

# COMPARATIVE ANALYSIS OF THE GAS SECTOR IN UKRAINE AND THE CZECH REPUBLIC

Oleksandr BOIKO<sup>1</sup>, Antonín KUNZ<sup>2</sup>, Martin KLEMPA<sup>3</sup>, Petr BUJOK<sup>3</sup>

<sup>1</sup> Faculty of Drilling, Oil and Gas, AGH University of Science and Technology, Al. Mickiewicza 30, 30-059 Kraków, Poland

<sup>2</sup> Department of Geological Engineering, Faculty of Mining and Geology, VSB – Technical University of Ostrava, 17. listopadu 2172/15, 708 00 Ostrava Poruba, Czech Republic

<sup>3</sup> Institute of Clean Technologies for Mining and Utilization of Raw Materials for Energy Use, Faculty of Mining and Geology, VSB – Technical University of Ostrava, 17. listopadu 2172/15, 708 00 Ostrava Poruba, Czech Republic

E-mail: boiko@agh.edu.pl; antonin.kunz@vsb.cz; martin.klempa@vsb.cz; petr.bujok@vsb.cz

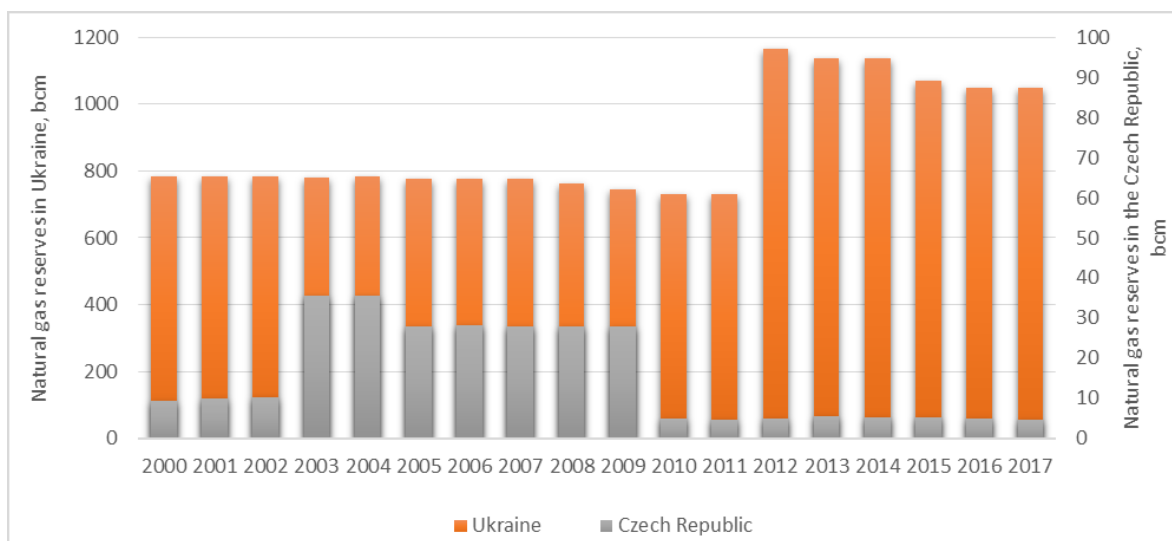
## ABSTRACT

In most countries, the gas sector is one of the sectors that have a significant impact on the state energy security. After the collapse of the Soviet Union and after the changes of communist rule, the Czech Republic as well as Ukraine began their own battle for energy independence. After political and economic revolution, there was a long and difficult journey which had both positive and negative consequences for the development of the countries. Natural gas consumption in Ukraine amounted to almost 114.95 billion cubic meters in 1991, while in the Czech Republic it was near 5.9 billion cubic meters. [2,4] Accordingly, gas consumption per person reached circa 2.2 thousand cubic meters per year in Ukraine, and 0.57 thousand cubic meters per year in the Czech Republic. Currently, Ukraine has a significant advantage in gas reserves and capacity of underground gas storages. According to the official data, the total gas reserves in Ukraine are about 1050 billion cubic meters, while in the Czech Republic only 4.73 billion cubic meters.

**Keywords:** natural gas, energy resources, storage capacity

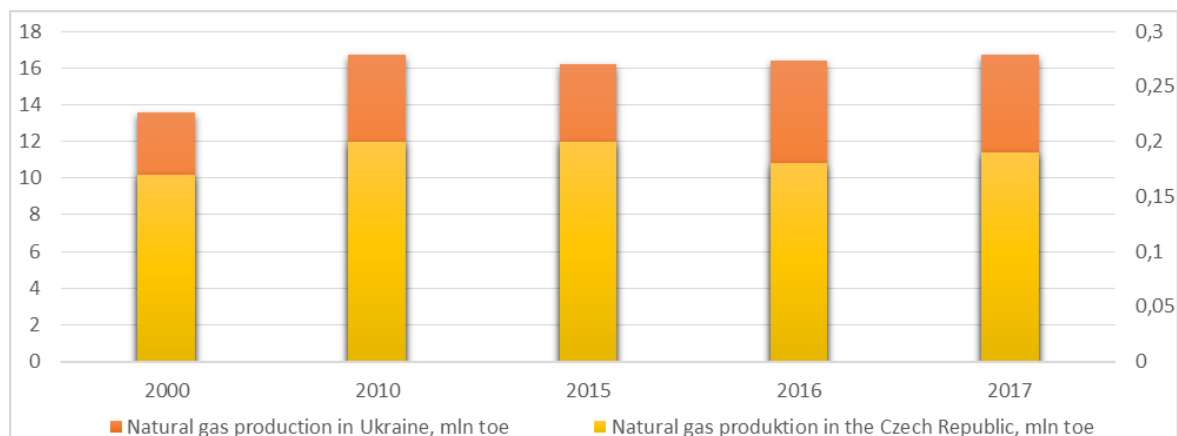
## 1 INTRODUCTION - ANALYSIS OF THE RESERVES, PRODUCTION AND CONSUMPTION OF NATURAL GAS IN UKRAINE AND THE CZECH REPUBLIC BETWEEN 2000 AND 2017

The history of the gas industry in Ukraine began at the beginning of the 20th century. Since then, the search for new deposits of natural gas has been ongoing. By 2017, the volume of all kind of reserves of natural gas attained the volume about 1050 bcm.



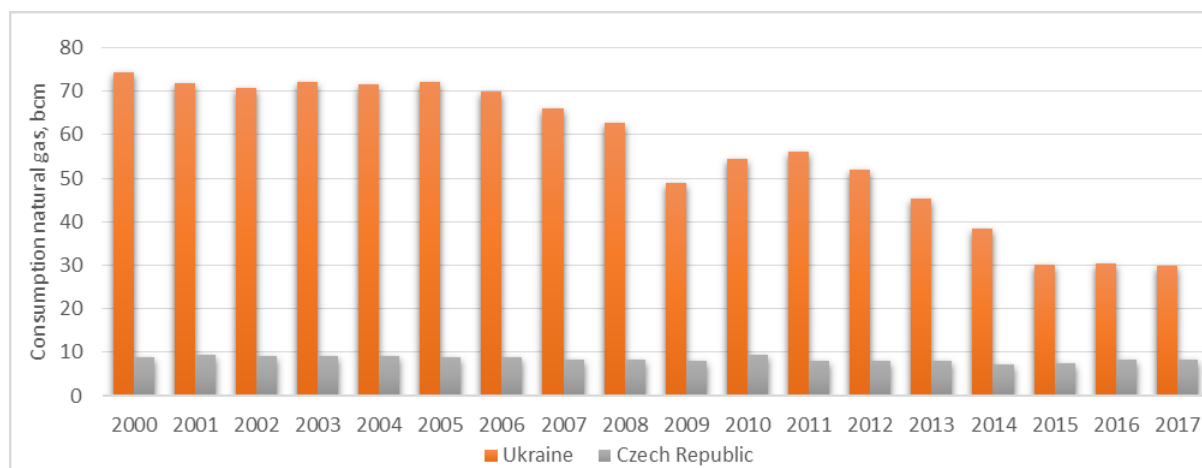
**Figure 1. Dynamics of change of natural gas reserves in Ukraine and the Czech Republic during the period from 2000 to 2017 [bcm]. [1,4]**

Figure 1 shows the dynamics of change of natural gas reserves in Ukraine and the Czech Republic during the years 2000 - 2017. In general, there were no significant changes in growth of natural gas reserves in Ukraine till the year 2011, in reality the gas reserves decreased by 7% in this period of time. This occurred predominantly by the regular gas extraction. In the year 2012, there was a significant increase in natural gas reserves of 59.8%. In general, in 2017 the Ukrainian natural gas reserves increased by 33.8% compared to 2000. This was a successful result of the vast investment of money and effort, spent on this activity and led to the improvement of proven gas reserves. On the other hand, the natural gas reserves in the Czech Republic are very low. There was an increase in the reserves in 2003, but after the update of coal bed methane reserves using a new methodology of reserve calculation in 2008 – 2009, the total amount of reserves fell down starting from 2010. As a result of this process, during the period from 2000 to 2017, the gas reserves decreased by 49.5% in the Czech Republic. Based on these numbers we can state that Ukraine had a significant advantage in natural gas reserve in 2017.



**Figure 2. Dynamics of change of natural gas production in Ukraine and the Czech Republic during the period from 2000 to 2017 [mln toe] [3,4]**

Figure 2 shows the dynamics in change of natural gas production in Ukraine and the Czech Republic during the period of time from 2000 to 2017. Own production of natural gas in Ukraine grew up in 2010 in one step, and kept the comparable level during the following years. Total growth of natural gas production in 2017 decreased by 22.8% compared to the year 2000. Total natural gas production was about 19.4 bcm per year. In the Czech Republic in 2017 there was also growth of natural gas production compared to 2000 – this rise was amounted to 11.7%. Although there was a small decrease of about 5% in 2017.



**Figure 3. Dynamics of change in the use of natural gas in Ukraine and the Czech Republic during the period from 2000 to 2017 [bcm] [3,4]**

Figure 3 shows the dynamics of change in the use of natural gas in Ukraine and the Czech Republic during the period from 2000 to 2017. Since 2000 to 2017 we can observe a decrease in natural gas consumption in Ukraine. Total decrease of natural gas consumption in 2017 was about 59.9% compared to 2000. The fluctuations of 2008-2010 are, in our opinion, linked to the world crisis in 2008, which led to 22% decrease in natural gas consumption in 2009. In the Czech Republic natural gas consumption was within 9.34-7.19 bcm per year during the period from

2000 to 2017. Total decrease of natural gas consumption was about 4%. Natural gas consumption in Ukraine in 2017 was about 702 cubical meters per person and in the Czech Republic it was about 791 cubical meters per person. Natural gas consumption per one person in the Czech Republic compared to Ukraine was higher by 12.7%.

## 2 ANALYSIS OF GAS IMPORTS TO MEET THEIR OWN NEEDS IN UKRAINE AND THE CZECH REPUBLIC DURING THE PERIOD FROM 2000 TO 2017

Figure 4 shows the dynamics of the change in the coefficient of difference of natural gas consumption and own production and the natural gas import to Ukraine and the Czech Republic during the period of time from 2000 to 2017. In Ukraine this coefficient grew from 21% in 2000 to 65% in 2017. This had a positive impact on the decrease of natural gas import from other countries. In the Czech Republic this coefficient almost did not change and it was within 2.27-3.09%. Due to the reduction of consumption and higher own production of natural gas, an import to Ukraine decreased by 76.2% from 2000 to 2017, and after situation in 2013 there changed directions to natural gas import. In the Czech Republic natural gas import was almost at the same level.

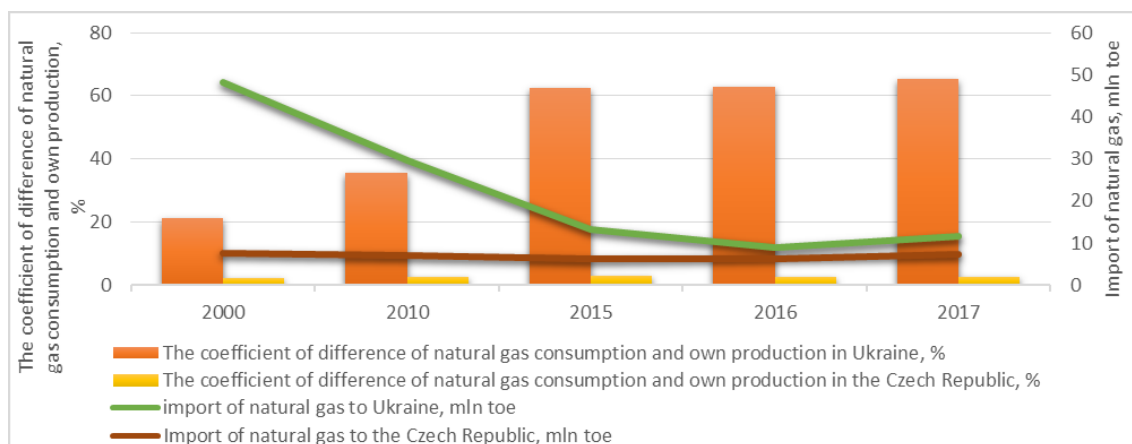


Figure 4. Dynamics of change in the use of natural gas in Ukraine and the Czech Republic during the period from 2000 to 2017 [bcm] [1,4]

## 3 ANALYSIS OF GAS USE WITHIN THE PORTFOLIO OF ENERGY RESOURCES

The structure of energy sources shows the amount of different kinds of energy used to satisfy the country's energy needs.

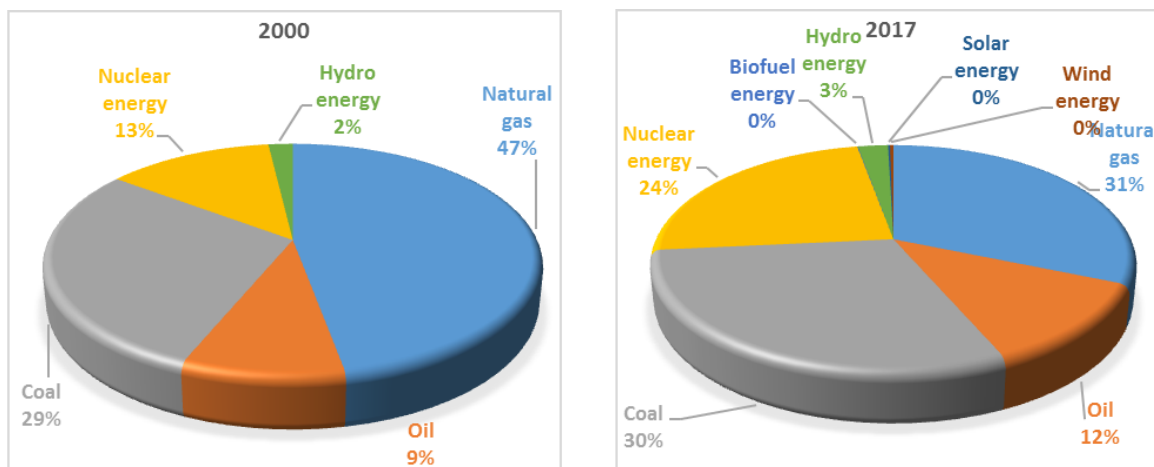
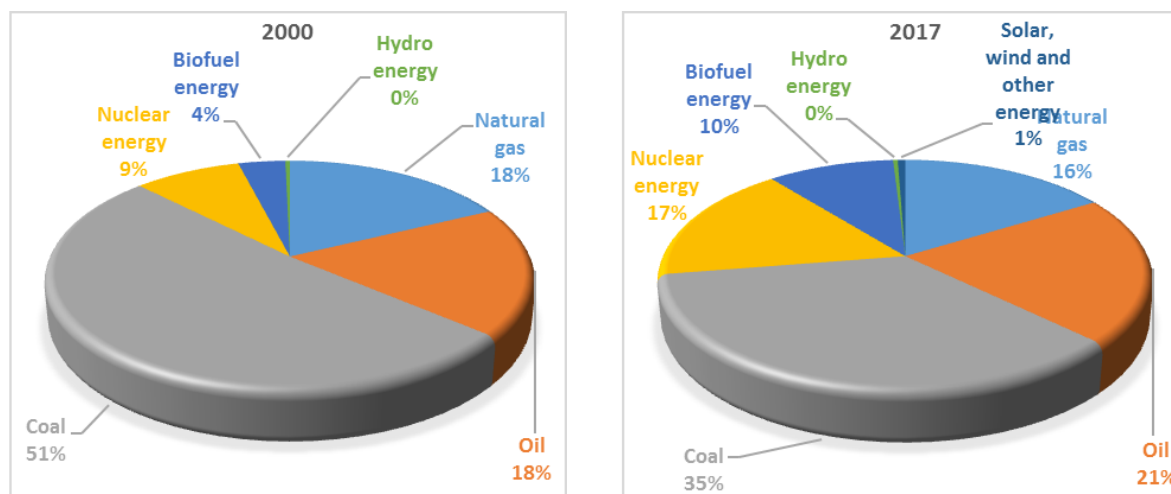


Figure 5. The structure of the use of energy sources in Ukraine in 2000 and 2017. [%] [3,4]

Figure 5 shows the structure of the use of energy sources in Ukraine in 2000 and 2017. There were the sources like biofuel energy, solar energy and wind missing in the structure of the use of energy sources in Ukraine in 2000. The consumption of natural gas represented about half of total energy consumption and was about 47% from total energy sources consumption in the year 2000. By 2017 the situation had changed. The Ukrainian energy industry included biofuel, solar energy and wind energy in its energy portfolio. Although these sources are represented with a zero indicator in the figures, it only means that they were very small, but they existed. Natural

gas consumption within the total energy sources consumption decreased by 16%, but this energy was replaced by the growth of nuclear energy and oil higher consumption.



**Figure 6. The structure of the use of energy sources in the Czech Republic in 2000 and 2017. [%] [3,4]**

In the Czech Republic, the situation looked a bit differently. Figure 6 shows the structure of the use of energy sources in Czech Republic in 2000 and 2017. In 2000, the half of total energy consumption was secured by coal. Natural gas consumption was about 18% from the total energy sources. The sources such as solar energy, wind energy and other renewables were missing in the whole energy production portfolio. In 2017 natural gas consumption in total energy consumption decreased by 2%. Coal consumption decreased the most, which was expressed by 16%, this reduction was compensated by the growth of utilizing of nuclear energy, solar energy, wind energy and oil. Water energy consumption in the figure is represented with a zero indicator, but it only means that this source was again almost negligible in the whole energy package.

#### 4 CONCLUSIONS

Each element of the energy resources package is indispensable in providing energy security of the country. Natural gas is no exception. With the development of the gas industry of Ukraine, both total natural gas reserves, and, consequently, proved gas reserves have increased.

The natural gas consumption in Ukraine in 2017 decreased from 114.95 bcm to 29.77 bcm per year compared to 2000. The coefficient of difference of natural gas consumption and own production in Ukraine was growing during the last 17 years almost by 44% and in 2017 reached the value of 65%. That has a positive impact on the decrease in dependency on import and on growth energy security of country.

However, in the Czech Republic natural gas consumption grew up from 5.9 bcm to 8.37 bcm per year in the period 2000 – 2017. The coefficient of difference of natural gas consumption and own production was only 2.64%. Big difference between natural gas usage and own natural gas production resulted in demand for import of gas from abroad. This growing dependence on import has negative impact on energy security of the Czech Republic. This strategy weakness had to be compensated for by several measures. The most important one is building a sufficient capacity of underground gas storage, which is happening nowadays.

The current total volume of gas stored is available to cover almost 40% of the country's annual gas needs. The second action which protects the country against the risk of unstable gas import is the smart portfolio of gas suppliers, which has to be created by reliable commercial partners.

During the period from 2000 to 2017 the redistribution of energy use changed the structure of consumption. So in Ukraine, from a leading position, the natural gas consumption decreased by almost 47% to 31%. In the Czech Republic, during this period, the usage of natural gas decreased by only 2%, but a significant change was in the coal consumption. As additional energy sources in the structure of the total energy consumption both in Ukraine and the Czech Republic, the renewables have started to play an important role: solar energy, biomass energy and wind.

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