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Energy Security of the Visegrád Countries

Energy security was always a key element of state security, however by the end of the 20th century its importance rose to a level never seen before. With the fall of the Berlin Wall a crucial process started what fulfilled as the dissolution of the Soviet Union in 1991. This process caused an end of an era, the end of the Cold War. This process brought changes in political, economic and social terms and despite the Visegrád countries winning their freedom, they still have not yet acquired their independence from the Eastern Block. All Visegrád states are highly dependent on the Russian gas exports, therefore the economic captivity still can be observed.

But how could the dependence on Russian gas imports influence the Visegrád countries energy security and how could these countries successfully fight against Gazprom's dominant position? However, not just Russia has its trump cards. The Visegrád countries could use their geopolitical position as a strategic weapon against their vulnerability in their energy sector.

As key transit states of natural gas to Europe, they could open new possibilities and challenges for energy security. New European gas market models and the gradual decline of the Groningen concept could lead these countries into a more sustainable energy model. Consensus and collaboration could re-establish their chances. For example, diversification of gas suppliers and shifting into a more short-term contracting could undermine Gazprom's dominant position.

However, one of the main problems of possible deeper energy cooperation between the Visegrád countries are the inadequate funding mechanism of new infrastructure and the insufficient cooperation on national and regional energy policies and strategies. Gas interconnections could enhance bilateral cooperation and could create a whole V4 energy security approach. But it is possible for the Visegrád countries to adopt a common energy security approach?

If yes, then how should they do it? These are some of the key questions that this study tries to answer. This paper can be divided into two parts. The first part contains the specific country reports which analyse each Visegrád country's energy policy, energy profile and dependency. The second part of the paper will try to formulate recommendations for Visegrád countries, how they should improve their energy policy and also tries to answer if it's possible to achieve a common approach or not.

Although it's quite interesting how contemporary deals could change each country's attitude towards questions like energy security. For example, the withdrawals of the Czech nuclear power plant amelioration or the Hungarian Paks deal, which could influence the Visegrád country's independence and credibility.

SLOVAKIA

With circa 90 percent of its primary energy sources being imported from abroad, the Slovak republic can be labelled as an economy with significant external dependence. With nearly all of Slovakia's major energy sources – be it oil, natural gas or even nuclear fuel to reactors – being imported from only one source (namely Russia), Slovakia is positioned to the highest place on list of the most vulnerable European states in terms of its energy security.

In terms of the proportional composition of the country's energy supply package: the share of natural gas represents 30 percent, nuclear power stands for 24 percent, coal for 20 percent and oil for 18 percent. Over 75 percent of current energy fuels (virtually everything except the coal and the renewable sources) are imported from the Russian federation – mostly through the territory of Ukraine. The events of the hitherto most serious energy crisis in Slovakia, the 2009 gas dispute, unveiled the level of threat the country was exposed to. Even a relatively short period of outage (11 days) caused considerable damage to the economy of Slovakia. During almost a dozen days, Slovakia lost 100 million euros per day or one billion euros over the overall duration of the entire crisis. At the end of the year, the impact over the domestic economic production was a 1-1.5 percent decrease in Slovakia's annual GDP. In order to increase the level of energy security and to enhance the levels of diversification, Slovakia decided to implement a series of structural changes in diversification of energy sources, supply routes and contractual settings - across all the energy sectors with a relatively small exception of nuclear energy. These changes encompassed modifications in the supply security standards, development of numerous natural gas storages, contractual (non-Russia oriented) diversification of gas supplies, reverse flow capability establishment for pipeline networks and further enhancement of the inland transmission systems.

Energy profile of Slovakia

As mentioned above, the energy mix of Slovakia consists of predominantly fossil (natural gas, oil and coal) and nuclear fuel. Renewable energy sources still represent a relatively minor share within the energy mix – i.e. cca. nine percent. While certain common features (lack of domestic sources or one sided trade dependence on Russia) tend to be present across the sector, each individual sector has its own specific set of features and characteristics.

Gas sector of Slovakia

Aside minimal domestic supply, almost 98 percent of the total natural gas consumption of Slovakia has its route in imports. On the side of importers, the Russian federation constitutes almost a 100 percent share among natural gas providers – this level of dependence places Slovakia (alongside Austria, Bulgaria and Finland) at the very top of the list of most dependent European nation on Russian gas.

In order to have diversification among gas suppliers, Slovakia decided to enter into contractual agreements with various European gas companies. Since 2009, the SPP (Slovenský plynárenský priemysel a.s. – the country's largest gas company) has aligned itself to German E.ON Ruhrgas, the Verbundnetz Gas and the French GDF SUEZ companies. While the ownership agreements had changed lately, their agreements remain to symbolize the intent of Slovakia to seek gas providers on the west of its boundaries. Another important way to diversify the gas sector is via building new interconnecting infrastructure between neighbouring countries. Slovakia and Hungary agreed to establish a mutually beneficial connection via a reversible pipeline with the annual carrying capacity of five billion cubic meters of gas. During the 2009 gas crisis, it became apparent that the most vulnerable part of the country is its Eastern region, where no gas storage capacity existed.

In addition, there was no reverse gas flow ability established within Slovakia's own pipelines either. Now, both the reverse flow capability establishment for the inland pipeline system, and the development of gas storage capacity in the Eastern part of the country have been established.

Oil sector

The oil sector produces many similarities to the gas sector in Slovakia. In the case of oil, Slovakia is an absolute net (100 percent) importer of crude oil – again with Russia being the primary source of supplies. The Družba (i.e. Friendship) pipeline, pumps oil to Slovakia from Tatarstan, western Siberia, the Urals, and the Caspian Sea. Slovakia has an additional route for oil supplies as well – the Adria pipeline which starts at the Croatian shore. Although, the carrying capacity of this pipeline (3.5 mil. of barrels of oil / annum) is relatively limited, especially compared to the Družba line, it is a valuable source of supply.

Another strategic alternative to the existing infrastructure is the enhancement of the reverse flow capability of oil from the Czech IKL pipeline into Slovakia. Czech Republic has placed a significantly higher emphasis on the diversification of its own energy sources and is able to import oil from Germany and Italy. Slovakia also intends to finalize the project of an oil pipeline interlink with Austria. Although the plans have been in place for many years, a significant majority of the population, numerous non-governmental organizations and regional (municipal) authorities have been actively advocating the cancellation of the project. This is due to that fact that it is almost unfeasible to circumvent the Žitný isle, which holds the biggest reserves of drinking water in the region and is objected to the highest levels of environmental protection. Similarly to the gas storage system's development, Slovakia decided (post 2009) to enhance its oil reserve framework. Currently, Slovakia maintains oil and oil product reserves sufficient to cover the need for 95-day domestic consumption.

The place of nuclear energy and of the renewables within the energy mix

With the heightening regulatory pressures aimed on offsetting fossil sources of renewable energy, biomass, geothermal, wind, hydro, solar and biomass have all been considered as alternative sources for meeting energy needs of Slovakia. Based on European Commission Directives, energy production in member states must be covered up to 20 percent by utilizing renewable sources of energy – effectively by the year 2020. In the case of Slovakia, the "green" benchmark to be reached is at a slightly lower level – 14 percent. Given the facts that renewables represent only six percent of domestic electricity production and with regards to the natural conditions that are characteristic of Slovakia, it is unrealistic to expect fulfilment of the above mentioned goal by 2020. The most realistic predictions assume that, until the year 2020, the renewable sources would provide the Slovak energy market with 12 percent of the total energy demands. While the current total share of the renewables represents cca. 6 percent of the energy supply, within the sphere of electricity production the share is understandably higher, i.e. around 17 percent - whereas hydropower by itself accounts for more than 50 percent of renewables. Less than half of the supply is provided by sources such as: biomass, geothermal wind and solar energy.

While there is global apathy for nuclear energy, Slovakia seems to stand outside the corridors of scepticism. Currently, Slovakia runs four operational nuclear reactors (in the municipalities of Jaslovské Bohunice and Mochovce) that produce over 50 percent of electricity – surpassing any other source. Slovakia's energy appetite is projected to grow constantly, and they are currently building two new reactors, which will be operational by the middle of this decade. With the two new installed nuclear reactors and with the modestly increasing role of renewable sources of energy, Slovakia aims to produce the 80 percent of electricity supply via carbon-free platforms by 2030. In terms of the fuel to the four existing (soviet designed) nuclear reactors, Slovakia has signed a long term contract with Russia for the delivery of the low enriched uranium (LEU). Similarly to natural gas and oil, the dependence of Slovakia on Russian material is present within the nuclear sector as well.

POLAND

Situation of energy security in Poland

Energy security is one of the main issues of the energy politics in Europe. It is an important factor of the wellbeing of the state economy and the society. Poland is systematically developing its energy security sector by finding ways to diversify suppliers. The Polish government produced a document with its strategy and policies until 2030, "Energy Policy of Poland until 2030." This document introduces a strategy for energy development in the country.

Polish energy policies are focusing primarily on improving energy efficiency, enhancing security of fuel and energy supplies, and also the diversification of the electric generation structure, by introducing nuclear energy. Moreover, Poland is hoping to develop the use of renewable energy sources (inc. biofuels), competitive fuels, and energy markets. Lastly, Poland aims to reduce the environmental impact of the power industry.

Main sources of energy in Poland

Coal

Coal is Poland's main source of energy so far and it will be for the coming years. The decision was made by the current government to use coal to secure the energy. A set of objectives were agreed upon to improve the situation in coal mining areas. Following the agreement Poland will implement regulations which will take into account proposed objectives under the energy policy. Furthermore, Poland will abolish legal barriers, and support research and development of technologies permitting the use of coal for liquid and gas fuel production.

The coal sector produces around 90 percent of electricity in Poland. So far it is the cheapest way to produce energy even if it creates obstacles that hinder its ability to meet the EU greenhouse gas emission targets. The state production was covering most of the current demand for coal. However, decrease of the coal production can be observed since early 1990s which shows the decrease of the demand, and in addition, low cost effectiveness. Despite this, Poland will remain a top ten producer of coal in the world. Since the early nineties, Poland implemented installations to reduce the amount of ash and sulphur.

Poland has a large number of coal resources and reserves which constitute the following; 3.79 billion tons of lignite, and 219.65 billion tons of coal resources. With the current production of coal, the resources would last 200 years. In Poland there is a common belief that coal is a secure source of energy for the future.

Gas

The main aim of the energy policy for Poland is to ensure security by the diversification of sources of natural gas supplies. Poland is covering 36 percent of its consumption, and the rest is imported, mainly from Russia. Demand for natural gas in Poland is increasing and will increase up to 30 percent by 2020 and 50 percent by 2050. Research shows that Poland has large sources of unconventional gas on its territory. So far the Polish government provided around 70 concessions for companies to undertake a search for shale gas. Its extraction would change the energy landscape not only for Poland but also for Europe.

The Polish pipeline system is connected to the European pipeline network, mainly in east–west. There are four main entrances to the Polish system: Lasów from Germany, Drozdowicze from Ukraine, Wysokoje and Kondratki from Belarus (Yamal pipeline).

In 2007 Poland implemented a law stating that the gas companies which are undertaking international gas transactions or imports must ensure the gas storage. The gas must be kept in installations that enable supply within 40 days. The amount of mandatory storage is controlled by the Chief of The Energy Regulatory Office. A dangerous problem for extracting the shale gas is the pollution that it generates.

As mentioned above, the main objective for Poland is to find alternative sources of gas supplies thus, close cooperation with Visegrád countries is required.

Petrol

Petrol remains as the second largest energy source in Poland. Poland produced around 1.5 million tons of petrol in 2009 which covered 5 percent of demand in the country. 94 percent of petrol is imported from Russia which comes through the pipeline called "friendship". The remaining amount of petrol is imported from Algeria, United Kingdom and Norway.

For Poland the main objective is diversification of the petrol supplies. In times of liquid and fuel competitiveness there is still a threat to security of oil supplies and threat of monopolistic price fixing. It is a consequence of a market dominated by one supply direction. To improve the situation, the Polish government agreed on a strategy which aims to increase the amount of oil transiting through the country. It enhances competitiveness in the sector in order to minimise the negative effects for the economy. Additionally, it supports Polish enterprises by gaining access to oil resources outside of Poland, retaining ownership in key companies in the sector, and its infrastructure. Poland has improved its oil sector security. The government is aware of the risk of being dependent on only a few number of sources, and is undertaking actions providing alter-

native sources of oil supply.

Renewable energy sources

In Poland the renewable energy sector is intensely developing. The primary renewable energy source is wind. Currently, in Poland there are 663 wind turbines. Most of them are located in the North-West part of the country. The second renewable source in Poland is hydro power plants, which produce 958 MW. The third source is biogas plants, which produce 124MW. Renewable energy covers approximately six percent of the energy demand in the country.

Nuclear energy

The Polish government agreed in 2009 to begin necessary work on the Polish Nuclear Energy Program. Its aim is to develop nuclear energy by 2020 to fulfil the needs in electricity generation with reasonable prices. Within the EU, nuclear energy became the most efficient and desired energy source. Currently the government is preparing the infrastructure needed for the nuclear energy plants, sharing its plans with the public. The nuclear energy plants would be located in the North of Poland. After the Fukushima disaster, there is a risk remaining in terms of security and the matter of nuclear waste.

Challenges of the Polish energy sector

Poland is on a strong path to improving its energy by implementing policies to improve the energy security. The energy sector is developing very fast and soon the changes will bring the expected results.

The Polish energy sector challenges include the following: high demand for energy, energy generation, infrastructural transmission, dependence on external supplies of natural gas, and absolute dependence of supplies of crude oil. Additionally, another significant challenge is environment and climate protection. Furthermore, Poland faces global scale challenges such as fluctuations in prices of energy production, the increasing demand of developing countries for energy, several breakdowns of energy systems, and continuously increasing environmental pollution.

The Polish energy situation is stable, however further developments are needed in order to combat the main challenges.

The infrequent use of the renewable energy resources, and high dependence on Russian energy supplies are two common problems which Poland is trying to tackle. For instance, the import of gas from one direction is 89 percent of the whole import. The situation is also complicated due to the infrastructural shortages.

The above challenges shows that Poland must continue its work on energy sources and infrastructure in order to provide efficient energy security for its self.

HUNGARY

Main characteristics

One of the main characteristics of Hungary's energy landscape, just like all other Visegrád Group countries, is high dependence on Russian imports. Hungary has the highest gas dependency ratio 71 percent)[1] in Central and South Eastern Europe[2] and the bulk of the gas consumed comes from Russia. Such dependency is a typical Eastern and Middle European socialist inheritance, just like the energy infrastructure which was built during the Socialist era.

The overall picture of the country's domestic energy landscape shows limited reserves, relatively low quality, and not enough quantity to satisfy the country's needs.

Hungary's energy mix

The primary sources of energy are natural gas (40 percent) and oil (26 percent), with natural gas representing the majority of imported energy source. The nuclear energy, which is the most important source of domestic energy accounts for approximately 12 percent of Hungary's energy sources. Renewable energy sources, predominantly biomass, account for only 4.3 percent of all energy supply, even though the use of renewable energy exhibited a dramatic increase in 2004.[3]

Energy consumption in Hungary, but in V4 in general, slightly differs from the EU average, as households alone account for more than a third of energy consumption (EU25 average being 26 percent in 2007).

Gas

Accounting for 40 percent of the total use of energy of the country, natural gas is the most important component of Hungary's energy mix. Hungary's natural gas consumption was expected to reach 12.6 billion cubic metres in 2012 and the share of natural gas in the energy mix has more than doubled over the last 40 years, making the country fourth in the EU by percentage. Because domestic output meets only a quarter of the demand, the rest is provided by imports. Imported gas comes from two directions: on one hand through the Brotherhood pipeline from Ukraine and on the other hand through the HAG pipeline via Austria. Yet it is important to note, that in both cases the primary source of the imported gas is Russia which causes an almost 80 percent dependence on gas from that country.

In the past, some quantities of unconventional gas were found in the Makó area in Southeastern Hungary. Yet, extraction with currently known techniques seems to be

commercially unviable.
In terms of infrastructure for gas storage and transportation Hungary boasts the most advanced position among the V4. This is mainly thanks to a consistent policy to secure energy supply from as early as the 1990s when Hungary engaged itself in comprehensive infrastructure projects. But the increased efforts were stimulated – like in the case of all other countries in the region – by the 2006 Russia-Ukraine gas crisis. These efforts aim not just to develop the country's own infrastructural assets and technology, but also to integrate it further into the regional gas market. Right now the country already has interconnectors joining its transmission system with five of its seven neighbours (Austria, Croatia, Romania, Serbia, and Ukraine) and the construction of a further one with Slovakia is due to be completed in 2015. The interconnector with Slovenia is still at the planning stage. Developing cross-border connections has a dual aim: to contribute to the supply source diversification in the long run, and to ensure alternative routes and access to gas at more competitive prices. However, the interconnectors need to be upgraded with reverse flow capabilities.

Of all the states in the region, Hungary not only stands best in terms of interconnectors with its neighbours, but it also has the largest underground gas storage system. This is due to the five gas storage units it owns which have a total capacity of 6.1 bcm. If properly linked to the interconnectors, these storage facilities can efficiently manage risk against regional crises in the future. An encouraging example is the crisis in 2009 when Hungary not only managed to satisfy its own consumption during the import supply interruption, but was even able to make emergency deliveries from its stockpiles to some of the Western Balkan states.

Oil

Oil's share in the country's total primary energy supply has declined progressively since the 1970s. In 1973 it stood at 39 percent, and by the year 2010, it dropped to a mere 26 percent. This is one of the lowest records among the member countries of the International Energy Agency (where the average is above 35 percent), yet for the V4 standards it is still the highest, as oil share in Slovakia makes up 20 percent of the energy mix, in the Czech Republic 21 percent) and in Poland 26 percent.

Hungary has some domestic oil reserves, mostly in the South-east of the country. Oil production peaked in 1985 and has been in decline ever since, and this trend is about to continue.

In 2010 domestic production, including crude oil and condensate, amounted to 13 percent of the total oil supply, and the rest of consumption was being provided by imports. Looking at the demand side, however, one can observe a growing trend: the demand for oil products is expected to grow by about two percent, per year, between 2010 and 2020. The key driver for growth is diesel use, increasing by about three to four percent yearly until 2020.
In terms of imports, close to 90 percent of Hungary's crude oil supply is externally supplied, with most of the imports coming from Russia via the Druzhba pipeline system. Due to the declining domestic production, such import dependency is expected to grow further.

Nuclear energy

Hungary turned to the use of nuclear energy in the 1980s, and in time it became the largest source of electric power production in the country after natural gas, providing 40 percent of the national energy production. In 2010, the four units of the nuclear power plant produced 15,761 GWh electric energy. As a proof of Hungary's continued commitment to the use of nuclear power, in 2009, the parliament gave its preliminary permission to begin preparations for the setup of new units at Paks.

Coal

The domestic coal reserves are estimated to be sufficient for the country's needs for around 200 years, but the high costs of mining and the CO2 emissions cause serious concern. In Hungary, unlike in the other V4 countries, coal ceased to be in the forefront of energy supply. Its share of total energy mix has been rapidly declining in recent decades from close to 40 percent in the 1970s to just 11 percent in 2010.

Renewable energy

The usage of renewable energy sources (RES) and the greening of economies, industries, transport, and the infrastructure became more and more relevant with the 2004 EU accession. Consequently, Hungary has adopted its Hungarian Renewable Strategy (2007-2020) which was approved by the Parliament in April 2008. In this strategy Hungary set out the aim of covering 13 percent to 15 percent of its energy demand from renewables, where most of the excess capacity would be provided for by new biomass power plants (as biomass represents around 90 percent of all RES production). It also targets a 13 percent share of RES on the final consumption of energy in 2020 and at least 10 percent share of renewable energy in final consumption of energy in transport by 2020. These RES targets were set thanks to the 2004 EU accession which had a generally positive influence on the energy market.
To achieve such ambitious goals several programs have been launched by the government, namely the Environment Protection and Infrastructure Operative Programme (EPIO) of Hungary's National Development Plan, the Operative Programme for Environment and Energy (KEOP) for the period of 2007–2013 and the National Energy-Saving Programme (NEP).

The importance of investing in renewables should be promoted, mainly by the government, as to diversify our

energy sources which is one of the possible ways of breaking the Russian dependency. Investing in renewables and their use however is expensive and therefore even more subsidies should be given by the state for this purpose. Nonetheless, due to the past commonly shared by the Visegrád countries as well as the Hungarian market mechanism, the state spends much more on social subsidies to energy costs, rather than on the costs of renewable energy. Policy instruments used in the case RES include feed-in tariffs (mainly for electricity), investment subsidies (for heating and cooling as well as in general to all RES) and tax exemption (for biofuels).[4]

The potential is undoubtedly there as Hungary is blessed with a wealth of natural resources such as biomass, photovoltaic, geothermal energy, wind and solar energy, and shale gas. The share of renewables in the energy mix is very low, thus the challenge remains of exploiting the given potential.

Evolution of Hungary's energy policy

The system change in the early 1990s marked a new era for many things among the national energy policy. Interests were now focused on the country's energy security. The best way to achieve it was to lower the unilateral import dependency as well as to increase strategic storage levels. The same applied for electricity, as Hungary was part of the East European Integrated Power System, which meant that Russia was Hungary's primary electricity supplier. By 2000, the basic energy security issues were addressed in the oil and electricity fields.

A legal framework was established and the privatisation of the oil and electricity sectors were launched. As for gas, the country had historically significant reserves within it. However, the residential needs grew and the country soon turned into a net importer. In addition, regulated natural gas prices were kept artificially low for the end-use customer. The dual effect of residential gas needs and electricity generation demand increase was that natural gas became the dominant energy source in the country (even though domestic production could only meet up to 20 percent demand) .[5]

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Today, amidst the Europe-wide economic crisis and the persistent regional concerns about energy security, energy policy continues to be prominent in the economic recovery plan of Hungarian government. It is seen as a key element in the country's efforts to promote green growth and job creation. It is also seen as of utmost importance that energy is supplied reliably and at a price.

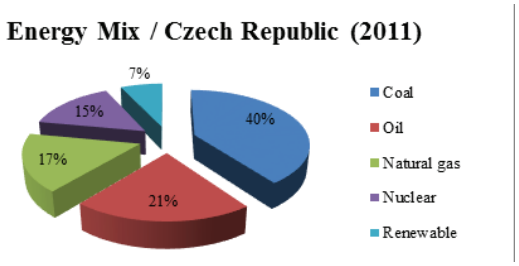
In October 2011 Hungary's parliament approved a new energy strategy up until 2030, which revised the previous 2008 strategy that was set up to 2020. One of the key changes brought by the new document is that the 2008 strategy foresaw a slight increase of total gas demand from 13 bcm in 2008 to 16 bcm by 2020, while one scenario in the new draft energy strategy foresees a stabilisation of gas demand at 9–10 bcm in the longer term. The main objectives of the strategy are increasing renewable energy utilisation, enhancing the share of nuclear energy in the total energy mix, developing the regional energy infrastructure, developing the new energy institutional framework, and increasing energy efficiency and energy saving.

As the 2011 strategy, along with the consistent acts of the government demonstrates, regional co operation is the core element of Hungary's security policy. To this end, several projects to diversify supply sources and routes are under way currently in Hungary. At the same time the government is also active in developing the regional electricity market, including new interconnectors and market coupling. Having in mind that Hungary has as much as seven neighbours, the country is well placed to continue to catalyse the development of closely integrated regional markets for electricity and gas.

CZECH REPUBLIC

The Czech Republic faces a number of challenges in the energy sector which include modernisation of national energy concepts, boosting mutual cooperation in the Central and Eastern Europe (CEE) region, improvement of the cross-border infrastructure, development of nuclear power plants, resolving the issue of limits for coal mining, greening of energy sector, and increasing the share of energy from renewable sources.

One of the main priorities of the Czech Republic's energy policy is to increase energy security and the diversification of energy sources and transportation routes. In order to increase its energy security and self-reliance, the Czech Republic should reduce the share of natural gas in its energy mix; improve safety and efficiency of the nuclear power plants in Dukovany and Temelin; invest into infrastructure projects both in oil and gas sectors, particularly in North-South oil and gas interconnections, which will provide access to the extended network of the European oil pipelines, as well as to the Liquefied Natural Gas (LNG) terminals; and promote and develop through investments of renewable sources of energy.



Coal is the only significant indigenous energy resource in the Czech Republic. The country's coal resources have been estimated at some 2.4 billion tons. Brown coal, which accounts for more than 70 percent of these resources, is mainly produced in North-Western Bohemia, while hard coal is mined in Northern Moravia.[6] The Czech Republic exports its hard coal to mainly Slovakia, Austria, and Poland.

According to the current National Energy Concept, coal is expected to remain an important energy resource in the Czech Republic until 2030.[7] The concept, which is currently being updated, suggests that the long-term availability of coal reserves should be ensured, and the options for extraction outside the mining limits imposed by the Czech government in 1991 should be reviewed.

In 1991, the Czech government set limits for the brown coal mining in North-Western Bohemia. These limits prevent the pulling down of the municipalities of Horni Jiretin and Cernice beneath which brown coal deposits are located, and they further protect 28 towns and villages against the extension of the mines.[8] The issue of mining limits is still on the agenda of the government and closely followed by the Czech public and political parties, who have rather different views on the issue (see table below).

Political Parties	Nuclear	Renewable	Coal
ODS	YES	RATHER YES	YES
TOP09	YES	YES	RATHER YES
KSČM	YES	YES	YES
Greens	NO	YES	NO
ANO	YES	YES	GRADUAL LIMITATION
KDU-ČSL	YES*	YES	GRADUAL LIMITATION
ČSSD	YES*	YES	GRADUAL LIMITATION
SPOZ	YES	RATHER YES	YES

*WITH SOME RESERVATION

Source: http://www.ceskapozice.cz/byznys/energetika/volebni-inspirace-uhli-nebo-bezemisni-zdroje?page=0,1

There are several challenges which will shape coal production in the Czech Republic. One of them is the reduction of emissions and greening the coal sector, another is availability of cheap coal imports, which may affect the Czech domestic coal production.

Nuclear energy

In the Czech Republic, the nuclear energy plays a very important role in the energy mixture. With 35.3 percent (2012)[9] of overall energy productivity, it is the second most important source of energy in the Czech Republic (after coal) and is on the rise. With the planned construction of two more reactors at Temelin power plant and one at Dukovany power plant, the overall share of electric productivity could go up to 50 percent.[10] And at the same time, part of the heating energy produced by reactors should be used to heat up larger city agglomerations.[11] For future long-term development (after year 2040), the new sites for construction of future power plants should be explored prepared.[12]

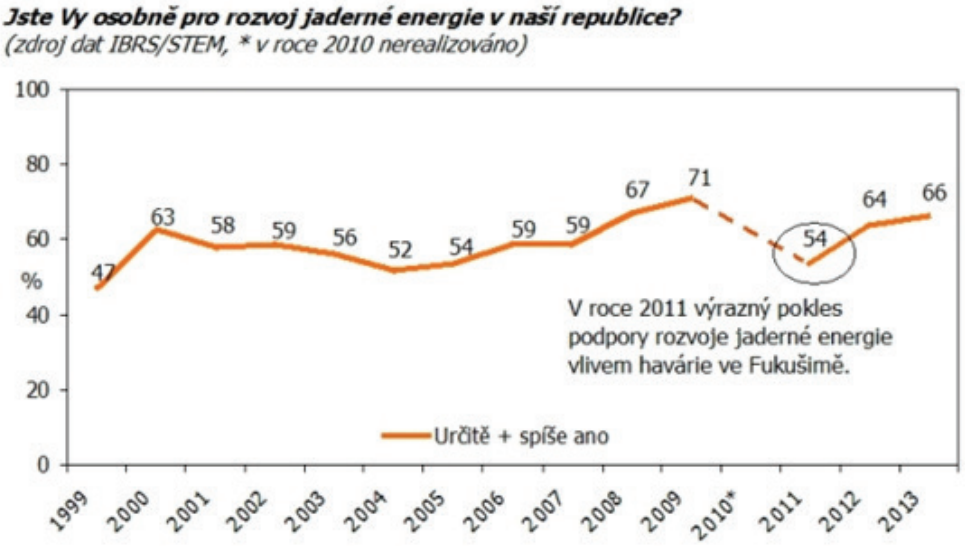
There are currently six nuclear reactors running in Czech Republic, producing 28.6 TWh (2012).[13] Four reactors are at Dukovany and two at Temelin. The construction of the first power plant – Dukovany began in 1978 and its four reactors started to operate between 1985 and 1988. Since that time the power plant has undergone several upgrades.

In 1982, work started on the Temelin power plant with four blocks planned to be built. In 1990 however, following the Velvet Revolution the construction slowed down, but the work on the first two blocks continued. This was subject to some protests, especially from the Austrian part of the border (including blockages of the border crossings). The American company Westinghouse, won the tender for the completion and the reactors started to work in years 2002 and 2003.[14]

Since 2008 when ČEZ announced the plan to build two more reactors in Temelin this became a hot topic in the Czech Republic. As of now, two companies are competing to get a contract to build these reactors – the Czech-Russian consorcium MIR-1200 and American-Japanese Westinghouse.

As with almost everything, the crucial question that comes into play here is the financing. As the authors of the newest World Nuclear Industry Status Report 2013 state "the current market price for electricity falls below the break-even point for nuclear new-build. In this case, the Finance Minister has stated the electricity from new reactors at Temelin would cost €60-65/MWh, well above the current market price of €40.548 Consequently, CEZ is looking for a Contract for Difference which leads to a Government guaranteed electricity price for a fixed, multi-decade, period."[15]

Market research of IBRS/STEM agencies shows us the majority of Czech people support nuclear energy and its development. The research further stated that if at that time a referendum about a completion of Temelin power plant would take place, 50 percent of the population would participate, and 84 percenst of respondents would vote for the completion.[16]



As to recommendations, the Czech Republic should continue the construction and development of nuclear power plants (build two new Temelin reactors and modernize all Dukovany reactors) as publicly supported and efficient energy source for the Czech Republic. This doesn't have to be necessarily sensible from the economic point of view (as was also showed in the text), but some sacrifices on the way to a more secure energy mix can and should be done.

Oil

The Czech Republic does not have significant oil reserves. Production of crude oil equates to roughly three percent of the country's total oil demand.[17] In the Czech Republic 97 percent of oil demand is met by imports, largely in the form of crude oil, primarily from Russia (more than 70 percent), Azerbaijan (nearly 25 percent)[18], and Kazakhstan. About two-thirds of this is delivered through the Druzhba (Friendship) pipeline, originating in Russia, and transiting Belarus, Ukraine, and Slovakia before ending in the Czech Republic at Litvinov. Another pipeline, which secures oil flow in case of disruption of Russian supplies through the Druzhba pipeline, is the Ingolstadt–Kralupy–Litvinov (IKL pipeline), which connects in Germany to the international Trans Alpine Pipeline (TAL). Approximately one-third of the Czech Republic's annual crude oil imports are sourced through IKL. In 2012, the Czech company MERO ČR, a.s. acquired a five percent share in companies owning and operating the Trans-alpine Pipeline (TAL).[19]

The flow direction of the product pipeline network within the Czech Republic is fully reversible. Total storage capacity of the Czech Republic is 25.4 million barrels (nearly 3 mln tons), and the country is building additional oil storage facilities. The present oil reserves of the Czech Republic amounts slightly more than 2 mln tons of oil and oil products.[20]

In order to secure regular oil supply into the country, the Czech Republic should continue to acquire an equity stake in the TAL oil pipeline, which is an alternative route to the Druzhba pipeline. The country should intensify cooperation with oil producers from the Caspian region, such as Azerbaijan, Turkmenistan, and Kazakhstan, as well as with transit-countries, such as Turkey and Ukraine, which will help to reduce oil dependence on Russia, as a single supplier. Investments into the North-South interconnections, as well as oil storage facilities, would strengthen Czech Republic's oil independence.

Natural gas

Only a small portion (less than two percent) of the Czech Republic's natural gas demand is met from domestic production, the rest is ensured by imports. In 2012, total imports of gas amounted to 7.4 billion cubic meters (bcm), with around three-quarters of it coming from Russia, and the rest from Norway and other EU-countries.[21]

The Czech Republic is an important transit country for Russian gas to Western Europe. Most of this gas enters from Slovakia at the Lanzhot interconnection point and leaves the country on the German border at Waidhaus and Hora Svate Kateriny.

In recent years, the Czech Republic improved its gas transportation routes, transmission capacity, and the infrastructure necessary for the reverse flow of gas, as well as gas storage capacity. One of the most important projects was completed and launched in January 2013, which was the Gazelle gas pipeline connecting to the OPAL gas pipeline. This would then be supplying the south of Germany and the east of France via the Waidhaus border transfer station.[22] Another important project launched in 2012,

was the Czech-Polish interconnector ("STORK"), which unites the Czech and Polish gas transmission systems near Český Těšín.[23] It should be noted that the Czech-Polish interconnector may in the long run give the Czech Republic access to Liquefied Natural Gas (LNG) terminals. The Czech–Austrian interconnector Oberkappel (planned year of completion 2018) will connect the Czech Republic with Austrian Penta West and TGL pipelines, with the possibility of connection to the Nabucco West, which is a modified concept of the Nabucco Gas Pipeline Project.[24]

Other investment projects focus on increasing flexibility through underground gas storage and reverse flow capabilities. The European Commission's European Energy Programme for Recovery (EEPR) is co-financing gas storage extension in UGS Tranovice[25] and UGS Tvrdonice.[26]

Investments in the development of the gas system have been significantly influenced by the January 2009 gas crisis and the ensuing need to enhance the security of supply for customers in the Czech Republic. Three storage system operators operate in the Czech Republic; in 2012, their total storage capacity amounted to 3.487 million m3.[27]

Shale gas

The Czech Republic recently introduced a moratorium[28] on exploration of shale gas, initially proposed by the Ministry of the Environment. The main reasons for the suspension of the exploration area approval introduced by the Ministry were "technological similarity between exploration and extraction, high consumption of water per well, risk of groundwater pollution under conditions of technological lack of restraint, or accidents and landscape degradation as well as deterioration of air quality."[29] Public debate on exploration of shale gas in the Czech Republic is highly polarized.

One side is arguing that the exploration of shale gas will contribute to the security of the energy supply to the country. The other side is bringing attention to the environmental risks, particularly contamination of the drinking water at the exploration sites.[30]

The recommendations for the Czech Republic in the gas sector include: expanding capacity of the gas storage facilities; increasing reversibility of gas flows in pipeline network; as well as in long-term contracts, especially in terms of termination of destination clause, which prohibits the resale into third countries, and easing of the take-or-pay clause[31]; further extension of the country's gas infrastructure, specifically in case of North-South interconnectors. By decreasing the share of natural gas in the Czech Republic's energy mix, the country will increase its energy security. As for shale gas, the Czech Republic should make further research in terms of the environmental impact of shale gas exploration, and monitor closely Poland's experience in the shale gas exploration process.

Renewable sources

Gross electricity production from the renewable sources in the year 2012 contributed to the overall gross electricity production by 9.2 percent.[32] Main sources of renewable energy in the Czech Republic during that year were photovoltaic power plants (26.7 percent), hydro power plants (26.4 percent), biomass (22.4 percent), biogas (18.3 percent), wind power plants (5.2 percent) and burning of a solid residential waste (1.1 percent).[33] By the year 2020, the Czech Republic is obliged to have 13 percent of its gross final consumption of energy covered from renewable sources.

Hydro power plants

When we look into the specific forms of renewable energy production, hydro power plants are a traditional source of energy in the Czech Republic. Their main role in the Czech Republic is "to act as a complementary source of electricity generation, mainly utilizing their ability to quickly ramp up to full output, which is an advantage when immediate power is needed to maintain the balance between electricity generation and consumption."[34] Unfortunately the possibilities to build more large hydro power plants are almost gone, and thus their share on electricity production will probably not significantly increase.[35]

Wind and solar power plants

The Czech Republic's geographical position is far from ideal when it comes to using wind and solar power plants. Solar power plants are now a subject of controversy thanks to its wrongfully set subsidizing schemes. (in detail, see the chapter The solar power plants boom) Wind power plants are controversial in terms of its impact on the character of the nature and the noise production. Nowadays there are some 50 localities in the Czech Republic where the circumstances to produce energy using wind power plants are favourable.[36]

Others

Energetic usage of residential waste is useful because it can replace primary energy sources, and at the same time deals with the problem of what to with waste itself.[37] It is estimated that around 4.4 million tons of residential waste is created every year in the Czech Republic, and from this amount, 78 percent goes to the waste dump, 14 percent gets materially used and only 8 percent is used in energetics.[38] These numbers clearly shows us how significant energetic use of residential waste is.

Another promising source is biomass. This term usually means a substance of biological origin, such as plant

biomass grown in soil or water, animal biomass, organic by-products, and/or organic waste."[39] In 2012, there was 1,802.6 GWh of electricity produced in the Czech Republic and as server issar.cenia.cz states, "it is the source where the biggest increase is calculated to come in the next years.[40]

Biogas typically refers to a gas produced by the breakdown of organic matter in the absence of oxygen[41] and biogas is practically produced as landfill gas (LFG) or digested gas.[42] It is a traditional form of energy production in the Czech Republic with the first biogas plants constructed in 1960s.[43]

The solar power plants boom

The big problem and the target of extensive public and political debate was the topic of supporting renewable sources of energy. During recent years, the cost of such support (especially in connection with solar power plants) became excessive, and thus politics, as well as the public opinion, gradually turned against it. There were several factors to blame, particularly the generous feed-in-tariff system which was not prepared to the sudden drop in prices of photovoltaic panels in 2010, and the following boom of construction of solar power plants fields (as we can see in the table the production of energy from photovoltaic sources raised from some 12.9 GWh in 2008 to 2,118.0 in 2011). The whole solar power plants business thus became extremely profitable. Under the former feed-in-tariff system, producers were guaranteed high fix sale prices of their electricity from 15 to 25 years.[44] This significantly raised electricity prices for consumers as well as for companies, and put a heavy burden on the state budget as well – the overall year subsidization reached 44 billion CZK, with 11.7 coming from the state budget and the rest from consumers.[45]

This development gradually lead to the introduction of a special solar tax that owners of photovoltaic power plants had to pay and ultimately in September 2013, led to the introduction of a new bill for renewable energies. As the PV magazine summarized: "The bill ends FIT support for all types of renewable energy starting January 2014, with the exception of wind, hydropower and biomass projects that secured construction permits this year and are completed in 2014. Furthermore, the bill extends the 28% tax currently applied retroactively on solar PV plants larger than 30 kW electrified in 2010. The 28% solar tax was to be in force until the end of this year, however the new bill passed on Friday brings an open-ended 10% tax on these installations."[46] The support will remain only for wind, water, and biomass power plants that were commissioned before December 31, 2015 in the case that they received an authorization before the bill came into effect.[47] Some owners of solar power plants are already considering potential court proceedings and international arbitrations because they feel discriminated.[48]

Recommendations

Slovakia

Basically, all of the V4 have their energy pipeline infrastructure built in the East-West direction while the North-South links have not been so far sufficiently established. Finalizing the Poland – Slovakia and Slovakia – Hungary gas interconnectors would produce a considerable push effect not only in bilateral terms, but it would increase the energy security for the whole V4.

In order to enhance coordinated energy diplomacy and negotiations with third parties (mostly importantly Russia) seriously consider the establishment of a Visegrád Energy Policy Secretariat.

As a part of V4 energy "Ostpolitik", provide the utmost assistance to the European Commission in current and future antitrust probes against Gazprom, coordinate negotiations on gas prices with Gazprom, and advocate for the transposition of EU market rules via promotion of ratification of the Energy Community and the Energy Charter in the case of Ukraine.

Poland

Strengthening the energy cooperation among V4 countries is important and it is a basis for further developments. Poland is aiming to cooperate in gas, oil, and electric sectors within the Visegrád members. As a result of arrears in infrastructure and regulations, Poland is aiming to work on memorandum on cooperation in the North-South corridor in Central-Eastern Europe. Moreover, Poland is systematically contributing in progressive works of regional cooperation in gas and oil sectors, including Eastern countries. During its presidency in the Visegrád Group, Poland aimed to work towards facilitating cooperation between inter-transmission system operators and institutions regulating implementations supporting the North-South corridor. Moreover, strengthening cooperation of the V4 states with the Eastern Partnership states is important to diversify sources of energy.

The Polish government strictly cooperates with V4 countries in gas and oil sector in areas of security. There are several promotional initiatives, exchange of experience meetings, or coordinating meetings where common stands are debated. Joint search for diversification is more likely the most important task for the Visegrád family. It is necessary that countries expand cooperation outsideof their borders, including states for example Turkey, Ukraine or Moldova, in order to maximise the cohesion of initiatives.

Cooperation in the electrical energy sector is crucial to improve the electricity flows within the countries. Exchange of information is needed to strengthen works on the electric infrastructure. Without strengthening solidarity

among the Visegrád states, nothing can be achieved.

Hungary

More ambitious goals should be defined at the national level. Quick but well analysed financially backed and long-term decisions are needed to react fast and to keep up with the rest of the EU member states. More money should be spent on R&D and new innovative technologies that create added value and employment within the country.

Political stability and transparency just as a predictable legal framework within the country, are essential for foreign investors to plan on a long-term basis. Red tape and administrative burdens related to e.g. licensing, permit process, etc. should be eased and possibly erased.

The market mechanism strategies, policy instruments, and the system of state subsidies should be revisited. Efforts should be intensified to improve energy efficiency in all sectors, through abolishing subsidies for energy use, and replacing them with direct support to those in need.

In a regional perspective, Hungary should continue to play a leading role in the regional energy market integration, and to build on the existing regional synergies to improve security and flexibility of the energy supply.

Czech Republic

As for the recommendations, the new state energetic concept includes the 13 percent requirement, and is encouraging interstate cooperation. When one state could start building more production facilities and strengthening their infrastructure, this would allow them to reach the obliged criteria.44 The Czech Republic should also continue the trend that was set during the last few years in strengthening the share of renewable sources on the energy mixture of the country. But if the Czech Republic doesn't want to repeat the same mistake as explained in the case of solar power plants, any steps to subsidize any type of energy type should be well-thought-out and planned.

Towards a common approach?

As we can see, all Visegrád members agree with a need of a common regional approach. In many cases the interests are nearly the same. All participants agree on the need of further development in the regional pipeline infrastructure, in order to gain more transit capacity which could strengthen the strategic position of the Visegrád countries. Coordinated energy diplomacy needs to be the next step, which could enhance the cooperation between the V4 countries. All member countries agree on the importance of regional cooperation, but unfortunately not all of them are willing to truly cooperate. However, without a common approach, the V4 countries could face serious economic risks.

The set-up of a common Visegrád Energy Policy Secretariat would be evidence for the need of a common energy security approach, and a new era of regional cooperation.

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