BACKGROUND REPORT

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Energy Union and Energy Security

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1 Introduction

Without energy there will be no lighting, heating, transport, goods production or effective communication. All day-to-day services, without which we cannot function, cannot actually function without energy. Massive technical, logistical and financial resources are involved in ensuring the fact that we would turn on our computers, charge our phones or cook our dinners whenever we need to. It is a strategic sector and our standard of living is backed by the high amount of energy we consume. Governments thus have to develop strategies to provide reliable and sustainable supply of the energy in all its kinds.

This background report will explain in the first place what the energy is, what kind of forms its supply could have and what the terms such as energy security, energy poverty or energy mix stands for. It will tackle the energy threats as well. Than the particular energy sectors in Visegrad Group countries will be explained together with its important partners – Germany and Austria. Following sections will mention the cooperation established and operating at the regional level – Visegrad cooperation and the European Union, explaining the basic framework of the Energy Union and the first evaluation document measuring the progress called the State of the Energy Union. The aim is therefore to provide to its readers a general overview with the further sources to explore in order to give them tools for successful negotiations.

2 Energy and Energy Security

Energy is the capacity to do work. Every living organism does work and needs energy to function, machines produced by humans is a system that also needs energy to function and it derives the energy from fuels. There are various types of energy – mechanical (potential, kinetic), solar, thermal, chemical, electrical or nuclear and they can be transformed from one type to another.

Energy has been the topic of top importance for Europe for quite a long time. Since the European Union imports more than half of its energy while being highly dependent on imports of crude oil (more than 90%) and natural gas (around 66%) mainly,[1] the actual events happening in relevant countries (energy resources producers and transit countries) such as Russian-Ukraine conflict or instability in Middle East may lead to significant threats to the Europe energy supply reliability.

[1] EUROPEAN COMMISSION. Energy Security Strategy [online]. Available at: http://ec.europa.eu/energy/en/topics/energy-strategy/energy-security-strategy

Many countries are heavily dependent on just single one supplier or the majority portion of supply from one country. For the Central and Eastern Europe this is definitely the case of Russian Federation. For the countries of Visegrad Group this has been an "*important cross-sectional topic*".[2]

2.1 Resources Used to Produce Energy

There are several ways on how to produce energy that we consume as a mankind. They vary depending on the geographical location and technological advancement of the particular country or producer. In the world, about 80% of all the energy is produced from the fossil fuels.[3]Five following categories are used in this document: coal, oil, natural gas, nuclear power, and renewable energy (while this one could be further specified). Especially in several texts we can find further division of renewable resources such as hydropower, solar or wind energy. These forms are called primary energy sources. Each form of energy production has its pros and cons, its cost (either financial or environmental) and complexity needed to produce the units of energy.

2.1.1 Coal

Organic source of energy formed from decayed prehistoric plant materials. It is a fossil fuel created by the process called coalification. We can distinguish several types of coal. Initially the peat is converted to lignite (also known as "brown coal") with low organic maturity. Lignite is in comparison to other types soft and has various ranges of colour. During millions of years, temperature and pressure increase its organic maturity and transform the lignite to harder and blacker coal through so called sub-bituminisation; bituminous forms finally form anthracite, a coal with most carbon.[4] The quality of each coal deposit is determined by types of vegetation, depths of burial, temperatures and pressures at those depths and the length of time the coal lays in the deposit.

Lignite and sub-bituminous coal are low-ranked and used only for generating electricity; bituminous coal and anthracite are high-ranked and used for thermal purposes, metallurgy of iron and steel making, cooking and heating fuel. Today, about 90% of the coal is used as thermal coal, majority of it is used to generate electricity.[5] Top coal producing countries are:

[2] VISEGRAD GROUP. *2015-2016 Czech Presidency* [online]. Available at: http://www.visegradgroup.eu/documents/presidency-programs/20152016-czech
[3] PLANETE ENERGIES. *About the Energy Mix* [online]. 2015. Available at: http://www.planete-energies.com/en/medias/close/about-energy-mix
[4] WORLD COAL ASSOCIATION. *What is coal?* [online]. Available at: https://www.worldcoal.org/coal/what-coal
[5] ALBERTA ENERGY. *What is coal?* [online]. Available at: http://www.energy.alberta.ca/coal/645.asp

China, USA, India, Australia, Indonesia, Russia, South Africa, Germany, Poland, and Kazakhstan.[6]

2.1.2 Oil

When we speak about oil it could have various different forms – crude oil, condensates, refinery feedstock, additives, synthetic crude oil, mineral oils and petroleum products (refinery gas, ethane, LPG, gasoline used in aviation, motor gasoline, jet fuels, kerosene, diesel oil, heavy fuel oil, naphtha, white spirit, lubricants, paraffin waxes, petroleum coke and some others.[7] Up to date, the world has produced about 1 trillion barrels of crude oil. In the next century, it is expected to produce approximately 2 trillion barrels more. Its demand is expected to grow over the long term even further.[8] The top 10 producers of crude oil are: Russia, Saudi Arabia, USA, China, Iran, Canada, Iraq, United Arab Emirates, Kuwait, and Venezuela.[9]

Conventional crude oil is produced by drilling wells, non-conventional crude oil requires other specific method for extraction. The distinction is usually made on the light oils and heavy oils based of the size of the chemical structure (hydrogen rich hydrocarbon molecules they contain). Light oil flows easily through pipelines and when refined it produces large quantity of transportation fuels. Heavy oil requires additional dilution or pumping and when refined, it produces more heating oil.[10]

2.1.3 Natural Gas

Natural gas is considered as one of the cleanest, safest and most useful forms of energy nowadays.[11] It is a fossil fuel similarly to coal and oil, it originates from organisms buried and exposed to heat and high compression underground. It is found in reservoirs beneath the surface of the Earth and we refer to these areas as pools of natural gas. Natural gas is seen as a good source of electricity supply for number of reasons: it is low-risk, lower-carbon relative to other fossil fuels and the power plants could be built in very short time frame. Natural gas plants are technically and economically flexible.[12] On the other hand, one of the biggest

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[6] WORLD ENERGY COUNCIL. *Energy Resources: Coal* [online]. Available at: https://www.worldenergy.org/data/resources/resource/coal/

[7] INTERNATIONAL ENERGY AGENCY. *Oil* [online]. Available at: http://www.iea.org/topics/oil/

[8] CHEVRON. Oil: *Providing Energy for Progress*[online]. 2015. Available at: http://www.chevron.com/deliveringenergy/oil/

[9] CIA. Country Comparison: Crude Oil – Production [online]. *CIA The World Factbook*. 2014. Available at: https://www.cia.gov/library/publications/the-world-factbook/rankorder/2241rank.html

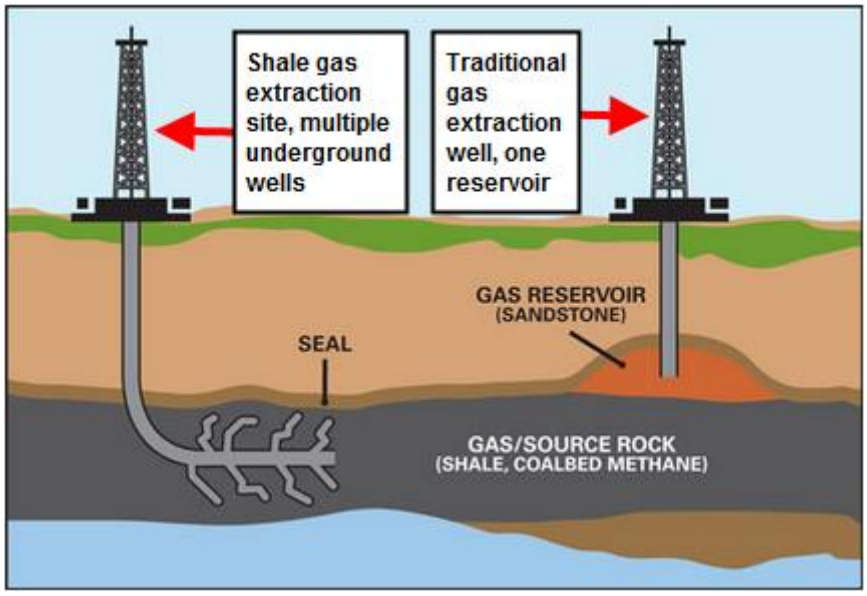
[10] ALBERTA ENERGY. *What is Oil* [online]. Available at: http://www.energy.alberta.ca/Oil/765.asp

[11] Although other opinions in favour of the opposite could be found as well. See TURMES, Claude. *Lost in the gas bubble* [online]. 2016. Available at: http://www.euractiv.com/section/climate-environment/opinion/lost-in-the-gas-bubble/

[12] INTERNATIONAL ENERGY AGENCY. *Natural Gas* [online]. Available at: http://www.iea.org/topics/naturalgas/

disadvantages is the price making it less competitive fuel. It could have various forms such as liquefied natural gas (LNG) and could be extracted by various ways. We can observe the rise of current shale gas production development.[13] The biggest world producers of natural gas are: USA, Russia, Iran, Qatar, Canada, European Union, China, Norway, Saudi Arabia, and Turkmenistan.[14]

Figure 1: Shale gas extraction



2.1.4 Nuclear Power

Nuclear power is an energy created by fission or fusion. This is a reaction when the nucleus of an atom splits into two or more nuclei and by this reaction releases a high amount of energy as well as more neutrons. The process then continues, neutrons split more nuclei and together a chain reaction is formed. Fusion, on the other hand, is the collision of nuclei where they join together into a heavier atom of hydrogen (deuterium or tritium). By doing so also considerable amount of energy is released at extremely high temperatures. Nuclear energy has been used for more than 50 years already.[15]

Uranium is the main resource used for the fission reactors. It releases the energy that heats water to about 280°C which is used to spin the turbines connected to generators producing electricity. Due to the complexity, a nuclear power is seen as highly-developed form of

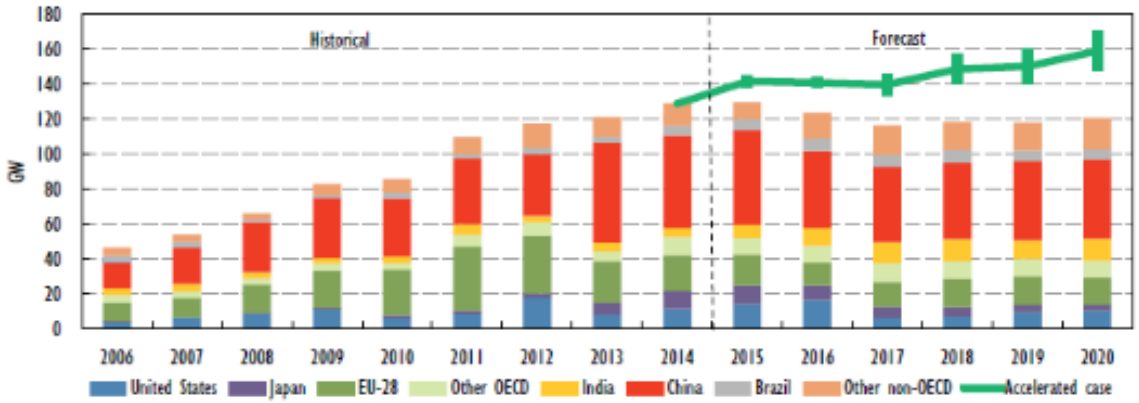
[13] ENERGY.GOV. *Natural Gas* [online]. Available at: http://energy.gov/natural-gas
[14] CIA. Country Comparison: Natural Gas – Production [online]. *CIA The World Factbook*. 2014. https://www.cia.gov/library/publications/the-world-factbook/rankorder/2249rank.html
[15] For more information how nuclear power works, please see: UNION OF CONCERNED SCIENTISTS. *How Nuclear Power Works* [online]. Available at:http://www.ucsusa.org/nuclear-power/nuclear-power-technology/how-nuclear-power-works#.VtLVyZzhDWI

industry. Nuclear power is quite cheap source once produced. It has, however, high upfront costs and is technologically demanding. The biggest producers of nuclear energy are: USA, France, Russia, Republic of Korea, China, Canada, Germany, Ukraine, Sweden and UK.[16] Among the world's biggest producers of uranium belong Kazakhstan, Canada, Australia, Niger, Namibia, Russia, Uzbekistan, USA, China and Ukraine.[17]

2.1.5 Renewable Energy

Renewable energy is a form of energy generated and derived from natural processes that are replenished at a higher rate than they are consumed. Among these forms of energy we can find solar, wind, geothermal, hydropower, bioenergy and ocean power sources. These resources are spread globally in contrast of natural resources and fossil fuels. The role of renewables in energy mix of the countries is expected to rise significantly and rapidly over the time and the trend is visible since 2000. There are many advantages of renewable energy production – positive environmental impacts (greenhouse gas emissions reduction), energy security, strategic development including rural one, energy access and off-grid solutions.[18] On contrary, some of the renewable sources – solar and wind – produce energy irregularly and therefore place demands on the stability of energy system. Some of the technologies still lack their economic competitiveness.

Figure 1 Renewable power net additions to capacity under main and accelerated cases



Solar energy relies on the nuclear fusion power in the core of the Sun. Collection and conversion can be done in various ways – from solar water heating to complex technologies of direct conversion. **Wind power** is generated by the uneven heating of the atmosphere by

[16] IAEA. *Nuclear Share of Electricity Generation in 2014* [online]. 2016. Available at: https://www.iaea.org/PRIS/WorldStatistics/NuclearShareofElectricityGeneration.aspx

[17] URANIUM INVESTING NEWS. *10 Top Uranium-producing Countries*. [online] June 2015. Available at: http://investingnews.com/daily/resource-investing/energy-investing/uranium-investing/top-10-uranium-producing-countries-russia-usa-canada-kazakhstan-2/

[18] INTERNATIONAL ENERGY AGENCY. *Renewables* [online]. Available at: http://www.iea.org/topics/renewables/

the Sun and movement of the atmosphere due to these various temperatures and pressure of the surface of Earth. Wind energy can pump water or generate electricity but requires extensive areal coverage to produce significant amount of energy. **Hydroelectric energy** is generated by gravitational potential of elevated water. **Biomass** is the form of energy from plants. Methane generation and production of alcohol as a fuel are some of more developed forms of biomass energy. **Hydrogen** can be used as a fuel for transportation although this is not strictly renewable resource. **Geothermal power** is the energy from the original accretion of the planet Earth. This mean is limited to few locations in the world and some technological limitations still remain there.[19]

2.2 Energy Mix

To put it simply, an energy mix is "*the range of energy sources of a region*"[20] or a country to which such energy is available. The term refers to "*how final energy consumption in a given geographical region* [e.g. country] *breaks down by primary energy source*."[21] It therefore does include the above-mentioned forms of energy production. Such sources are then used for generating electricity, transportation, heating or cooling.

There is an important distinction between the energy mix and a so-called power generation mix as they are not the same. While power generation mix is the range of resources used for producing electricity, energy mix includes also large sectors of industry and transportation. The proportions may differ significantly. For example French nuclear power has almost three-quarters share of the power generation mix but only about 40% of the energy mix.

The composition of energy mix depends on several factors:

- availability of usable resources in the territory or possibility of imports;
- energy needs to be met;
- policy choices which are determined by historical, economic, social, demographic, environmental and geopolitical factors.

An example how such energy mix could look like as graphically demonstrated is shown on the chart of the energy mix of European Union Member States.

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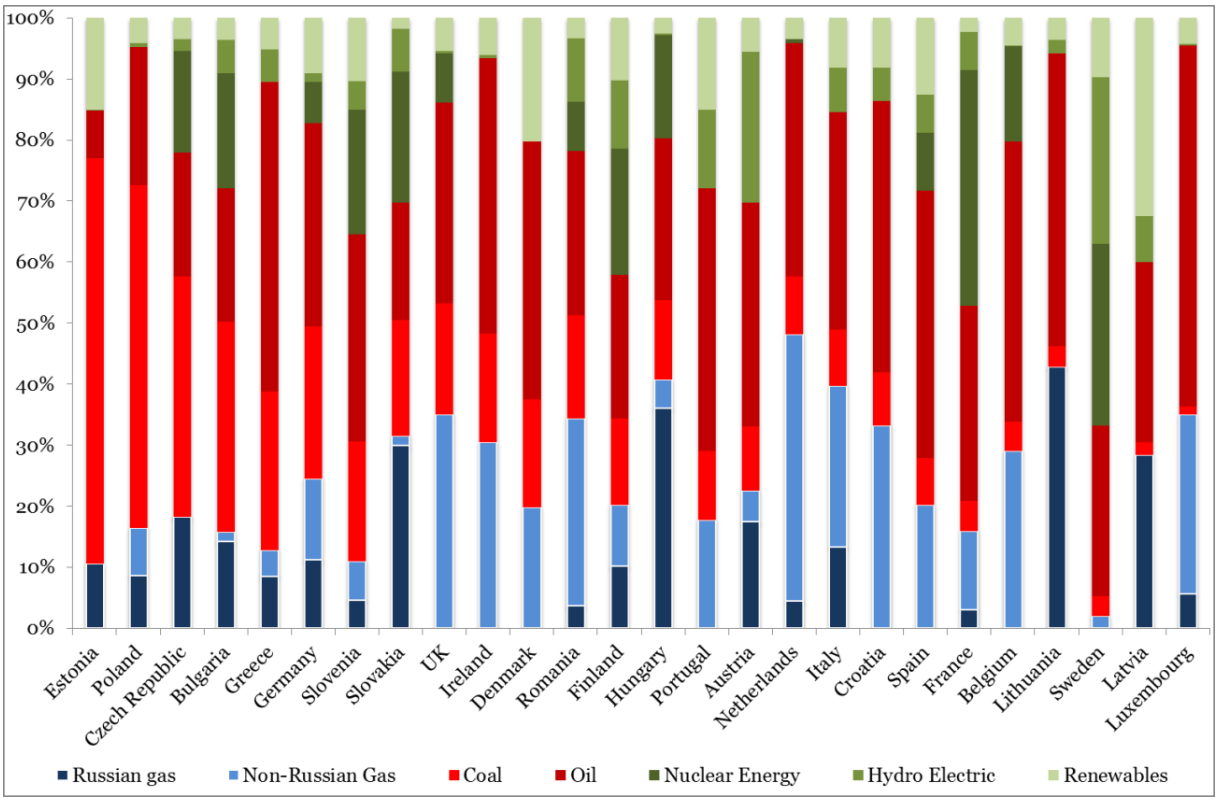
[19] ALTERNATIVE ENERGY. *Renewable Energy* [online]. Available at: http://www.altenergy.org/renewables/renewables.html; for further information see also for example: NATURAL RESOURCES DEFENCE COUNCIL. *What is Renewable Energy?* [online]. Available at: http://www.nrdc.org/energy/renewables/

[20] PLANETE ENERGIES. *Lexicon: Energy Mix* [online]. Available at: http://www.planete-energies.com/en/lexicon/E#energy-mix

[21] PLANETE ENERGIES. *About the Energy Mix* [online]. July 2015. Available at: http://www.planete-energies.com/en/medias/close/about-energy-mix

Figure 2: Energy mix, EU countries[22]



2.3 Energy Threats

Energy security is defined as a predictable access to 1) desired types of energy sources; 2) desired quantities for the supply security; and 3) transparent and affordable prices.[23]

Energy poverty, for example, can be one of the threats to the modern society. The lack of energy access and access of the households to electricity and clean cooking facilities (fuels and stoves without air pollution in the house) is defined as energy poverty. This access to modern energy services is crucial to human well-being and to country economic development. Estimated 1.3 billion people are without access to electricity and 2.6 billion without clean cooking facilities, mostly from the sub-Saharan Africa and developing Asia.[24]

Although the energy poverty is not the case of the Visegrad countries and their neighbours Germany and Austria, there are still threats which must be taken into consideration. In the policy paper produced by the Visegrad Security Cooperation Initiative from V4 countries, the

[22] http://www.ecfr.eu/page/-/fuel_mix_of_member_states.png?v=1426599338184
[23] NOSKO, Andrej. *Regional energy security: Visegrad finally at work?* In: MAJER, M.; ONDREJCSÁK, R.; TARASOVIČ, V.; VALÁŠEK, T. (eds.): Panorama of global security environment 2010. Bratislava: CENAA, pp. 79-91. [online]. Available at: http://cenaa.org/analysis/regional-energy-security-visegrad-finally-at-work/
[24] INTERNATIONAL ENERGY AGENCY. *Energy Poverty* [online]. Available at: http://www.iea.org/topics/energypoverty/

authors recognize as areas with highest potential risks a natural gas and electricity, including transmission and generation.[25] They argue that some of the countries have too big share of natural gas in their energy mix. And the low diversification of supplies can cause troubles in the future.

V4 countries are therefore more exposed to energy supply disruptions from Russia than most of the other EU member states. The Czech Republic, for example, imports up to 99% of its natural gas from Russia[26], similarly to Slovakia with 95%.[27] This is also visibly shown on the chart in previous chapter. The most discussed case was the 2009 event where a major shortage of gas occurred in the EU, Central and Eastern Europe in particular.[28] This clearly showed how vulnerable can be the V4 and the whole EU, especially in the states where imports depend solely or from major part on Russia.

The price is important aspect for securing the access to the energy sources but it is not discussed very often (at least compared to other aspects). During the years 2004-2008 it turned out that the Czech Republic, Slovakia and Hungary paid much higher prices for imported gas than Austria and Germany did.[29] Either could be the Austrian and German companies better at bargaining or they enjoy a better functioning market with natural gas. For Russia, Germany is the largest single customer; V4 countries together are the second largest one.

For some of the countries in Visegrad one of the threats are also so called loop flows. Electricity current usually takes the path of least resistance and should mainly flow in the most direct power line between two points. Sometimes, if these power lines are congested, it may happen that the electricity takes a detour – looping around the blockage. This is the case of the Czech Republic and Slovakia experiencing the loop flows from Germany for example.[30]

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[25] NOSKO, A.; ORBÁN, A.; PACZYNSKI, W.; ČERNOCH, F.; JAROŠ, J. *Energy Security*. 2010. p.1

[26] However, the Czech Republic is connected to Western European countries through interconnectors. This allows it to import the gas also from the alternative routes and to have an access to alternative sources such as Norway. See http://energostat.cz/plynarenstvi-cr.html

[27] CHYONG, Ch. K.; TCHERNEVA, Vessela. *Europe's vulnerability on Russian gas* [online]. March 2015. European Council on Foreign Relations. Available at: http://www.ecfr.eu/article/commentary_europes_vulnerability_on_russian_gas

[28] For further information about the 2009 gas shortage, please see OFGEM. *Electricity interconnections* [online]. Available at:https://www.ofgem.gov.uk/electricity/transmission-networks/electricity-interconnectors or BBC. *Russia opens gas taps to Europe* [online]. January 2009. Available at http://news.bbc.co.uk/2/hi/europe/7839053.stm

[29] NOSKO, Andrej. *Regional energy security: Visegrad finally at work?* In: MAJER, M.; ONDREJCSÁK, R.; TARASOVIČ, V.; VALÁŠEK, T. (eds.): Panorama of global security environment 2010. Bratislava: CENAA, pp. 79-91. [online]. Available at: http://cenaa.org/analysis/regional-energy-security-visegrad-finally-at-work/

[30] RUSSEL, Ruby; SCHLANDT, Jakob. Loop flows: Why is wind power from northern Germany putting east European grids under pressure? [online]. Clean Energy Wire 2015. Available at: https://www.cleanenergywire.org/factsheets/loop-flows-why-wind-power-northern-germany-putting-east-european-grids-under-pressure

3 Structure of the Energy Sector in V4 Countries

Even within the Visegrad Group and neighbouring partner countries such as Germany and Austria, the structures of energy sectors and mixes differ very substantially. This fact makes it quite challenging to negotiate and agree upon coherent strategy. Each country gives preference to its own strategic interest and this may lead to various issues. It is, however, crucial to understand these structures of the particular countries involved in order to understand the positions and stances and lead the debate in a constructive manner.

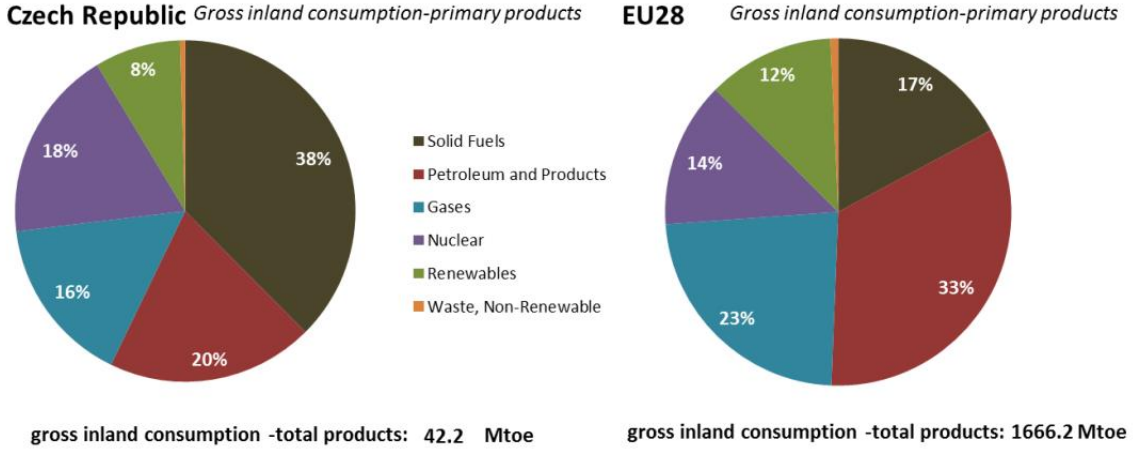
Some similarities can be recognized in the structure of energy consumption of the V4 countries, such as a large role of fossil fuels and low level of domestic natural gas production. They are thus heavily dependent on import of the resources.[31]

Earlier during the communist era, the energy sector was in all four countries controlled by state-run monopolies. After the fall of communism, the sector has been broken up to various separate enterprises and partially sold to foreign investors. These became the operators of the utilities.

3.1 Czech Republic

The Czech Republic is capable to supply its energy consumption by domestically produced coal and lignite, forming the energy mix of the country up to 38%. Nuclear energy accounts for 18% of its energy mix. Thermal power plants and nuclear plants are the mainstay sources of electricity complemented by hydroelectric plants buffering the daily peaks of grid load. Due to

Gross inland energy consumption in 2013



Source: European Commission, based on EUROSTAT

[31] Szabó, John. *V4 Energy Cooperation* [online]. January 2015. Available at: http://visegradplus.org/analyse/v4-energy-cooperation/

the faster economic growth and rising electricity exports, the consumption of primary energy sources scored a growth by 2% annually.[32]

The Czech Republic is therefore a net exporter of coal and electricity. On the other hand it has a negative trade balance of energy products – oil and gas. The country has a low import dependency for solid fuels but a high one on gas and oil. It is very important to mention that in 2013, the 99.9% of gas imports came, either directly or indirectly through other EU member states, from Russia.[33] Anyway, the Czech Republic does have the access to the pipelines from the West as well. Physically, it imports through this routes Russian gas in terms of trade and the origin, however, it still means that the country has the access to liberalized market of Western European countries. The Czech Republic plays a role of transit country for the southern Germany and France, in case of necessity also for Slovakia and the region of Central and East Europe.

In the State Energy Policy of the Czech Republic approved by the government in May 2015, which cover the period of time until year 2040, the country strives for three strategic objectives which are based on the EU energy strategy:

- **Security of energy supplies**
  - Ensuring essential energy supplies for consumers both in normal operation and in case of blackouts, price fluctuations, malfunctions or attacks
  - Rapid restoration of supplies
  - Full provision of supplies of all forms of energy to necessary extent for economy functioning in "emergency" mode
- **Competitiveness of energy sector and social acceptability**
  - Final energy prices comparable with prices in other countries in region
  - Energy businesses able to create economic added value in the long term
- **Sustainability**
  - No further damage to the environment
  - Financial stability of energy enterprises and provision of necessary investment in renovation and development
  - High level of education and employment, availability of primary sources

[32] KUBICA, J. *Energy Mix in Central European Countries of the V4 Group: The Quest for Stability*. 2010. p. 4
[33] EUROPEAN COMMISSION. *Country Factsheet Czech Republic* [online]. November 2015. Commission staff working document. Available at: http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52015SC0220&from=EN, p.3

The Czech Republic sets up also five strategic priorities of the energy sector:[34]

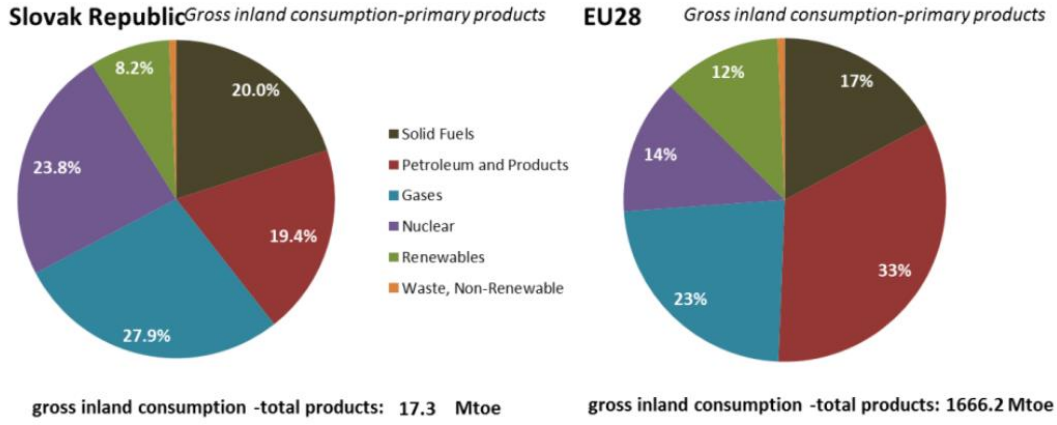
- balanced energy mix
- savings and efficiency
- infrastructure and international cooperation
- research, development and innovation
- energy security

The plans for the future are to build two[35] additional nuclear reactor units, by 2040 would then nuclear energy account for 30-35% of the energy mix. Solid fuels are expected to drop from 40% to just 12-17%. The Czech Republic is expecting to raise the role of natural gas as well to 22% in 2050's.[36]

3.2 Slovakia

The energy sector is important for Slovakia since the share of gross value added is much higher than European average, similarly to the employment in the sector. Slovakia is a net importer of energy products but it had tried to decrease the trade deficit in the past years. Slovakia's energy mix reflects to the major extent the European one. There is a higher share of nuclear energy at the expense of petroleum. The country has a dependency for all fossil

Gross inland energy consumption in 2013



Source: European Commission, based on EUROSTAT

[34] MINISTERSTVO PRUMYSLU A OBCHODU. *State Energy Policy of the Czech Republic*. December 2014. p. 47

[35] Or more specifically, 1 new nuclear reactor in Temelin plant, 1 in Dukovany with a possible extension to 2 new reactors in each power plant.

[36] Szabó, John. *V4 Energy Cooperation* [online]. January 2015. Available at:http://visegradplus.org/analyse/v4-energy-cooperation/

fuels, gases and petroleum. Almost all the gas is imported from the Russian Federation.[37] On the other hand, Slovakia has interconnection capacity[38] for electricity well above EU-set targets for 2020 and 2030 – 61%. Some more focus is put on interconnections with Hungary.

A new version of Energy Policy of the Slovak Republic produced in October 2014 introduces four pillars of the country energy policy: Energy security, Energy efficiency, and Competitiveness and Sustainable energy. Several priorities to support these pillars are stated in the document as follows:[39]

- optimise the energy mix;
- increase the security of energy supply;
- develop energy infrastructure;
- diversify energy sources and transport routes;
- maximise the utilisation of transmission networks and transit systems passing through Slovakia;
- improve energy efficiency and lower energy intensity;
- ensure a functioning energy market with a competitive environment;
- ensure quality energy supply at an acceptable price;
- protect vulnerable consumers;
- resolve energy poverty;
- ensure an appropriate pro-export balance in the power industry;
- utilise nuclear energy as a zero-carbon source of electricity;
- increase the safety and reliability of nuclear power plants;
- support high-efficiency cogeneration of heat and electricity.

The measures to be fulfilled are of a legislative, financial and regulatory nature. These covers:

- amendments of the Energy Efficiency Act, the Construction Act, the Act on Promotion of Renewable Energy Sources and High-Efficiency Cogeneration and Health among others acts;
- reaching the objectives using EU funds and state aid schemes;

[37] EUROPEAN COMMISSION. *Country Factsheet Slovakia* [online]. November 2015. Commission staff working document. Available at: http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52015SC0220&from=EN. p. 1-2

[38] Electricity interconnectors are the physical links which allow the transfer of electricity across borders. OFGEM. *Electricity interconnectors* [online]. Available at: https://www.ofgem.gov.uk/electricity/transmission-networks/electricity-interconnectors

[39] MINISTRY OF ECONOMY. *Energy Policy of the Slovak Republic*. 2014. p. 21-22

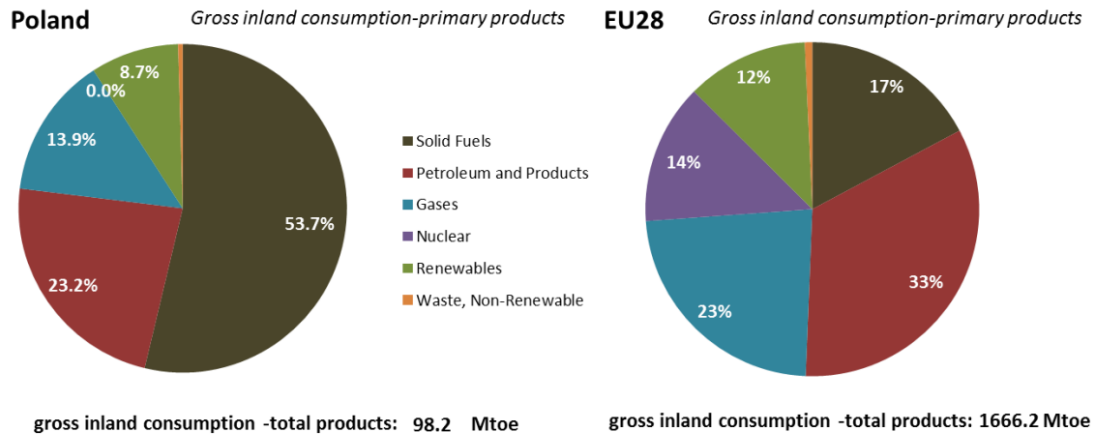
- independence of the Regulatory Office and its powers in the area of defining regulated prices;
- protection of energy consumers.

3.3 Poland

Poland has a negative energy trade balance, making the country net importer of energy sources. There is a substantial difference in energy mix of Poland compared to the EU-28 energy mix. The share of solid fuels, coal mainly, is more than a half – 53.7%. Oil products and gas are important for Poland as well but the share is lower than EU average. Poland has no nuclear power plants and as such the nuclear power is missing from the energy mix completely. As for the imports, Poland has vast national resources of fossil fuels; however, it imports a significant share of oil and gas from Russia.[40] Surprisingly, being the biggest producer of the coal in the EU today, Poland is still net importer of the coal as well, for example from Australia.[41]

Poland has a very low level of interconnection capacity, in 2014 it was just 2% and it is unlikely that it will meet the given target set by European Commission which is 10 % by the year 2020. Poland government published its updated energy strategy in 2013 named Poland's Optimal Energy Mix until year 2060.[42] In this report, Polish government claims that the coal will remain the main source of the energy for Poland up till the year 2060. About 90% of the electricity is

Gross inland energy consumption in 2013



Source: European Commission, based on EUROSTAT

[40] EUROPEAN COMMISSION. *Country Factsheet Poland* [online]. November 2015. Commission staff working document. Available at: http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52015SC0234&from=EN, p. 2

[41] BERARDI, Lorenzo. *Coal in Poland: black gold or deadly master?* [online]. Visegrad Revue 2016. Available at: http://visegradrevue.eu/coal-in-poland-black-gold-or-deadly-master/

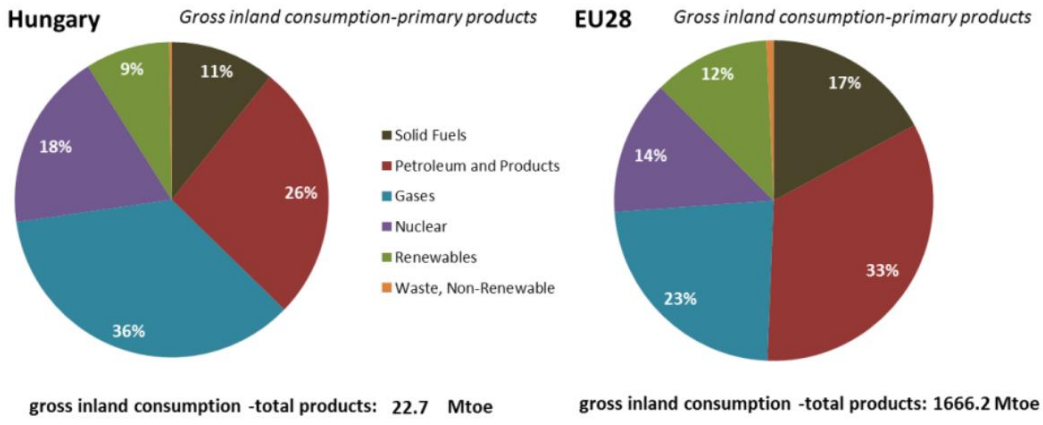
[42] Available in Polish language: KANCELARIA PREZSA RADY MINISTROW. *Model Optymalneho Miksu Energetycznego* [online]. Warszawa. November 2013https://www.premier.gov.pl/files/files/energymix_das.pdf

produced by coal plants. It is believed to be the cheapest option for the country.[43] Shale gas will be another source of energy, on contrary there will be just small investments in renewables. The investment strategic plan for the first two new nuclear reactors in operation by 2024 exists, at the moment; however, shale gas receives the priority due to lesser costs and delay will therefore probably occur.[44] Yet, the predictions for shale gas production are not optimistic any more.[45] Another important project recently developed is Polish LNG terminal in Swinoujscie.

3.4 Hungary

Hungary is a net importer of energy products due to considerable oil and gas imports having the trade deficit higher than the EU average. The energy sector plays an important role in Hungarian economy. The energy mix is relatively similar to the situation of EU-28, the differences might be found in higher share of gas and nuclear energy. Hungary gas import is dependent almost exclusively on Russia. Hungarian interconnection capacity is above the EU target being on 29% in 2014.[46] Currently, in electric power sector, the government have the

Gross inland energy consumption in 2013



Source: European Commission, based on EUROSTAT

[43] YEO, Sophie. *Coal set to be Poland's main energy source until 2060*[online]. Climate Home. 2013. Available at: http://www.climatechangenews.com/2013/11/16/coal-set-to-be-polands-main-energy-source-until-2060

[44] PHYS.ORG. *Poland anchors energy strategy in coal, shale gas: PM* [online]. 2013. Available at: http://phys.org/news/2013-09-poland-anchors-energy-strategy-coal.html

[45] See for example NESLEN, Arthur. Polish Shale industry collapsing as number of licences nearly halves. [online] The Guardian 2015. Available at: http://www.theguardian.com/environment/2015/oct/09/polish-shale-industry-collapsing-as-number-of-licenses-nearly-halves

[46] EUROPEAN COMMISSION. *Country Factsheet Hungary* [online]. November 2015. Commission staff working document. Available at: http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52015SC0227&from=EN

potential to influence the market through its state-owned MVM Zrt. and Paks Nuclear Power Plant Ltd. It aims in to have the similar power in natural gas and oil sectors in the future.[47]

According to its National Energy Strategy 2030, Hungary's basic objectives are briefly described as follows:[48]

- **Increasing the competitiveness**
  - By active participation in the single internal energy market of the EU
  - Improved energy efficiency and utilization of renewable energy sources
  - Appropriate management of domestic resources and supplies
- **Transition to sustainability**
  - Balance between social, environmental and economic dimensions
  - Reducing energy consumption
  - Strict sustainability criteria, most efficient manner
  - Critical review of consumption patterns
  - Support of low CO_2-emission technologies
- **Security of supply**
  - Diversification of natural gas sources and transit routes
  - Energy saving and efficiency
  - Exploitation of renewable energy potential
  - Nuclear electric power as priority[49]
  - Eco-friendly utilization of fossil fuel resources

Strategy also presents five tools on how to achieve such objectives as they cannot be met simultaneously:

- energy saving;
- highest possible share of renewable energy of decentralized domestic generation;
- safe nuclear energy as basis for electrification of road and rail transport;
- regional infrastructure platform;

[47] MINISTRY OF NATIONAL DEVELOPMENT. *National Energy Strategy 2030* [online]. 2012. Available at: http://2010-2014.kormany.hu/download/a/b7/70000/Hungarian%20Energy%20Strategy%202030%20Summary.pdf, p.30

[48] MINISTRY OF NATIONAL DEVELOPMENT. *National Energy Strategy 2030* [online]. 2012. Available at: http://2010-2014.kormany.hu/download/a/b7/70000/Hungarian%20Energy%20Strategy%202030%20Summary.pdf, p.15-24

[49] Although, the current Paks nuclear power plant does face challenges. For further information see WORLD NUCLEAR NEWS. European Commission seeks clarity on Paks II state aid issue [online]. 2016. Available at: http://www.world-nuclear-news.org/NN-European-Commission-seeks-clarity-on-Paks-II-state-aid-issue-13011601.html

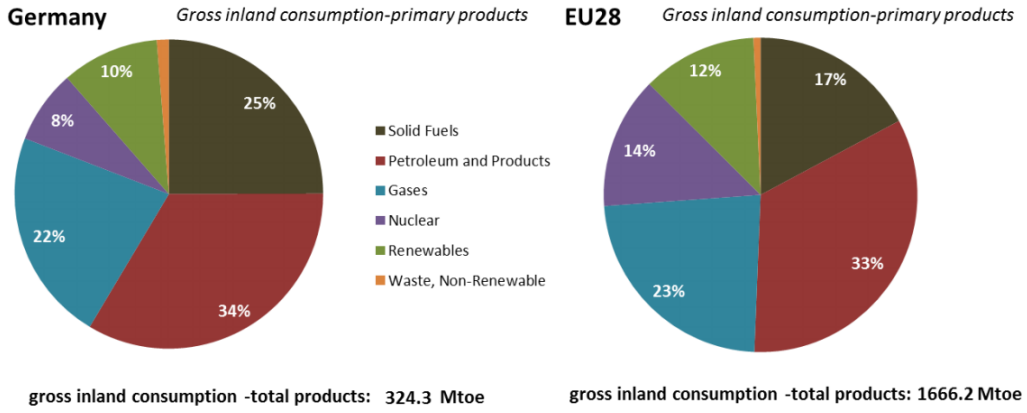
- government involvement and increasing representation.

4 Structure of the Energy Sector in Germany

Germany is a key member state of the EU which is especially true in terms of energy. By far it is the largest energy user within the EU, accounting for almost 19% of the gross energy consumption, 20% of net imports and 19% of electricity generation. Its geographical location gives the country an importance as a centre of the EU electricity grids and natural gas transit hub.[50]

Germany's energy trade balance is in the negative numbers and it takes place as net importer of oil, gas and coal as well. In 2013 the trade deficit has started to shrink for oil and gas and to a lesser extent also for coal. On the other hand, Germany is a net exporter of electricity produced from these commodities. Its energy mix is not significantly different than the one of the whole EU-28. There is a higher share of fossil fuels and coal and somehow smaller share of nuclear energy. The current situation in Germany is subject of significant transition. Based on political decision after the events in Fukushima, Japan, Germany decided to phase-out the nuclear energy by 2022 and to achieve decarbonisation of the energy with higher share of renewables. These shall account for 18% of gross final energy consumption in 2020.[51]

Gross inland energy consumption in 2013



Source: European Commission, based on EUROSTAT

[50] CWIEK-KARPOWICZ, Jaroslaw; GAWLINOWSKA-FYK, Alexandra; WESTPHAL, Kirsten. *German and Polish Energy Policies: Is Cooperation Possible?* [online]. Policy paper, The Polish Institute of International Affairs. January 2013. Available at: http://www.kas.de/wf/doc/kas_33537-1522-1-30.pdf?130215102802, p.2

[51] EUROPEAN COMMISSION. *Country Factsheet Hungary* [online]. November 2015. Commission staff working document. Available at: http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52015SC0225&from=EN, p.1-2

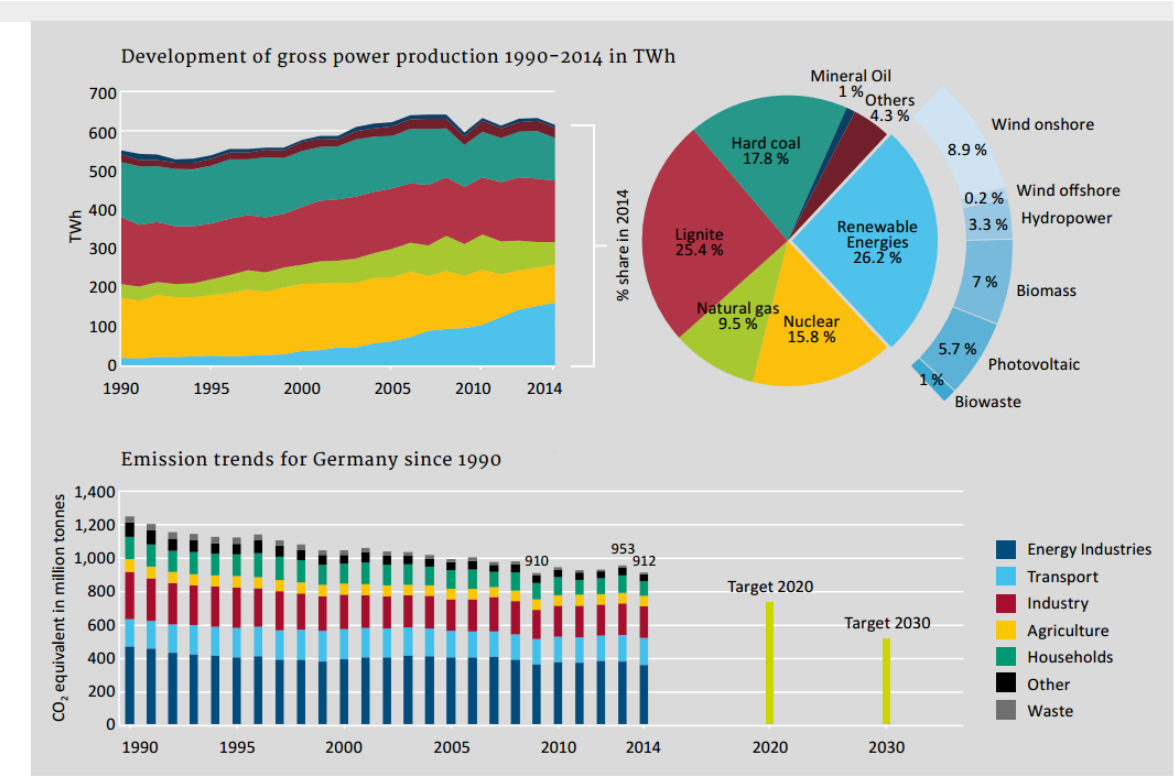
Germany is by its 10% of interconnectivity capacity meeting the goal set for 2020 but there will be still a need for ever increasing interconnection level with neighbouring countries. The major issue for Germany and its eastern neighbours are loop flows that occur due to insufficient internal transport connections from north to south within the country and therefore causing overloads in Poland and the Czech Republic. Development is being made in close cooperation with them on the grid expansion and avoiding these troubles.[52]

Germany is dependent on the import for all fossil fuels. Russia is major partner in gas imports for Germany but, unlike the Visegrad countries, it has a substantial level of diversification of sources and routes. Russian imports of gas account for slightly more than 40%, another important supplier is Norway with 20%.[53] In total numbers, more than 80% of its gas is imported. Germany also imports more than 70% of the coal it uses, 98% of its oil and all the uranium for nuclear power plants are from foreign sources.[54]

Germany's new energy policy for year 2050 has been published in 2012. It follows the long-term vision and strategy of the energy transition in Germany called *Energiewende*, which basically means the energy portfolio is based mainly on renewables and efficient energy consumption. The aim is to abolish fossil fuels and nuclear power in the future of Germany. The targets of *Energiewende* are for the year 2050 as follows:[55]

- reduce greenhouse gas emissions by 80-95% in 2050;
- reduce electricity consumption to 75% of the state in 2008 in 2050;
- reduce energy consumption to 50% of the state in 2008 in 2050;
- reduce heat requirement to 80% in 2020;
- reduce final energy consumption in transport to 60% in 2050;
- increase number of e-cars.

[52] Ibid., p. 3
[53] Ibid.
[54] CWIEK-KARPOWICZ, Jaroslaw; GAWLINOWSKA-FYK, Alexandra; WESTPHAL, Kirsten. *German and Polish EnergyPolicies: Is Cooperation Possible?* [online]. Policy paper, The Polish Institute of International Affairs. January 2013. Available at: http://www.kas.de/wf/doc/kas_33537-1522-1-30.pdf?130215102802http://www.kas.de/wf/doc/kas_33537-1522-1-30.pdf?130215102802 p. 2
[55] CLEAN ENERGY WIRE. *A Reporter's Guide to the Energiewende* [online]. Available at: https://www.cleanenergywire.org/sites/default/files/files/article/new-clew-reporters-guide-energiewende/clew-reporters-guide-2015-2nd-edition.pdf



Sources: AG Energiebilanzen 2015; UBA 2015.

While meeting the goals of re-structuralised energy system is needed in order to secure future energetic stability for Germany, five core tasks shall be followed by the country:[56]

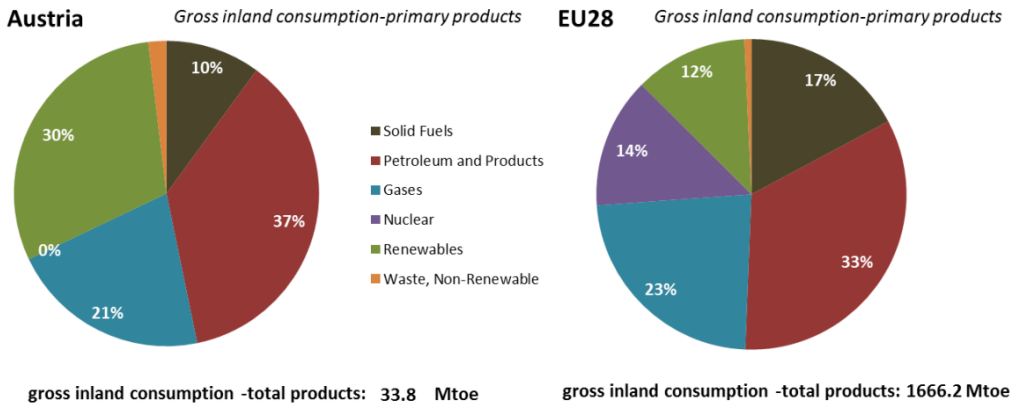
- The development of renewable energy must be synchronised with the expansion and upgrading of the power grids.
- A need for fossil-fired power plants in order to guarantee a reliable energy supply will remain.
- Germany is committed to cost-effective development of renewables.
- Energy efficiency will be increased mainly through incentives, rather than regulatory law and mandatory measures
- Energy research and emerging technologies will be supported.

[56] FEDERAL MINISTRY OF ECONOMICS AND TECHNOLOGY. Germany's new energy policy. [online]. April 2012. Available at: http://www.bmwi.de/English/Redaktion/Pdf/germanys-new-energy-policy, p. 3

5 Structure of the Energy Sector in Austria

Austria is another important partner of V4 countries with a deep concern about its energy. Austria is involved in many international organisations dealing with energy related policy. Austria is a net importer of all energy sources and it has overall higher energy trade deficit than the EU-28 average. The energy mix is relatively different from the EU as a whole. The high shares of renewables accounts for 30%, share of solid fuels is lower (10%) and there is an absence of the nuclear power. Austria does take a negative stance towards the nuclear energy and development of nuclear power in neighbouring countries. The renewables and its role in Austria's energy mix are on the significant rise over the past years.[57]

Gross inland energy consumption in 2013



Source: European Commission, based on EUROSTAT

Austria is dependent on imports of fossil fuels, gas and petroleum. Up to 62% of its gas import comes from Russia. Austria has large underground gas storage facilities with capacity above average annual domestic consumption. Austria also uses its important trading hub in Baumgarten. The electricity is generated mainly by the renewable power – almost 80% of the whole production. Its interconnection level is almost 30% and planned Projects of Common Interest (with Germany and Italy)[58] will increase this ratio even more. The example of the regional cooperation is forming the common price zone with Germany. Challenges to Austria

[57] EUROPEAN COMMISSION. *Country Factsheet Austria*[online]. November 2015. Commission staff working document. Available at:http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52015SC0208&from=EN, p.1-2

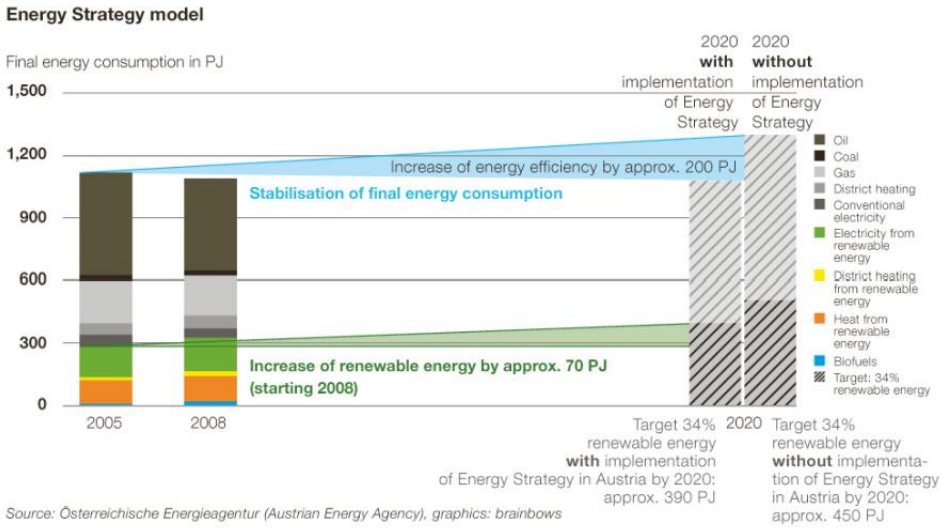
[58] For detailed information see EUROPEAN COMMISSION. *Commission delegated regulation (EU) 2016/89 of 18 November 2015 amending Regulation (EU) No 347/2013 of the European Parliament and of the Council as regards the Union list of projects of common interest.* 2016 [online]. Available at: http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:JOL_2016_019_R_0001&from=EN, p.8

are to be found in its electricity grid because of volatile production of electricity mainly from the solar and wind or loop flows caused by the actual common price zone with Germany, too.[59]

The core objectives of Austrian Energy Strategy are "*[s]ecurity of supply, environmental compatibility, cost effectiveness, social compatibility and competitiveness*".[60] The strategy itself has three pillars:

- **energy efficiency** – improvement in energy efficiency at all stages of the provision and use of energy (e.g. new and refurbished buildings, sustainable mobility, implementation of energy management systems, spatial planning, etc.);
- **renewable energy** - focus on hydro power (including pump storage), wind power, biomass and photovoltaic;
- **security of supply** - to be increased and aimed at the highest possible degree of cost effectiveness (e.g. district heating and cooling, new transmission networks, diversification of supply sources and routes, gas storage, smart grids and smart metering).

Through implementation of its strategy, new 80 000 workplaces are expected to be created and an additional 31 000 places through measures for extension of high-level public transport infrastructure.[61]



[59] EUROPEAN COMMISSION. *Country Factsheet Austria*[online]. November 2015. Commission staff working document. Available at: http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52015SC0208&from=EN, p.3

[60] FEDERAL MINISTRY OF ECONOMY, FAMILY AND YOUTH. *Energy Strategy Austria*[online]. Available at: http://www.en.bmwfw.gv.at/Energy/Energystrategyandpolicy/Documents/Energy%20Strategy%20Austria%20(engl%20Kurzfassung)%20(2).pdf, p.1

[61] Ibid, p.2-6

6 Cooperation in the Field of Energy in V4

A statement of the original 1991 Visegrad Declaration expressing that the signatories shall jointly focus on "*the development of the infrastructure in communications* (…)*, mainly in the north-south direction, and shall coordinate the development of their power systems*"[62] was the first mention of future collaboration in the field of energy of V4 countries.

Thus, energy has been a long-term topic important for Visegrad countries and their neighbours not excluded. The activities currently undertaken by the V4 has begun during the Slovak presidency of V4 group[63] and are continued by its Czech and Polish successors. The Energy Union project is, as mentioned, a key priority for current Czech presidency but it does involve also other areas of cooperation.[64] Besides the Energy Union, which is described in detail below, among the priorities belong the security of energy supply, countries of the Eastern Partnership and the Energy Community. One of the issues discussed on the V4+ level is indeed the crisis in Ukraine.[65] There are already several projects in place on building the energy interconnectors and LNG terminals between the Visegrad countries and its neighbours. For successful completion there is a constant need for investment in the infrastructure but also to significant research and development.

Internal Gas Market is closely linked to the mentioned topics and is of a big importance for the countries of the V4+ too. Successful implementation of this single market of natural gas may significantly improve the energy security of this particular resource. Main issues are the lack of necessary completed infrastructure (specifically North-South gas corridor), legislative and regulatory barriers preventing the commercial integration of the V4 markets. Austria and Croatia are directly involved in the efforts of are thus invited for the V4 conferences dealing with this area of interest. As stated: "*the V4 joint risk assessment* (…)*is being finalized under the V4 forum for Gas Market Integration."*[66] The aim is to develop preventive action plan and emergency plan for V4 countries. Some of the analyses and news are talking about its completion in 2020.[67]

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[62] VISEGRAD GROUP. *Visegrad Declaration 1991*[online]. Available at: http://www.visegradgroup.eu/documents/visegrad-declarations/visegrad-declaration-110412
[63] VISEGRAD GROUP. *2014-2015 Slovak Presidency*[online]. Available at: http://www.visegradgroup.eu/documents/presidency-programs/20142015-slovak
[64] VISEGRAD GROUP. *2015-2016 Czech Presidency*[online]. Available at: http://www.visegradgroup.eu/documents/presidency-programs/20152016-czech
[65] Ibid.
[66] Ibid.
[67] See for example SAWICKI, Bartlomiej. *Poland, Slovakia and Hungary closer to the integration of gas systems*[online]. 2015, Visegrad Plus. Availableat: http://visegradplus.org/opinion/poland-slovakia-and-hungary-closer-to-the-integration-of-gas-systems/

Searching for the new energy sources, which have been the focus point of previous Polish, Slovak and Hungarian presidencies, is taking place especially with the USA. The import of resources from the USA and potential deliveries of LNG to Europe and V4 countries in particular is closely linked to the Energy Union project.[68]

The need for further cooperation in the field of energy has been based on the Declaration of the Budapest V4+ Energy Security Summit in February 2010. At this summit the participants adopted a text where they expressed their support to gas networks integration and diversification of routes and sources (LNG terminals[69], Nabucco[70] and NETS[71] projects). The emphasis has been given to demand to proper EU funding for common energy projects and setting up ad hoc expert working groups (interconnectors, oil supply etc.).[72]

7 EU Energy Union

The original vision for the European Energy Community, initiated in 2010 by Jacques Delors and Jerzy Buzek, was the model for current Energy Union being implemented in the European Union nowadays. The new President of the European Commission Jean-Claude Juncker elevated the Energy Union at one of the key priorities of his new European Commission. Vice-President for the Energy Union Maroš Šefčovič and Commissioner for Energy and Climate change Miguel Arias Cañete received strong mandates for the implementation of the related activities.

On February 25th 2015 the Commission adopted „*A Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy*". Energy Union, as called in short, address the issues of the field of energetics that the EU is worried about in the long run. Excessive dependence on a limited number of supply sources, greenhouse gas emissions, affordability of the energy, uncoordinated national policies, absence of the common stance are just some issues identified as an indicators for the need of coherent and complex strategy.

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[68] EURACTIV, *"Visegrad 4" want US gas to cut dependence on Russia*[online]. 2014. Available at: http://www.euractiv.com/section/europe-s-east/news/visegrad-4-want-us-gas-to-cut-dependence-on-russia/

[69] EUROPEAN PARLIAMENT. *Liquefied Natural Gas in Europe*[online]. November 2015. Briefing. Available at: http://www.europarl.europa.eu/RegData/etudes/BRIE/2015/571314/EPRS_BRI(2015)571314_EN.pdf

[70] ROWLEY, Mark. *The Nabucco Pipeline Project: Gas Bridge to Europe?*[online] September 2009. Pipelina&GasJournal, Vol. 236 No. 9. Availableat: https://pgjonline.com/2009/09/07/the-nabucco-pipeline-project-gas-bridge-to-europe/

[71] MOL HUNGARY. *European Energy Infrastructure – NETS Project*[online]. Available at: http://mol.hu/en/about-mol/media-room/press-releases/2708-european-energy-infrastructure-nets-project

[72] VISEGRAD GROUP. *Declaration of the Budapest V4+ Energy Security Summit*[online]. February 2010. Available at: http://www.visegradgroup.eu/2010/declaration-of-the

Some of the agreements and steps has been already taken to provide a basis for the Energy Union and are considered as important ground sources for the further actions. To mention some, **2030 Framework for Climate and Energy**[73], **European Energy Security Strategy** adopted in 2014[74] are two examples of such basic conception documents.

The EU's Energy Union strategy is made up of five closely related aspects:[75]

- **Decarbonisation (emission reduction)** - Renewing the EU Emissions Trading System, pushing for a global deal for climate change in Paris in December 2015, and encouraging private investment in new infrastructure and technologies.
- **Energy efficiency** - Consuming less energy in order to reduce pollution and preserve domestic energy sources. This will reduce the EU's need for energy imports.
- **Fully integrated internal energy market** - Using interconnectors which enable energy to flow freely across the EU - without any technical or regulatory barriers. Only then can energy providers freely compete and provide the best energy prices.
- **Energy supply security, solidarity and trust** - Diversifying Europe's sources of energy and creating better, more efficient use of energy produced within the EU.
- **Research, innovation and competitiveness** - Supporting breakthroughs in low-carbon technologies by coordinating research and helping to finance projects in partnership with the private sector.

The Energy Union is a complex strategy, conception documents accompanied by the road map for activities, communications and factsheets and analyses. The Energy Union Package summarises the Energy Union in fifteen action points. These include, among others, full implementation and strict enforcement of existing legislation related to energy, diversification of gas supply and resilience to disruptions, intergovernmental agreements that complies with EU legislation and are transparent, proper infrastructure, design and implementation of internal energy market, regional approaches to market integration, transparency on energy costs and prices, at least 27% energy savings by 2030, energy efficient buildings, focus on

[73] EUROPEAN COMMISSION. *2030 Energy Strategy*[online]. Available at: https://ec.europa.eu/energy/en/topics/energy-strategy/2030-energy-strategy
[74] EUROPEAN COMMISSION. *Energy Security Strategy*[online]. Available at: http://ec.europa.eu/energy/en/topics/energy-strategy/energy-security-strategy
[75] EUROPEAN COMMISSION. *Energy Union and Climate* [online]. Available at: http://ec.europa.eu/priorities/energy-union-and-climate_en

alternative fuels and decarbonisation in the transport sector, at least 27% level for renewable energy by 2030.[76]

The progress of the Energy Union implementation shall be, according to its new governance principle, subject of annual reporting. The report produced in order to assess the progress is called the State of the Energy Union.

7.1 State of the Energy Union 2015

The State of the Energy Union is part of a new governance mechanism where the European Commission presents annually every autumn the state of affairs in this field of interest. It is aimed to show the progress made in the implementation of this strategy.[77] First State of the Energy Union was thus published on November 18th, 2015.

During this first year, Vice-president Maroš Šefčovič carried out the so-called Energy Union Tour where he explained to the governments, national parliaments, industries and broad public the project and its benefits. From these discussions and dialogues an analysis for each Member State has been produced and attached to the report in a form of factsheet. The main advantage of these factsheets is comparability of European data.

Additionally to the State of the Energy Union, Commission published guidance for national plans of energy and climate strategies in period from 2021 to 2030. Several other documents have been adopted the same day along with the State of the Energy Union as well. To mention some: the second list of Projects of Common Interest, Energy efficiency progress report, Energy Customer Trends or Report on the Implementation of the EU Energy Security Strategy.[78]

What does the State of the Energy Union 2015 says? The opening sentence of the press release puts it: "*The first State of the Energy Union Report shows that much progress has already been made since the adoption of the Energy Union Framework Strategy 9 months ago. Still much remains to be done, and 2016 will be an important year of delivery.*"[79] The document itself mentions all aspects of the Energy Union and describes the progress made and lay down the way activities undertaken should go forward.

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[76] EUROPEAN COMMISSION. *A Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy* [online]. February 2015. Available at: http://eur-lex.europa.eu/resource.html?uri=cellar:1bd46c90-bdd4-11e4-bbe1-01aa75ed71a1.0001.03/DOC_1&format=PDF, p. 19-21

[77] See the current complete State of the Energy Union: EUROPEAN COMMISSION. *State of the Energy Union* [online]. Available at: https://ec.europa.eu/priorities/energy-union-and-climate/state-energy-union_en

[78] EUROPEAN COMMISSION. *The Energy Union on track to deliver*[online]. November 2015. Press release. Available at: http://europa.eu/rapid/press-release_IP-15-6105_en.htm

[79] Ibid.

Decarbonisation is the first of the aspects of the Energy Union – and the EU is the most carbon-efficient major economy in the world with significant decrease in greenhouse gas emission. In 2015, progress was made in three important fields: emission trading, renewables and further low carbon technology investments. Revision of the EU Emissions Trading System and introduction of Market Stability Reserve, increasing share of renewables and investments via European Structural and Investment Funds or European Fund for Strategic Investments are some of the successes worth mentioning. "The Way Forward" section introduces some proposals – further CO_2 emission standards for cars and vans, effective enforcement of regulatory standards. In 2016, a new Renewable Energy Directive will be presented. Mentioning two of the V4 countries, European Commission is not certain about the meeting its national renewable energy targets in case of Poland and Hungary. Member states are encouraged to engage in the renewable energy cooperation mechanisms on regional levels.[80]

In the field of **energy efficiency** the Commission in 2015 proposed a revision of Energy Labelling Directive, which should strengthen enforcement and effectiveness. Number of the labelling measures has entered into force in the last year. Nevertheless, still numerous barriers remain. These involve information failures or shortage of financial tools dedicated to the projects. Smaller energy efficiency will be in the lead of such efforts. According to the recommendations, most Member States "*should take the additional measures to accelerate their ambition levels and efforts in order to achieve their national energy efficiency targets for 2020."*[81]

Integrated internal energy market relevant for V4 countries involves new examples of good cooperation during 2015 such as LitPolLink, an interconnection initiative between Lithuania and Poland, and also gas interconnector between these two countries. An important milestone mentioned in the document is the Hungary-Slovakia interconnector. Installed reverse flow equipment is of great importance for energy security of the countries involved. Intensive work is being carried out concerning the regulatory barriers, infrastructure development, financing and public acceptance. In the following year 2016, the Projects of Common Interest (PCI) will undoubtedly need a bigger political will for its completion without delays. Several PCIs are relevant for V4 members and Germany with Austria.[82] Among other

[80] EUROPEAN COMMISSION. *State of the Energy Union 2015*[online]. November 2015. Available at:http://eur-lex.europa.eu/resource.html?uri=cellar:ebdf266c-8eab-11e5-983e-01aa75ed71a1.0008.02/DOC_1&format=PDF, P. 2-4

[81] Ibid., p. 5-6

[82] For the complete second list of PCIs see EUROPEAN COMMISSION. *The Union List of Projects of Common Interest ("Union List")* [online]. November 2015. Available at: https://ec.europa.eu/energy/sites/ener/files/documents/5_2%20PCI%20annex.pdf

priorities, a better access to information and statistics about gas and electricity prices and costs by consumers (households and industry) shall be done in an improved and transparent way. There is a clear recommendation to improve interconnection between the countries in region (explicitly mentioning Poland, Germany, and the Czech Republic).[83] Questions like energy poverty, administrative burdens, market price differences and energy market integration should be addressed further on.

For the **energy security** 2015 was a year full of events – tensions between Russia and Ukraine, low oil prices, additional supply infrastructure initiatives for natural gas from Russia, nuclear deal with Iran are just some of them that are worth mentioning. Although Ukraine proves its reliability as the transit country and EU is actively involved in negotiations with both Ukraine and Russia, the reverse flow infrastructure allows the EU to export gas to Ukraine as well if deemed necessary. EU diversification of energy supply routes has been aimed at projects between Russia and Germany (Nord Stream). It is certainly important to mention a clash over the Nord Stream as Visegrad countries oppose the Nord Stream 2 project and its further expansion which is on contrary favoured by Germany. This situation complicates the V4-German relations when it comes to energy.[84] Recent discoveries in East Mediterranean[85] could in the future contribute to energy security similarly as re-launch the talks about Trans-Caspian pipeline. Another issue that has been addressed is the oversupply of electricity in some countries. The questions expected to be discussed include the revision of the Regulation on Security of Gas Supply, mitigating the supply shocks and solidarity in case of emergency. Diversification from the Russian supply will be the case for Member States (the Czech Republic, Hungary, and Slovakia among others).[86]

The last but not least, there is the issue of **research, innovation and competitiveness** was aimed at better coordinating and prioritizing across Europe. Several financial tools were used in 2015 and will continue to operate – European Fund for Strategic Investment,[87] EU

[83] EUROPEAN COMMISSION. *State of the Energy Union 2015* [online]. November 2015. Available athttp://eur-lex.europa.eu/resource.html?uri=cellar:ebdf266c-8eab-11e5-983e-01aa75ed71a1.0008.02/DOC_1&format=PDF, p.7-9

[84] DENKOVA, Adela; GOTEV, Georgi. Tusk joins „Visegrad Four" in attack on Nord Stream 2 [online]. 2015. Available at: http://www.euractiv.com/section/energy/news/tusk-joins-visegrad-four-in-attack-on-nord-stream-2/

[85] THE GUARDIAN. *Eni discovers largest known gas field in Mediterranean* [online]. August 2015. Available at: http://www.theguardian.com/business/2015/aug/30/eni-discovers-largest-known-mediterranean-gas-field

[86] EUROPEAN COMMISSION. *State of the Energy Union 2015* [online]. November 2015. Available at: http://eur-lex.europa.eu/resource.html?uri=cellar:ebdf266c-8eab-11e5-983e-01aa75ed71a1.0008.02/DOC_1&format=PDF, p. 10-12

[87] An initiative of European Investment Bank Group and European Commission to mobilize private financing for strategic investments which should help to overcome the current investment gap in the EU. For further details see EUROPEAN INVESTMENT FUND. *EFSI – Investment Plan for Europe: boosting jobs and growth* [online]. Available at: http://www.eif.org/what_we_do/efsi/

Emissions Trading System[88] (Innovation Fund, Modernisation Fund) and Horizon 2020 Framework.[89] In 2016 a finalized integrated Energy Union strategy for research, innovation and competitiveness will be presented. Private investment, bottom-up research and digitalization of the energy and transport sectors should be promoted. More environmental and growth friendly tax systems shall be introduced by member states which will contribute to Energy Union objectives.[90]

To sum up, past year was a year of dialogues and process for gathering the much clearer picture of the opportunities, strengths and weaknesses of the Energy Union project. There is an urgent need for much more strategic planning at national levels while producing the long-term national plans. In 2016 the Commission "*intends to come forward with guidance on how to strengthen regional cooperation in the broader sense and how the Commission can facilitate regional approaches.*"[91] 2016 will be, according to the State of the Energy Union, a year of delivery in which the strategic vision will be translated in more concrete EU-level initiatives.

8 Conclusion

The field of energy, its supply and production, security and cooperation activities are currently the top priorities internationally, regionally and domestically. The information presented in the paper should give the readers a brief overview of the cooperation in the field of the Energy Union within the EU and energy collaboration of countries forming the Visegrad Group and their important neighbours.

The national overviews presented some general facts and similarly the introduction to regional cooperation within the EU and V4 in particular explains the main topics of discussions currently being held. To summarise some of the most crucial topics that need to be addressed and developed further these include the emission standards and effective enforcement of them, information barriers within states and between them, lack of financial tools allocated for development of research and infrastructure, access to information about prices and its transparency, interconnections, administrative barriers, market integration, mitigating the

[88] A part of the EU policy to combat the climate change and tool for reducing industrial greenhouse gas emissions. For more details visit: EUROPEAN COMMISSION. *The EU Emissions Trading System (EU ETS)*[online]. Available at: http://ec.europa.eu/clima/policies/ets/index_en.htm

[89] The biggest EU Research and Innovation programme with €80 billion of funding available over 7 years. It is an initiative aimed at securing Europe's global competitiveness. For more information see: EUROPEAN COMMISSION. *What is Horizon 2020?*[online]. Available at: https://ec.europa.eu/programmes/horizon2020/en/what-horizon-2020

[90] EUROPEAN COMMISSION. *State of the Energy Union 2015*[online]. November 2015. Available athttp://eur-lex.europa.eu/resource.html?uri=cellar:ebdf266c-8eab-11e5-983e-01aa75ed71a1.0008.02/DOC_1&format=PDF, p. 13-14

[91] Ibid., p. 15

supply shocks, diversification of energy supply, private investments and bottom-up research. Such topics are very broadly defined and therefore leave a great space for ever-closer regional cooperation.

Special focus of the V4+ could be then, according to the steps taken already, given to the gas market integration, sufficient resources allocation, expert group regulation, setting and promoting energy security agenda, infrastructure development, erasing the legislative barrier, interconnectivity or new routes of energy supplies.

This short summary is, however, far from being comprehensive and in-depth focused. It is highly recommended to consult also other sources mentioned in the next chapter called Useful Information Sources and to do a broader reading on this topic in order to be able to participate in discussions to the full extent with understanding the facts and connections. The Energy Union is a young child of the European Union but it does give an important tool to the countries of the V4, Germany and Austria to stress out their importance, close ties and have their voice heard on a broader forum.

Useful Information Sources

Visegrad Group

http://www.visegradgroup.eu/

- Official websites of Visegrad Group where its areas of interest, including the energy sector, could be found along with relevant declarations and joint statements

European Commission websites – Energy Union and Climate

http://ec.europa.eu/priorities/energy-union-and-climate_en

- Comprehensive insight in the Energy Union, its implementation and relevant basis documents shall be the core of further research. The EC publishes not only its communications but also factsheets on the Energy Union and national progress

State of the Energy Union

http://ec.europa.eu/priorities/energy-union-and-climate/state-energy-union_en

- Broad range of progress being made on the field of the Energy Union including relevant documents and analyses

International Energy Agency

http://www.iea.org/

- Organisation of 29 member states producing a valuable publications, extensive research and analyses on the national energy sectors including all type of data, international statistics not excluding

CIA World Factbook

https://www.cia.gov/library/publications/the-world-factbook/geos/bf.html

- Good source of information and figures produced by US Central Intelligence Agency

National Strategies of the V4 Countries, Germany and Austria

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