New Energy Security Policies in Europe: Making All Quiet on Western Front

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Abstract

This paper is focused on the problem of energy security in Europe, particularly on security of natural gas supplies. Regarding the problem of high dependence on import of natural gas from the third countries, this paper is aimed on finding political pathways to reduce dependence of European countries from most unreliable natural gas supplier – Russian Federation – through establishing solid political agenda with other countries, which are important for natural gas supplies to Europe, as well as important for procedure of gas transit.

This paper will use the method of network analysis and process-tracing in order to investigate, which countries increase its importance for natural gas supplies to Europe by 2030, as well as its importance as countries who performs transit of gas and its distribution within European gas pipelines network. We will also investigate current relations between EU and these countries in order to indicate, whether these relations include "energy component", aimed on common rules, principles and understandings for natural gas supplies security.

The main findings of this paper show that at current stage relations between EU and countries, important for gas natural supplies and transit are limited in sense of energy security provision.

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Note on abbreviations and definitions

Since in this work technical aspects of gas transportation will be used very actively, as well as the same terms applied to the technical and commercial side of the transportation of gas, it is necessary to describe a series of abbreviations, which will later be used in the text of this work.

Bln – billions.
Mln – millions.
Bcm – billions cubic meter of gas.
Tcm – thousands cubic meter of gas.
USD – United States Dollars (equivalent of year when applicable).
MMBtu – Million of British thermal units.
GWh/d – Gigawatt per hour per day.
GTS – Gas Transportation System.
LNG – liquefied natural gas.

Moreover, hereafter, we will distinguish between pipelines, which are going *through* the country, and pipelines, which are going *to* the country. When the pipeline is going through the country, it just work as a carrier of a natural gas to the third country, while not supplying gas to the countries through which it goes. When the pipeline goes to the country, the country's consumption of natural gas is directly supplied by this particular pipeline.

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Introduction

Why should we be concerned about the topic of energy security? The answer to this question conceals three components: the first - why do we need energy, the second - what could be the consequences of a breach of energy security to particular country, the third - what is wrong with ensuring security of energy supply in the modern world, particularly in Europe as a whole?

The answer to the first question is pretty obvious: energy derived from any type of energy supplies is necessary to provide basic needs: heating, cooking, generating electricity, provision of production capacity, and so on.

What may result in a violation of energy security? The answer to this question is also quite simple: "[a]ny longer interruption of a steady and plenty flow of energy would massively harm a nation's economic output, political stability and the personal wellbeing of its citizens" (Bauman 2009, p.4).

The third question, however, is more complex. Natural gas is one of the most common energy supply used for energy extraction in Europe, and the share of natural gas in structure of energy supplies consumption in Europe will increase by 2030 (Rather et al. 2013). Prevalence was not able to surpass even after dropping of coal prices in the mid-2010s. Undoubtedly, the world's natural gas reserves in deposits explored to date are enough gas for supplying to Europe in the years ahead[1]. The problem here is the structure of the European gas market, or more precisely - the structure of the main suppliers of natural gas to Europe.

The “market” of natural gas suppliers is extremely limited on the “set” of the main suppliers, and as it will be showed below to a greater extent is an oligopolistic market - a market with imperfect competition, which is dominated by a limited number of players.

[1] By the year 2011 common amount of natural gas consumption in EU was 459 billions of cubic meters (CIA 2011), when proven gas reserves only in Russia contain 4770 billions of cubic meter of natural gas (EIA 2014).

Limited number of suppliers of gas in the gas market is due to the geographical distribution of gas fields - they exist not everywhere, and still less present as deposits, economically "suitable" for the commercial production of gas.

Although the gas market, which exists in the form of oligopoly, as itself also presents a problem for the European gas consumers due to the greater bargaining power of gas suppliers, it is a much bigger problem who (or rather - which countries) occupy the largest market share in supply of natural gas to Europe. In different years, European countries have exported a significant amount of gas from Russia, Nigeria, Qatar, Libya, Algeria and Norway. All these countries except Norway are authoritarian[2], and two of them - Nigeria and Libya - in the last five years have experienced serious internal political and armed conflicts. At the same time, in 2013 more than 70 % of its natural gas exports to Europe were of Russian origin (European Commission 2013).

Since the market for the supply of natural gas to Europe is oligopolistic, the issue of formation of gas prices for specific customers, the conditions of supplies and transit of gas in the first place are the subject of political agreements, and not formed solely by market conditions. Thus, the presence of mostly authoritarian countries in the market of gas suppliers generates additional risks due to the unpredictability of political behavior inherent to authoritarian leaders.

Most "fragile" player in this regard is the Russian Federation. The share of Russian gas in the gas supply in different countries of the European Union in 2012 fluctuated from 24% to 100% (see chart below). At the same time over a long period, Russia was the largest supplier of gas to Europe, giving "palm of gas championship" to Norway only in early 2014 (in case if European trade statistics is "cleaned up" from deliveries to Turkey) (Euractiv 2014).

[2] According to the classification of Freedom House, in 2013 Algeria, Qatar, Libya and Russia were "Not Free" countries (Freedom House 2013a, 2013b, 2013c, 2013d), Nigeria - "Partly Free" (Freedom House 2013e).

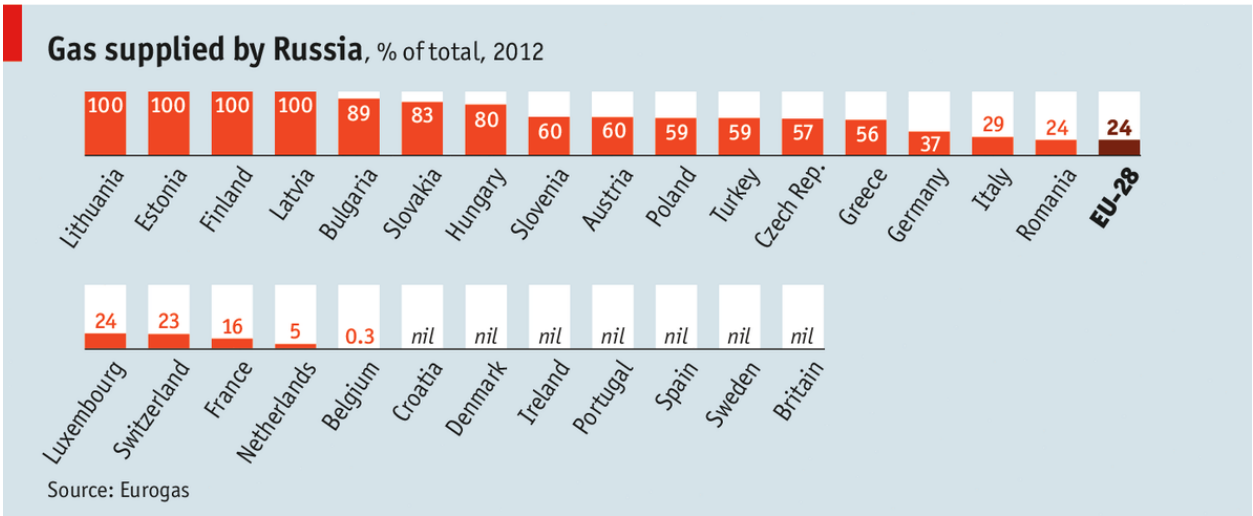

Figure 1. Specific share of gas supplies from Russia in the structure of the gas consumption in the European Union.
Source: Economist 2014.

At the same time Russia is a supplier of gas, which is the most prone to binding gas prices to political arrangements and concessions, as well as to the use of natural gas prices and manipulate the terms of gas supplies (so-called "gas lever") for political pressure on European countries. Thus, for comparison (not currently going into the details of pricing in specific cases; for details see: Balmaceda 2013; Balmaceda 2014), the price of Russian gas to Germany, taking into account transportation costs is about 450 dollars per thousand cubic meters, to Lithuania - about 470 dollars, to Belarus - about 250 dollars[3].

In addition, during the 2000s, Russia repeatedly demonstrated behavior jeopardizing energy security in Europe, not so much because of excessively high gas prices, but because of the natural gas supply stops westbound through the Ukrainian gas transportation system. Actual physical stop gas supply was the result of two so-called "gas wars" between Ukraine and Russia, which took place in 2005-2006, and 2009.

[3] To understand the meaning of price difference: the GDP per capita in Germany is 37 thousand dollars (IMF 2014a), Lithuania - 22 thousand dollars (World Bank 2014a), Belarus - 15 thousand dollars (World Bank 2014b).

In late 2005, “Gazprom” suggested to the Ukrainian side to raise the price of Russian gas to the level of European average price in exchange for an increase in tariffs for transportation of Russian gas through Ukrainian GTS. This proposal actually contradict existing contract for the supply of Russian gas to Ukraine until 2013, which resulted in the rejection of the proposal by the Ukrainian side. As a result, the Russian side has suspended gas supplies to Ukraine, while maintaining at the same time the supply of gas to Europe. To provide themselves with gas, Ukrainian side began siphoning gas off, which resulted in a reaction from the Russian side in the form of lowering gas pressure in the gas transmission system, which in turn resulted in a decrease in the volume of gas delivered by European consumers.

In late 2008 - early 2009 began the second round of the “gas war” between Russia and Ukraine, associated with commercial issues of payment for the supply of Russian gas, as well as a sharp increase in the price of natural gas for Ukraine. In addition, as a result of agreements between representatives of “Gazprom” and the Government of Turkmenistan, Turkmen gas supplies to Ukraine were eliminated. The result of the “second gas war” was, first, the cessation of gas for Ukrainian consumers, then - decline in gas pressure, and later - the complete cessation of gas supplies to European consumers. Russian gas supplies to several European countries fell from 75% to 100% of the total supply, forcing local gas operators begin selection of gas from underground gas storage facilities (see: Balmaceda 2013).

In addition, in 2005 there was a gas conflict between Russia and Belarus. “Gazprom” has offered the government of Belarus to move away from a barter payment scheme for gas supplies to Belarus, as well as raise the price of gas supplied to the Republic from 105 dollars per thousand cubic meters to 165 dollars per thousand cubic meters. General Director of “Gazprom” Alexey Miller stated that in case of refusal to retreat from a barter scheme and disagreement with rising gas prices, the Russian side may terminate the supply of natural gas

to Belarus, which in turn, could cause a reduction in Russian gas supplies to European consumers (see: Balmaceda 2014).

Thus, Russia has repeatedly demonstrated a desire to use the energy component to exert political pressure on neighboring states, especially those that are most dependent on energy supplies from Russia. After the Russian-Ukrainian gas war, several countries in Central and Eastern Europe, the most dependent on Russian gas supplies, hastened to declare Russia as an unreliable energy partner.

Result of gas wars between Russia and Ukraine has become a series of plans to reduce energy dependence of European countries on gas exports from Russia. For example, European countries began to buy more of Norwegian gas (see: Söderbergh 2009), LNG gas port started to be constructed in Polish city Swinoujscie (Hydrocarbons 2006), and European Commission began to build long-term plans to import natural gas from Algeria and Trinidad and Tobago through the construction of an LNG terminal in Spain (Kommersant 2006). In addition, as response to the gas wars and insecurity Russia as an energy partner also became unrealized pipeline project “Nabucco”, envisages gas supplies from Central Asia (Euractiv 2007).

In this connection, the question for the European Union is: how to reduce dependence on Russian natural gas supplies? The most common answer to this question suggest diversification of energy supply sources, including gas, as well as switching to other types of energy supplies: coal, renewable energy and nuclear energy (Rather et al. 2013). In addition, the European Commission has developed a number of legislative measures, such as, for example, so-called “Third Energy Package” (European Commission 2014), as well as number of antitrust investigations was conducted, undermining Russian monopoly position in the European gas market (European Commission 2012).

At the same time, the specific percentage of Russian gas in total gas is high enough, and can not be easily replaced with other types of fuel. At the same time alternative projects of gas supply through the construction of new branches of the pipeline supplying gas from Central Asia, firstly, are high costly, and secondly, require a relatively large amount of time to implement them. Anyways, over the next few decades European consumers in one way or another will be depend on the supply of Russian gas, and hence - to the whims and unpredictable behavior of the Russian government.

Thus, one of the options to ensure Europe's energy security is increase of the predictability of Russia as an energy supplier, which can be reached by implementation of a number of measures aimed at increasing the bargaining power of the European countries and the European Union as a single actor. For this purpose, the European Union needs to develop a common policy of cooperation with countries that are important for the transit of Russian gas, thereby neutralize impact of Russia on them. The main argument here is the fact that almost 70 % of Russian gas intended for export is delivered to Europe, which in turn makes Russia dependent on European consumers as well.

For example, Russia is trying to avoid its dependency on countries, which are important for the transit of Russian gas due their geographic location through the building of the “South Stream” and “North Stream” gas pipelines, as well as through plans to build “Yamal – Europe 2” pipeline. Russia also is trying to avoid its dependency on Belarusian gas pipeline “Yamal – Europe” and Ukrainian gas network through the attempts to create common pipeline managing consortium, at the same time manipulating on gas prices for Ukraine. Big threat for the sustainability of gas supplies from Russia as well is the so-called “shale revolution” in the United States, which according to some forecasts will lead the USA to the status of a net exporter of natural gas (Platts 2014). At the same time Russia is

threatened by EU strategies of energy supplies diversification, which may lead to the political and trade conflicts up to suspension of gas supplies to European countries.

However, what countries are important for the transit of Russian gas to Europe and Europe's energy security as a whole? Does the European Union have unified strategy of interaction with these countries in matters of energy? Does the EU act as a single actor or as a set of separate countries when it comes to interaction with countries critical to Europe's energy security and transit of Russian gas? Answers to these questions, as well as specific policy-recommendations will help to ensure the security of gas supplies to Europe in the long run, through the inclusion of an “energy agenda” not only in sense of the diversification of energy resources, but also in sense of issues relating to the political component of international relations.

Thus, our **research question** is: is EU relations agenda to countries, which are important for transportation of Russian natural gas, adequate in order to maintain energy security of Europe, considering future plans of building natural gas pipelines?

Here we **hypothesize** that current framework of relations between these countries and EU is inadequate in sense of lack of attention to energy security issues, while Russia pays significant attention to the “energy component” of relations with politically unstable countries.

Overall argument of our paper is that EU in order to maintain energy security has to develop a new strategy of relations with politically unstable countries which are important for transportation of Russian natural gas, paying much more attention to energy issues component. Firstly, it is necessary to prevent them from being “captured” by Russian influence, secondly, because some of those countries experience(d) serious political changes

(e.g. Algeria, Egypt, and Ukraine – especially after recent events in Crimea), or are members of the Eastern Partnership program (Ukraine, Belarus).

This paper is structured as follows. In the second part we will describe main concepts which will be used for our research, especially on features of European gas market functioning. In the third part we will describe the chronology and important features of two so-called “gas wars” between Ukraine in Russia, which will help us to understand why and how Russian jeopardizes energy security in Europe. In the fourth part we will describe network analysis methodology, its relevance to our analysis, as well as results on which countries are important for gas delivery, supply and distribution to the European gas market. In fifth part we will analyze current relations of EU with those countries in order to investigate if EU has solid political agenda with concern to the energy issues, which will help to reduce Russian dominance on European gas market. In sixth part we will describe our conclusions.

Chapter 1. Theory and concepts

1.1. The concept of energy security

Despite the fact that the concept of energy security includes up to 20 dimensions and 370 definitions (Cherp 2009), for simplicity we will use the most common definition. Hereafter, the energy security will be understood as "[r]eliable supplies at [a] reasonable price" (Bauman 2009, p.4), understanding by "supplies" natural gas. At the same time the concept of energy security includes so-called "triad": supply security, sustainability and competitiveness (Ibid).

Thus, energy security implies a protection of supply materials (resulting in a rough example in relation to natural gas - protection against unauthorized siphoning), the continuity of gas supply, i.e. no interruption in the gas flows, and the possibility to choose between different suppliers. Under interruptions in gas flows we will imply the absence of gas in the gas transportation system and the need for gas extraction from underground gas storage facilities.

Talking more specifically on the European natural gas market, taking into account its oligopolistic nature, we can say that energy security in the European market can be ensured by a presence of a sufficient number of natural gas transit pipelines, as well as the lack of gas suppliers, having greater bargaining power than gas consumers.

Besides the "components" described above, the concept of energy security also includes four dimensions: internal policy dimension, economic dimension, geopolitical dimension, security policy dimension (Ibid, p.5). In this paper we will focus primarily on the geopolitical dimension, which concerns the security of Europe-wide trade in energy commodities. Focus on the geopolitical dimension will be made for the reason that the object of our analysis will be the relationship between the countries, which are not included under umbrella of common rules, when rules are elaborated situationally: in this case the

commercial issues of gas supplies, gas supply conditions and political concession, on which conditions for the supply of gas are based, are directly interconnected.

1.2. Oligopoly market

Why do we think that the European gas market is oligopolistic? Technically, we can call market "a competitive market", when there is a sufficient number of service providers, which allows to "change" service provider without any losses for customer, as well as the entry costs on which are relatively small.

At the same time, as mentioned above, the European natural gas market is limited by the number of suppliers, and the entry costs are prohibitively high because of geographically uneven distribution of natural gas fields.

Level of competition among providers in any market is most often determined on the basis of the so-called Hirshman-Herfindahl Index (hereafter - HHI), firstly invented in (Hirshman 1964), which "is calculated by squaring the market share of each firm competing in the market and then summing the resulting numbers (the higher the index, the more concentrated the market)", when "[m]oderate concentration: 750-1800, high concentration: 1800-5000; very high concentration: above 5000" (European Commission 2011).

For all European countries for which statistics are available, HHI indicates a high concentration of natural gas suppliers. In other words, a high concentration represents a small number of providers, and thus features a market as oligopoly (distribution of HHI for European gas market see in Table 1).

Country	HHI
Austria	3371
Belgium	3000
Bulgaria	2318
Czech Republic	5370
Denmark	5600
Estonia	>7500
France	4374
Germany	1886
Greece	7912
Hungary	2875
Ireland	6009
Italy	2575
Latvia	10000
Lithuania	6048
Luxembourg	9068
Netherlands	6535
Poland	9600
Slovakia	7388
Slovenia	5748
Portugal	2445
Sweden	Approx. 5000
United Kingdom	1245

Table 1. Hirshman-Herfindahl Index for gas market for European Union member countries (where available).

Source: European Commission 2011.

1.3. Bargaining power

The concept of "bargaining power" came to the social sciences from labor economics, to be exact - from the analysis of the relationship between employees and employers, and the influence of trade unions on the ability of employees to influence the determination of the level of wages. Despite the long history (theoretical problems associated with the analysis of the phenomenon of bargaining were formulated by John Nash (Nash 1950)), the concept of "bargaining power" is not clearly defined, and its applicability has been questioned by some researchers. Thus, the bargaining power is described as "blurred analytical construct in the collective bargaining literature" (Bacharach and Lawler 1981, p.220), as well as a concept that is both "complex and non-monolithic" (Rubin and Brown 1975, p.233). In addition, the concept of bargaining power is described as "notoriously slippery" (David and Sebenius

1986, p.249), and as concept against which arises "the general question whether the concept of unequal bargaining power is fruitful, or even meaningful" (Ibid). In general, "economic literature reveals a serious lack of agreement as to its definition and importance" (Posner 1986, p.102).

The most significant factor affecting the level of bargaining power of actors, regardless of their number in a particular bargaining situation, is the unequal distribution of resources among them (Knight 1994; Knorr 1977; Hirshman 1980). Thus, according to Hirschman, "superior bargaining power enables one monopolist <...> to increase his gain at the expense of that of his partner" (Hirshman 1980, p.45).

At the same time, resources here are understood in the broadest sense and not only as material resources. For example, considering the situation of negotiations with the employer on the employee salary increase, "resources" of the employer, which are giving him an advantage in the negotiations will be the amount of free labor in the labor market: in other words, the easier it will be to hire a new employee, the more difficult it will be for the employee to agree on wage increase.

Inequality in the distribution of resources between the contracting parties, however, is significant, but not the determining factor in the outcome of the negotiations. Thus, in the case of negotiations, which are including the economic component, Wagner pointed out that the "<...> asymmetrical economic interdependence does not imply that one bargainer will be able to exercise political influence over another" (Wagner 1988, p.462). Putnam and Schelling (Putnam 1988; Shelling 1960), in turn, separately from each other developed model, showing that the party with less bargaining power can make more credible claims, increasing their bargaining power.

Thus, the concept of bargaining power does not allow us to fully use it to describe any negotiation situations, whether political negotiations or commercial negotiations which include political concessions. However, the existing literature allows us to identify the main factors influencing the level of bargaining power that allows us to develop our own definition of bargaining power in relation to the situation of oligopolistic market of natural gas.

In general, bargaining power can be viewed as a set of conditions, benefits and constraints that the market imposes on the negotiating parties. As pointed out by Fletcher, "<...> the competitive situation in the market in which the transaction takes place and all restraints and repercussions each party must face in all related markets enter as determinants of bargaining power" (Fletcher, 1961, p.2). In turn, Leap and Grigsby, referring to Cohen pointed out that the

> "<...> the triggering forces affecting bargaining outcomes are environmental variables, especially those of an economic nature. Environmental characteristics are seen as shaping organizational characteristics <...>, structural characteristics (formal bargaining structure and extent of pattern bargaining), and the negotiation process" (Leap and Grigsby 1986, p.203).

Thus, we need to determine what structural and organizational conditions affect the ability of the parties to agree on certain conditions with respect to supply on the natural gas market. Because of this we can determine, by changing of what conditions the bargaining power of consumers of natural gas which may be increased. At the same, hereinafter member countries of the European Union will be treated as a single actor or negotiator having total bargaining power of all EU member states.

In fact, the bargaining power in the market of natural gas is mainly influenced by two parameters: the amount of available resources and the availability of use of additional

resources, as well as saliency. At the same resources can be both material and institutional, symbolic, etc.:

> "bargaining power is affected by resources available to the parties as well as by constraints operating in the bargaining relationship. <...> In an exchange relationship <...> the ability to provide, obtain, and withhold resources is key to power" (Leap and Grigsby 1986, p. 204-205).

Size of "controlled" resources allows to increase bargaining power due to the use of the unused resources, thereby increasing the size of enacted bargaining power due to the use of potential bargaining power[4].

Several theorists of international relations also determined saliency as the most important resource that affects the outcome of the negotiations. Saliency plays a role even higher in the case of asymmetric economic interdependence. Thus, the oligopolistic market is not giving an exceptional advantage in the negotiations only to gas suppliers due to even a small ability of consumers to "switch" between suppliers. Suppliers, in any case, are dependent on the consumer: de facto without consumers it is not possible to generate supply revenue. Therefore consumers' saliency here acts as an important resource of consumers in negotiations.

Thus, in the case of natural gas market, we decide saliency of negotiator *i* (S*i*) as

$$S_i = C_i + R_i, \qquad (1)$$

Where C*i* is the volume of gas consumption of negotiator *i*, and R*i* - disposable resources of negotiator *i* regardless of their type. We include the level of consumption in the saliency based on economic interdependence of consumers and suppliers of natural gas: in

[4] As Leap and Grigsby argues: "A theory of bargaining power should distinguish between power that is available (potential power) and power that the parties actually use (enacted power)" (Ibid, p.205).

fact, gas suppliers are highly dependent on large consumers of gas as the main generators of profit, which gives consumers an additional advantage in the negotiations.

Moreover, taking into account oligopolistic nature of gas market, while also taking into account the possibility of diversification of energy sources by consumers - both internal and external, due to the "change" of supplier - the bargaining power in the case of natural gas market should also include the consumers' desire to buy gas at the proposed price (WPP*i*). Then the bargaining power of the negotiator *i* is assumed to be

$$BP_i = \frac{C_i + R_i}{WPP_i} \qquad (2)$$

Given that we accept buyers in the European natural gas market as a single actor, the formula of bargaining power in this case of natural gas market takes the form:

$$BP = \sum_{i=1}^{n} \frac{C_i + R_i}{WPP_i} \qquad (3)$$

Thus, increase of the bargaining power in the market of natural gas is possible if one of two conditions is reached: with increase of resources available to the actors, as well as reducing the desire of consumers to buy gas at the proposed price[5]. Thereby increase in disposable or use of untapped resources is the most affordable means of increasing the bargaining power in the case of the natural gas market.

1.4. Our workhorse model

Given the economic interdependence of suppliers and consumers in the European natural gas market, we consider the European gas pipeline network as one of the resources that can be used to increase the bargaining power when negotiating on the supply conditions of Russian natural gas. European gas transmission network can be activated as a resource due to the limitation or granting special rights of access thereto for the natural gas suppliers. This

[5] Here we assume that the level of gas consumption by European countries is not growing fast enough from year to year.

negotiation approach has been already used in the discussion on the conditions of access to the OPAL pipeline for Russian gas transported through the pipeline "Nord Stream" (Jamestown Foundation 2014).

Thus, we need to find out which areas of the European gas pipeline network, to be exact - which countries as its "carriers" - are critically important for transporting natural gas to Europe.

At the same time, cooperation with countries on the issue of the use of their gas transportation systems as specific negotiation resource requires the development of a special political agenda, regardless of whether such countries are members of the EU or not.

Above we considered the concept of energy security as a "triad" of factors, and defined a continuous gas flow and supply security as two important elements of energy security in Europe. This allows us to use network analysis approach as a method for determining the level of energy security by calculating the vulnerability and robustness of European gas network system, determined by the configuration of European gas transmission system, as well as for determining which countries are important for the transport of natural gas to European countries.

It is important to notice, in this respect, that such approach is not new. The research conducted in (Vedres and Scotti 2012) has used methods borrowed from food web analysis (Ulanowicz 1986) to investigate, how the importance (hereafter, dominance) of different countries for natural gas supplies to Europe will change by 2020 and 2030, considering the plans to build new gas pipelines in Europe. Moreover, the research has shown that the plans to build new pipelines will increase the dominance of politically unstable countries.

However, first, this study appears to us as a study, the results of which must be updated. As Vedres and Scotti wrote, "our dataset describes the gas pipeline network at three

points in time: the present (2008), the first step of construction (up to 2020), and a second step of construction (up to 2030)". Thus, estimating the changes that were to occur in the European gas transmission system, the authors used the system configuration that existed in 2008, as well as plans to build new pipelines, which also existed in 2008.

We consider network analysis as relevant method here, because, according to (Vedres and Scotti 2012, p.229) "there are many analogies between food webs and the gas pipeline network". We will expand analysis conducted in (Vedres and Scotti 2012) by making flow betweenness test for European gas pipeline network.

Secondly, we want to investigate current and past relations of countries, important for gas transition, with and the EU using **methods** of **process tracing** (Beach and Pederson 2013). Since the dominance of such countries may increase, we want to see the specificities of these relations and its linkage to questions of energy security, gas prices and usage of gas pipeline in those countries which are important for transportation of Russian gas. We justify these methods as relevant because we have to trace dynamics and content of energy issues component included in EU with countries, important for transit of natural gas.

Chapter 2. How Russia treats energy security in Europe

2.1. Ukraine-Russia gas dispute 2005-2006

Concerns about dependence on Russia as one of the largest suppliers of natural gas to Europe comes back to the Ukrainian-Russian gas conflict happened in late 2005 - early 2006, which is better known as "the first Ukraine-Russia gas war". Briefly summarizing, concerns are based on opinion that Russia, using its position of gas oligopoly will put forward extremely unfavorable conditions of gas supplies for countries dependent on Russian gas, using as main argument so-called "gas lever" - the threat of a possible termination of gas supply.

In the case of the first gas war (as well as "second gas war") counterpart of Russia was Ukraine. Given the importance of the Ukrainian gas transportation network for the supply of Russian gas to Europe[6], Russian threats to cut off gas supplies to Ukraine generated risks to halt gas supplies to many European countries. The unpredictability of the Russian government, as well as the dependence of the stability of energy supplies to Europe on Russia's conflicts with third party, forced European countries to seek ways to diversify sources of natural gas supplies. At the same time, understanding what caused the different strategies of energy diversification is impossible without considering the essence of the Ukrainian-Russian gas wars.

Why do we consider the first and second gas war between Russia and Ukraine as political conflicts, and not commercial? First, the sale of energy resources brings significant revenue to the budget of the Russian Federation, and a monopoly on the supply of Russian natural gas has a vertically integrated public company "Gazprom", control over the activities of which is the direct responsibility of the president of Russia (2005-2006 - Prime Minister) Vladimir Putin (see: Minchenko Consulting 2013). Secondly, in a certain stage the conflict

[6] Through the Ukrainian gas transportation system annually up to 142 Bcm of natural gas are transported, which are supplied to Slovakia, the Czech Republic, Austria, Germany, France, Switzerland, Slovenia, Italy, Poland, Hungary, Serbia, Bosnia, Romania, Bulgaria, Greece, Turkey, Macedonia (Eastern European Gas Analysis 2013).

came to the government level, and its resolution become dependent on the top political leadership of Ukraine and Russia. Third, in the world practice commercial conflicts of such kind in the majority of cases are resolved without public coverage, while the Ukrainian-Russian gas war was widely reported in the Russian media, considering the fact that the nature of coverage was highly politicized.

In general, first Ukrainian-Russian gas war progressed by the following chronology. The immediate cause of the war was a conflict on the establishment of a consortium to manage the Ukrainian gas transportation system, which began in March, 2005. In early March, President of Ukraine Viktor Yushchenko held talks with the head of the German gas company Ruhrgas Burchard Bergman on the establishment of a joint Ukrainian-Polish-German consortium for supplying Russian (and possibly Central Asian) gas to Europe. At the same time Ukraine allocated a syndicated loan in the amount of 2 bln USD for the construction of the Odessa-Brody-Plock-Gdansk pipeline, as well as for investment in the development of gas production on territory of Ukraine with the participation of Kazakh companies (RusNewsJournal 2005).

Creation of the Ukrainian-Polish-German consortium managing the Ukrainian gas transport system potentially could rule out any possibility for the Russian side to influence the terms of Russian gas supplies through and to Ukraine, and would also increase the bargaining power of European consumers and the Ukrainian side by increasing the number of stakeholders who have influence on decision on the terms of Russian gas supplies through and to Ukraine.

On March 19, 2005 negotiations between Vladimir Putin and Viktor Yushchenko was held on the participation of the Russian side in the consortium to manage the Ukrainian GTS. It is not reported to what specific conclusions parties came by following talks, but in an interview given after the meeting Viktor Yushchenko said that the control over Ukrainian

GTS will remain solely in charge of the Ukrainian side. Thus, formally, the outcome of the talks was the failure of Ukraine to participate in a consortium together with Poland and Germany (Podrobnosti 2005).

Three days later, March 22, 2005, an official visit of Viktor Yushchenko to Turkmenistan was made, during which different consortium management structure has been discussed: it had to include Turkmenistan, Kazakhstan, Russia and Ukraine. Decision on a development plan for its creation was made as well (Jamestown Foundation 2005b).

Returning to Ukraine by end of the visit, Viktor Yushchenko said about the need for full withdrawal from a barter payment scheme for Russian gas and increase of the cost of transit of Russian gas from 1.09 USD to the level 1.75-2.0 USD per 100 kilometers. The President also criticized the company “RosUkrEnergo” - official intermediary for the sale of gas between “Gazprom” and the Government of Ukraine - for opaque and non-market methods of doing business for the sale of Russian gas to Ukraine (Rbc.ru, 2005).

Just over a month later the first reaction to the demands of the Ukrainian side to increase the cost of transit and withdrawal of barter scheme came. On April 26 in Kiev negotiations between Ukrainian President Viktor Yushchenko, Prime Minister Yulia Tymoshenko, and CEO of “Gazprom” Alexei Miller were held. The reason for the negotiations was accused stealing of 7.8 bcm of Russian gas pumped into Ukrainian underground gas storage facilities, made by Ukrainian side.

Question about the loss of Russian gas has not been resolved, and on July, 6 response to the proposals of the Russian side were “expanded”: during a meeting of Alexey Miller and Minister of Fuel and Energy of Ukraine Oleksiy Ivchenko Miller stated the need to raise the price of Russian natural gas for Ukraine from 50 to 160 USD/Tcm to equalize the prices with the average European price (Lenta.ru 2006).

After this, as a possible attempt to diversify sources of natural gas supplies to Ukraine was chosen Turkmen gas. On September 8 2005 Ivchenko said about the possibility of purchasing up to 60 Bcm of Turkmen gas per year. A little bit later an agreement on the supply of natural gas with the government of Turkmenistan was signed. However, less than three weeks later, four-year agreement was signed between “Gazprom” and Uzbek company “Uztransgaz”. The agreement undermined managing structure of Turkmen transit gas through Uzbekistan, which formally made “Gazprom” as main operator of the full amount of Turkmen gas transported westward. On the same day, the Chairman of the Board of “Gazprom” Alexander Ryazanov said that outside of already contracted volumes of gas there is no possibility to supply Turkmen gas until 2028 (Gazprom, 2014).

Thus, after this the possibility of diversification of gas supplies by Turkmen gas for Ukraine was de facto terminated. Attempts of the Ukrainian side to agree on gas supplies directly with the Turkmen government failed: the Turkmen side refused to sell gas without the mediation of “Gazprom” as the operator of supplies.

Thus, the Russian gas has become the only possibility to ensure supplies of energy for Ukraine. On November 11 negotiations between representatives of “Naftogaz of Ukraine” and “Gazprom” ended in vain: Russian side continues to insist on raising the price of Russian gas to 160 USD/Tcm for Ukraine (Pravda.com.ua, 2005).

On November 23 during phone conversation Ukrainian President Viktor Yushchenko said to Russian Prime Minister Mikhail Fradkov that the new price of 160 USD/Tcm is unacceptable for Ukraine and will not be paid. On the same day Fradkov announced the cancellation of his visit to Kiev, during which signing of a new agreement on gas supplies to Ukraine was scheduled. Furthermore, the proposal for payment of gas supplies with production of Ukrainian military-industrial complex was rejected by “Gazprom” on the basis

of previous statements of Ukraine on the need to move out from a barter payment scheme for gas supplies (Lenta.ru 2006).

Anatoly Kinah, Secretary of the National Security of Ukraine said on November 30 that the delay in negotiating on the terms of Russian gas supplies to Ukraine could adversely affect the gas supply to European countries, and Ukraine's position on the terms of gas supplies is supported by most EU countries (Ibid).

On December 19 in Moscow Prime Minister of Ukraine Yekhanurov and Prime Minister of Russia Fradkov again met for negotiating on the terms of Russian gas supplies to Ukraine. The main argument, which was used by Yekhanurov for reasoning the need to keep prices at the previous level, was a special price condition of Russian gas supplies to Belarus. The saving of the previous conditions of supplies was linked by Fradkov with the creation of a consortium to manage the Ukrainian GTS, in which Russia should participate. Fradkov proposed to move to a one-year agreement on gas supplies to Ukraine, which is supposed to change together with development of negotiations and adoption of concessions in a future consortium. On the next day, December 20, Yekhanurov said about the need for a draft intergovernmental agreement on gas supplies, as well as coordination of pricing formulas, threatening the possibility of transfer of the conflict to the framework of the Stockholm Arbitration Court (Ibid).

To put pressure on decision of Kiev to establish a joint Russian-Ukrainian consortium to manage the Ukrainian GTS, on 23 December representatives of “Gazprom” announced that from 1 December of 2006 the price of gas for Ukraine will be increased to 230 USD/Tcm; in case of failure to pay the new price for Russian gas supplies, supplies to Ukraine will be supposed to stop. At the same time it was proposed by “Gazprom” to pay for gas with part of the shares of Ukrainian gas supply companies, preferably – with the shares of the gas transportation consortium.

Proposal of "Gazprom" was slightly mitigated by Vladimir Putin, who on December 31 asked to leave the old price for Russian gas for Ukraine during the first quarter of 2006, and invent a new price at 230 USD/Tcm in the second quarter of 2006. Representatives of the company "Naftogaz Ukraine" has officially renounced new "soft" offer (Lenta.ru 2006)

As it was promised earlier by representatives of "Gazprom, from January 1 2006 gas supplies to Ukraine were cut. At the same time the supply of gas through the Ukrainian gas transportation system in the European direction was preserved, supplies were cut only in the amount of daily intake of Ukraine, which was 120 Mcm/d. After the "pressure drop" in gas pipe, EU Energy Commissioner Andrew Pielbags scheduled special meeting of the European Commission Coordination Group on Gas (Ibid).

Beginning from the January 2, the Ukrainian side said that Russia in violation of previous agreements does not pay for Russian gas transit through Ukrainian territory by barter method by providing gas supplies to Ukraine. As a result, Ukraine has become a daily siphon of 95 Mcm of gas to meet its own needs.

Beginning from the January 3, Ukraine increased the volume of the gas siphon, bringing it up to 188 Mcm/d, which resulted in a shortfall of gas supplies to European customers (BBC 2006).

January 4 at the head office of "Gazprom" Ivchenko and Miller had reached an agreement on the terms of Russian gas supplies to Ukraine. Under the new terms, in 2006 Ukraine has to receive 16.5 Bcm of gas at a price of 230 USD/Tcm. Transit tariff for Russian gas through Ukrainian territory was raised to 1.6 USD per 100 kilometers. At the same time, the price for the gas in the first half of 2006 for Ukraine was set at 95 USD/Tcm by mixing Russian and Turkmen gas (Polit.ru, 2006).

2.2. Ukraine-Russia gas dispute 2008-2009

Signing agreements on deliveries of Russian natural gas in 2006, however, did not lead to stabilization of the conditions of transportation of gas in the long run. In late 2008 - early 2009 the "second gas war" between Russia and Ukraine was held. Conflict characteristics were very similar to those that were inherent to the "first gas war": despite the fact that formally the conflict concerns only the commercial aspects of the question of payment for Russian gas, at some stage it has moved to the government level, and all the events were widely covered in the media - primarily Russian - and were often propagandistic.

In fact, the conflict began when in late 2008 "Gazprom" announced the presence of Ukrainian debt to pay for gas for the first 11 months of 2008 in amount of 2.4 bln USD. At the same contract for the supply of gas in 2009 was not signed. At the same time negotiations for a new contract were suddenly interrupted by representatives of "Naftogaz Ukraine" without explanation (Energosoft 2008).

Early in the morning on December 1, 2008, a statement of the President of Ukraine was issued, where it was stated that the Ukrainian side has completely paid for the gas delivered in 2008. Statement as well reported unfavorable conditions of Russian gas supplies, and sets out the requirements of the Ukrainian side: the cost of Russian natural gas for Ukraine – 201 USD/Tcm, transit fare – 2 USD per 100 kilometers. The statement also affirmed the disadvantages of Russian proposal, which demanded to 250 USD/Tcm, as well as the level of transit tariff of 1.7 USD per 100 kilometers (Ibid).

At 10:00 am on January 1, 2009, "Gazprom" without any warning has stopped supplying gas to Ukrainian consumers, lowering the overall flow of gas through the Ukrainian gas transportation system about 100 Mcm/d. In the evening of the same day a statement of CEO of "Gazprom" Alexey Miller was issued, in which it was stated that upon failure to pay the proposed "Gazprom" price of 250 USD/Tcm, the price for Ukraine will be established at the level of European average price in amount of 418 USD/Tcm (Rbc.ru 2009).

Beginning from the January 2, Ukraine began siphon of transported gas in amount of 21 Mcm/d as payment for transit tariff for the transportation of Russian gas. At the same time the amount of Russian gas transported westward was not agreed. More precisely, Ukraine did not agree to transport 303 Mcm/d requested by "Gazprom", while approving only 296 Mcm/d. As a result, a number of Balkan countries by the evening of January 3 were reporting a shortage of gas supplies received (BBC 2009).

January 4 representatives of "Gazprom" announced the increase in the volume of gas Ukraine illegally siphoned from the gas volumes for third countries. Ukrainian side, in turn, denied involvement in the disappearance of the supplied gas volumes. Directorate Generale of Energy of the European Commission said that the decline in the volume of gas is not due to gas extraction on the territory of Ukraine. On the same day Ukraine rejected requests of "RosUkrEnergo" and "Gazprom" on harmonization of additional volumes of gas transited through the Ukrainian gas transportation system to meet the requests of European consumers. After this, the press-service of "Gazprom" issued a statement, where a new price for Ukraine in the amount of 450 USD/Tcm was approved, at the same time stating that the price increase "will bring Ukraine back to the negotiating table" (Ibid).

January 5 Kyiv Economic Court banned the transportation of Russian gas through Ukrainian territory, recognizing as illegal the agreement on the transportation of Russian gas signed before 2010, in which the cost of transportation of Russian gas was fixed at the level of 1.6 USD per 100 kilometers. Basically, the actual transportation of gas was not prohibited, but the transportation of gas by costs specified in the existing agreement (Interfax, 2009).

At the same time, from the January 5 gas transit to Ukraine was reduced to a level which, according to Vladimir Putin, was illegally siphoned from the Ukrainian gas transportation system. According to Putin's statement, since January 1, 2009 the total amount of the gas, illegally siphoned by Ukraine gas was on the level of 65.3 Mcm. At the same time

it was stated that compensation for reducing the volume of gas supplied by “Gazprom” will be reached by the increase of the volume transported via Belarus, and “Gazprom” will also provide purchase of gas on the spot market to meet commitments under long-term gas contracts with European consumers.

January 6 on meeting with Alexei Miller, Vladimir Putin supported the proposal to reduce gas supplies to Ukraine in volumes that were previously siphoned by Ukraine in payment of technological gas supplies to Europe. On the same day, European consumers started to feel the acute shortage of gas. Particularly acute shortage was felt because of the winter season, when gas consumption traditionally grows. Starting from January 7, Russian gas supply was terminated at the level of 70% to 100% for 18 European countries.

January 11 Ukrainian government signed a document on the establishment of a tripartite monitoring committee, whose mandate will include inspection of gas compression stations and control the flow of natural gas through the Ukrainian gas transportation system. In turn, Russian President Dmitry Medvedev banned the resume of gas supply to the point where all the experts included in the monitoring committee will arrive gas pressure stations for monitoring.

January 12 Russia, Ukraine and the EU signed a tripartite protocol stipulating the conditions for resuming supplies of Russian natural gas through the Ukrainian GTS. However, within the next week, until January 18, the transit of Russian gas through Ukrainian GTS still was not rebuilt.

On the night of 17 on January 18 talks of Russian Prime Minister Vladimir Putin and Ukrainian Prime Minister Yulia Tymoshenko was held. Following the talks, an agreement was reached on the resumption of Russian gas transit through Ukraine on January 19. Directly in Moscow January 19 signed agreements on deliveries of Russian gas to Ukraine for a period of 10 years. The parties agreed on the transition to a market payment formula gas

prices, as well as the preservation of preferential transit tariff. On the same day, Dmitry Medvedev instructed the "Gazprom" to restore pumping gas through the Ukrainian GTS.

January 20 "Gazprom" sent to "Naftogaz Ukraine" two applications for pumping gas through the Ukrainian GTS. At 9 am applications were satisfied, and the gas began to enter the distribution system.

The same day the European Commissioner for Energy Andris Piebalgs at a press conference with Prime Minister Yulia Tymoshenko said that the European Commission had not found evidence of unauthorized siphoning of gas by the Ukrainian side.

Conflict actually was exhausted on January 21 when "Gazprom" has applied for gas transportation to Slovakia and Poland, which were satisfied on the same day.

2.3. External reaction on the conflict

As a result of the first gas war January 7, 2006, EU Energy Commissioner Andris Piebalgs has officially ordered to establish in all EU Member States two months natural gas reserves in the event of recurrence of similar crises (ABC.az 2006).

January 27, 2006 Prime Ministers of Italy and Poland declared Russia as an unreliable partner for the supply of energy. Polish Prime Minister Kazimierz Marcinkiewicz proposed to European countries to the beginning of the joint development plan to diversify the sources of supply of oil and gas (Warsaw Voice, 2006).

At the end of the Russian-Ukrainian gas war Croatia, Poland, Hungary and Italy have started negotiations to build a terminal for regasification of liquefied natural gas from pumped from North Africa (Adria LNG). The terminal was expected to be built on the Krk island. The terminal was supposed to connect to the Trans-Adriatic gas pipeline through the construction of the Ionian Adriatic Pipeline. Technological capacity of the terminal was planned at 10 Bcm/y (Reuters 2012).

One of the results of the second gas war were plans to build a Persian pipeline, which is supposed to be to supply Iranian gas to Europe, passing through Turkey, supplying with gas in the amount of 37 to 40 billion cubic meters of gas per year (PressTV 2009). In addition, the result of the second gas war was to expedite construction of the pipeline, Shah Deniz II, which also passes through the territory of Turkey, had to supply Azerbaijani gas to Europe.

On the Russian side the result of "the first gas war" was the decision to build a gas pipeline "South Stream" to reduce dependence on Ukraine as the country's gas transporter (Downstream 2009). The second gas war has accelerated plans to build the "South Stream", and also led to the decision to increase the power of the "Blue Stream", increasing the capacity of the pipeline "Yamal – Europe" going through Belarus, and later - to the decision to build the second branch – "Yamal - Europe 2" - coming from Belarus to Poland to Slovakia and Hungary (Gazprom 2014b).

2.4. Why we think that Russia jeopardizes energy security in Europe?

In fact, de jure gas war between Ukraine and Russia were exclusively commercial conflict and concerned only the conditions for the supply of Russian natural gas to Ukraine and its territory, as well as the content of future gas contracts and terms of debt for gas supplies, Ukraine has accumulated.

First of all it should be noted the "special regime" of pricing, which applies to the former Russian post-Soviet republics. High dependence of these countries on Russian natural gas due to the underdevelopment of alternative sources of energy (in the case of Lithuania), as well as high energy intensity of the economy as the Soviet "legacy of the past" (the case of Belarus), allows Russia to use non-market pricing methods, which are used as an instrument of pressure for adoption some political concessions. So, for example, in 2005-2006, the price

of natural gas for Belarus was 46.68 dollars per thousand cubic meters, while in Ukraine - about $ 80 per thousand cubic meters, and for Lithuania - about 120. (see: Balmaceda 2014)

In addition, as noted above, conflicts between commercial companies, in the case when it comes to supplies of natural resources, in international practice often dealt with directly at the company level, and the course of the conflict remains closed to the public before the announcement of the outcome of negotiations or agreements. In the case of the Ukrainian-Russian gas conflict wars, first came to the government level, and secondly, widely reported in the Russian media propaganda standpoint.

Plus, analysis of the chronology of the first gas war shows that changes in the price of natural gas for Ukraine, as well as the changing dynamics of the negotiations depended on the progress of negotiations on Russia's inclusion in the consortium to manage the Ukrainian GTS. At the same time, apparently, Russia put pressure on the Turkmen side to avoid providing supplies of Turkmen gas to Ukraine.

Chapter 3. Network analysis.

3.1. Methodology

In the core of our network analysis will be the methodology implemented in already mentioned research conducted in (Vedres and Scotti, 2012). Here we will describe methodology more briefly, focusing only on main features.

The dataset includes 55 countries, when the methodology of network creation is as follows. We consider countries as *nodes*. As soon two countries included in the dataset have cross-border pipeline(s), we consider this pipeline(s) as one *link* between the nodes. The weight of the link is counted as a sum of all pipelines maximal technical capacity from one node to other, measured in Gwh/d. Data for building of network were extracted firstly from "European Network of Transmission System Operators of Gas" (GIE, 2013), as well as from specified web-sites and databases, such as Eastern European Gas Analysis, British Petroleum, Energy Information Administration, International Energy Agency, Gazprom and others.

Thus, three datasets were: one representing European gas pipelines network as it is in in 2008, one – considering most likely plans for pipelines building by 2020, third – representing pipeline system change considering most probable plans for building new pipelines up to 2030. For each country in datasets also coded proven gas reserves were coded (natural and LNG reserves, as well as amount of gas available in underground gas storage), level of domestic gas consumption and level of domestic gas production. Then, for each country its level of dominance was counted, which basically determines, how important a concrete country is for gas transportation, and which effect the removal of country from gas network will affect transportation and consumption in other countries. As argued in (Vedres and Scotti, 2012),

> "[d]isruptions in the gas delivery may lead to direct consequences: absence of any natural gas input and energetic collapse for countries that exclusively rely on removed

country; <…> There are also countries without direct links to the node removed, but nevertheless they might be affected via their pathway stream".

Thus, the level of dominance of each country was counted "as the ratio between total impacts to all the nodes and the sum of their unaffected domestic consumptions". Full methodology of counting the level of domination of exact country see in (Vedres and Scotti, 2012, pp. 243-239).

Since our network is weighted, and real gas pipeline network allows implementing reverse gas supplies, and supplies bypassing other nodes if it is allowed by pipelines capacity, for each country we will count the level of its flow beetweenness. Flow betweenness is a term which came from analysis of trade and economic networks, and its level describes "the extent to which any node in a trade or capital flow network could "block off" the others by cutting of flow or could collect a markup on flow-through and a markdown on in-flow" (White and Smith 1988, p.15). In other words, flow betweenness measures how important particular countries are for free distribution of flow throughout the network.

All our data will be coded in Gephi Software Package 0.82 and converted to UCINet Software Package 6.2 for quantitative analysis and visualization of network configuration.

3.2. Results

Changes in dominance. Considering the changes in countries domination, the analysis conducted in analysis (Vedres and Scotti, 2012, p.242) shows countries with different change of level of dominance up to 2030. Countries with highest level of domination, included in 3rd and 4th clusters (intermediate and high level of dominance) are the countries, which are mostly are the suppliers of natural gas to Europe: Russia, Norway, Algeria, Turkmenistan, Tunisia, and Uzbekistan. Moreover, in 3rd cluster are included also countries, which are transporting high amount of Russian natural gas (Ukraine), and countries which represent

hubs in network (Germany, Netherlands, Slovakia). For the list of countries depending on their dominance change see table below.

D1	D2	D3	D4
Albania Armenia Austria Belarus Croatia Denmark Egypt Estonia Finland France Ireland Israel Italy Jordan Latvia Lebanon Libya Lithuania Luxembourg Moldova Morocco Northern Ireland Portugal Sweden Slovenia Spain Switzerland United Kingdom	Belgium Bosnia and Herzegovina Bulgaria Czech Republic Georgia Greece Hungary Macedonia Poland Romania Serbia Turkey Iran	Algeria Germany Kazakhstan Turkmenistan Norway Slovakia Ukraine Uzbekistan The Netherlands	Russia

Table 2. Countries dominance expected up to 2025 (D1 = very low; D2 = low; D3 = intermediate; D4 = high).
Source: Vedres and Scotti, 2012, p.242.

In fact, most of the countries, included in 3rd cluster cannot be included in our further analysis of relations with EU. This is due to the high influence of Russian side on rules of operation of their GTS (Turkmenistan, Kazakhstan, Uzbekistan), or the low level of gas supplied to Europe (Algeria). Other countries will be included in flow beetweenness analysis.

In our analysis we will also include Turkey and Azerbaijan. Although their dominance remains low, their importance for gas transportation will increase. The importance of Turkey will increase because of building of Trans-Anatolian gas pipeline, Persian pipeline and Shakh Deniz II pipeline, which will go through territory of Turkey. At the same time, the importance of Iran will increase because following plans of building Persian pipeline, which is expected to increase the share of Iran on the European gas market as one of the gas suppliers. The dominance of Azerbaijan will increase because of building of Trans-Caspian gas pipeline, which will connect Azerbaijan with Turkmenistan as a part of the Shakh Deniz II gas transportation system.

Flow betweenness analysis and importance of countries for gas transportation within the system. As already mentioned above, since our network is the directed one, we can run flow betweenneess analysis in order to investigate, which countries are important for the transportation (or actual flow) of natural gas throughout the system. However, since the main aim of our paper is to investigate, which countries are important to the transportation of Russian natural gas in order to increase bargaining power of European gas customers, we will exclude from our dataset natural gas suppliers others than Russia, as well as countries, which are not included in transportation of Russian natural gas. We will compare actual flow betweenness as it is at the current stage of network development with the flow betweenness as a feature of the system expected to be constructed up to 2025.

Thus, from our dataset we will exclude Armenia, Azerbaijan, Algeria, Egypt, Iran, Kazakhstan, Libya, Marocco, Norway, Tunisia, Turkey[7], Norway, Turkmenistan, Uzbekistan, Algeria, Georgia.

At the same time we should notice, that flow betweenneess test is working not with links, but with nodes, showing which nodes are important for the access of other nodes to

[7] Although up to 2025 Turkey is expected to be connected with Russia with the Blue Stream gas pipeline, this pipeline is not planned to be connected to Nabucco stream and Trans-Anatolian gas pipeline.

them. Thus, if fact we will test importance of *distributors* of gas, but not importance of *transit countries* for supplies of Russian natural gas.

Country	**Flow betweenness**
Austria	17.09
Belgium	10.36
Switzerland	9.135
Czech Republic	12.795
Germany	58.147
France	8.9
The Netherlands	18.118
Poland	8.9
Slovakia	16.282
Ukraine	5.78
United Kingdom	4.291

Table 3. List of countries (nodes) by level of their flow betweenness. Countries with betweenness lower than 4 are excluded as not significant.

Thus, we can see that Germany, Austria and the Netherlands are the most important countries for the distribution of Russian gas after input of Russia controlled pipelines into pipelines on the territory of European Union. The consequences of removal of these two nodes for the whole network might be seen in visualized simulation of random attacks on nodes, represented below.

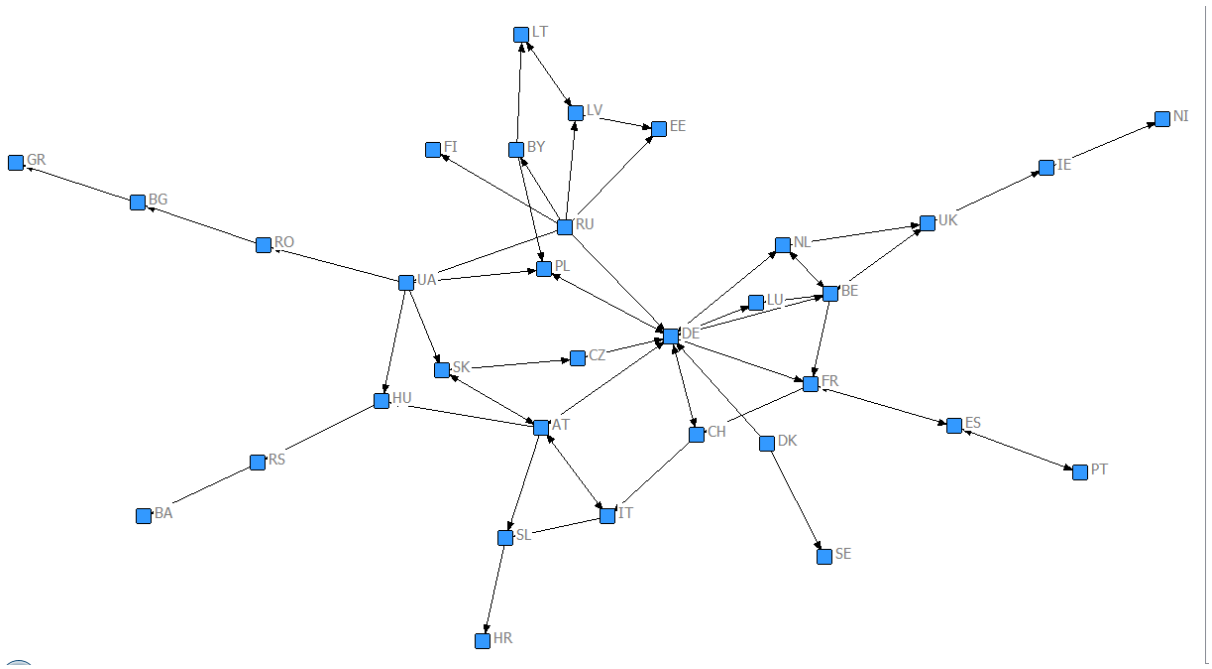

Figure 2. Gas pipelines network visualisation before random attack simulation.

In case of removing Germany and Austria as nodes the network breaks on two not connected pieces, which completely disconnects Russia from gas transportation system in the rest of the Europe. The visualization of the gas network after the random attack on two nodes you can see below.

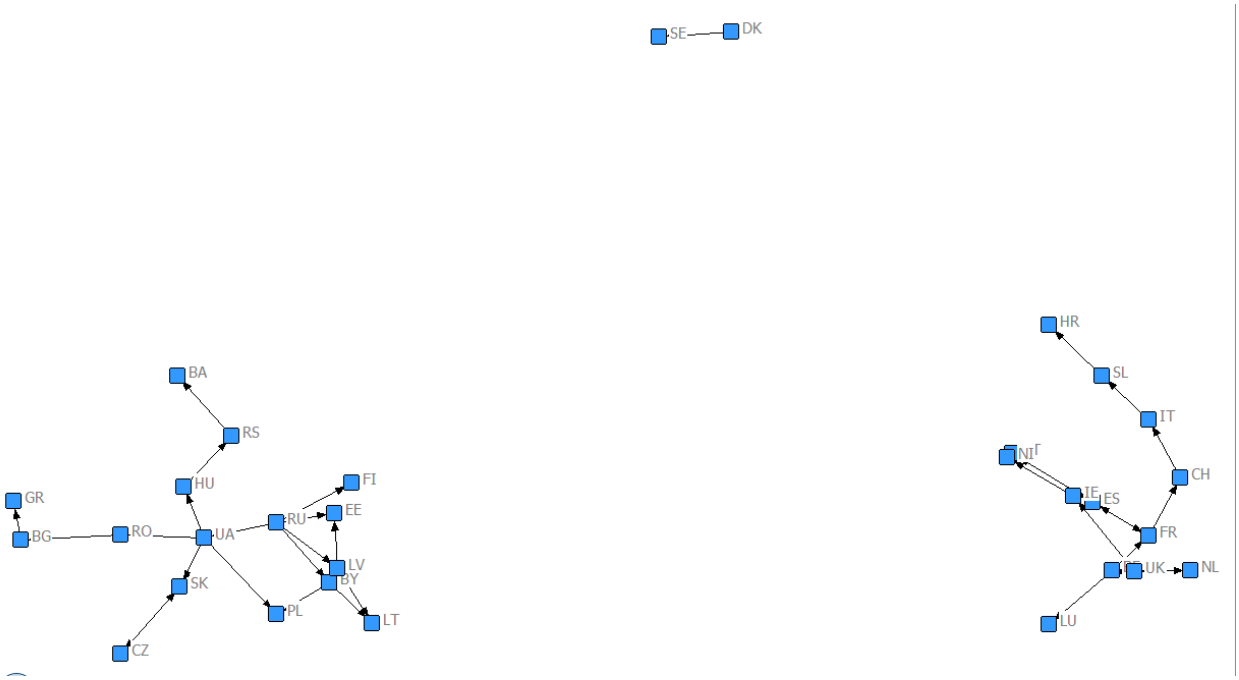

Figure 3. Gas pipelines network visualisation after random attack simulation.

3.3. Conclusions on network analysis simulations

Our analysis on changes in dominance of countries for gas supply, as well as analysis of flow betwenneess within the gas system gives us several conclusions on policy implications for the European gas market. *If unification*

Firstly, we can conclude, that in sense of gas supply Russia can not be considered as almighty Leviathan. The analysis of dominance of countries shows us, that sources of gas supplies up to 2025 will be quite diversified, and sustainable gas supplies to Europe are dependent not only on physical input to the transmission system, but also on transit countries.

Secondly, based on findings, extracted from network analysis, we can classify countries, important for sustainability of gas supplies to the Europe, on three categories. First category is the gas suppliers: countries, which are providing physical input of the gas to the transportation system. Among these countries we distinguish (apart of Russia) Norway, Turkmenistan, Azerbaijan, Uzbekistan, Iran, Algeria. In second category we include countries, which are important as an "entrance" from gas suppliers to the transmission system. To this category we include Ukraine and Turkey (transit countries). In third category we include countries, which are important for the gas distribution within the European gas transmission system: Germany, Austria, Slovakia and Poland.

Thus, considering our definition of bargaining power on gas market, we should continue our analysis with further steps. First, we should investigate, if European Union has a solid energy agenda with countries, important for gas supplies, i.e. political agenda, which considers includes agreements on energy maintenance and management of issues. The factual presence of those agreements will allow diversifying the sources of energy supplies, and increasing bargaining power through possibilities to lower the willing to buy Russian gas by particular price due to presence of possibility to switch the supplier (WPP in estimation 2).

Second, we need to investigate, if political agenda, which is considering energy issues, exists in relations with countries, important for energy resources transit. The presence of such of kind political agenda will increase the amount of resources, available for European countries in order to increase its bargaining power (R in estimation 1).

Third, for the same reason as it mentioned for the transit countries, we have to investigate, if European countries have common rules and developed framework on internal transmission system regulation, the presence of which will allow using pipelines as a resource to increase bargaining power.

Fourth, we need to investigate, if the European Unions is playing as a single actor on the gas market, which will allow to come to the formula of the bargaining power as it is represented in (3), summing up bargaining power of all EU members when playing on gas market.

Chapter 4. Pathways and bottlenecks of European energy cooperation policies

In this part we will analyze the current stage of EU relations with Ukraine and Turkey, as well as the structure of agreements on energy supplies with the energy sources countries, as well as structure of agreements and legislation on internal gas transmission system operation in order to classify and make conclusion on its sustainability in long-term run. We will start analyzing EU relations with Ukraine and Turkey, and as further steps move to the analysis of agreements on gas supplies and internal gas transmission system operation.

4.1. EU-Ukraine energy relations

In general, relations between European Union and Ukraine are regulated in the framework of the Eastern Neighbourhood Policy (ENP). In general, ENP framework includes energy security issues, and its program action plan (EEAS 2014) includes five core objectives to be implemented till 2017. These objectives are (Ibid):

1) approximation of the regulatory framework,

2) development of electricity, gas and oil interconnections and diversification of supply,

3) stakeholder dialogue in energy efficiency and renewable energy,

4) cooperation in establishing and strengthening a regulatory framework in nuclear safety,

5) conventional and unconventional oil and gas resources.

Thus, we can conclude that in general European Union has the common roadmap for cooperation on energy issues with Ukraine, as well as all countries included in ENP: we will extrapolate this conclusion as well on Azerbaijan, which is included in ENP structure.

General strategy off cooperation between EU and Ukraine in the field of energy sector was stated in the Memorandum of Understanding on Co-operation in the field of Energy between Ukraine and the European Union (European Commission 2005), which was signed on the 1 December of 2005. Basically, the structure of the Memorandum duplicates core

objectives on the ENP framework part on energy issues, although sprecifying second core objective on two more precise tracks of policies to be developed and implemented: 1) integration of electricity and gas markets, 2) enhancing security of energy supplies and transit of hydrocarbons (Ibid, p.4).

First track on integration of electricity and gas markets states its aim to smoothly bring the Ukrainian market of gas to the common rules, adopted in European Union on markets of energy supplies and resources, bringing Ukraine to the adaptation of "<…>equivalent basic rules with respect to market access, infrastructure and opening, as well as compatible environmental and safety standards" (Ibid, p.6).

Nevertheless, in fact, in relation to the first track Memorandum states the necessity on technical reforms of Ukrainian GTS. The very small part of Memorandum in relations to the first track considers the necessity of institutional reform of institutional structure of regulation of energy field in Ukraine, stating that

> "Ukraine will endeavour, where necessary, to create or strengthen the role of institutions for the operation of an open electricity and gas market <…>: by the end of 2006 an Energy Regulatory Authority independent of the interests of the electricity and gas industry" (Ibid, p.6).

In relation to the second track Memorandum states the importance of the Ukrainian GTS for the transportation of the hydrocarbons to the European countries. The roadmap for the reforms implementation in the field of hydrocarbons transportation, written in Memorandum, is mostly aimed on the technical issues of the hydrocarbons transportation, stating the necessity of energy security maintain in very minor and diffused way[8]. At the same

[8] The Memorandum states only the necessity of «studying the possible reform options for oil and gas transit, taking into account the strategic interests of Ukraine", and does not contain particular aims to achieve in order to maintain energy security of Ukraine (ibid, p.8).

time, Memorandum contains the basic aim to achieve on "identifying and promoting additional sources and supply routes for gas and oil to Ukraine and onwards to the EU, including the potential for LPG and LNG" (Ibid, p.6).

Although the necessity to promote additional sources and supplies of gas to Ukraine, the implementation of Memorandum to the moment has marginal character in the sense of reducing energy dependence of Ukraine from Russian gas supplies. Although the Memorandum roadmap initiated the sign of Joint Declaration from 23 March 2009 on the modernization of the Gas Transit System (European Commission 2010), at the moment Declaration has led only to technical assessment and study of social and economic impact of the modernization of Ukrainian GTS and underground storage capacities. The Declaration signing and activities undermined in Memorandum agenda at the moment basically led to the implementations of the number of the EU rules to the internal regulations of gas operators in Ukraine and access to the gas pipelines and underground gas storages under the principle of Third Party access according to the European Energy.

At the same time, the concrete negotiations on possibilities to diversify sources of natural gas supply to the Ukraine were started only after annexation of Crimea by Russia, when Ukrainian government agreed with German gas company RWE on reverse gas supplies from Slovakia.

Current results and bottlenecks for Ukraine. Thus, we consider current EU-Ukraine relations as being present in marginally developed stage. Despite high concern of EU member countries about sustainability and security of energy supplies, carried through Ukrainian GTS, at the moment Ukraine still remain as a single actor in bargains with Russia, and remain not fully included in the EU energy market regulation framework. In fact, European Union does not have institutional mechanisms of influence of cooperation, which will allow implementing the strategy of "playing together" in the negotiations with Russia on terms of energy supplies.

Moreover, although Ukraine signed and ratified European Energy Charter (Energy Charter 2014), which provides common mechanism of regulation of the access to the pipeline system, Russia did not ratify Energy charter and consider it as an agreement, which harms Russian energy sector, which does not eliminate the risk of further conflicts on terms and features of transportation of Russian gas through Ukrainian GTS.

4.2. EU-Turkey energy relations

At the time relations of EU and Turkey in field of energy are not framed in any specific political framework. The only document, which somehow frames the relations and states the plans for relations in middle run perspective is a memorandum from 4th June, 2012, based on conclusions of meeting between Commissioner for Enlargement and European Neighbourhood Policy Štefan Füle, Commissioner for Energy Günther Oettinger, Turkish Minister for EU Affairs and Chief Negotiator Egemen Bağış, and Energy Minister of Turkey Taner Yildiz. The memorandum states "5 topics on mutual interests", which include (European Union Commission, p.1),:

1. Long term perspectives on energy scenarios and energy mix.
2. Market integration and development of infrastructures of common interest (gas, electricity, oil).
3. Global and regional energy cooperation.
4. Promotion of renewable energy, energy efficiency and clean energy technologies.
5. Nuclear safety and radiation protection.

In field of gas transportation and security memorandum states, that

"Cooperation could notably address the framework for the transport of natural gas through the EU to Turkey and through Turkey to the EU. Turkey and EU are partners

in promoting the development of bidirectional pipeline connections around the Southern Black Sea, aimed at strengthening their security of supply. The promotion of direct contracts and the development of dedicated infrastructure would be important in this respect. It would be of mutual interest to ensure that the Anatolian routes included in the Southern Gas Corridor will be of a sufficiently large scale to accommodate future increased volumes of gas. Cooperation on development of necessary infrastructure for the purposes of bi-directional flow and on the construction of LNG terminals and relevant storage facilities will be key to enhancing diversification of routes and sources and to the development of Turkey as a regional natural gas hub" (Ibid).

Thus, these 5 topics are very similar to those included in energy part of ENP framework. Nevertheless, current EU-Turkey relations in energy field in fact lacks of any specific agreements on adaptation of common rules and realization of mutual infrastructure projects.

Moreover, the future of expected projects on gas pipelines building, which are planned to go through the territory of Turkey, mostly stays away from the field of politics, and depends on the conclusions of business companies included in gas operations consortium. The Nabucco project was cancelled by the decision of companies included in Shah Deniz II consortium. Although Nabucco was later replaced with the project of building of Trans-Anatolian pipeline, the cancellation of the project show the absence of common political will of EU on questions of energy policy since the absence of common decision of EU-member countries of construction of Nabucco project, which was mostly promoted by European companies involved in its building, such as Austrian OMV. Thus, the future of energy path from Shah Deniz II gas field in fact depends on the decision of companies, not on the decisions of institutional structures of EU.

4.3. EU-Azerbaijan relations

In fact, Azerbaijan together with Turkmenistan is one of two energy supplier, which will deliver natural gas to EU countries after building Southern Gas Corridor. Earlier in 2008 European Commissioner for Energy Andris Piebalgs "underlines the strategic role of Azerbaijan for the realisation of the Southern Gas Corridor" (European Commission, 2008).

As mentioned above, relations of EU with Azerbaijan are framed within ENP agenda. The cooperation between EU and Azerbaijan in field of energy policy and energy security is prescripted in ENP Action Plan for Azerbaijan, which was jointly signed in 2006 (European Commission 2006). The Action Plan for Azerbaijan includes specific priority objective on "[s]thenghthening EU-Azerbaijan energy bilateral cooperation and energy and transport regional cooperation" (Ibid, p.8), which includes "ensure an increasing convergence with EU energy policy objectives" (Ibid). At the same time, area of energy policy convergence as a specific aims includes:

> "enhancing security of transit systems and energy supplies for Azerbaijan and for the European Union" (Ibid, p.34), and "[c]ooperat[ion] for the development of the transit capacities of Azerbaijan as regards exports of Central Asia and Caspian Basin energy resources to the EU and its neighbours' markets" (Ibid).

Relations in field of energy security between Azerbaijan and EU in frame of ENP are more precisely state in the Memorandum of Understanding on a Strategic Relationships between EU and Azerbaijan in field of Energy (European Commission, 2006b). Memorandum states, that

> "[t]he EU and Azerbaijan face common energy policy challenges. The diversification and security of energy supplies, the deepening of energy market reforms, the

development and modernization of energy infrastructures, energy efficiency, energy savings and the use of renewable energy sources are key concerns for both parties" (Ibid p.3).

Particular attention in memorandum is paid to the Azeri part of Southern Gas Corridor, where stated that

"[w]ith a view to enhancing European energy security, both sides particularly stress the vital role of the development of all means of transportation from the Caspian region, including the Baku-Tbilisi-Erzerum gas pipeline, and relevant multimodal transportation projects" (Ibid p.4).

Both sides, as it mentioned in Memorandum, also agree to enhance "the safety and security of energy supplies and transit systems from Azerbaijan and Caspian basin to the EU" (Ibid).

By the end of 2013 Azerbaijan signed Intergovernmental Agreement with Turkey on building Trans-Anatolian pipeline, while in June 2013 "the Shah Deniz II (SD II) shareholders' consortium selected the Trans-Adriatic Pipeline as the European supply route for SD II gas. In September, long-term gas sales agreements were signed with nine European companies to supply 10 bcm/y of SD II gas to Italy, Greece and Bulgaria" (Trans Adriatic Pipeline 2014, p.5). In fact the signature on agreements on gas supplies is the final stage before final investments decision of European Commission on financial participation on Trans-Anatolian and Trans-Adriatic pipeline buildings.

4.4. Internal regulation of European gas pipeline system

Internal regulation of European gas pipeline system "obeys" to Energy Charter Treaty, formatted in 1991, and Third Energy Package, which entered into legal force on September 3, 2009.

In fact, Third Energy Package (hereafter – TEP) is the legislative package on internal management of European gas pipeline, building and operating of gas pipelines on the territory of EU member countries, as well as regulation of access of third parties to European gas pipeline system. TEP prescribes to every EU member country to create National Regulatory Authority on gas transmission networks operation. National Regulatory Authorities actions are coordinated by Agency of Energy Regulators.

The main background of TEP formulation and adoption was the lowering of big gas and electricity suppliers by creation of independent transmission and system operators, as well as formulation of procedure of ownership unbundling.

At the same time Energy Charter Treaty (hereafter – ECT) is the legal document, which is open for signature for any country in order to establish legal framework on energy trade and transit across the ECT member countries, including rules for investments in infrastructure, rules for trade and infrastructure access, and conflicts resolution.

In sense of lowering dependence on energy suppliers, who is operating on oligopolistic market of natural gas, Energy Charter Treaty and Third Energy Package both provide important procedure of ownership unbundling. This procedure means separation of ownership on gas transit and transmission pipelines, and supplies of gas. This means that countries who are in fact producers of natural gas cannot owe transit and transmission pipelines within European gas pipelines network:

> "In practice this means that Member States must ensure that the same person or persons cannot exercise control over a supply undertaking and, at the same time, hold

any interest in or exercise any right over a transmission system operator or transmission system. This provision also applies vice versa, that is, control over a transmission system operator precludes the possibility of holding any interest in or exercising any right over a supply undertaking" (Third Energy Package, 2014).

Third Energy Package states as one of the propositions "the effective separation of supply and production activities from network operation" (Ibid). Regarding this, TEP states that "transmission ownership unbundling is the most effective tool to promote investments in infrastructures in a non-discriminatory way, fair access to the grid for new entrants and transparency in the market" (Ibid).

In sense of natural gas supplies from Russia ownership unbundling allows to use gas pipelines as one of the resources in gas prices bargains. Firstly, ownership unbundling allows to nationalize gas transmission networks within European gas pipelines system, which are already fully or partly in ownership of Gazprom (case of Lithuanian gas company "Lietuvos dujos"). Second, when European gas pipeline network is connected to pipeline, which is owned by gas supplier, TEP allows to reduce the access of supplier to the European pipeline network, regulating amount of gas available to input into the transmission system.

Conclusions

In this paper we tried to investigate the main problems, which European Union faces in field of energy security regarding to the configuration of European gas pipeline network, rules of its regulation and agreements between EU and countries, which are main gas suppliers, and countries, which are important for natural gas transit from gas fields to European customers. Our concern on energy security is based on the structure of natural gas suppliers, which is oligopolistic and allows for main gas suppliers to manipulate natural gas prices and supply conditions, as well to "put" into the natural gas price formulation political agreements and concessions.

The main gas supplier who is inclined to manipulate gas prices and "put" political agreements as a basis for gas prices formulation, as it was shown above, is Russia. Thus, the main challenge, which is faced now by European countries is not only the diversification of gas suppliers and sources of energy in general, but also limitation of bargaining power of Russia in order to receive gas price formulation conditions, which are free from political issues.

Using our own formulation of bargaining power on gas markets, as well as common definition of energy security concept, we showed that "resources" in a broadest sense are most required for limitation of bargaining power of Russia on European gas market. Under the definition of resources we putted the factual and planned configuration of European gas network.

Using the methods of network analysis, we investigated current and planned structure of European gas pipelines networks. This analysis allowed us to indicate countries inside and outside European Union, which are important for natural gas distribution to European customers. We divided those countries on three categories: countries, important for gas supply; countries, important for gas transit; countries, important for gas distribution.

Based on results gained from network analysis and simulation, we investigated current relations between EU and countries, important for gas supplies and countries, important for gas transit. Among those countries we indicated Ukraine, Turkey and Azerbaijan in order to answer the question, whether EU has solid and adequate political agenda regarding energy security issues with these countries. Since network analysis, based on flow betweenneess test resulted in high importance of Germany and Austria in distribution of natural gas within the Europe, we investigated also current EU rules and legislation regarding gas transit and transmission system management and operations. Our analysis was based on argument, that regulation of access to gas pipelines network, as well as security of gas transit and gas supplies, will reduce bargaining power of Russia on European gas market.

Based on our analysis we can **conclude**.

1. The EU relations agenda with countries, which by 2030 will increase its importance for gas transit, partly includes solid energy component. In case of Ukraine EU has well developed legal framework, which although only partly allows to increase EU and Ukraine bargaining power due to absence of EU membership of Ukraine, which determines its "playing role" as a single actor, which is still highly dependent on Russian gas. The role of EU in negotiation between Ukraine and Russia on gas prices and supply conditions is limited to the role of internal moderator.

   EU relations with Turkey regarding energy issues are very limited. In fact, the operation of Trans-Anatolian Pipeline and Persian pipeline, which will be important for transit of Turkmen, Azeri and Iran gas by 2030 is determined by the will of business companies – operators of pipelines. The most important role here comes to Azerbaijan.

2. The EU relations with Azerbaijan (country, which importance for gas supply will increase) regarding energy component are well developed and include many legal

agreements and common rules on energy security development. Gas supplies from Azerbaijan and supplies of Turkmen gas through Azeri territory are protected by legislative framework. At the same time, political agenda regarding energy issues between EU and Iran is completely absent.

3. EU has well developed legal framework on regulations of internal gas transmission and transportation system, which allows blocking out Russian gas supplies, and increasing bargaining power through use of pipeline system as resource in order to achieve better gas supply conditions. However, regarding the rules of internal transit and transmission system, EU does not act as a single actor, which may reduce its bargaining power.

Thus, the hypothesis of this paper is partly proved. EU external agenda, which includes energy issues, is developed only with some countries, which are important for gas transit and supplies by 2030. Regarding internal rules of gas transmission and transit system, EU still does not act as a single actor.

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