Security of Supply in Europe during the Ukraine Crisis

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Abstract

- Gas supply could be secured during a temporary disruption of Ukraine transits in most European countries.
- Only Ukraine itself, Bulgaria, Macedonia and Turkey would face gas supply shortages if Russia would halt transits to and through Ukraine.
- The high resilience of Europe against a suspension of Ukraine transits can be explained by low gas demand, large gas storage capacities and increasing market integration because of bi-directional interconnector capacities.
- At current infrastructure capacities, Europe could however not replace a permanent suspension of Ukraine transits without risking serious gas shortfalls. In such a scenario, Europe would need to increase its LNG imports substantially, but even then, many countries in Southeast Europe could not be entirely supplied due to missing transport infrastructure.
- Since Russia has announced to halt Ukraine gas transits in 2019, a variety of new pipeline projects such as the “Turkish Stream” pipeline is currently discussed.

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Analysis

Few topics have resonated through the gas market in Europe and Germany in recent months as much as security of supply. In particular, the new gas dispute between Ukraine, Europe's most important gas transit country, and Russia, Europe's leading supplier of natural gas (with exports of about 140 billion cubic meters covering about 30% of the annual European demand in 2013) led to discussions about the state of Europe's security of supply. Memories of the gas conflict in 2009 have arisen, when some EU Member States, particularly in Eastern Europe, suffered from supply shortages. Six years later, Ukraine remains the main transit country for supplies of Russian gas to Europe.

Indeed, Russia and Ukraine were able to come to a short-term agreement on the "winter package" in October 2014 and the "summer package" in March 2015. However, since these agreements are usually only valid over a several-month period, the issue will remain critical in the coming years.

High resilience of most European countries against a Ukraine disruption

In this context, the Institute of Energy Economics at the University of Cologne (EWI) has recently published a study analyzing Europe's dependence on gas transits through Ukraine.

The basis of the analysis is the simulation of different crisis scenarios that each assume a suspension of Russian gas transits via Ukraine for 2 weeks as well as 3 and 6 months. The simulations were performed using the European gas market model TIGER. The model simulates the daily gas flows in the European gas market. That is gas production, imports of liquefied natural gas (LNG), pipeline transports, gas storage utilization, as well as the consumption of natural gas, thereby taking into account the relevant infrastructure capacity.

The analysis shows a high level of resilience in most European countries. In the case of a two-week outage of Ukraine transits, only Turkey, Bulgaria and Macedonia (in addition to Ukraine itself) would be affected by minor supply shortages. Over the span of a three-month failure, the demand shortfall within these countries would increase: Up to 12 percent on peak days in Turkey, up to 35 percent in Bulgaria and even up to 90 percent in Macedonia of the expected gas demand could not be supplied. All other countries would, despite a lengthy outage of Ukraine transits, be in a position to guarantee the gas supply of the population, power plants and industry.

Given a delivery interruption of six months between November 2014 and April 2015, a total of about 51 billion m^3 of Russia's natural gas exports to Europe would not be supplied. This amount corresponds to just over 10% of Europe's annual demand. More than two thirds of this shortfall could be offset by an increased use of gas storage and additional LNG imports. About 12 billion m^3 of natural gas could not be replaced.

Simulation of an additional 2-week winter cold spell in Europe shows that a 6-month interruption would cause Italy and Greece to struggle to fill supply gaps.

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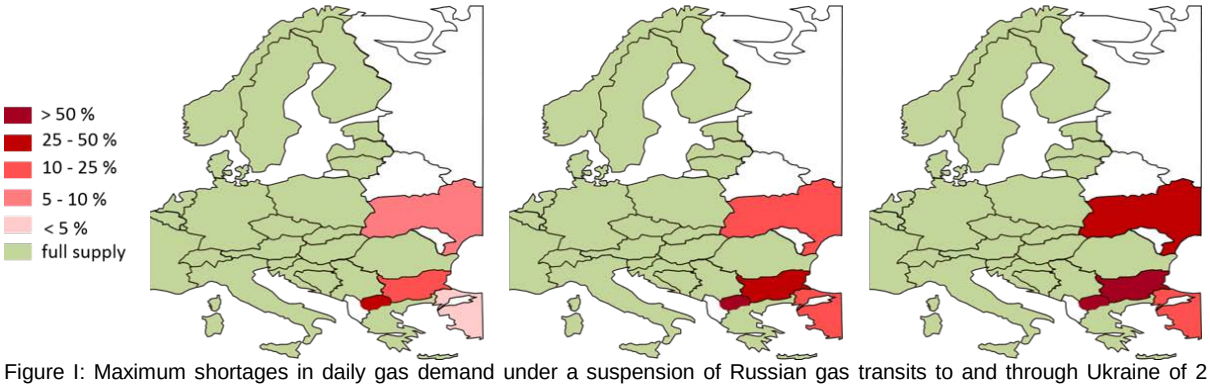

Figure I: Maximum shortages in daily gas demand under a suspension of Russian gas transits to and through Ukraine of 2 weeks / 3 months / 6 months

Infrastructure expansion and reduced gas demand strengthen supply security

The results of the simulations show that Europe would be much better prepared to withstand a possible disruption of Ukraine gas transits in comparison to the situation during the crisis in 2009. The significant improvement in the supply situation in Europe is due to several reasons:

Decreasing importance of Ukraine transits

Although the transit route through Ukraine is still essential for Europe's gas supply, its importance has decreased in recent years. Whereas in 2005 121 billion m^3 of natural gas were delivered through Ukraine to Europe, only around 57 billion m^3 were delivered in 2014. This development can also be explained by the fact that large amounts of natural gas can now be transported from Russia to Europe through the Baltic Sea pipeline "Nord Stream", built in 2011.

Increased expansion of natural gas infrastructure

In addition to the Nord Stream pipeline, numerous other infrastructure projects in Europe have been implemented in recent years that have had a positive effect on security of supply. For example, ca. 40 percent of the cross-border interconnection points now carry gas in both directions; i.e., in an emergency, natural gas could also move from Western to Eastern Europe, against the normal flow direction. The larger the transport capacity from west to east, the more that gas storage or LNG terminal in western Europe could contribute to security of supply. In addition, new gas storage capacities have been built up in many countries, especially in Eastern Europe.

Reduced demand for gas in Europe

Furthermore, the current annual European gas demand is far below the expected values. Many demand forecasts from several years ago predicted an annual gas demand for Europe of about 550 billion m^3- but the actual demand last year was at about 450 billion m^3. Due to the lower demand, the European infrastructure is transporting less capacity than originally thought. In a crisis, the spare capacity would then be additionally available.

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Europe remains dependent on Ukraine transits

The results of this analysis should not lead to the conclusion that Ukraine would now become superfluous as a transit country. On the contrary, the country will take an important position in the European natural gas market in the future as many eastern and southeastern European countries, in particular, continue to be increasingly dependent on Ukraine-transits, as further analysis shows:

If one simulates a permanent loss of Ukraine as a transit country, it becomes apparent that many countries could no longer fully cover their annual gas demand. One decisive factor for Europe's dependence on Ukraine gas transits is the additional LNG imports from the world market. The more LNG that is delivered, the better that missing Ukraine transits are compensated. But a complete replacement of the Ukraine-route by LNG is readily impossible: Even if European importers would purchase over 95 billion m^3 at the global LNG market in one year – an amount that was imported in record year 2010 - could a number of countries in Central Europe still not fully cover annual demand. And even if European importers were hypothetically able to purchase as much LNG as possible, a demand shortfall could not be prevented in many southeast European countries given the current infrastructure. Under such circumstances, further construction of new LNG terminals in southeast Europe and corresponding pipeline expansions would be necessary.

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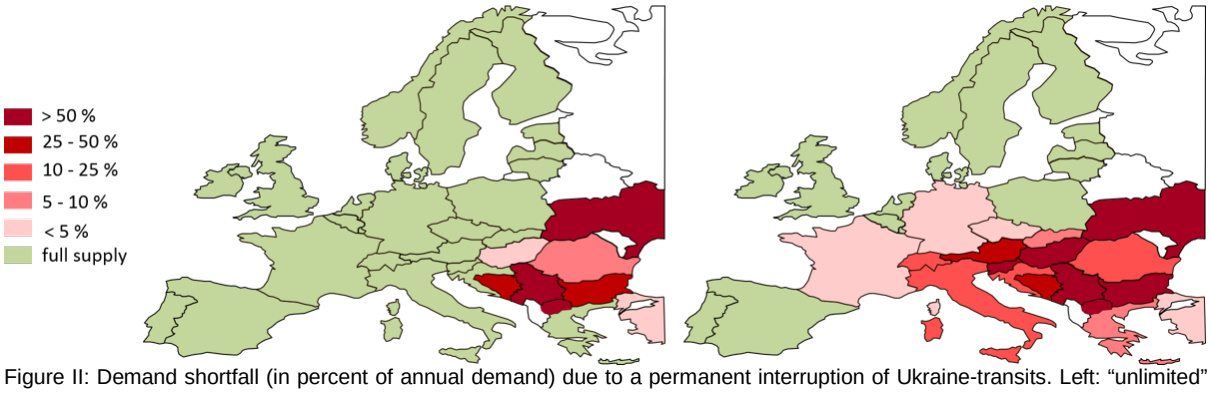

Figure II: Demand shortfall (in percent of annual demand) due to a permanent interruption of Ukraine-transits. Left: “unlimited” LNG availability in Europe. Right: annual LNG availability for Europe of 95 bio. m³ per year.

Turkey instead of Ukraine: Russia will exchange its transit countries

Just as Europe, at present, cannot lose Ukraine as a transit country, Russia also depends on the transits through the former Soviet Republic. Even if Russia would fully utilize the other major pipeline routes such as the Nord Stream, Yamal (through Poland) and Blue Stream (across the Black Sea), about 100 billion m^3 per year — including sales to Ukraine — could not be sold at current infrastructure capacities.

In this context, Russia has aimed and still aims at further reducing its dependence on transits through Ukraine. Until the end of 2014, the South Stream pipeline project through the Black Sea was intended to connect southeast Europe directly with Russia. This plan has since been discarded, and Gazprom is planning instead to build a different Black Sea pipeline directly to Turkey, the so-called "Turkish Stream" project. As soon as the project was realized, Gazprom could become independent of Ukraine in terms of gas export. In fact, Gazprom CEO Alexei Miller announced in April 2015 that once the construction of the new pipeline is completed, i.e., from 2019 onwards, no more gas would be transported through Ukraine.

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Ultimately, this development would mean nothing more than Russian trading one transit country, Ukraine, for another, Turkey. Yet Russia could only avoid Ukraine as a transit country (while still putting its gas volumes on the market) if the markets in southeast Europe gain access to the gas delivered by the "Turkish Stream" pipeline. In order to do so, countries would first have to create a connection to this new pipeline. This would not only take extra time to complete but also require greater investments, as there is currently hardly any significant pipeline capacity for gas transport from Turkey to the Balkans. If the investment can be financed and/or be realized until 2019 is an open but important question for the future gas market especially in southeast Europe.

New pipeline projects on the horizon

One part of the solution could be the "South European Pipeline", a project which has been agreed upon in June 2015 between Russia and Greece, extending the "Turkish Stream" pipeline over Greek territory. Another project which is currently discussed in this context is the revival of the abandoned "Nabucco" project, starting at the Turkish-Bulgarian border and continuing along the old "Nabucco" road to the gas hub in Baumgarten/Austria. A third major project on the horizon is the doubling of Nord Stream capacity. Gazprom, Shell, E.ON and OMV have signed a Memorandum of Agreement for this project in June 2015.

Security of supply comes with a price

Even though none of the mentioned projects is yet realized (at the time of writing), any of these new investments and the corresponding construction of an alternative route for Russian natural gas would, on the one hand, improve security of supply, especially in southeast Europe. On the other hand, this development would mean that utilization rates of other pipelines in Europe might decrease.

This emphasizes, once again, the tension between security of supply and economic feasibility. In the event of a crisis, more available infrastructure improves security of supply. However, the lower the utilization of infrastructure is, the more inefficient it is. As shown previously, the majority of European countries could withstand a temporary interruption of Ukraine transits—due to the solid pipelines infrastructure, LNG terminals and storage as well as the current low demand.

However, it is questionable whether, from the perspective of security of supply, the favorable combination of large infrastructure capacity and lower demand for gas is economically sustainable. In the market of (non-regulated) gas storage, for example, the decline in summer-winter price differences has been observed for many years, such that the economic operation of some storage is increasingly questionable. Concerning gas transport pipelines, most of them are subject to the national regulations with secure revenues, but a permanently low utilization would inevitably lead to higher network charges.

Therefore, it is unclear whether and the extent to which European consumers are prepared to permanently finance these high infrastructure standards. It also remains open whether the market will be able to ensure a socially desired level of security of supply, or whether it needs further government intervention in the market. But one thing is for certain: security of supply comes at a price.

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Remarks: Opinions expressed in this contribution are those of the author.

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About the Author of this Issue

Harald Hecking has been the Managing Director of the non-profit research organization ewi Energy Research & Scenarios since June 2015. After he had joined EWI in May 2011, he became manager and Head of Fuel Markets in October 2014. He conducted consultancy and research projects for EWI, amongst others, on the impacts of the German "Energiewende" on the power market, future potentials of natural gas in Germany, the economics of long-term gas contracts and questions on the security of gas supply in Europe, such as on the consequences of supply disruptions. Moreover, EWI seconded him twice to the International Energy Agency in Paris to be co-author of the Medium-Term Coal Market Report. In his doctoral thesis he focused on the simulation of economic decisions in energy and resource markets.

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