Chapter Eleven

What are the Security Challenges of the Natural Gas Golden Age? Natural Gas Security in the U.S. and Europe

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Natural gas is a depletable, fossil, natural resource. Compared to oil it has lower energy per unit content, however it has relatively low carbon footprint—lowest among fossil fuels—making it an attractive energy resource, which could technically replace oil in many modes of consumption. Nevertheless, the transportation and storage of natural gas remains more difficult and expensive then oil, casting a shadow over the huge potential of natural gas. In some crucial areas natural gas has overtaken the position of oil in the last three decades such as in the heating and electricity generation sector of the Organization for Economic Cooperation and Development (OECD) member countries. Both in the United States and Europe the majority of new electricity power plants built since 1990s were natural gas fueled, so-called Combined Cycle Gas Turbine (CCGT). No new nuclear power plant was built in the last two decades in these regions. Irrespective of whether transportation sector switches to electrcity or natural gas as a fuel, in both cases this gaseous primary energy source will play a crucial role in the future. Natural gas clearly pushes to take a leading role. As electricity network balancing depends progressively on natural gas generation capacities—partly due to increasing share of hardly controllable or storable renewable energy production—and more households depend on natural gas run heating, the short interruptions in natural gas supplies are increasingly inconvenient and have escalating economic, political, and social side effects. This chapter therefore discusses the

[1] The contents of this paper are the authors' sole responsibility. They do not necessarily represent the views of the Regional Centre for Energy Policy Research or any of its members.

medium term supply security risks of natural gas.[2] Long run security is not discussed due to the substitutability of natural gas, which limits long term policy decision making. To put it other way, any interruption within a year in supplies are desirable to be avoided, but if it is clear that natural gas supply will not be available from a supplier in a foreseeable period, both policy makers and the market is capable to adapt to that new situation by providing alternative fuel sources.

How is Domestic Natural Gas Production Reshaping Supply Security in the Transatlantic Space?

Today, the United States is the largest consumer and producer of natural gas resources. Meanwhile, Europe is the second largest natural gas consumer of the world. In 2009 the EU imported 65% of its natural gas demand; more than 70% of imports were shipped via pipelines. The largest pipeline import partners were Russia (34%), Norway (31%) and Algeria (14%).[3]

Historically, the United States and the European Union have been the largest natural gas consumers in the world.[4] Both entities have significant yet depleting conventional domestic natural gas production. The 1990s saw a significant upward demand trend for natural gas, as electricity generation from natural gas became more efficient, and commercial, industrial consumers also started to switch to this "convenient" fuel. The opening of new domestic natural gas production wells were not capable to keep up with the pace of the increasing demand. Many wells peaked in this decade in the U.S., in the Netherlands and the North Sea. Due to the fact that domestic production was not satisfactory on the long run and its replacement doable with imports, natural gas started to gain a geopolitical importance both sides of the Atlantic.[5]

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[2] Short term risk measurement has technical tools. For a summary of the existing measurement tools and methodology see Regional Centre for Energy Policy Research: *Measures and Indicators of Regional Electricity and Gas Supply Security in Central and South-East Europe* in: Péter Kaderják ed., *Security of Energy Supply in Central and South-East Europe* (Budapest: AULA, 2011), pp. 8-50.

[3] Eurostat (2009).

[4] British Petrol: *BP Statistical Review of World Energy 2011* (London: BP, 2011).

[5] The European dependence increase on Soviet natural gas supplies were already heavily debated in the US during the 1970s and 1980s.

At the millennium the majority of market participants expected that the United States would substitute declining domestic production with natural gas imports from overseas.[6] The global energy majors rushed to support leading LNG import projects to cover future U.S. demand.[7] However, thanks to the favorable regulatory environment in the U.S., the solution for an adequate supply answer came from small-scale unconventional natural gas producers that were overlooked by the big energy majors for decades. The unconventional gas production technology—fracturing—was there since the 1950s. However, only upward trends in U.S. domestic natural gas prices at the end of the 1990s and the experience gained in the last decades made this technology feasible. The fracturing and cracking technology debuted as a major "game changer" in the American continent. In 2009 the U.S. was capable of covering 87% of its demand domestically.[8] Today and in the upcoming two decades unconventional natural gas production is the basis of the security of natural gas supplies in the U.S.[9]

On the other side of the Atlantic Ocean Europe's domestic production is less fortunate. The traditional conventional fields in the Netherlands and the North Sea are depleting. There have been insights that the unconventional natural gas production revolution can happen in the European Union as well. According to available data, the EU's unconventional natural gas technical potential is 1.4 trillion cubic meters.[10] The largest fields of these types are in Poland, France, Denmark, the UK and the Netherlands. Some have argued that the

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[6] International Energy Agency: *World Energy Outlook 2000* (Paris: IEA, 2000), Energy Information Administration: *U.S. Natural Gas Markets: Recent Trends and Prospects for the Future* (Washington: U.S. Department of Energy, 2001).

[7] David G. Victor, Amy M. Jaffe, Mark H. Hayes, eds., *Natural Gas and Geopolitics From 1970 to 2040* (Cambridge: Cambridge University Press, 2006), Energy Information Administration, *The Major's Shift to Natural Gas* (Washington: U.S. Department of Energy, 2001).

[8] U.S. Energy Information Administration, *Annual Energy Outlook 2011* (Washington: EIA, 2011).

[9] Kenneth B. Medlock, Amy Myers Jaffe, Peter R. Hartley, *Shale Gas and U.S. National Security* (Washington: James A. Baker III Institute for Public Policy and U.S. Department of Energy, 2011), available at: http://bakerinstitute.org/publications/EF-pub-DOEShaleGas-07192011.pdf.

[10] U.S. Energy Information Administration: *World Shale Gas Resources: An Initial Assessment of 14 Regions Outside the United States* (Washington: EIA, 2011).

complexities of European regulation and legal systems are not as favorable as that of the United States, i.e. that ownership rights, tight environmental regulation and lack of experience make Europe a less favorable place for shale gas investments.[11]

Does Europe Really Not Welcome Shale Gas Investments?

Property rights are a major obstacle to shale gas investments in Europe. While in the U.S. the land owner owns everything under ground, in Europe mineral resources under the ground belong to the state. As land owners cannot gain automatic benefits, they are less motivated to allow major drilling developments on their field. This leads to a "not in my backyard" syndrome. While investors have to pay rents for the government, they also have to agree on land usage with the owner. Europe, particularly the former EU15,[12] have a very strong tradition in environmental protection and politicians are keen to be careful not to take a stand on issues that cause public skepticism.[13]

Unconventional natural gas has been perceived as a water- and chemical-intensive industry that threatens drinking water resources and requires huge areas of land. These prejudices have to be overcome on the continent. Furthermore, there is no consensus whether the availability of waste amounts of cheap domestic natural gas should be perceived as a threat to renewable energy production development or rather perceived as a catalyst that helps to regulate the imbalanced energy systems that renewable energy production causes. While large scale, widely adaptable electricity[14] storage technology is not readily

[11]Florence Gény: *Can Unconventional Gas be a Game Changer in European Gas Markets?* (Oxford: Oxford Institute for Energy Studies—Working Papers NG46, 2010) and Paul Stevens: *The 'Shale Gas Revolution': Hype and Reality* (London: Chatham House Report, 2010).

[12]Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom.

[13]See Fukushima consequences in the European electricity market.

[14]Although hydro energy provides storage opportunity its usage and capacity is limited to geographic givens. The European hydro potential has been developed, further development potential is limited to the Balkan countries or natural parks and protected areas. For example in Hungary a debate is going on for several decades whether the country neeads a pumped stroge hydroenergy. See more: Andras Kiss et

available, some renewable energy production remains weather-dependent (wind flows, sunny hours), thus the amount of their production cannot be regulated. The clear advantage is that natural gas production can be activated fast, and the fuel itself (natural gas) can be stored, while large scale non-hydro dependent electricity storage remains unresolved. Thus natural gas could serve as a bridge technology until the renewable energy or electricity storage becomes a mature technology.

The environmental worries have a particular importance for the new eastern European members that are basically the Achilles Heel for EU level natural gas supply security. Eastern European members are more relaxed on environmental issues, and they are heavily dependent on one single natural gas supplier. Security of supply, due to lack of diversified supplies are top of the agenda that is far from the case on the western side of the European continent. Furthermore, for eastern European countries unconventional gas production would be a significant boost for the economy and would provide faster integration with the old EU member states.

Nevertheless, environmental concerns within western European member states can lead to such EU level regulations that may not favor unconventional production in the whole EU. France has already suspended rights for unconventional gas test drillings for an unknown time. Germany has not expressed a clear stance yet, while Poland is particularly against introducing any EU-level legislation that would shrink its maneuvering opportunity or constrain an investment-friendly environment for shale gas development. Major pipeline importers such as Russia would clearly benefit from a strict environmental regulatory outcome.

Europe also lags behind the U.S. in unconventional drilling technology and human know-how. Europe lacks the production capacity of drilling wells and wellheads to support an unconventional production boom. Historically, the continent has no onshore drilling expertise that matches in scale that of the U.S. The lack of human capital and industrial capacities means that even if the regulatory environment is welcoming the necessary capacity build-out would take years. This means that unconventional natural gas production would not

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al, *A szivattyús energiatározás kérdésének közgazdasági elemzése* (Budapest, REKK, 2008) Available at: http://www.rekk.eu/images/stories/letoltheto/wp2008-8.pdf.

provide a full covered domestic supply security earlier then 2020, but more likely around 2030.[15]

Furthermore, the huge unconventional natural gas technical potential does not reflect the economically viable potential of Europe. Economic viability is much dependent on pricing and technology costs. Currently there are no major signs that would suggest booming natural gas prices that would initiate unconventional gas production. Hungary can stand for an example of peculiar shale gas expectations in Europe. In 2008 this central European country became a place to hype unconventional natural gas, when ExxonMobil and Hungarian MOL announced test drilling of the Mako field, which has a potential of 350 bcm of shale gas. The test drilling results were a disappointment; the field with its deepness, pressure and temperature characteristics was very challenging, the flow rates turned out to be very low. After two years the companies decided to abandon the project until new technology became available. Today the Mako field concessions are partly held by the Serbian NIS, in which Gazprom has a majority stake. Thus, the Hungarian example shows that technical potential may turn out to be uneconomic and that traditional pipeline suppliers are keen to secure their comfortable supply positions by acquiring stakes in potential upstream fields that can lead to competition.

In short, it can be said that the shrinking European domestic production cannot be replaced by unconventional resources currently and it is questionable for the present whether after 2020 unconventional resources could play a major role in European supplies. The domestic and EU-level regulatory regime and environmental concerns are significant challenges for unconventional natural gas production. The capacity buildup in Europe will be drawn out. Furthermore, these weaknesses will be actively or indirectly exploited by the largest natural gas suppliers in the European neighborhood. The conclusion is that European demand on the mid run can be satisfied only by expanding imports. Therefore, the security of LNG and pipeline

[15]In Poland commercial domestic unconventional gas production is expected to begin by 2014 (in Hungary small scale uncovnetional production is already online). However, the capacity build out will take at least a decade. AFP: *Poland targets 2014 for shale gas debut* (Warsaw, AFP, 2011).

imports will play an increasing role in European policy decisions in upcoming decades.

How Secure are LNG Supplies?

Natural gas liquefaction technology, similarly to unconventional natural gas production, has a long history, yet the evolution of this technology and its spread happened at a snail's pace. The technology has been available since the 1940s. However, it was hugely expensive, and due to its technical complexities (e.g.: natural gas has to be cooled below -160 Celsius) and limit of physics, it remains a capital intensive technology and no significant cost reduction is expected.[16]

Large scale LNG shipments started from Algeria in the 1970s, targeting the U.S. and the European markets. However, since then many producers built out import capacities. Currently Qatar has the largest liquefaction capacity and it has approximately accounts for one fourth of total capacity in the world. Nevertheless, the announced new capacity development suggests that Qatar will lose its number one position and that Australia will become the largest liquefied natural gas exporter on capacity basis by the end of this decade.[17] This will allow a slight balancing out for the supply diversification and minimize the role of a single huge supplier that can influence pricing and may lead to sensitive geopolitical areas.

Despite Qatar's current significant influence it can be said that LNG suppliers are well diversified. Qatar supplies both the Atlantic and Pacific basin markets, these markets have a spread of suppliers from South America, the Caribbean, Africa to the Far-East. This not only guarantee global access for LNG, but also limits the single one large suppliers role. In this manner, most potential turbulence in any one LNG producer country could be managed in the upcoming decade. The global economic slowdown and the U.S. shale gas revolution enabled the industry to keep up with the pace of demand growth.

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[16]International Energy Agency: *Energy Technology Perspectives 2010* (Paris: IEA, 2010).

[17]Howard Rogers, *LNG Trade-flows in the Atlantic Basin: Trends and Discontinuities* (Oxford: Oxford Institute for Energy Studies—Working Papers NG41, 2010).

At the moment and in the midterm there are no foreseenable bottlenecks on the supply side.

LNG is supplied by ships, thus securing the major shipping routes in Hormuz and in Asia (South China Sea, Paracel and Spratly Islands) will remain a key issue. These shipping routes cannot be secured by the European allies alone without the active support of the United States. Threats to Asian supplies will automatically lead to rising prices in European markets. In Asia, China's LNG demand is projected to grow enormously. It is likely that China and Japan will each seek to have their supply routes secured, and Australia as a supplier will take an increasing role in the upcoming decade. Nevertheless, for Europe, the Middle Eastern and African shipping routes remain crucial to guarantee physical delivery of LNG shipments.

Besides securing physical deliverability of LNG, another important aspect is avoiding extreme price volatility. Although LNG is perceived as a form of global trade of natural gas, its product pricing remain dependent on the shipping distance. Thus shipping from the Pacific Basin producer to the Atlantic Basin consumer in most cases is not economic. In the last few years, however, when LNG markets—due to economic slowdown and North American unconventional production boom—have seen turbulent times of oversupply, some LNG cargoes even from Australia landed on European shores.[18] Despite this extreme example, in the long run these physical shipments are hard to justify, due to the increased long distance shipping costs. In general, swap deals should happen between the Pacific and Atlantic Basin producers to limit the arbitrage gap. Thus the "global LNG pricing" is secured up until both basins have sufficient surplus capacities. Any major interruption or capacity drop out in one of the basins can lead to significant price signals in the other market. It can be said that European import pipeline infrastructure, which many Asian countries lack completely, is not sufficient to fully hedge against Asian price developments. Hence, while Asia is more vulnerable to LNG supply security, the EU as a growing natural gas importer shall not downplay the effects of turmoil, increasing demand and security challenges in the Far Eastern LNG market.

[18]Eurostat and LNG trader reports.

In the Atlantic Basin the shale gas revolution in the U.S. caused significant shifts in the LNG market. By becoming self-reliant on domestic production, the United States no longer needed those LNG import capacities that were specifically built out for U.S. market demand during the last decade. As a consequence, natural gas from these surplus capacities started to flow to the nearest and biggest market, Europe. Some argue that these surplus capacities will be swallowed up by the Asian markets during the next decade.[19] Currently we saw that the events in Fukushima did not affect the midterm supplies to Europe. After a few months of significantly increased prices—when the increase of oil prices also played a role—the European spot prices returned almost to their pre-Fukushima level. It can be expected that Australia's heavy investments will meet most of the future Pacific Basin LNG demand. Thus, the demand increase in Asia will absorb the European surplus slower than earlier expected.

Secondly, increased liquidity in the Atlantic Basin provided the opportunity for functioning moments of the two Atlantic markets as theoretically one single market, i.e. arbitrage became possible between the two markets through LNG swaps. In the past decade, the European and the U.S. spot market prices became linked twice for a longer period.[20] In a very simplified way this means that the price differential between the U.S. and European markets is equal to the transportation and storage cost. Otherwise the upward and downward terms and scale are equal. In this framework the U.S. price is set by the demand and overwhelmingly by the cost of domestic production, while the European price is more complex with Take or Pay pipeline supplies, domestic production and LNG imports. In theory, when the U.S. producer has an opportunity to enter the European market with profit (e.g.: LNG swap deal), that is production cost and transport is lower than the European spot price, it enters the European market capping the European price increase level up until the limit of available surplus

[19]See more on this discussion, Ibid.

[20]Directorate-General for Energy: *Quarterly Report on European Gas Markets* (Brussels: DG-Energy, 2010) pp.4., Jonathan Stern and Howard Rogers: *The Transition to Hub-Based Gas Pricing in Continental Europe* (Oxford: Oxford Institute for Energy Studies—Working Papers NG49, 2011) and Howard Rogers: *LNG Trade-flows in the Atlantic Basin: Trends and Discontinuities* (Oxford: Oxford Institute for Energy Studies—Working Papers NG41, 2010).

capacity in the U.S. Or the other way around, when Europe has extra surplus from cheap pipeline natural gas below the U.S. price plus transportation cost, the gas flows to the U.S. market.[21] This way the price of the two markets follow each other, provided there are no bottlenecks at the supply and receiving terminals. Once the U.S. builds out its first LNG export capacities in the Atlantic Basin this theoretical framework will be further strengthened.

While it appears that there is a liquid natural gas supply to Europe, it is limited to the western European natural gas markets. The EU has to ease access to this liquidity by eastern European countries—in some cases land-locked—that do not have access to LNG terminals.[22] Brussels has already set plans for upgrading and increasing internal pipeline capacities. Maintaining the current liquidity level and eliminating physical and regulatory bottlenecks will limit oil-price-linked pricing and increase market liquidity in the new member states.[23]

[21]See a more sophisticated description in Rogers 2010, Ibid.

[22]There are several plans in Eastern Europe to build new LNG terminals:

- Romania and Bulgaria both plan to have an LNG or compressed natural gas (CNG) terminal on the Black Sea cost. However, no energy major is involved in these projects besides the national champions. Taking account the shape of these countries budget and the rising capital costs these plans cannot be seen as real.
- In Croatia the Krk LNG terminal has been in the news for two decades. Although international majors, like E.On are present in the project company that is part of the EU backed North-Sout corridor of the Visegrad4 countries (Czech Republic, Hungary, Poland and Slovakia) the lack of demand, budget problems in the region and involved energy majors, the competition from South corridor pipelines (see last part of this chapter) all compose a significant barrier for investment decision. Therefore it is higly unlikely that an LNG terminal would become available before the end of this decade.
- The only LNG terminal under construction in Eastern Europe is located in Swinoujscie, Poland. Although, post 2014 this 2.5 bcm receiving capacity would increase Polish supply security, it will not guarantee it, as its capacty is minor compared with the country's consumption of 16.4 bcm in 2009. With such capacity the Swinoujscie LNG terminals regional contribution is limited. It has to be mentioned that capcity increase up to 7.5 bcm have been announced, but this security contribution have to be judge on a border perspective. Namely, what path will Poland choose to address its climate commitments and whether it will switch its overwhelmingly coal based energy prodcution to a more environmental friendly one. (data obtained from www.polskielng.pl).

[23]Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia.

These commitments will bring the first results in 2015. In general, it is expected that the price link between the two shores of the Atlantic Basin markets will grow. That leads to an increasing likeliness that the U.S. and European markets become one common natural market, which would mean certain obligations for policymakers in the field of diplomacy and common transatlantic policy decisions.

The common market, which brings benefits for both regions' end users in a form of low and competitive prices, will exist up until the adequate liquidity levels are guaranteed. An export restriction on U.S. shale gas, would lead to economic inefficiencies. U.S. producers would receive less value for their product, and domestic consumption—which does not reflect global prices—would lead to wasteful utilization. Although it can be argued that domestic production is a crucial element of national security, not having a transatlantic common natural gas market with America's closest allies could lead of endangerment of their supply security. Thus an America-first approach may carry a higher geopolitical price tag at the end.

The United States and the European Union are taking a leading role in energy market liberalization. The U.S. and the UK set a benchmark of national energy market opening, which is why EU efforts lead to an example of how national economies can create a single energy market, thus laying the example of a more opened global energy market. The U.S. shale gas revolution boosted western European natural gas market liquidity and thus significantly accelerated market opening efforts in Europe. As a result, natural gas markets in the transatlantic space are showing the signs of becoming a single one. This integration is driven by market forces, with active support of policymakers. The market integration and the increased liquidity give solutions for such long-standing geopolitical challenges as the Russian energy supply dominance or Maghreb energy supply dependence in Europe. These indirect (market-driven) political efforts provide greater diplomatic maneuvering room by relaxing some painful interdependencies. However, they also underscore the need for a more sophisticated mix of soft and hard policy tools to maintain the fragile and newborn transatlantic natural gas market.

The transatlantic single natural gas market cannot become a reality without LNG supply; however, LNG is not sufficient to meet all

European demand. While LNG is the key to enabling market functioning and liquidity in the transatlantic space, pipeline supplies will remain a crucial form of supply of the Eastern side of the future common transatlantic market.

How to Deal with Pipeline Security?

Natural gas supplied via pipeline creates a significant interdependence between the producer and supplier. The pipeline shipment, unlike LNG, cannot be switched between different producers and different markets. The involved parties engage each other—and sometimes the third parties as transit countries—in a long term commitment. David G. Victor et al. have looked at the history of natural gas deliveries for the last four decades.[24] Their research concluded that in case of pipeline delivery, producers have higher propensity to cancel deliveries and to underutilize pipeline than the propensity of end users cancelling deliveries due to price or delivery condition dispute. In addition to these academic findings, the European experience with regard to pipeline security is closely associated with the 2006 and 2009 January events, when Russia decided to stop shipments for Ukraine after several unsuccessful rounds of negotiations with their Ukrainian counterparts regarding future delivery amounts and prices. That led to the largest natural gas supply crises in European history. The episodes significantly damaged Russia's reputation as a reliable supplier, which previously had been immaculate, at least among the 15 old EU member states.[25]

The share of natural gas pipeline imports in the United States is minimal. Any major interruption in the North American import network can be addressed with sources from domestic storage, production or additional LNG imports. From Washington's view point the key question remains how secure is the pipeline supply of its Euro-

[24]David G. Victor, et. al, op. cit.

[25]The Swedish Defense Research Agency documents 38 cases of supply cuts. Jakob Hedenskog and Robert Larsson. *Russian leverage on the CIS and the Baltic States*. (Stockholm: User reports. FOI - Swedish Defence Research Agency, 2007) Available at: http://www2.foi.se/rapp/foir2280.pdf.

pean allies, as well how much strength and influence producer countries may gain by supplying the European markets.

At least 70% of European natural gas imports came via pipeline in 2009. The three key suppliers were Algeria, Norway and Russia; their supply did not overlap with each other in some parts of the continent, thus making some EU members dependent on one single pipeline supplier. Algerian gas is delivered mainly to the Mediterranean markets of Spain, Portugal, France and Italy. In these regions Algerian gas has to compete with other LNG or North Sea suppliers. Furthermore the LNG-receiving terminals in this region are around 50-80% utilized,[26] offering a wide enough buffer to receive any additional LNG supply in case of pipeline disturbances. An interruption of Algerian pipeline supplies due to internal EU network characteristics would be felt only in a few pocket regions of the EU, and network development projects are addressing these solvable problems.

Norwegian gas also enters the more liquid, competitive parts of the European market. Although any major disturbance or loss of 31% of supply would be challenging to substitute from other suppliers, both Norway and Algeria have additional LNG terminals for exports. In this manner the mode of delivery can be diversified up to existing capacity limits. In contrast, Russia is enjoying a more comfortable supplier position, having its own exclusive markets in eastern Europe, where it only has to compete with local domestic production. Furthermore, these eastern European markets have less weight, both measured in the amount of consumption and in political power. This gives Russia significant space to maneuver in terms of price setting and bargaining conditions. In northern and western European markets Russia is one out of many competitors and has no bargaining leverage; it has to follow market trends. In Germany, Russia's unwillingness to introduce more flexible terms of pricing caused headache, financial and market share loss to German energy majors (RWE, E.ON), however, the domestic prices could not be influenced by the rigid Russian stand.

[26]European Regulators Group for Electricity and Gas (ERGEG) *Final ERGEG study on congestion management procedures & antihording mechanisms in the European LNG terminals* (Brussels: European Regulators Group for Electricity and Gas, E10-LNG-11-03b, 2011) p. 9.

Thus, it was proved, the Russia has not enough share and power to determine natural gas prices in the German market.

Italy, the second largest importer of Russian gas, is building several new LNG terminals. Once competitively-priced LNG starts to flow it will cause a significant burden to Gazprom's Italian trading partners if the Russian company persists in maintaining its current inflexibility in pricing. While Italy, Germany, France and the UK are significant merchandise exporters to Russia, the new eastern European members do not have similar trade-flow-based bargaining leverage. They also lack adequate infrastructure access to more liquid western European natural gas markets. Brussels has recognized this problem; funds were allocated to make the existing infrastructure reverse-flow-capable and the third energy package envisaged a more rigid unbundling conditions. Futhermore member states were obliged to address free access to cross-border capacities and when necessary to build new ones. The implementation of 994/2010/EC regulation[27] basically addresses all the major security threats of pipeline supply of the eastern European internal market. The ongoing discussion on creating a common natural gas market (Gas Target Model)[28] aims to provide liquid markets across the entire territory of the EU.

The measures taken by the EU will bring results—similar to the ones that EU market liberalisation has already achieved in Western Europe, where well connected infrastructure was given—by the middle of the decade. As expected under the new regulatory and infrastructure regime, the eastern European countries will be able to address any supply interruption similar to those in 2006 and 2009, when Russia closed the taps on Ukraine. Russia learned its lesson and was particularly keen to reduce its interdependence on transit countries and avoid similar conflicts that significantly harmed its international reputation. The heavily criticized North Stream pipeline, which runs under the Baltic Sea and bypasses transit through Belarus, Ukraine or Poland, has been switched on. Poland and other CIS

[27]European Parliament and the Council: *Regulation (EU) No 994/2010 of the European Parliament and of the Council of 20 October 2010 concerning measures to safeguard security of gas supply and repealing Council Directive 2004/67/EC.*

[28]Further information about the concept at European Energy Regulators' website (www.energy-regulators.eu).

countries became less secure, as their transit bargain chip disappeared, and are no longer able to bargain on prices and delivery conditions in exchange for transit. On the other hand, although Poland is unwilling to recognize it, Warsaw gained an alternative supply route from the same source. Any new transit dispute with Ukraine or Belarus will not threaten Polish supply, providing adequate surplus capacities are available on the North Stream pipeline.

Similarly, Moscow's intention to guarantee the security and independence of its supplies from rouge transit states led it to propose the South Stream pipeline. This route runs under the Black Sea and would bypass Ukraine. South Stream is perceived by some[29] as a bluff in order to distort the development and available finances of other competitive pipeline projects that would provide alternatives to Russian supplies from the Caspian basin. The EU calls these alternative options the Southern Corridor. It consists of several different pipeline projects that partially compete for suppliers and deliver gas to different parts of the European markets. Nabucco, based on Azeri, Northern Iraqi and probably Turkmen resources, would bring natural gas to the Central European Gas Hub, in Baumgarten, Austria. This would be the first pipeline project that would aim to deliver natural gas from different fields in different countries along one major shipping route. British Petrol (BP) has recently announced an alternative pipeline along the route of Nabucco. The South-East Europe Pipeline (SEEP) advantage over Nabucco would be a significant reliance on the existing infrastructure along Nabucco's planned route, thus building only the most necessary—around 1300 km—new pipeline.[30]

The Italy-Greece-Turkey-Interconnector (ITGI) and Transadriatic-Pipeline (TAP) are competing with Nabucco (along with SEEP) for the same Azeri production at Shah Deniz II field. However, ITGI and TAP pipelines would deliver gas to Italy instead of Central Europe, with minor differences in routes.

All of the proposed Southern Corridor projects would strengthen Turkey's geopolitical position. Ankara, having gained the leverage of a

[29]Vladimir Socor, Xypaki Maria, Andrew E. Karmer.

[30]Instead of Nabucco's 3800 km, "BP plans gas pipeline to Europe from Azerbaijan," *The Financial Times* (26th September 2011).

significant transit country, will have closer relations with the EU and a stronger voice across the region. Although Iran currently struggles to meet its internal demand, in the middle term (post-2020) it can strengthen its export position and use Turkey and its new infrastructure to enter European markets. Clearly, it would need Ankara's tacit agreement, which at the moment is hard to imagine. Nevertheless, it is to be seen which direction Turkey is heading and how it is rising as a major regional and increasingly independent player in the region.

It is clear that no more than one of the above mentioned pipeline projects in the Balkans would be economically feasible, as the regional demand would not be able to absorb all those amounts that these pipelines would carry with their nominal capacity. Project development has been going on for almost a decade in the case of Nabucco, but the laying down of pipeline has still not started in any of the above mentioned projects.[31] Furthermore, Azerbaijan has not committed its Shah Deniz II production to any specific transport project. Meanwhile, the alternative Southern Corridor projects seem to be idle,[32] while Russia has intensified its efforts on the South Stream project by boosting the staffing of the project company. However, this may turn out to be insufficient for actual pipeline delivery. As time passes it is clear that none of the above-mentioned projects will come online before 2017.

By the end of the decade many new pipelines will be laid down within the European Union and some across its external borders. Challenges will no longer result from technical bottlenecks or unilateral dependence, but rather from a mix of competing producers for European and global gas markets, which could intensify regional confrontation or competition for influence. These regions can be identified as (1) Central Asia-Russia-China-(Europe), where Europe will play a small role alongside Chinese and Russian competition; (2) the

[31]The Greeks claim, that due to an earlier capacity increase at the Turkish-Greek border, they have already developed 20% of ITGI. (Costis Stambolis presentation "*A New Actor in the Caspian Energy Chain: Greece and Prospects for TAP and ITGI*" 14th July 2011, Baku, and unnamed source from Hellenic Ministry of Public Order).

[32]Lot of work have been done behind the close doors, but no visible breakthrough has been achieved in a sense that there is still lack of commitment from the producers and the construction phase has been delayed.

Caspian Basin with Azerbaijan-Iran-Turkey, where each of these countries will seek to enhance its capacity to boost its geopolitical interests by gaining strength through exports or transit.

In this pipeline competition, Central Asia can play a key role. This region has the potential to supply Europe and the Far East at the same time, a scenario that Russia clearly wants to avoid. Nevertheless, in the long run the role of the region in transatlantic supply security can increase, as it can guarantee the price link between the Atlantic and Pacific Basins. As a consequence, any turbulence in this region can lead to price shocks and global gas trade disturbances. In the future, when the number of natural gas consumers increases, avoiding global price shocks of natural gas will rise to the top of the agenda. Global market liberalization will lead to diverse and liquid markets, yet the markets are insufficient to provide security and stability in producer countries or shipping routes. The future of natural gas security will increasingly hinge on the stable and predictable pricing of natural gas.

Conclusion

The largest currently known conventional natural gas reserves reside on the axis of northwest Siberia down to Qatar (the Siberian-Persian axis consists of Russia, Iran, Qatar, and Turkmenistan[33]). While the United States is independent from the resources of this axis, the European Union views the South-Siberian-Persian axis (Azerbaijan, Turkmenistan, North Iraq) as a potential source region for its current (Norwegian, Algerian) pipeline imports, which are depleting over the midterm, and as an alternative to the currently dominant Russian supplies. As the EU taps into the region's resources, the Caspian region's geopolitical importance will increase. In global natural gas supply, Qatar's role will be balanced out by new capacities in Australia. However, for European LNG supplies Doha will remain a key supplier. Europe has not been able to extend its capabilities beyond the tools of soft power. Therefore, its increasing reliance on distant resources will require support in the framework of transatlantic cooperation.

[33]The order of these countries represents their proven reserves (BP 2011).

The unconventional natural gas production revolution not only resolved the supply security of the United States, it significantly eased pressure on European supply security challenges. The amounts diverted from the U.S. to EU markets significantly diminished earlier European supply concerns, and led to diversified supplies. Currently the EU's is addressing internal regulatory and infrastructure bottlenecks that will enable Brussels to deal more effectively with threats that may be related to Russian-origin natural gas supplies.