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Security of Gas Supply in the Countries of the Visegrád Group

Introduction

In spite of strenuous efforts on the part of the European Union and its Member States to promote renewable sources of energy, conventional resources such as oil, natural gas and coal still dominate in individual EU energy mixes. With the rising costs of resources, their uneven distribution and limited supply, each state is busy trying to ensure its energy security. Secure and stable supply of energy resources has becoming the main preoccupation, especially in the countries of Central and Eastern Europe. Over the recent years, the Visegrád Group states have made particularly intensive efforts to ensure their supply of natural gas, an important component in the energy mixes of Poland, the Czech Republic, Slovakia and Hungary. The unstable political situation in the east of Europe as well as changes in natural gas markets (shale gas revolution in the USA, increased importance of LNG) gave rise to new challenges when it comes to ensuring gas security, but also new opportunities to become independent of eastern imports (Pirani et al., 2009, p. 8; *The Russian...*, 2009, p. 6). It is precisely the fact of being dependent on natural gas imported from Russia that determines the situation of Visegrád Group states. The present paper tries to analyse the situation in Poland, the Czech Republic, Slovakia and Hungary in terms of security of their natural gas supply. Part Two presents challenges faced by V4 states and recommendations for their future energy security policies.

Energy (gas) security needs to be approached in a comprehensive manner as an existing problem which exerts significant impact not only on the economic environment of individual countries, but also on their policy making. This is the sort of approach espoused by the so-called *gas supply chain*. The project is a geopolitical interpretation of global gas security linking politics and international relations under the broad theme of

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energy security. Specifically important are empirical and geographical studies to determine the territorial distribution of resources as well as industrial infrastructure, supply networks and routes making up the global gas industry (Bradshaw et al., 2014, p. 5).

The analysis takes its point of departure in the nature of gas supply which comprises three stages – *upstream*, *midstream* and *downstream*. In practical terms, these refer to the security of supply, security of transport (transit) and security of demand (satisfying demand). The analysis of the supply chain makes it possible to understand the interests of all actors and the specificity of their interactions covering the process starting with gas production from wells all the way up to providing it to final consumers. The supra-national nature of the chain is decisive for national energy security, although we must also bear in mind the important role played by the activities of national institutions at the last stage in the chain (so-called EU Third Energy Package, actions taken by national regulators).

Tab. 1. Gas supply chain – aspects and key considerations

	Energy Security	Aspects	Key Considerations
Upstream	Security of supply	Resources Technology Investment	Expansion of confirmed resources Investment necessary to expand resources Investor relations Profitability of resources given currently available technologies and prices
Midstream	Transport security (transit)	Processing Transport Storage	Gas processing Pipeline networks Compressor stations Liquefaction installations Transport of LNG Regasification potential Gas storage facilities Interconnectors
Downstream	Security of demand	Energy production Application in the industry Application in households Transport	Role of gas in the energy mix Price trends Competition Contract structure Energy policy Carbon tax (Cap & Trade) Carbon Capture & Storage technology

Source: own study on the basis of: M. Bradshaw, G. Bridge, S. Bouzarovski, J. Watson, J. Dutton, *The UK's Global Gas Challenge – Research Report*, London, November 2014.

Also apparent are various problems influencing global and national gas security. Globally, *upstream* problems relate to the volume of reserves, available technologies and the amount of investment allocated to satisfy global demand. For the gas importing countries, the crucial *midstream* consideration is supply certainty and the best price if supplies can be diversified. Key issues here are processing, transport and distribution of natural gas. The third stage – *downstream* – is the least internationalised and mainly depends on internal national policies, structure of the economy (its energy intensity) and legal regulations.

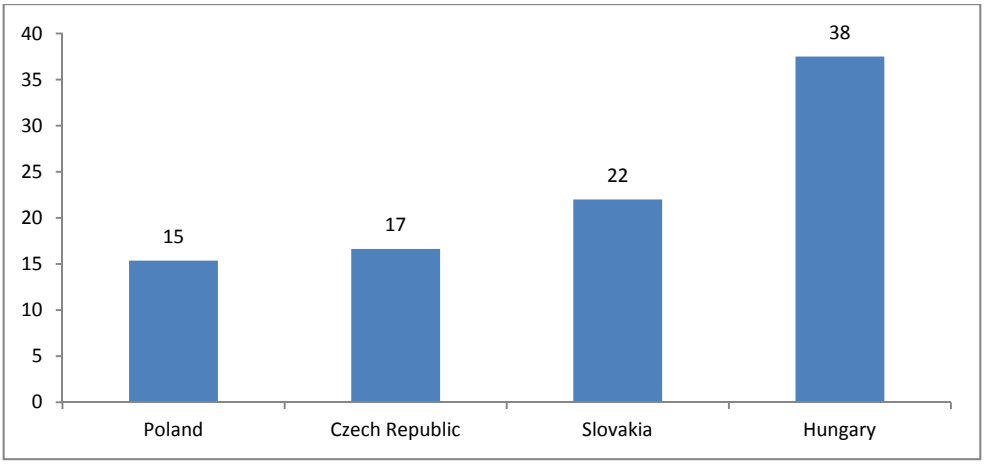
Taking account of these factors, the analysis of gas security in V4 states will necessarily focus on stage two in the chain, that is *midstream*. Due to limited gas resources, stage one – *upstream* – is of no interest. Only Poland has its own sizeable natural gas resources and is, moreover, engaged in intensive prospecting for shale gas. Changes in international markets and the emergence of new suppliers following the development of LNG will definitely have a significant impact on supply diversification (Waterlander et al., 2009, p. 13). However, any major steps in this direction have again been taken only by Poland (construction of the LNG terminal in Świnoujście). As for the *downstream* part of the chain, V4 states, being members of the European Union, are subject to EU regulations on the organisation of the internal market or climate change.

Role and Importance of Gas for V4 States

Natural gas plays a significant role in the energy mixes of V4 states, its share varying between 15% in Poland and 38% in Hungary. In Poland, it is only the third most important source of energy after coal which dominates in the mix accounting for over 50% of energy. Similarly, coal carries the most weight in the Czech Republic (with 40% of energy derived from it) whereas gas ranks third. A large amount of energy is also produced by nuclear plants, especially when it comes to electric power. In Slovakia, even though gas prevails, the share of the other sources (coal, oil, nuclear energy) is comparable amounting to about 20% each. In the case of Hungary, however, we may safely say that gas is enormously important as its share in the energy mix is close to 40%. When analysed, the above data suggest that the notion of the "important role of gas" will have a completely different meaning for each of the V4 states. Although Poland has its own gas resources with production covering about one third of the annual demand for gas and the share of gas in the energy mix is small, we must remember that the country is also the largest consumer of energy in the region. If we only take the

annual imports of gas (about 8.9 bn m^3 in 2014 from Russia only, plus about 1.7 bn m^3 of gas originating from Russia), the figure is almost equal to the combined total gas consumption in the Czech Republic and Slovakia. The main customer for gas is the industry – fertilizer plants, refineries and petrochemical plants use about 40% of gas consumed in Poland efforts on the part of the European Union and its Member States to promote renewable sources of energy.

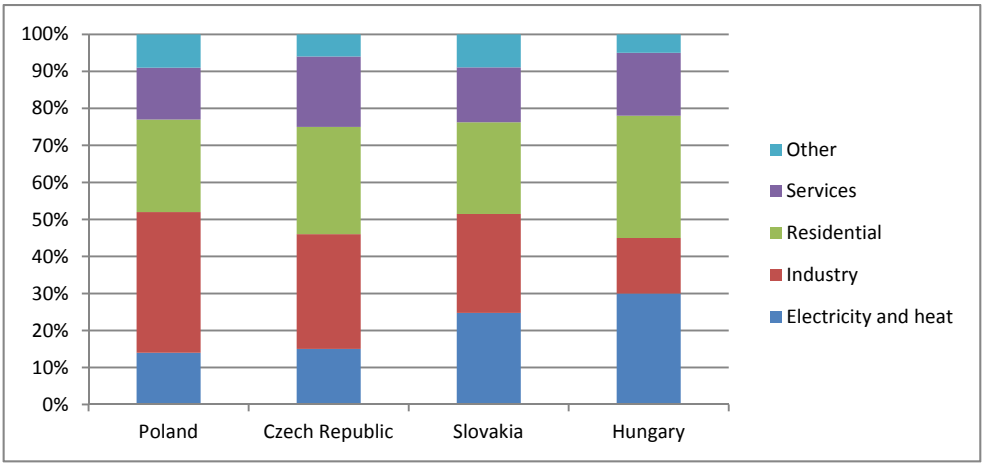
Fig. 1. Percentage share of natural gas in energy mixes of V4 states in 2014



Source: study on the basis of *BP Review of World Energy*, June 2015.

The pattern of gas consumption in the Czech Republic is similar, the only difference being that more gas is used to heat households. We must also remember that the share of gas itself in the energy mix is modest and the Czech government has made much effort over the last years to diversify gas supply focusing mainly on Norway thanks to interconnectors with the German pipeline network. Slovakia faces a totally different set of problems as 30% of its energy is produced from gas, the demand for which is satisfied solely by supplies from Russia. The biggest potential challenge is the one facing Hungary where the importance of gas is central and 80% of domestic consumption depends on imports (mainly from Russia). Gas is mainly used to produce electric power and heat households, which makes it a socially sensitive commodity.

Fig. 2. Consumption of natural gas in V4 states by sector in 2014



Source: study on the basis of *BP Review of World Energy*, June 2015.

Poland is the largest consumer of gas out of all V4 states. In 2014, consumption amounted to about 14,7 bn m^3, 8.9 bn m^3 of which was purchased in Russia, 1,7 bn m^3 came mainly from Germany while the remaining part was produced from domestic sources. In 1996, Poland signed a long-term contract for gas supply with Gazprom. The contract was amended in 2010. Until 2022, Gazprom will sell about 10.2 bn m^3 of gas per year to Poland under the *take or pay* arrangement. Domestic market is monopolised by PGNiG which, in practice, controls 100% of imported gas and accounts for over 95% of domestic production. PGNiG is also the sole operator of the underground gas storage system and a *de facto* monopolist on the retail market (about 96% market share). Transmission infrastructure is managed by GAZ-System. Poland is a key transit state for Russian gas transported to Europe via the Yamal pipeline.

The Polish gas system is connected with the European networks, but interconnectors work mainly in the East-West direction. Gas is imported through five points: Lasów (from Germany), Drozdowicze (from Ukraine), Wysokije (from Belarus), Kondratki (from Belarus, Yamal) and Cieszynie (from the Czech Republic). Moreover, since the end of 2013, it is possible to reverse the flow in the Yamal pipeline. The pipeline system in Poland is about 10,000 kilometres in length. The first LNG terminal in the region (not counting the one in Klaipėda) is being build in Świnoujście, a project which will be important not only for Poland, but also for other regional countries. Planned to be

opened in 2015, the terminal will make it possible to regasify around 5 bn m³ of gas annually, a potential which is to be increased to 7.5 bn m³. In 2009, PGNiG concluded a 20-year-long contract with Qatargas for the supply of 1.5 bn m³ of gas a year starting from 2014. Total gas storage capacity amounts to ca. 2.75 bn m³ (the largest facilities are Wierzchowice with the capacity of ca. 1.2 bn m³, Mogilno with the capacity of ca. 0.40 bn m³, as well as Husów and Strachocina, ca. 0.35 bn m³ each). There are plans to build new storage facilities and expand the existing ones, which is supposed to increase the capacity of underground storage to about 4.0 bn m³ of gas in 2020 (*Operator Systemu Magazynowania*, 2015; *PGNiG*; 2015, *BP Review...*, 2015).

Map 1. Gas Infrastructure in Poland

Source: *Energy Supply Security* (2014).

The Czech Republic has virtually no natural gas resources, domestic production (mainly in South Moravia) not exceeding 0.2 bn m³ per annum. This covers around 2% of annual demand for gas. Until mid-1990s, all of gas imports originated in Russia, and

it was only later that diversification efforts brought gas from Norway (a consequence of a 20-year-long contract for gas supplies signed in 1997).

Over recent years, the share of Norwegian gas has fluctuated from a dozen or so per cent to almost 30% of annual consumption, but it must be noted that, physically, practically all of natural gas used in the Czech Republic comes from Russia (as a result of swap transactions). However, during the gas crisis of 2009, Norwegian gas was sent to the Czech Republic directly which, combined with gas reserves in storage facilities, helped manage the crisis effectively. A small amount of gas is also purchased on German commodity exchanges. Until 2006, the gas market was dominated by RWE Transgas. As the market was deregulated, the company was divided into RWE TransgasNet, the operator of the gas network, and RWE Gas Storage, the operator of storage facilities.

There are also several operators of distribution systems, the three largest of which have about 75% of the market share (RWE, JMP Net and SMP Net). In March 2010, RWE TransgasNet changed its name to NET4GAS and it is this entity which manages the network of transit pipelines to date. Czech pipeline network is used to transmit ca. 8.5 bn m^3 of gas for domestic needs and ca. 30 bn m^3 of gas transported via the Czech Republic to Germany and Austria. The system has three main interconnectors linking it to other European countries: Lanzhot (connection with Slovakia), Brandov (connection with Germany) and Waidhaus (also with Germany). In January 2013, the *Gazela* pipeline was opened to connect the *Opal* pipeline (used to send Russian gas from *Nord Stream* south via Eastern Germany) with the *Stegal* pipeline network (transporting gas from southern Germany to France).

Interconnection with Poland has also been operational since April 2012 (it is located in the area of Cieszyn). Plans have been developed to build an interconnector with Austria (Lanzhot-Baumgarten) which will give access to the Austrian market, LNG ports on the Mediterranean Sea, and, possibly, the future *TANAP* pipeline.

There are three operators of gas storage facilities in the Czech Republic: the already mentioned REW Gas Storage, MND and SPP Bohemia. Total capacity of the eight functioning facilities amounts to ca. 3.49 bn m^3 (the largest facilities are Haje, Tranovice, Stramberk, Lobodice) (*RWE Gas Storage*, 2015; *MND Gas Storage*, 2015; *BP Review*..., 2015).

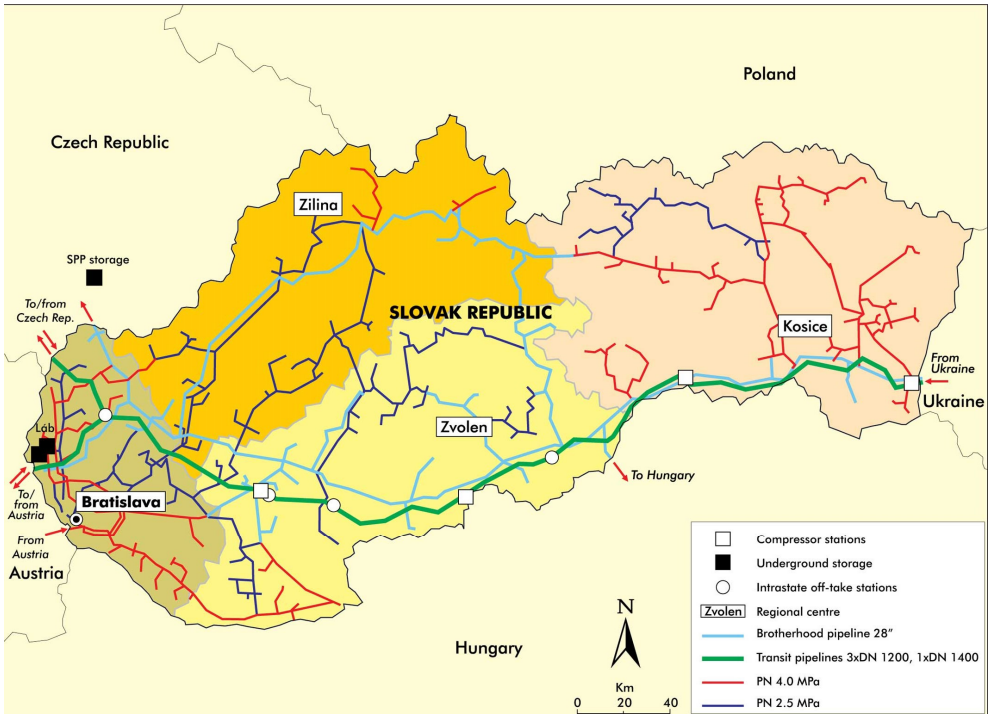
Map 2. Gas Infrastructure in Czech Republic

Source: *Energy Supply Security* (2014).

Own production of gas in **Slovakia** amounts to ca. 0.15 bn m^3 per annum covering ca. 3% of domestic consumption. All of the remaining gas is imported from Russia (ca. 4.3 bn m^3 in 2014). Although gas transmission and distribution sectors were deregulated in Slovakia after 2006, the main importer of gas and also the operator of the transmission network is Eustream (owned by German E.ON Ruhrgas, French GDF Suez and the Slovak Energetický a průmyslový holding – EPH). Eustream is one of the largest transmission system operators in Europe and focuses primarily on the transit of Russian gas to Western and Southern Europe. There are two companies operating in the gas storage market: Nafta and Pozagas. The main transit pipelines in Slovakia have four interconnectors with other countries, the annual transmission capacity of the network amounting to ca. 90 bn m^3. Gas from the East is transported via Ukraine (Velke Kapusany station), whereas the two major exit points for western-bound gas are Lanzhot (on the border with the Czech Republic) Baumgarten (on the border with Austria).

In addition, there is an interconnector in Budnice on the border with Ukraine. Plans are being drawn up for an interconnector linking up the Slovak and Hungarian systems (between the towns of Velke Zlievce and Vecsés). The 115-kilometre-long pipeline is to help create the North-South corridor and link LNG terminal in Poland and Slovakia in the future. The capacity of gas storage in Slovakia amounts to ca. 3.13 bn m^3. Its facilities are comprised in the Láb complex in Gajary-Baden, but Slovakia also uses a facility (directly connected to the Slovak network) located in Dolni Bojanovice in the Czech Republic (*Nafta*, 2015; *Pozagas*, 2015; *BP Review...*, 2015).

Map 3. Gas Infrastructure in Slovakia



Source: *Energy Supply Security* (2014).

Domestic gas production covers ca. 20% of demand for natural gas in **Hungary**, the rest being imported mainly from Russia (apart from gas purchased from Germany and Austria on European commodity exchanges). Gas resources are estimated at ca. 90 bn m^3. Given annual production of 2 bn m^3, this opens up the prospect of

exploiting domestic resources for about 40 years. Hungary has unconventional gas resources but their potential is not explored. Several companies such as MOL, ExxonMobil and Falcon got involved in exploration activities in Makó Trough and Békés Basin. The process is in its initial phase, however, and it is difficult of ascertain when large-scale production of unconventional gas might take place.

Map 4. Gas Infrastructure in Hungary

Source: *Energy Supply Security* (2014).

Russian gas is imported via Beregdaróc on the border with Ukraine, whereas gas coming from the European market reaches Hungary via Mosonmagyaróvár on the Austrian border. Hungary is also a key transit country for Russian gas sent to South-East Europe (Serbia, Bosnia, Macedonia) and plans to increase its role in transit. Out of the total flow capacity of the Hungarian pipeline network (ca. 12 bn m^3), about 2,5-3 bn m^3 is used for transit – the interconnector with Romania has been operational since 2010

(Szeged-Arad with flow capacity of ca. 3 bn m^3 annually), whereas the one with Croatia has been active since 2011 (Városföld – Slobodnica, flow capacity 6 bn m^3 annually).

There are plans for interconnectors with Slovakia (Velke Zlievce and Vecsés) and Slovenia (the shortest connection with the planned terminal on the Krk island). Hungary can boast an impressive capacity of its underground storage facilities amounting to ca. 6.33 bn m^3, which is a record figure (given annual demand) not only in the V4 group, but also in the whole of Europe. The largest gas storage facilities are Zsana-Nord (2.17 bn m^3 capacity), Szoreg-1 (1.9 bn m^3) and Hajduszoboszlo (1.64 bn m^3). Storing gas is necessary as the electric power sector in Hungary is almost totally dependent on gas power plants whereas household demand (for heating) is high and relatively inflexible (*Hungarian Gas Storage*, 2015; *MMNB*, 2015; *BP Review...*, 2015).

New challenges, potential difficulties and recommendations

V4 states, similarly to other countries of continental Europe, are inevitably affected by the globalisation of gas security. Resulting from factors beyond their control (lack of domestic resources), their dependence on natural gas imports makes consumers vulnerable to changes in global gas markets. There are three interrelated areas of interest for V4 states having to do with the integration of the European gas market and the growing importance of LNG in global gas trade.

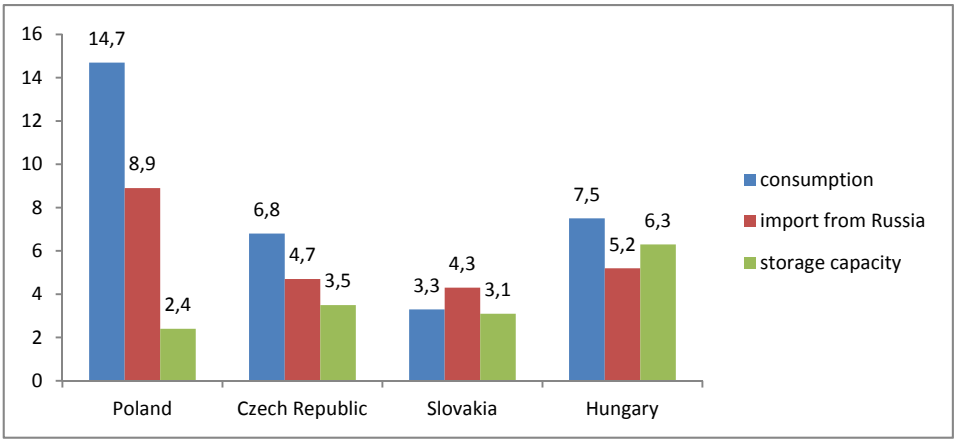
First, as Europe sees an ever closer integration of domestic gas markets, more importance will be attached to local gas hubs trading on the basis of spot contracts. Naturally, for this to happen, several conditions must be met starting with integrated infrastructure and the need to supply the market with more gas from various sources. Since domestic gas networks get new interconnectors and there should be surplus gas on the market, the process seems to be inevitable, but also beneficial. In crisis situations, it will be possible to purchase and physically transmit additional amounts of gas.

Second, there is the problem of being dependent on gas imports from Russia and the pricing formula used by the Russians (coupling of gas and oil prices). Due to changes described in point one, the Russian position may have to be modified to move away from the formula, which of course does not mean that dependence on Russian gas will disappear. Nevertheless, it presents an opportunity to increase the clout of the European Union in discussions between Russia and individual states.

Third, LNG supplies will influence on the European gas market as more and more European countries invest in LNG infrastructure, but there will be limited impact on

prices in Europe. However its presence in some countries will be good for consumers as it will curb Russian ambitions to voluntarily influence prices.

Fig. 3. Consumption of natural gas in V4 states, import from Russia and storage capacity in 2014



Source: study on the basis of *BP Review of World Energy*, June 2015; *Gas Infrastructure Europe*, July 2015.

Each of these processes will bear upon gas security in V4 countries. However, detailed analysis of challenges, difficulties and potential implications should be broken down into the upstream and midstream parts of the chain mentioned above. **Upstream implications:**

- The pace of gas production from domestic resources in individual V4 states will slacken, which is inevitable given the rate of depletion of conventional resources of natural gas. This is especially important for Poland and Hungary which satisfy their demand for gas by themselves (Poland ca. 25%, Hungary ca. 20%). A drop in production coupled with increasing demand for energy are the key factors increasing dependence on gas imports.
- There is a need for further work on unconventional gas exploitation. Even though such work is quite advanced in Poland and Hungary, the number of wells does not bode well for the future compared to the situation in the USA or even Canada. It would be welcome to establish cooperation between Poland and Hungary and develop a common position in EU discussions.
- From the perspective of V4 states, it is still an interesting idea to diversify supplies through entering into cooperation with Norway. While it was the Czech Republic

that took the initiative, the development of interconnectors will also open way for transactions with Poland, Hungary and Slovakia.

- It is also recommended that V4 states should cooperate in gas-related talks held with Russian Gazprom. That such cooperation is possible was proved by the events unfolding over the recent months when Poland, Hungary and Slovakia supplied gas to Ukraine which was cut away from Russian gas. In time of crisis the V4 need to cooperate also within EU and IEA.
- The development of the global market in LNG creates new opportunities for ensuring gas security especially in those countries which are conveniently located and have invested in infrastructure. The situation may be beneficial for Poland which will purchase gas from Qatar since 2015 and may use it as an argument during renegotiations of its contract with Gazprom. However, it is difficult to predict the impact the supplies will have on the internal market given the high prices of gas imported from the Middle East (*Global LNG...*, 2014, *World LNG...*, 2013).

Midstream implications:

- Gas infrastructure must be adapted so that it is sufficiently flexible and able to react to changing demand and supply (quick reaction to gas supplies from diversified sources). Expansion of gas infrastructure also seems necessary due to disruptions in the supply of renewable energy.
- Therefore, strategic importance should be attached to interconnectors which will operate as key gas mains at times of crisis and, taking a long-term perspective, will help set up the single European market for natural gas. The project may be co-financed by the European Union under the so-called PCI (Projects of Common Interest). The list published by the European Commission in October 2014 mentions four such interconnectors related to the V4: Libhost-Hat-Kędzierzyn (the so-called second connector between Poland and the Czech Republic), Polish-Slovak interconnection, Baumgarten-Reinthal-Breclav (Czech Republic-Austria connector) and Nagykanizsa-Lendava-Kidricevo (connector between Hungary and Slovenia). The projects were given funds for studies as in the case of studies on the LNG terminal on the Krk island. It is worth adding that about EUR 300 million were allocated to support the project of a gas connection between Poland and Lithuania (the so-called Amber project where funding also covers construction works).

- It is also necessary to expand underground storage facilities which are supposed to ensure the functioning of the gas market in the context of the more and more frequent supply disruptions, especially when they originate in the East. Those countries which can store relatively large amounts of gas are in a comfortable situation. Such is the case of Hungary where storage capacity is equivalent to 70% of annual demand.
- The aim of interconnectors is to ensure the integration of the gas market, especially in Central and Eastern Europe where the key gas mains have so far operated in the East-West direction. In the recently announced PCI projects, emphasis is clearly put on the need to establish connections on the North-South axis. This is important from the perspective of improving security of V4 states as such connection would allow them to tap into alternative sources of gas. The solution seems probable due to the coming launch of the LNG terminal in Świnoujście and the future connection between gas infrastructure and the existing LNG terminals in Italy and Greece as well as the planned terminal in Croatia (Apte S. et al., 2013; Waterlander O. et al., 2008).

Conclusion

In conclusion, each of the V4 states is engaged in intensive efforts to improve its energy security especially when it comes to diversification of natural gas supplies. These states will have common interests only when their gas systems are integrated, primarily by means of interconnectors. Once such integration takes place, we will enter a totally new energy reality as opportunities for diversification and crisis management will significantly increase. Currently, it seems that such actions bring similar results in three countries: Poland, the Czech Republic and Hungary. Each of these countries has developed its own way to ensure and improve the security of natural gas supplies. Poland has constructed LNG terminal and connects its network to the systems of neighbouring countries; the Czech Republic has concluded a contract for gas with Norway and pursues closer integration with Germany; Hungary has connected its gas network with all neighbours and expands underground storage facilities which are already impressive given domestic demand. Only Slovakia experiences some problems with improving its gas security, problems which are mainly due to its geographical location. Indeed, there is every reason to believe that it will be one of the few European states which will long continue to be vulnerable to any turmoil in the gas market

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Abstract

In spite of efforts on the part of the European Union to promote renewable sources of energy, conventional resources such as oil, natural gas and coal still dominate in individual EU energy mixes. With the rising costs of resources, their uneven distribution and limited supply, each state is busy trying to ensure its energy security. Secure and stable supply of energy resources has becoming the main preoccupation, especially in the countries of Central and Eastern Europe. Over the recent years, the Visegrád Group states have made particularly intensive efforts to ensure their supply of natural gas. The unstable political situation in the east of Europe as well as changes in natural gas markets (shale gas revolution in the USA, increased importance of LNG) gave rise to new challenges when it comes to ensuring gas security, but also new opportunities to become independent of eastern imports. It is precisely the fact of being dependent on natural gas imported from Russia that determines the situation of Visegrád Group states. The present paper tries to analyse the situation in Poland, the Czech Republic, Slovakia and Hungary in terms of security of their natural gas supply.

Keywords: *gas supply, Visegrad Group, Russia, import dependency, infrastructure*

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