ANALYSIS OF THE HUNGARIAN GAS SECTOR– PRESENT SITUATION AND FUTURE PROSPECTS

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Abstract

The main aim of this article is to determine the level of security of supply of the Hungarian natural gas sector and to provide forecasts of the potential sources of oil imports by 2025. The research questions posed by the author relate to self-sufficiency of the domestic gas sector, a high level of dependence on supplies from the east, the lack of diversification of suppliers in the market, and the impact of the possibilities of re-gasification of underground natural gas storage facilities to improve energy security in Hungary. The research hypothesis of the paper was that the level of self-sufficiency of the gas sphere will remain at a constantly low level, that the security volume will decrease until new gas supply routes are established, and that the role of underground gas storage facilities as a result of highly probable loss of transport through the territory of Ukraine will be crucial. In order to solve the research problem and obtain answers to the questions raised, the following energy indices were used: self-sufficiency index, Herfindahl Hirschman index, Residual Supply Index, and the ratio of underground storage capacity of raw material to quarterly demand for fuel. The source of information and data used, due to the lack of many current studies on Hungary's energy security, are reports of national and European energy organizations, as well as reliable industry portals rich in current information. The conclusions of the analysis show that Hungary is a country highly dependent on imports from the East and that its security of supply will decrease significantly as a result of the political turmoil between Ukraine and Russia. Underground storage facilities will be responsible for maintaining a safe gas volume in the demand of the domestic economy in the near future. And the more distant future of the Hungarian gas industry will continue to be connected mainly with the eastern exporter. This will be facilitated by the Turkish Stream connection and possible supplies from Nord Stream II.

Keywords: Natural Gas, Hungary, Energy Security, Turkish Stream

Introduction

The characteristics of the European natural gas sector can be divided into two groups. The western one, which is independent of supplies from the Russian Federation, and the eastern one, which is quite heavily dependent on gas imports from the fields of the eastern giant. The monopoly prevailing in the markets of the dependent countries usually has a rather negative impact on the structure of supplies. This is mainly due to their continuity and price, which is often very high due to low competition on the market (Turowski, 2016: 165-166). As a result of these characteristics, most Central and Eastern European countries are pursuing a diversification policy aimed at achieving the greatest possible diversification of their supplier structures. Such measures are currently very popular on the gas market and are supported by many different types of EU instruments, such as the Connecting Europe project or the Trans-European Energy Networks (TEN-E) programme (Gawlikowska, 2007: 6). An analysis of the actions of some EU member states shows that not every state dependent on supplies from the East minimises the share of the dominant supplier in relation to other sources. One of the countries of this type is Hungary, which, despite the fact that this part of Europe is subject to significant influence from Russia, acts quite differently from the plans of Europe in general. Planning to maintain a high share of supplies from the eastern tycoon. This article describes the current state of the gas sector in Hungary. It was determined how the supplies from the Russian Federation influence the level of energy security of the country. The resistance of the system to supply

interruptions was tested. And the main factors specific to Hungary's energy policy were identified.

The general characteristics of the hungarian gas sector

Natural gas is a key raw material for Hungary's energy sector. In primary energy production, it ranks first. With a result of 33%, it outperforms the equally popular crude oil by 4% and by 16% the dominating atom in particular in the power industry (OECD, 2019: 1). Gas consumption in 2018 in Hungary amounted to (9.6 bcm) (BP, 2019: 34). This is a relatively small amount compared to the annual levels of blue fuel consumption of other countries in the region: Germany (75.9 bcm), Poland (17 bcm), Ukraine (26.3 bcm) (BP, 2019: 34). In Hungary, domestic demand for natural gas is falling slightly year on year. In relation to 2017, it decreased by 0.3 bcm, and over the last decade its volume decreased by 25% (2.7 bcm) (BP, 2019: 34). The domestic natural resources of the raw material are quite small and, according to the latest research, they are estimated at 1,639 bcm (MBFSZ, 2017). However, only 74 bcm of gas is stored in conventional deposits, and the remaining 1,565 bcm are difficult to extract and at the same time have low economic potential – unconventional deposits, including traces of shale gas, closed gas and methane deposits in coal deposits. Such scarce conventional sources do not allow for large annual production of raw materials. As a result, in 2018 it amounted to 1.73 bcm, which satisfied only about 18% of the total domestic demand (FGSZ, 2018: 18). The remaining amount of fuel, unattainable from its own production, was obtained from imports, which in base year 2018 reached 12.64 bcm (FGSZ, 2018: 19). The structure of blue fuel suppliers has been dominated by one major exporter. The Russian Federation, which last year sent to Hungary (7.69 bcm) (Gazpromexport, 2019), thus gaining about 60% of shares in Hungarian natural gas imports. As in previous years, the remaining transports of raw materials came from Germany and Austria.

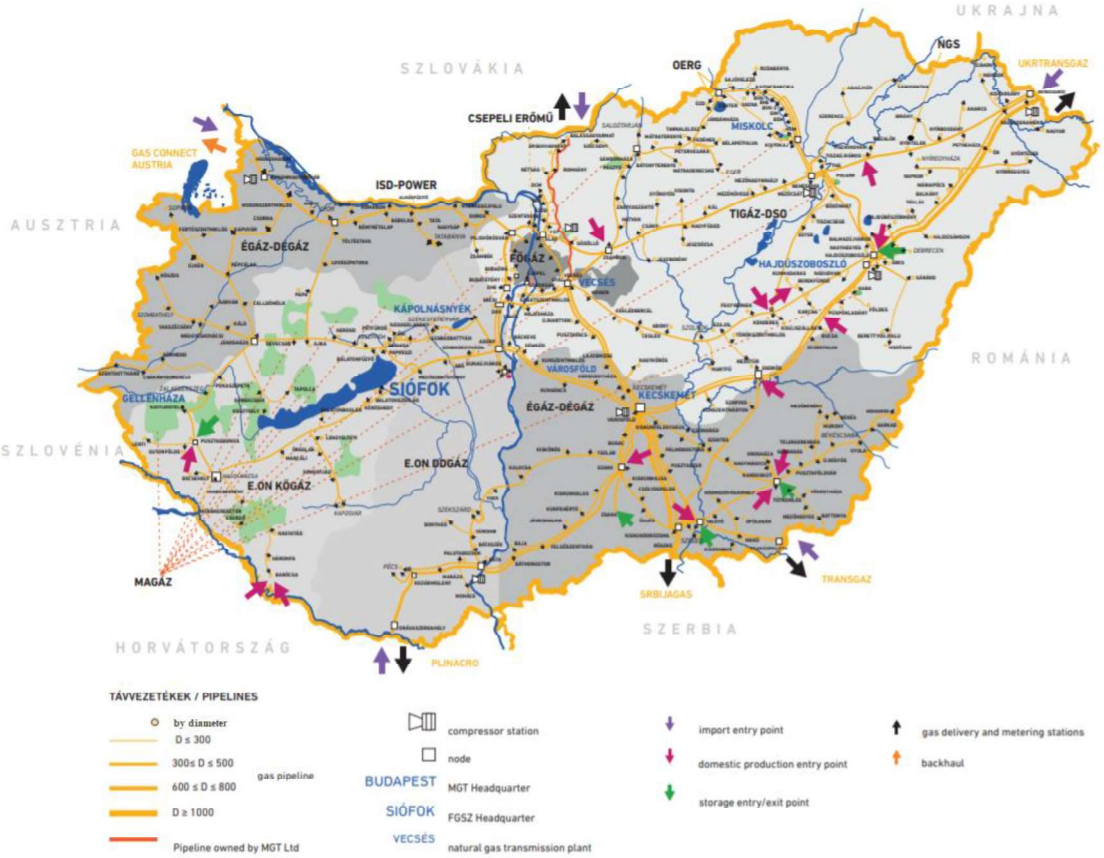
In 2018, Hungary also played the role of an exporter on the European gas market. They are a transit country through which Russian gas is transported to other neighbouring regions of Europe, e.g. Croatia, Romania and Serbia. In 2018, the export volume amounted to (4.97 bcm) (FGSZ, 2018: 28). The receipt and transmission of raw material from outside the country was made possible by 7 interconnectors (ENTSOG, 2017). This includes 4 receivers (Fig. 1): Beregdaróc - 219 - (from Ukraine) 22.6 bcm, Balassagyarmat - 75 - (from Slovakia) 4.74 bcm, Csanádpalota - 57 - (from Romania) 0.09 bcm, Mosonmagyaróvár - 47 - (from Austria) 5.72 bcm, with a total capacity of 33.15 bcm, and 3 transmitters: Csanádpalota - 57 - (to Romania) 1.92 bcm, Drávaszerdahely - 58 - (to Croatia) 2.84 bcm, Kiskundorozsma - 48 - (to Serbia) 5.31 bcm, with a total transmission capacity of 10.07 bcm.

Figure 1: Transmitting and receiving points in Hungary

Source: https://www.entsog.eu/maps#transmission-capacity-map-2017 (20.06.19)

The Hungarian internal gas system consists of 5,873 km of high-pressure transmission routes connecting 7 main gas compressor stations and approximately 400 regional supply points (Figure 2) (FGSZ, 2018: 12). Importantly, in the area of energy security, the gas sphere of Hungary includes four underground blue fuel storage facilities: Zsana (2.17 bcm), Hajdúszoboszló (1.64 bcm), Pusztaederics (0.34 bcm), Kardoskút (0.28 bcm), whose regasification capacities reach 4.43 bcm (MGFT, 2018). The amount of gas stored in comparison with the domestic demand creates quite a rich emergency resource base.

Fig. 2 . Hungarian national gas system



Source: Own study based on FGSZ, Data of the Hungarian natural gas system, p. 18.

Energy security analysis - indicators

Starting the analysis of Hungary's energy security, it is worth focusing on the basic determinant of the level of energy security, which is the self-sufficiency rate (Ruszel, 2017: 7). The final result of the index used consists of domestic production of natural gas and the demand for blue raw material achieved in the analysed period of time. For the data from the audited year 2018, the value of the ratio was 18.02%. This result confirms the fact that due to such low extraction of raw material, the Hungarian economy is not able to function independently, efficiently and is forced to obtain gas from abroad. At the same time, it exposes itself to high costs, political influence on the part of exporters and, most importantly, the possibility of occurrence of raw material crises related to unexpected interruptions in fuel supply. Focusing on the future, it is necessary to take into account the downward trend in the country's demand for natural gas, which has been in place for several years. Therefore, if the current production level is maintained, the self-sufficiency ratio will be able to slightly increase. Mainly as a result of lower demand for gas imports. However, given the current trend towards the abandonment of hard coal and the huge role of natural gas as a transitional fuel in the modernisation of energy production, this scenario may change significantly as a result of increased consumption.

Formula 1: Self-sufficiency ratio

$$\mathrm{WS} = \frac{1.73 * 100\%}{9.6} = 18.02\%$$

Where:

Domestic natural gas production in 2018 (FGSZ, 2018: 18) - 1.73 bcm

Domestic demand for natural gas in 2018 (BP, 2019: 34) - 9.6 bcm

Currently, the situation related to the acquisition of raw material supplies by Hungary is quite complicated. The Russian Federation's transit through Ukraine is under threat. The agreement between the Ukrainians and Gazprom has still not been extended and if the parties do not reach an agreement, its validity will expire on January 1, 2020 and Hungary will be cut off from the main source of imports (Cire, 2019). If no fuel is obtained from the East, stocks accumulated in relatively abundant gas storage facilities will probably be a defence against the negative effects of this phenomenon. However, this will be a temporary solution. And the period until the start of operation of the newly implemented gas pipeline projects, which are a plan for the future, including (Turkish Stream, Nord Stream II, LNG port on the island of Krk), has been extended for the time being. It is therefore necessary to focus on the most dangerous threat that may arise in the near future, namely the possibility of interruptions in imports. Analysing this fact, the question immediately arises: how could the Hungarian gas system function if supplies from its most important exporter are lost? Would the economy there still be able to function smoothly or would there be a serious crisis. In the base year 2018, the Russian Federation had the largest share in the fuel supply mix. Importing 7.69 bcm of raw material to Hungary (Gazpromexport, 2019). In relation to all imports in that period of time (12.64 bcm), this represented almost 60% of the total volume of fuel obtained. To assess the level of readiness of the Hungarian gas sector in this respect, it is worth using the RSI index (ACER, 2017: 11) created by ACER, which takes into account the total import of gas, domestic production, gas storage capacity, import volume from the supplier with the largest market share and the level of demand for a given fuel in a given year. The collected data allow us to examine the fact in case of loss of deliveries from the exporter with the largest share in the receiving department. The gas sector will be able to secure the necessary amount of gas from another direction. In the audited year 2018, assuming that gas storage facilities were full, the index volume reached 115.8%, which is a seemingly high value. Providing security in the event of a shortage of supplies from the East. However, one important aspect should also be taken into account. The export of the raw material includes the part of the gas that is exported further inland to Southern Europe. According to data from the analysed period, 4.97 bcm of natural gas was exported. Given this reduction in domestic volume, the Residual Supply Index would have fallen to 63.95%. As a result, in a blue fuel dependent sector, there would not be an excessive crisis but only if the underground gas storage facilities were full at that point in time. Filling the receiving capacity of the warehouses to the maximum in the current situation is a priority for Hungarians. And their activities since 2018 have been aimed at fulfilling this plan. This is evidenced, for example, by the agreement with Gazprom under which exports of raw materials were increased by 2 bcm (Biznesalert, 2019).

Formula 2: Residual Supply Index

$$\mathrm{RSI}_{2018} = \frac{18.8 - 7.69}{9.6} * 100\% = 115{,}8\%$$

Where:
Volume of natural gas acquired in 2018 (FGSZ, 2018) - 14.37 bcm
Gas stored in underground storage facilities (MGFT, 2019) - 4.43 bcm
Imports from the Russian Federation in 2018 (Gazpromexport, 2019) – 7.69 bcm
Total gas resources owned - 18.8 bcm
Domestic demand for natural gas in 2018 (BP, 2019: 34) - 9.6 bcm

In the event of a significant shortage of fuel, Hungary should look for opportunities to obtain raw material from other locations than Ukraine. Analysing the capacity in relation to the directions of supply, it turns out that Hungary currently operates in the rather unfavourable international characteristics of cross-border gas connections. They have 4 reception points. The largest of them connects the Hungarian gas system with Ukraine with a capacity of 22.6 bcm, the next largest on the border with Austria with a regasification capacity of up to 5.72 bcm, the next with Slovakia with a capacity of 4.74 bcm and the last with a very low off-take capacity connecting Hungary with Romania with a capacity of only 0.09 bcm (ENTSOG, 2017). The determination of the level of competition and the diversity of the sources of origin of the pipelines transporting gas to the interconnectors shows a study of capacity against supply directions using the Herfindahl Hirschman Index (Kosciuszko Institute, 2010: 22), which has a limit value between 0 and 10 000. Where 0 indicates a free market, great competition, values between 1 800 and 2 500 with high market concentration, a result above 2 500 with low competition and a limit value of 10 000 indicates that the market in question is fully monopolised. For 2018, the HHI volume amounted to 5150.6378, which confirms the fact that there is quite a high monopoly in the Hungarian receiving sector. The receiving capacity is dominated by the eastern direction, whose shares amount to 68.18%. And when analysing supplies from other directions, it can be concluded that they also indirectly inject or could inject gas from Russia into the Hungarian economy, since their gas systems also rely mainly on supplies from this global potentate. This includes the Austrians at around 75%, Slovaks around 75%, Romanians around 75% (Eurostat, 2018: 9). As a result, there is a problem because Denmark held back the Nord Stream II project and the start of pumping gas may be significantly delayed (Energetyka24, 2019). The construction of the South Turkish Stream is also still in the process of signing agreements and the completion of its construction and operation is unknown. The implementation of the last of the plans was stared but Hungary must wait for sourcing natural gas to 2021 year. With the begin exploatation in 2021 of Croatia's 2.6 Bcm/year LNG import terminal at Krk, Hungary will be able to source close to 1.6 bcm regasified LNG per year. Qatar may be one of

the gas suppliers. This is for now only one project which can may to some extent change the current situation in Hungarian gas system. (S&Pglobal, 2019)

Formula 3: Capacity in relation to delivery directions - HHI

$$\mathrm{HHI} = (14.3)^2 + (17.25)^2 + (68.18)^2 + (0.27)^2 = 5150.6378$$

Where (ENTSOG, 2017):

North 4.74 billion bcm - 14.3%
West 5.72 bcm - 17.25%
East 22.6 bcm - 68.18%
South 0.09 bcm - 0.27%

As a result of so much perturbation, it is important to wait for things to move forward. In the case of Hungary, it is important to prepare for even the most negative scenario. It is therefore worth looking at the underground storage facilities for natural gas. They are a priority element of the country's gas sphere, which has a positive impact on the level of energy security. And it is a factor that minimises the risks associated with the effects of an overly monopolised import sector. As mentioned earlier, they are relatively abundant in regasification capacity. Their capacity reaches 4.43 bcm (MVMgroup, 2019), which, given the demand in 2018 of 9.6 bcm (BP, 2019: 34) is a considerable amount. And when comparing the active capacity of underground gas storage facilities with the average quarterly domestic demand (Kosciuszko Institute, 2017: 14), it turns out that the maximum offtake capacity exceeds the value of energy sector needs in a given quarter (184.58%). This has a very positive impact on the level of security and reduces the effects of gas crises. Such as the one in 2009 as a result of the conflict between Russia and Ukraine, for example. Hungary used its strategic reserves and was forced to reduce the use of blue raw material by industry (Ruszel, 2015: 52-54). When analyzing this energy index, it is worth paying attention to the consumption of raw material in individual quarters. The highest gas consumption in Hungary in 2018 occurred in the 1st and 4th quarter (4.03 bcm, 3.26 bcm), in the 2nd and 3rd quarter gas consumption was (1.34 bcm, 1.24 bcm). In 1st and 4th quarters, the country's gas sector was most burdened and threatened in the event of unexpected interruptions in supply because gas consumption was higher. However, as the calculations confirm, the Hungarian gas sector could still work well with potentially full gas storage (coefficient value: 1st quarter - 110.7%, 2nd quarter - 346.76%, 3rd quarter - 369.1%, 4th quarter - 138.4%).

Formula 4: Summary of storage capacity and quarterly demand for raw material

$$\mathrm{PMG} = \frac{4{,}43}{2{,}4} * 100\% = 184{,}58\%$$

$$\mathrm{PMG(1stQ)} = \frac{4.43}{4} * 100\% = 110.7\%$$

$$\mathrm{PMG(2ndQ)} = \frac{4.43}{1.3} * 100\% = 340.76\%$$

$$\mathrm{PMG(3rdQ)} = \frac{4.43}{1.2} * 100\% = 369.1\%$$

$$\mathrm{PMG(4thQ)} = \frac{4{,}43}{3.2} * 100\% = 138.4\%$$

Where:

Capacity of underground natural gas storage facilities (MVMgroup, 2019) - 4.43 bcm

Average quarterly gas demand in 2018 (BP, 2019: 34) - 2.4 bcm

Gas demand 1st quarter 2018 (FGSZ, 2018 : 30) - 4.03 bcm

Gas demand 2nd quarter 2018 (FGSZ, 2018: 30) - 1.3 bcm

Gas demand 3rd quarter 2018 (FGSZ, 2018: 30) – 1.2 bcm

Gas demand 4th quarter 2018 (FGSZ, 2018: 30) – 3.26 bcm

Summary - current hungarian gas policy

Hungary's policy towards the natural gas sector differs significantly from the policy promoted in the European Union, which the majority of its members are implementing. One of the main characteristics of Hungarian activities is cooperation with the Russian Federation. Unlike the other countries of Central and Eastern Europe, this country supports the energy strategy of the eastern state. This includes, inter alia, the expansion of new supply routes, opposition to the creation of transport routes for raw materials freem from Russian influence, cooperation with EU Member States in the field of fuel distribution to increase sales and attempts to take over shares in European energy infrastructure (Brodacki, 2017: 50-57). Hungarian politicians have for some time been trying to support Russian interests, support Russian ideas and even suggest in the European community that economic sanctions imposed on the Russian Federation should be abandoned (Forsal, 2018). According to year-on-year statistics, the share of Russian natural gas in Hungary is steadily increasing (Gazpromexport, 2019). It would seem that the current characteristics of Russian activities in the gas arena of the Hungarian region are not very favourable to them. The Eastern giant plans to withdraw from the extension of the agreement for transit through Ukraine and complete cut-off of supplies through the local transmission routes. Although talks are under way between Ukrainians and Russians, in which the European Commission is also taking part, it is very difficult to reach a final agreement because of the huge differences in interests. Despite the enormous risk of losing the main source of supply, Hungary is not against abandoning this import route and already consumes an additional 2 bcm of gas annually to fill its storage facilities and meet its domestic needs at this transitional stage (AboutHungary, 2019). This will consist of the loss of supplies from the territory of Ukraine in favour of sourcing from the same eastern supplier via the planned branch of Turkish Stream at the border with Serbia and possibly the Austrian hub Baumgarten, whose transmission capacity

will be increased by the continuously expected start of exploitation of the Nord Stream II gas pipeline. Currently, the works related to the implementation of the first project (Turkish Stream) are in the commencement phase. The gas pipeline route will run through Turkey, Bulgaria and Serbia and will deliver gas to Hungary and Slovakia. The Hungarian Foreign Minister and the Serbian Energy Minister have already signed a joint agreement on the implementation of this project. Initially the plan is to start construction in summer 2020 and end it in the last quarter of 2021 (Biznesalert, 2019). If everything is completed as planned, the new connection may provide Hungary and Slovakia with up to 15 bcm of gas annually, replacing their existing supplies from the territory of Ukraine (Warsaw Institute, 2019). In the case of receiving deliveries from the second project, the situation is more complicated. The execution of the project is currently prolonged due to perturbations connected with the transition of NS II infrastructure through the territory of Denmark (Energetyka24, 2019). As a result, the start of gas production from that direction may be postponed. And what is also important is that it has not yet been officially confirmed whether there will certainly be a transfer of gas from the northern gas pipeline to Hungary.

These two strategic solutions confirm the fact that Hungary does not intend to diversify its natural gas suppliers, and its future is still linked to the Russian Federation. This is probably caused indirectly by a kind of coercion resulting from the lack of connections with routes independent of Russia and signing short-term agreements with eastern partners tempting with low gas prices, without the "take or pay" clause existing in previous years, which brings huge savings (1,500 billion ft/year) (Biznesalert, 2019). When talking about the current policy of Gazprom's southern European customer, it is worth mentioning that, although the Hungarian energy policy is highly pro-Russian in nature, they are beginning to look for other independent suppliers. An example of this is the willingness to agree with Croatia on the construction of infrastructure and the transport of raw materials from the LNG port on the island of Krk. Such an investment could enable them to obtain supplies from currently unavailable overseas countries. Everything is currently at the realization stage. If the process of creating connections can be successfully completed, from 2021 the Hungarian gas sector will be able to obtain 1.6 bcm of natural gas annually (probably from Qatari sources).

To sum up, the Hungarian gas sector is facing a major modernisation. In the next few years, the characteristics of the system have the opportunity to change significantly. Hungary is a country highly dependent on the activities of the Russian Federation. However, as you can see, they are not trying to totally reverse the situation. This is mainly due to the fact that doing business with Russia is, for the time being, economically and strategically profitable for them, and due to the existing infrastructure, also somewhat forced. As far as the assessment of their gas system is concerned, like most of the countries in the region, their supply routes connect

mainly with the eastern direction. Their gas market is quite strongly monopolised. The advantages of their gas sphere include relatively large underground natural gas storage facilities.

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