die Grünen. On the basis of a study, the party has suggested using the European natural gas network to feed in biogas from the large agricultural areas of Eastern Europe and transport it to the densely populated conurbations of Western Europe.

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