MASARYK UNIVERSITY
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The Challenges of Achieving Energy Security through Cooperation: The Case of the Visegrad 4 Natural Gas Market Integration

Habilitation Thesis

Brno, 2018 Jan Osička

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Abstract

In this text, I focus on the issue of the integration of the natural gas market in the Visegrad 4 region, which I approach as an instance of an energy security-seeking regional cooperation initiative. I endeavor to provide insights into the current state of the integration process, and I introduce the main challenges that stand in the way of further progress of this integration. I start by introducing the analytical framework of the research, for which it was necessary to develop a specific approach to studying Energy Security. The approach allows the diversity among theoretical families of scientific disciplines engaged in energy (security) research to reveal themselves. In the case of this research, I draw upon Alexander Wendt's Social Constructivism, which belongs to the discipline of International Relations. I use these constructivist lenses to look into the material and ideational factors characterizing the V4 market integration project. Methodologically, I utilize a case study design for analysis of the material factors, and a combination of quantitative content analysis and Discourse Network Analysis for analysis of the ideational factors. The findings show that the project has not really proceeded any further beyond fostering physical interconnection between three out of the four V4 countries, with Poland remaining largely disconnected from the rest. The increasingly diverging gas market conditions, which result from different priorities in the V4 countries' respective gas policies and the different roles that the gas industry plays in their energy sectors, makes the task of bringing them together ever more complicated. Furthermore, the perceptions of the project by the platform itself, as well as by its stakeholders, suggests that perspectives on the issue are as diverse as the involved countries' energy policies. At the V4 level, the gas market integration project is mostly associated with physical interconnection and the security of supply dimension at the expense of market and price-related goals and benefits related to integration. A more granular analysis of the stakeholders' perceptions shows that the defining feature of V4 gas market integration is a lack of shared understanding of how to actually define the term itself, how to implement it at the regional level, how to recognize that integration has been achieved, and how to relate regional integration to integration that takes place at the European level. In light of these findings, I conclude that the lack of hierarchy in the V4 platform and the no-regret basis envisaged for the integration process make the rather ambitious goals of the project nearly impossible to achieve.

Disclaimer

In accordance with Section 6, Article (1) b) of Masaryk University Directive No. 7/2017 on Habilitation Procedures and Professor Appointment Procedures, this research report is a written thesis introducing new scholarly or scientific findings. The report partially builds on previously published empirical work, specifically Osička, J., Plenta, P., & Zapletalová, V. (2015); Osička, J., Lehotský, L., Zapletalová, V., & Černoch, F. (2017) and Osička, J., Lehotský, L., Zapletalová, V., Černoch, F., & Dančák, B. (2018). The relevant segments of these texts (see the list below) are contextualized via introductory theoretical discussion of "Energy Security", the overarching concept used as an analytical framework, and, via research design inspired by Alexander Wendt's constructivism, connected to the new findings. These include for example the analysis of regional interconnectivity or the analysis Russian supply outlook and export policy.

The segments of the already published empirical work featured in this research report:

- Osička, J., Plenta, P., & Zapletalová, V. (2015). *Diversity of gas supplies as a key precondition for an effective V4 gas market* (1st ed.). Bratislava: Research Center of the Slovak Foreign Policy Association.
    - The chapter "Current situation on V4 markets – Opening up the market" was translated into this report's Section 4.1.1 "Opening Up the Market."
    - The chapter "Availability and accessibility – Norway" was translated into this report's Section 4.2.2, "Norway."
    - The chapter "Availability and accessibility – UNG Poland" was translated into this report's Section 4.2.3, "UNG Poland."
    - Chapter "Availability and accessibility – LNG" was translated into this report's Section 4.2.4, "LNG."

- Osička, J., Lehotský, L., Zapletalová, V., & Černoch, F. (2017). *Natural Gas Market Integration in the V4 Countries*. Masaryk University Press. https://doi.org/10.5817/CZ.MUNI.M210-8901-2016
    - Chapter 5, "Intergovernmental level" was translated into this report's chapter 5.1, "Perceptions of Energy Cooperation and Market Integration at the V4 level."
    - Chapter 10.1, "Content analysis" was translated into this report's Chapter 3.2, "Quantitative Content Analysis."
    - Chapter 10.2, "Stakeholder analysis" was partially included into this report's Chapter 3.3.1, "Data collection and processing."

- Osička, J., Lehotský, L., Zapletalová, V., Černoch, F., & Dančák, B. (2018). Natural gas market integration in the Visegrad 4 region: An example to follow or to avoid? *Energy Policy*, *112*. https://doi.org/10.1016/j.enpol.2017.10.018
    - Chapter 3, "Method," was translated into this report's Chapter 3.3, "Discourse Network Analysis."
    - Chapter 4, "Data collection and processing," was translated into this report's Section 3.3.1, "Data collection and processing."
    - Chapter 5, "Data analysis," was translated into this report's Section 3.3.2, "Data Analysis."
    - Chapter 6, "Results," was translated into this report's Chapter 5.2, "Perceptions of Market Integration by the Project's Stakeholders."
    - Chapter 7, "Discussion," was included into this report's Chapter 6, "Discussion."
    - Chapter 8, "Conclusions and policy implications," was included into this report's Chapter 7, "Conclusions."

I hereby confirm that I am the sole author of all the parts of the above mentioned three publications that were used in this research report. In the case of Section 3.3.1 of this research report, which is derived from Chapter 4 of the Osička, J., Lehotský, L., Zapletalová, V., Černoch, F., & Dančák, B. (2018) article as well as from Chapter 10.2 of the Osička, J., Lehotský, L., Zapletalová, V., Černoch, F. (2017) monograph, the co-authors assisted in the data collection and processing phases by: interviewing representatives of the stakeholder institutions, transcribing recorded interviews, reconstructing unrecorded interviews from the available notes, and coding the data corpus. A statement of authorship in which my co-authors certify that information included in this disclaimer is correct can be found in Appendix 1.

Brno, April 19, 2018

[redacted]

Jan Osička

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1. Introduction

As a policy problem, energy security emerged in the early 20th Century in connection with supplying oil for militaries. Academic reflections on what came to be known as Energy Security date back to the 1960s, and came of age with the oil crises of the 1970s. In the late 1980s and 1990s, academic interest in Energy Security declined following the stabilization of oil prices and the receding threat of political embargoes. It re-emerged in the 2000s, driven by rising demand in Asia, disruptions of gas supplies in Europe, and pressures to de-carbonize energy systems (Cherp & Jewell, 2014), and continues to be one of the key components of energy policy. In fact, energy security is often portrayed as paramount to human security (B. K. Sovacool & Mukherjee, 2011), as a crucial element of the planning and development of the energy system from a technical, economic, social, and environmental point of view, as well as from a political one (Augutis, Krikštolaitis, Martišauskas, Pečiulytė, & Žutautaitė, 2017), or as a key driver and justification of a great deal of energy policy in recent years (E. Cox, 2016).

Contemporary energy security challenges have begun to extend beyond securing energy supplies, and now encompass a wider range of issues; the concept is now closely entangled with other energy policy problems, such as providing equitable access to modern energy and mitigating climate change (Cherp & Jewell, 2014). In spite of this, some argue that such evolution has not only contributed to the widening of the scope of the concept of “Energy Security” but has also triggered a re-securitization process, which highlights numerous energy policy issues such as climate change, energy poverty, and energy equity (Valdés, 2018). In such a conceptual environment, defining and conceptualizing Energy Security is an increasingly difficult task. Despite considerable efforts to formulate a universal conceptualization of Energy Security (APERC, 2007; Cherp & Jewell, 2011; Goldthau & Sovacool, 2012; Jewell, Cherp, & Riahi, 2014; B. K. Sovacool, Mukherjee, Drupady, & D’Agostino, 2011; Vivoda, 2010; von Hippel, Suzuki, Williams, Savage, & Hayes, 2011), the concept remains “contested.” In this research report, I endeavor to contribute to the conceptual literature by rejecting the idea of a universal conceptualization; instead I propose that rather than being used as an analytical concept, “Energy Security” should be used as a three-dimensional analytical framework. In the empirical part of this thesis, I demonstrate the practical applicability this approach through an analysis of natural gas market integration in the Visegrad 4 countries (V4; the Czech Republic, Hungary, Poland, and Slovakia).

The relevance of the research topic for our understanding of Energy Security is as follows: First, natural gas. The least carbon-intensive of the fossil fuels covers 37.0% of derived heat production and 16.4% of electricity generation in the EU-28 (Eurostat, 2017). At the same time, 70% of the European gas supply is imported, and 30% of the import comes from the EU’s geopolitical rival, Russia (Eurostat, 2018). A structural setting such as this, together with the supply crises that hit Central and Eastern Europe in 2006 and 2009, reinforces the image of natural gas as a geopolitically-burdened energy source, and echoes the energy security concerns of the 1970s (Cherp & Jewell, 2014).

Second, market integration – a process of bringing previously separated markets together, so that the trading activities within the integrated market area cause wholesale gas prices to converge (Asche, Osmundsen, & Tveterås, 2001), has emerged as one of the leading strategies to achieve greater security of supply. With market integration, the availability (and diversity) of energy supplies naturally increases, as bigger markets generally attract more suppliers and traders, and as various areas of the integrated region gain access to supplies that were previously inaccessible. Similarly, the competition that results from more suppliers and traders being attracted to the region puts downwards pressure on price, positively contributing to affordability or the "price dimension" of energy security. However, the deeper an integration process goes, the more robust infrastructure connecting various parts of the integrated region needs to be. Market integration thus positively affects infrastructure development and contributes to improved availability and diversity of supply, and increased competition. Evidence from various energy industries support the positive effects of market integration on energy security. With regards to physical availability, the world oil market is, contrary to the popular belief, a striking example of enhanced security of supply. The simple fact that targeted oil embargoes have never prevented consumers who have access to the integrated world market from accessing oil, or, for that matter, producers from selling it (after all, even the Islamic State was selling oil to increase its revenues) suggests that in robust energy markets, physical availability is rarely an issue (Nordhaus, 2009). Furthermore, evidence from electricity market integration between Germany and Austria shows that Austrian consumers in particular have benefited greatly from the downward price pressure that the establishment of a common bidding zone between the two countries brought along. The German experience with cooperation between and integration of its four electricity TSOs highlights the positive effects of integration on the overall costs of operating the infrastructure (specifically, through the optimization of balancing energy use) (Bundesnetzagentur, 2015). Finally, the ability of Ukraine to take advantage of Western European liquid gas markets and of the West-East transit capacity that was made available by the V4 countries and completely re-route its foreign gas supply, from exclusively eastern-sourced deliveries to exclusively western sourced ones within just one year, is an impressive example of how deep and far-reaching the consequences of gas market integration can be for a gas-importing country's energy security.

Third, the Visegrad 4. Over the last two decades, the EU has aimed to develop an integrated gas market, outlining a vision of a common trade area providing households and businesses with reliable and affordable supplies of natural gas. To accelerate this process, the EU encouraged regional cooperation, resulting in two processes: the distribution of EU Member States into three major regions of enhanced cooperation and support, to various smaller bilateral and multilateral projects of gas market integration (ACER, 2016). The integration project by the V4 is one of these “smaller” projects. Introduced in 2013, “The Road Map towards the Regional Gas Market” document calls for the development of new, as well as further extension of existing, interconnections between the V4 countries and for the preparation of a market design for the V4 region (The Visegrad Group, 2013, p. 3). To date, the physical infrastructure development has prospered and V4 countries enjoy a growing grid of connection points. On the other hand, the regulatory aspects of the integration project have stagnated. Not only has the goal of a multiply coupled market zone failed to come to pass, but even preparatory work has not yet been conducted (ACER, 2016). The mixed results that the project has brought so far are what makes it an attractive case for studying the challenges of integration.

The contrast between the generally successful cooperation in the field of energy generally, which ranks among the Visegrad 4’s top priorities and has been evaluated as the area in which it performs best (Kořan, 2011; Kořan et al., 2016; Törő, Butler, & Grúber, 2014), and the limited results of the gas market integration project is the focal point of this research report. I attempt to answer the following research questions:

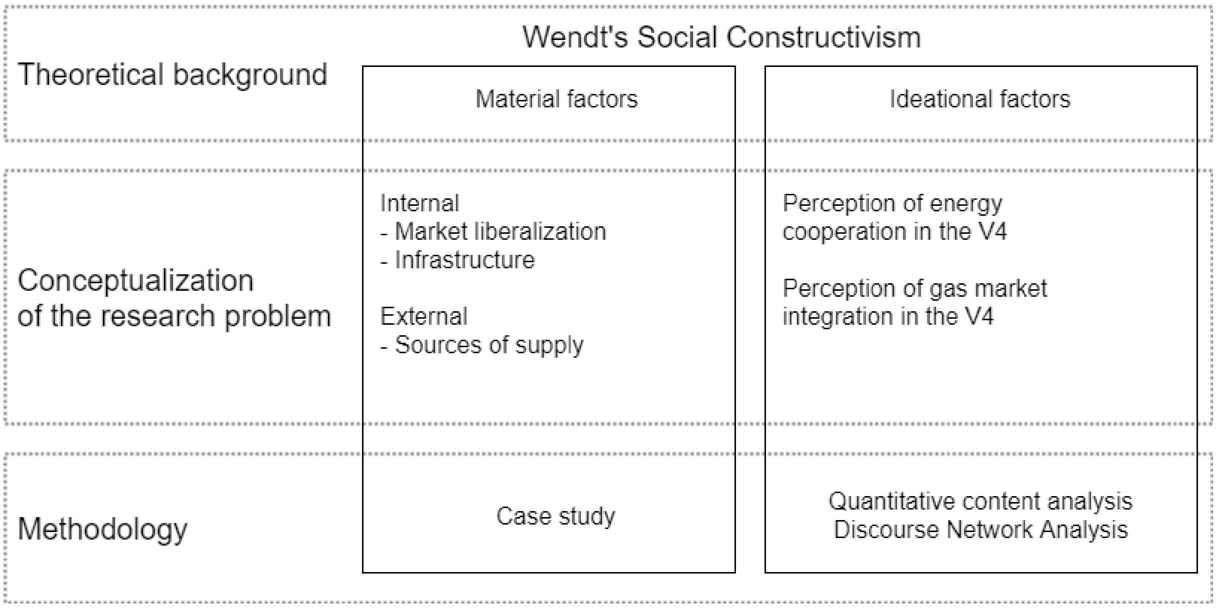
(1) What is the current state of the integration project?
(2) Which challenges hinder its further progress?

The literature that deals with market integration in general (Eberlein, 2008; Glachant, Hallack, Vazquez, Ruester, & Asacri, 2013; Padgett, 1992) and the V4 market integration project specifically (Ascari, 2013; Dąborowski, 2014b, 2014a; De Jong & Egenhofer, 2014; Osička, Ocelík, & Dančák, 2016; Slobodian, Theisen, Goda, & Karaskova, 2016) identifies three main sets of challenges: physical challenges (infrastructure and supply patterns), market compatibility challenges (market liberalization, regulatory provisions), and interest compatibility challenges (Which goals are pursued by participation in an integration project? Which actors participate in articulation of these goals? What role does energy play in domestic politics? Does the government see energy as a market commodity or as a public service?). On the theory side, this research is grounded in Alexander Wendt’s Social Constructivism (Wendt, 1995). Wendt’s approach was selected for three reasons: first, coming from International Relations, the branch of political science where security is among the key concerns, the approach facilitates a link between the empirical focus of this research and the theoretical concept of “Energy Security”. Second, the approach recognizes both domestic and international inputs into policymaking, which makes it suitable for the analysis of a problem that spans across several domestic and foreign policy issues. Third, because it acknowledges the importance of both material and ideational factors in policymaking (Adler, 2005; Onuf, 2013; Wendt, 1995), it makes it suitable for the analysis of the physical and market compatibility issues (material factors) as well as the issues associated with perceptions and interests (ideational factors, or, in the words of Wendt 1995, pp. 72–74, “shared knowledge”).

Conceptually, the selection of the material factors pursued in this research is informed by Sergio Ascari (2013), who identified three fundamental market criteria that any cost-effective integration project must meet: (1) a size of at least 20 bcmy, (2) three different sources of gas, and (3) low wholesale market concentration – with an HHI (Herfindahl-Hirschman Index) of 2,000 or less (Ascari, 2013). Apart from that, the individual markets need to be physically connected to each other. Cross-border interconnection thus represents an additional material factor in the research. Ideational factors are associated with the perceptions of energy cooperation within the V4 and the integration project specifically; these perceptions are held by the V4 platform as a unit, as well as the main national stakeholders of the integration process.

Methodologically, material factors are analyzed in this report using a multi-case study design, while the analysis of the ideational factors employs a combination of quantitative content analysis (the perceptions of energy cooperation and the integration project by the V4 platform) and Discourse Network Analysis (the perception of the integration project by the project’s stakeholders). A graphical expression of the research design can be found in Figure 1.

Figure 1. Research design



The research presented here provides insights into the V4 market integration project that not only reveal new information about the case itself, but also provide us with new perspectives on the general issue of market integration in the EU. Given the importance of the regional arrangements in the EU’s integration plans, the V4 market integration can be approached as model that can help us identify the less apparent challenges for the integration process more generally.

This research report is structured as following. In Chapter 2, I discuss the main concepts examined in this research and establish the connection between the existing body of literature and the objectives and procedures of this research. Chapter 2.1 starts with a thorough discussion of the polysemic and contested concept of “Energy Security” (Chester, 2010) and an acknowledgement of the undisputable contribution of current conceptualization efforts in identifying the substantive boundaries and landmarks of the concept. The chapter concludes by introducing an alternative analytical framework for Energy Security, which I consequently employ to analyze the V4 market integration project. Chapter 2.2 discusses the basic principles of market integration, provides a review of the existing research on the issue, and briefly introduces existing integration models. At the end of the chapter, I specify which market model fits best for the characteristics and goals of the V4 region.

Chapter 3 introduces the methods applied by this research report and describes the procedure of using them more thoroughly. It is in this chapter that the processes of case selection, data collection, data processing, and data analysis are introduced and the analytical decisions associated with them are explained and justified.

Chapter 4 is focused on the material factors shaping the integration project. I map the current situation on V4 markets, focusing primarily on the state of market liberalization and on cross-border interconnection. Second, I analyze the existing sources of gas supplies and their future export potential, as well as the future export potential of other plausible suppliers.

In Chapter 5, I discuss the ideational factors. First, I analyze the results of quantitative content analysis, looking for the most frequent meanings that the V4 platform’s official documents associate with regional energy cooperation and with the integration project. I combine these findings with results from a Discourse Network Analysis employed to analyze perceptions of the integration project as held by the project’s main stakeholders – ministries responsible for energy, ministries of foreign affairs, transmission system operators, and national regulatory authorities.

Finally, Chapters 6 and 7 feature the discussion of the research results and, respectively, the conclusions.

2. Theory and Literature

2.1 Energy Security

Over the past decades, energy security has firmly established itself among the key concerns of developed societies as well as becoming a subject of intensive research within many scientific disciplines, including the social and political sciences. Interestingly enough, despite the substantial attention that the concept enjoys within a variety of discourses, its precise meaning remains unclear. The main reason behind this seems to be the ambiguous nature of both its components – "energy" and "security." "Energy," according to Ciută (2010, p. 135), is a "total concept": "The totality of energy is inherent in its three key dimensions of growth, the environment and sustenance: energy affects everything, everything affects energy, and, ultimately, everything is energy." The concept of "security," for that matter, has been labeled as "contested" and avoided even by Security Studies scholars. According to Baldwin (1997, p. 9), "Security has been a banner to be flown, a label to be applied, but not a concept to be used by most Security Studies specialists." As a result, the conceptual clarity of, and the theoretical reflections on the concept of "Energy Security" remain underdeveloped, making it difficult to carry out energy security-related research, connect the field with other fields of scientific inquiry, or base political decisions on energy security concerns.

Despite the ample attempts to conceptualize "Energy Security," a universal – e.g. applicable, coherent and consensual – conceptualization has not yet been formulated. In fact, the Energy Security Studies field now appears to even be drifting away from the idea of a universal conceptualization of energy security, rather than approaching its formulation. The epistemological debate between Benjamin Sovacool and Aleh Cherp (Cherp, 2012; B. K. Sovacool, 2012; B. K. Sovacool & Mukherjee, 2011) has demonstrated the increasing complexity of this conceptual debate, which has led some scholars to argue for a substantial reconsideration of the way we approach it. Cox (2016) for example argues that "there is a real need to attempt to take into account multiple competing and context-specific views on energy security, instead of trying to close the discussion down around a small number of simple quantifiable indicators or metrics." The natural follow-up question to Cox's appeal – What views should we take into account and how should we approach them? – seems to be answered by Cherp & Jewell (2014), who see "Energy Security" as an instance of security in general, and suggest employing the conceptual framework developed within the better-established discipline of Security Studies. Throughout their innovative article, they apply David Baldwin's general conceptual framework for security research to highlight the contrast between the "classic Energy Security Studies" of the 1970s and 1980s, and the "contemporary Energy Security Studies" of today.

In this chapter, I intend to pick up where Cherp & Jewell and Cox left off. First, I provide support for Cox's appeal through a critical examination of the existing strategies/approaches to formulating a universal conceptualization of energy security, and argue that none are likely to yield an analytically useful tool. Building on this assumption, I introduce a different tool to facilitate the connection between the empirical reality and its theoretical reflection: an analytical framework called "conceptual spaces." The idea behind this framework is that instead of being *guided by* a (universal) conceptualization of energy security, empirical research could be *embedded in* a particular conceptual space. These spaces are demarcated by the intersections of three cleavage lines: the first deals with the normativity of Energy Security research – an issue that has not been raised yet; the second with the well-addressed broadness of its scope; and the third with its theoretical background. The last cleavage line develops Cherp & Jewell's idea of employing analytical frameworks established within Security Studies, but given the multidisciplinary nature of contemporary Energy (Security) Studies, I argue that theoretical guidance can just as well be adopted from other disciplines – in the case of this research report, from International Relations.

2.1.1 Defining "Energy Security": The State of the Art

As of today, a vast majority of the contemporary empirical literature opts to define "Energy Security" in terms of *availability* and *affordability* (Yergin, 2006, pp. 70–71). Faced with the ambiguous nature of these two terms and with the ever-growing scope of the empirical research that declares itself to be based on the concept, scholars have tended to refine the common-sensical conceptualization of "available supplies at affordable prices" by (1) expanding its scope so it can capture a wider variety of referent objects, threats, and contexts; or, on the contrary, by (2) narrowing it down to more tangible concepts; or by (3) building multidimensional/multilevel conceptualizations to capture the broader context while avoiding conceptual stretching (see Sartori 1970).

2.1.1.1 Expanding the Scope

The core question in expanding the concept is which referent objects in which contexts are necessary and/or useful to include. Many authors stress complexity and interdependence in contemporary international energy transactions (see for example Alhajji, 2008; Van der Ploeg and Poelhekke, 2009; Yergin, 2006), and do not limit energy security to availability of just energy supply (the consumers' point of view), but tend to take also other participants into account: "Security of demand is as important to producers as security of supply is to consumers" (Barkindo, 2006). As a consequence, the main threat is no longer seen as solely coming from supply shocks, but from any instability that would jeopardize the continuity of energy flows.

As energy security ceases to be interchangeable with security of supply and becomes more of a security of energy exchange, more attention must inevitably be paid to transportation, and, consequently, to transit states. Their place in a conceptualization of "Energy Security" may be twofold: (1) Building on the notion of energy security as shared among producers and consumers, issues such as infrastructure capacity, access to infrastructure, or costs of transit come to the fore; And (2) Similar to energy producers, transporters maximize the volume of transited energy to achieve financial and/or non-financial benefits. Well documented examples include relations between Turkmenistan-Iran-Turkey, Russia-Ukraine-EU, or Turkmenistan-Russia-EU.

Operating at multiple analytical levels is another means of broadening the scope of the concept. At the structural/global level, some conceptualizations embrace factors such as environmental sustainability, while at the individual level issues such as the socioeconomic sustainability of energy exchange patterns (such as energy poverty) come to the fore:

> "In a situation of energy poverty, not even the basic needs of energy are satisfied and there is a clear deficit in terms of reliability and adequacy of supply. Thus energy poverty also implies insecure energy supply." (Bhattacharyya, 2013, p. 427).

> "Energy poverty and deprivation result in four major, interrelated, negative energy security consequences: poverty, death, gender inequality, and environmental degradation" (B. K. Sovacool, 2013).

Arguably, both global and individual levels of analysis have been firmly incorporated into and/or reflected by some widely accepted conceptualizations of energy security, such those by European Commission (2000) and by the World Economic Forum (2013):

> "[Energy security means] uninterrupted physical availability of energy products on the market at an affordable price for all consumers, whilst respecting environmental concerns and looking towards sustainable development" (European Commission, 2000).

> "Energy security is the reliable, stable and sustainable supply of energy at affordable prices and social costs" (World Economic Forum, 2010).

Finally, WEF & CERA (2006) provide a conceptualization that is truly complex in its listing of referent objects (including sub-state agents such as IOCs) and the contexts they operate in:

> "Energy security is an umbrella term that covers many concerns linking energy, economic growth and political power. The energy security perspective varies depending upon one's position in the value chain. Consumers and energy-intensive industries desire reasonably-priced energy on demand and worry about disruptions. Major oil-producing countries consider security of revenue and of demand integral parts of any energy security discussion. Oil and gas companies consider access to new reserves, ability to develop new infrastructure, and stable investment regimes to be critical to ensuring energy security. Developing countries are concerned about the ability to pay for resources to drive their economies and fear balance of payment shocks. Power companies are concerned with the integrity of the entire network" (World Economic Forum & Cambridge Energy Research Associates, 2006).

2.1.1.2 Narrowing the Scope Down

Another strand of literature proceeds the opposite way: instead of the most comprehensive conceptualization possible, these authors seek to distill the very essence of the term, and leave out everything that could compromise the clarity and analytical usability of the term. As a result, the authors who follow this strand narrow the scope of the term down to what they consider its conceptual core. For example, Noël (2008) stresses the importance of well-functioning markets in the global allocation of energy commodities, and argues against combining the desired market focus of Energy Security analysis and decision-making with problems that are not part of the "functionality of energy markets" issue:

> "Energy markets themselves will simply not address climate change, at least not in a meaningful way. This is why I think it is not helpful to bundle energy security (strictly defined) and climate change into a single, wider definition of Energy Security."

> "I would advocate a narrow definition of Energy Security, centered on the availability of energy to those who are willing to pay the market price. Energy insecurity can then be linked to situations when energy markets do not function properly. Energy security policies should be mostly aimed at 'making markets work' and letting them work when they do." (Noël, 2008)

Winzer (2012) elaborates on the idea of separating Energy Security from issues that do not belong to its conceptual core, which, according to the author, is security of the energy supply. According to Winzer, a narrower concept can be quantified more easily, it facilitates the trade-off between different policy goals, and can reduce the double counting of aspects that lie on conceptual boundaries. When developing his line of reasoning, Winzer identifies three distinctions that reflect three conceptual boundaries:

> "The first distinction is between threats that have an impact on the supply chain and impacts of the supply chain on the environment. The concept of energy security could be limited to threats that have an impact on the energy supply chain, while impacts of the energy supply chain on environmental belong to the concept of sustainability. This would narrow down the concept of energy security to the concept of energy supply continuity. Depending on the stage of the transformation process at which the continuity of supplies relative to demand is measured, energy supply continuity could further be divided into commodity supply continuity, service supply continuity or the resulting continuity of the economy.
>
> "The second distinction is between the description of supply continuity and value judgments about the worth of different continuity levels. The concept of energy security could be limited to the measurement of commodity, service and economic continuity levels, while value judgments about the desirability of continuity level are addressed by the policy goal of economic efficiency. The pricing of continuity levels would then be an area of overlap between energy security and economic efficiency in the same way as the appropriate pricing of environmental externalities is an overlap between economic efficiency and sustainability.
>
> "The third distinction is between constant scarcity and changes of scarcity levels. The concept of energy security could be limited to changes of scarcity levels, while the impact of constant scarcity levels would belong to the concept of economic efficiency. On longer time-scales, any scarcity level is subject to change. The analysis of very slow changes in scarcity is therefore an area of overlap between economic efficiency and energy security." (Winzer, 2012)

2.1.1.3 Building a Multidimensional Conceptualization

Greater stratification is for many scholars a preferred means of reducing the banality of expanded conceptualizations. Generally, they introduce an all-embracing conceptualization and then divide it into several sections, analytical levels, or dimensions, according to various criteria.

The 2007 report on energy security in the Asia-Pacific region by the Asia Pacific Energy Research Centre (APERC, 2007) is widely considered to have been the first analysis to consistently work with a multidimensional conceptualization. Similar to the scope broadeners, APERC identified three "fundamental elements" of "Energy Security": physical, economic, and environmental (APERC, 2007, p. 6). Based on this structure, the center identified four dimensions that further developed these elements into analytical segments of conceptualization of "Energy Security," using these segments as points of connection between particular indicators of energy security and within the concept itself. These dimensions include: Availability (the physical existence and disposability of energy sources); Accessibility (the presence/absence of barriers in redistribution of the sources from producers to consumers); Affordability (the costs related to resource acquisition and energy infrastructure development); and Acceptability (the environmental impact related to the use of a particular energy source).

Bert Kruyt et al. (2009) in their "Indicators for energy security" article, drew upon the perceived contrast between the proliferation of Energy Security literature in relation to the unexpectedly high oil prices recorded during 2004-2008 period and the lack of a usable operational definition of Energy Security. Their attempt to establish one began with a decision to consider "Energy Security" to be synonymous with the security of supply. Then, building on the security of supply literature existing at that time, they introduced a toolbox for Energy Security analysis that comprised existing simple and aggregated indicators of security of supply, paying additional attention to whether the indexes were actually being used when drafting energy policies.

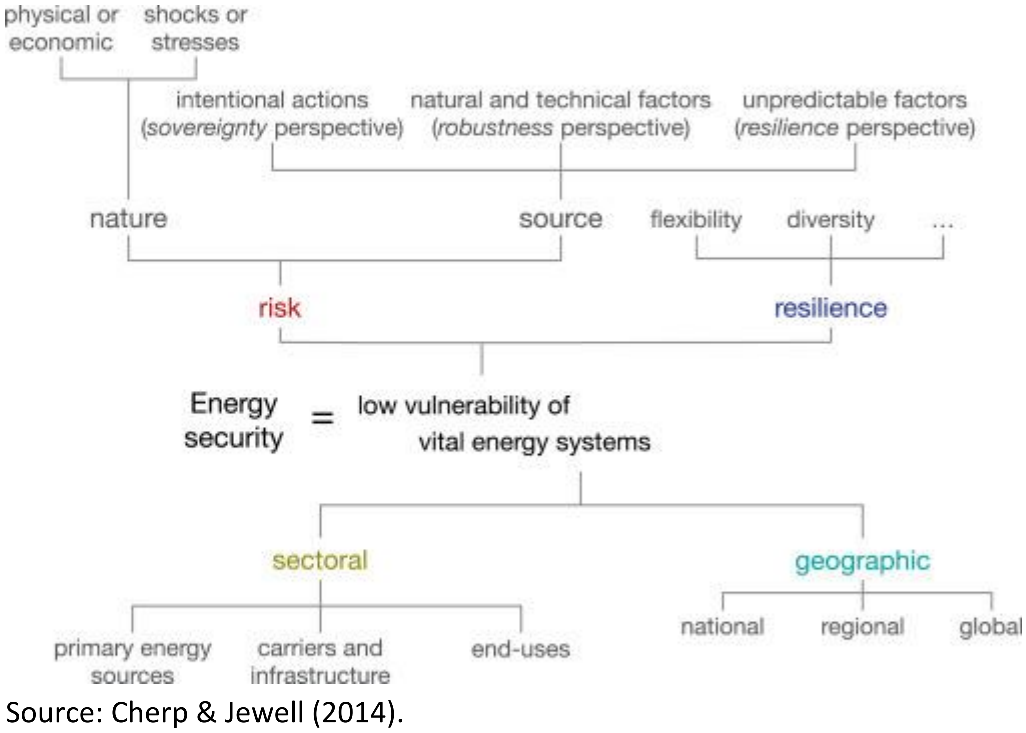
David von Hippel et al., in their 2011 article "Energy security and sustainability in Northeast Asia" called for a more comprehensive operational definition of "Energy Security" as well as for a workable framework for analysis of which future energy paths or scenarios would be likely to yield greater Energy Security in a broader, more comprehensive sense. They argue that while "Energy Security" has typically, to those involved in making energy policy, meant mostly securing access to oil and other fossil fuels, the trends in international energy transactions justified a need for a new framework. These trends were, according to the authors, the increasingly global, diverse energy markets, and the increasingly transnational problems resulting from energy transformation and use. In the face of these trends, the old energy security rationales were less salient, and other issues, including climate change and other environmental, economic, and international considerations were starting to become increasingly important (von Hippel et al., 2011). Consequently, they introduced a complex framework called the "Comprehensive Energy Security Concept," arguing that a nation-state is energy secure to the degree that fuel and energy services are available to ensure: (a) the survival of the state, (b) the protection of national welfare, and (c) the minimization of risks associated with supply and use of fuel and energy services. The six dimensions of Energy Security include supply, economic issues, technological issues, environmental issues, social/cultural issues, and military/security issues. Energy policies must address the domestic and international (regional and global) implications of each of these dimensions (von Hippel et al., 2011).

Vlado Vivoda, in his 2010 article "Evaluating energy security in the Asia-Pacific region: A novel methodological approach," builds on von Hippel's operational definition of "Energy Security" and expands it to what he calls an "Energy Security Assessment Instrument." He envisages the instrument as a systematic interrogative tool for evaluating the energy security of individual states or regions. In addition to adopting and adapting the six dimensions introduced by von Hippel, Vivoda's instrument includes an additional five dimensions, all – according to Vivoda – associated with the current global energy system. Vivoda argues that these dimensions help take into account numerous additional quantitative and qualitative attributes of each country's energy security and policy, including both traditional energy security concerns and many new factors, such as the environment, sociocultural elements, and technology. Furthermore, Vivoda focuses also on the existence of, and the issues addressed in, energy security policy in each country (Vivoda, 2010).

Arguably the most complex multidimensional conceptualization to date was introduced by Benjamin Sovacool and Ishani Mukherjee in their 2011 article "Conceptualizing and measuring energy security: A synthesized approach." They conceived "Energy Security" as a complex goal, involving questions about how to equitably provide available, affordable, reliable, efficient, environmentally benign, properly governed, and socially acceptable energy services; the authors followed the same practical pathway as von Hippel *et al.* (2011) in conceptualizing the term. They first identified the dimensions of "Energy Security," and then introduced indicators for each of these dimensions. To enhance the clarity of these dimensions, they added a layer of "dimension components" which was intended to facilitate a better connection between the dimensions and the indicators as well as increase the validity of the conceptualization. Altogether, Sovacool and Mukherjee outlined five dimensions and twenty components, and identified an impressive set of 319 simple and 48 complex indicators for measurement and to provide information to policymakers. The set includes commonly used indicators such as Proven Recoverable Energy Reserves per Capita (which belongs to the Security of Supply and Production component of the Availability dimension), Total Energy Research Expenditures (Innovation, Technology), and Market Share of the "Three Largest Energy Suppliers or Companies (Competition and Markets, Regulation and Governance); less frequent metrics such as Number of Coal Mines and Number of Flex Fuel Vehicles (Diversification, Availability), Annual Transfers of Wealth to Oil Producers (Dependency, Availability), Percentage of Energy Use Covered by Long-term Contracts (Price Stability, Affordability), and Periodic Publication of Official Energy Planning Documents and/or Statistics (Knowledge and Access to Information, Regulation and Governance). They also include many rather unusual indicators, such as Annual Sales of New Air Conditioners, or Per Capita Number of Refrigerators (both under Access and Equity, Affordability), Cases of Pneumoconiosis (black lung disease); (Safety and Reliability, Technology), Availability of Trained Repair Personnel (Resilience and Adaptive Capacity, Technology), Volume of Tritium Leaked into Local Water Supplies (Water, Environmental and Social Sustainability) or the Number of Annual Protests relating to Energy (Governance, Regulation and Governance), which have probably never been used in Energy Security research before, and which underline the complexity of the authors' approach.

Finally, Aleh Cherp and Jessica Jewell, in their 2014 article entitled "The concept of energy security: Beyond the four As," approach "Energy Security" as the "low vulnerability of vital energy systems." In their view, "vital energy systems" consist of energy resources, infrastructure, and uses linked together by energy flows that support critical social functions. These can be delineated by sectoral or geographic boundaries (e.g. "the Eurasian gas market" or "the Western US electricity grid"). Examples of vital energy systems, according to the authors, may include oil supplies to militaries, energy infrastructure, renewable energy sources, energy "services," energy exports, or biofuel or hydrogen trade in decarbonized energy systems. When discussing the concept, Cherp & Jewell pay most attention to vulnerabilities. They recognize two dimensions of vulnerabilities: the nature of the risk and the source of the risk. The nature of the risk is again two-dimensional, where the authors differentiate between physical risks (typically infrastructure-related disruptions) and economic risks (price fluctuations and the question of the affordability of energy). With regards to the source of risks, they identify three distinct perspectives (see also Figure 2):

Figure 2. "Energy Security" according to Cherp & Jewell (2014)

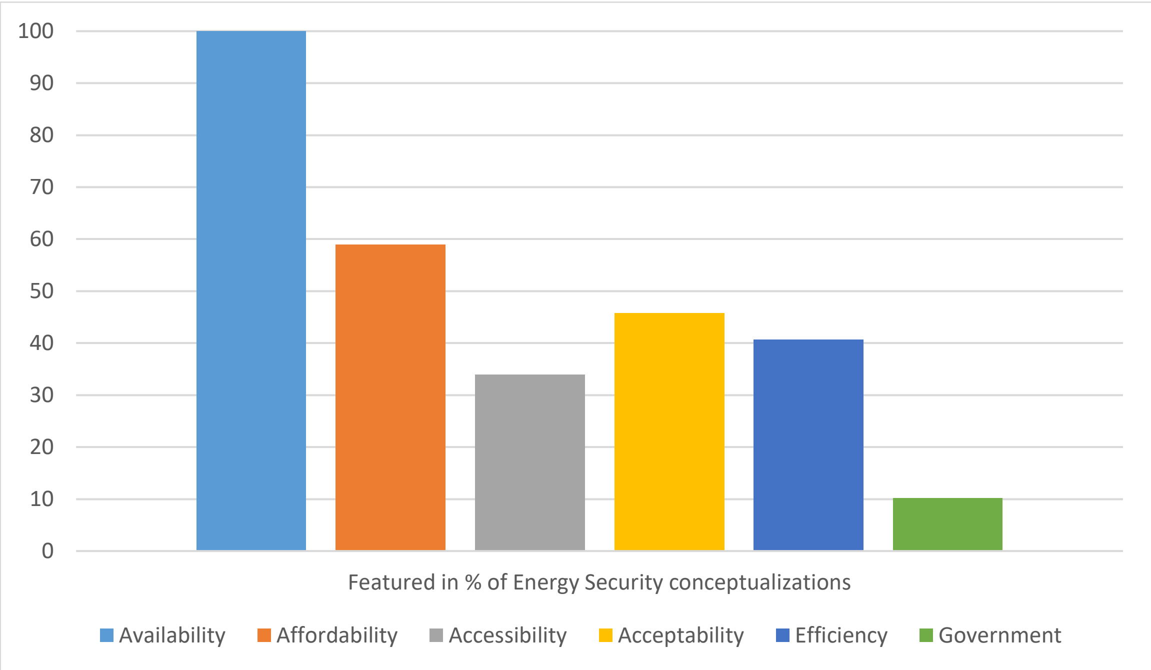


Source: Cherp & Jewell (2014).

The "sovereignty perspective" sees the origin of risks in deliberate actions of foreign actors. It has its roots in political science and focuses on interests, power, intentions, and room for maneuver. The "robustness perspective" sees the origin of risks in natural and technological phenomena, such as resource scarcity, the aging of infrastructure, and natural events. It has its roots in natural science and engineering, focusing on the probability, magnitude, and impact of disruptive events. The "resilience perspective" sees the origin of risks in largely unpredictable social, economic, and technological factors. It has its roots in ecology, economics, and complex systems analysis. It shifts the emphasis away from risk exposure to the obverse side of vulnerability, resilience. The resilience factors addressed by the science and policy of energy security range from more straightforward ones (such as backup production capacities, stockpiling, emergency plans, and diverse suppliers) to technological diversification (Cherp & Jewell, 2014).

Apart from the existing conceptual inquiry, there is also a substantial body of meta-research dealing with the issue of the conceptualization of "Energy Security," which helps identify the landmarks and boundaries that are commonly shared among contemporary energy security theorists and help present their relationship to gas market integration. The two most elaborate contributions in this field have arguably been delivered by Erahman et al. (2016) and Ang et al. (2015). Erahman et al. (2016) examined 39 studies from the Energy Security field and focused on structures of the conceptualizations of "Energy Security" that they build on. The authors found out that out of 39 conceptualizations, all 39 reflect the "Availability" dimension, 23 the "Affordability" dimension, 20 "Accessibility," 27 "Acceptability," 24 "Efficiency," and six also reflected the "Government/Regulation" dimension (Figure 3).

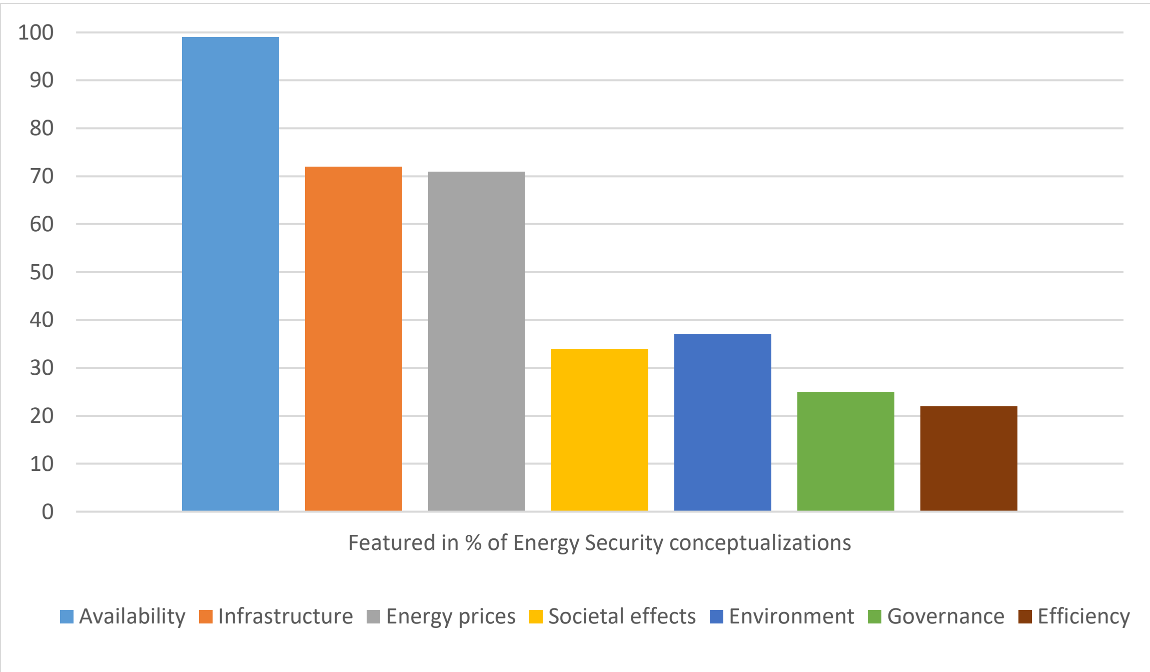
Figure 3. Distribution of "Energy Security" dimensions in 39 conceptualizations according to Erahman et al. (2016)



Source: Erahman et al. (2016).

Similar results were presented in a meta-research by Ang et al. (2015). The authors examined as many as 104 different studies on “Energy Security,” focusing on several issues such as whether the scope of the studies were national, regional, or global; whether the articles were published as journal articles or official reports (or as another publication type); whether they attempted to define “Energy Security” (81% of the studies did); whether they provided any “Energy Security” indicators or indices (49% of the studies did); and, finally, which dimensions of “Energy Security” they chose to include. Altogether, the authors determined seven dimensions to be coded within the studies and came up with the following findings: within the 83 studies that actually provided some definition of “energy security,” the “Availability” dimension, which comprises issues such as diversification of supply and geopolitical risks, was featured 82 times; “Infrastructure” (robustness, spare capacity, adequate investment to ensure maintenance and proper development) 60 times, “Energy Prices” (absolute price levels, price volatility, the degree of competition in energy markets) 59 times, “Societal Effects” (energy poverty, local acceptance) 28 times, “the Environment” (global warming, air pollution, deforestation, spills) 31 times, “Governance” (long-term development of infrastructure, taxes, subsidies, energy diplomacy, data collection) 21 times, and “Efficiency” (reducing energy intensity) 18 times (Figure 4).

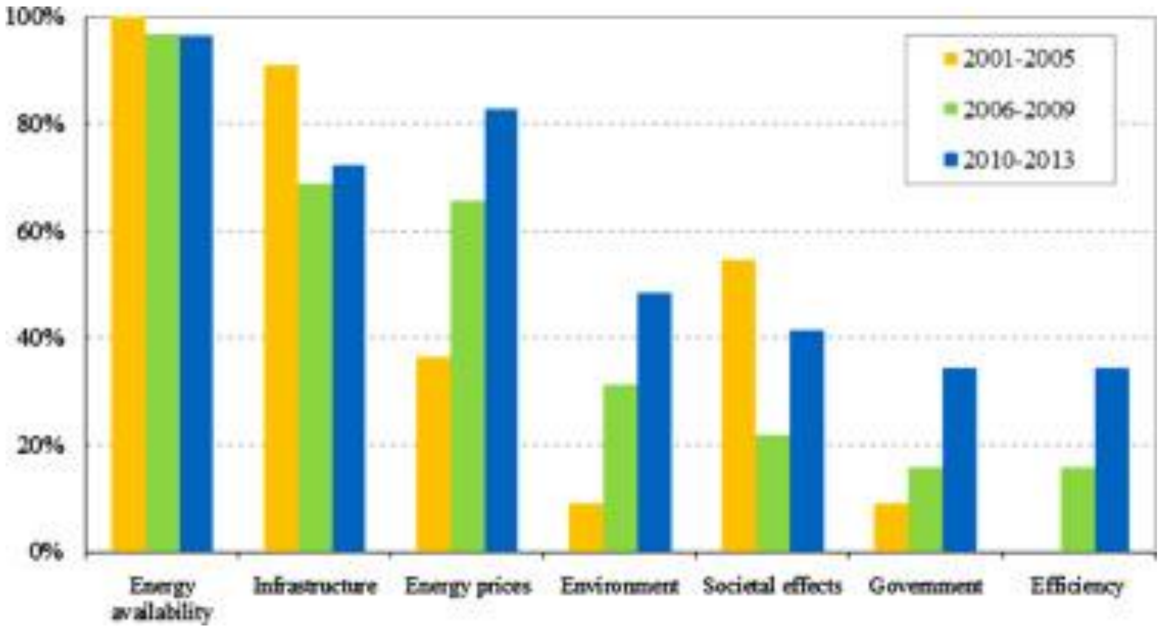
Figure 4. Distribution of “Energy Security” dimensions in 83 conceptualizations according to Ang et al. (2015)



Source: Ang et al. (2015).

Apart from the overall classification process, the authors provide also a temporal layer to their research, looking at how the representation of the respective dimensions of “Energy Security” in the selected texts changed over three specific time periods: 2001-2005, 2006-2009, and 2010-2013. From this point of view, the “Availability” dimension remains the most represented one in absolute terms, as well as the one that scores the highest with respect to stability of representation: in all the time periods, it scores consistently over 95%. Meanwhile, four dimensions have shown steady growth in representation: the “Energy Prices” dimension grew from less than 40% in the first period to more than 80% in the third; “the Environment” grew from less than 10% to nearly 50%; “Governance” from less than 10% to more than 30%; and “Efficiency” from zero to more than 30%. Representation of the “Infrastructure” and “Societal Effects” dimensions did not show any trend (Ang et al., 2015). See also Figure 5.

Figure 5. Representation of “Energy Security” dimensions over time according to Ang et al. (2015).



Source: Ang et al. (2015)

The listed meta-researches show that the most common themes in conceptualizing “Energy Security” concern the availability of energy and energy prices, both of which are critically affected by the infrastructure condition in the country or other area of interest under study. Notably, market integration is a process that substantially affects all of them.

2.1.1.4 The Inadequacies of Current Conceptualizing Strategies

There are several reasons why none of these previous approaches have provided a satisfactory outcome. The existing critique points out that expanding the scope of the concept actually makes it more difficult to conceptualize (Cherp & Jewell, 2014). Ciută (2010, p. 136) goes further, arguing that validity gains from expanded conceptualization are offset by increased banality (conceptual stretching):

> "Energy security [then] means the security of everything: resources, production plants, transportation networks, distribution outlets and even consumption patterns; everywhere: oilfields, pipelines, power plants, gas stations, homes; against everything: resource depletion, global warming, terrorism, 'them' and ourselves. At its maximum, this logic invests every single object of any kind with and in security. At least potentially, the result is a panoptic view of security that legitimates panoptic security policies" Ciută (2010, p. 136).

Narrowing the concept down, as Noël or Winzer suggest, certainly reduces banality. On the other hand, it largely compromises validity, as it leaves out referent objects and threats that are acknowledged by both existing scholarly literature and contemporary political practice. Noël's suggestion to restrict the concept to "availability for those who are willing to pay market prices" not only ignores those who are willing but unable to pay (energy poverty), but more importantly it fails to consider the reasons why energy security emerged as a security issue in the first place: the strategic/(geo)political behavior of energy companies, market failures, and dysfunctional market designs that reflect a more regional distribution of power than the supply-demand nexus (typically the oil shocks of the 1970s, or contemporary natural gas markets in Central and Eastern Europe).

The clear demarcation of borders between various scientific disciplines utilizing the concept as suggested by Winzer is an important step forward in terms of analytical applicability. However, a complete separation of Security Studies, Economics, and Environmental Science seems to run counter to contemporary political practice, in which energy security, climate change, and end-user prices are very much interconnected (see for example the German discussion on the decentralization of power generation). Furthermore, the environmental dimension of energy use can have as serious effects on a country as traditional energy security challenges have: see for example the case of Tuvalu, or the costs of environmental pollution in China. Similarly, the social sustainability of the energy industry and access to energy are the most important energy-related issues as far as the sheer impact on human society is concerned. Energy poverty of some form affects half of the world's population (WEF 2015) – around 38% of people do not have access to clean cooking facilities and 20% to electricity (IEA 2013). Thus, from the point of view of an average human being, to have some useful form of energy at one's disposal needs to be addressed *before* supply disruptions or price fluctuations can be dealt with.

Multidimensional definitions that address wide-ranging issues, including those just mentioned, seek to combine the validity of expanded conceptualizations with the usability and clarity of narrow conceptualizations. However, they too face substantial criticism. Cherp & Jewell (2011) for example note that:

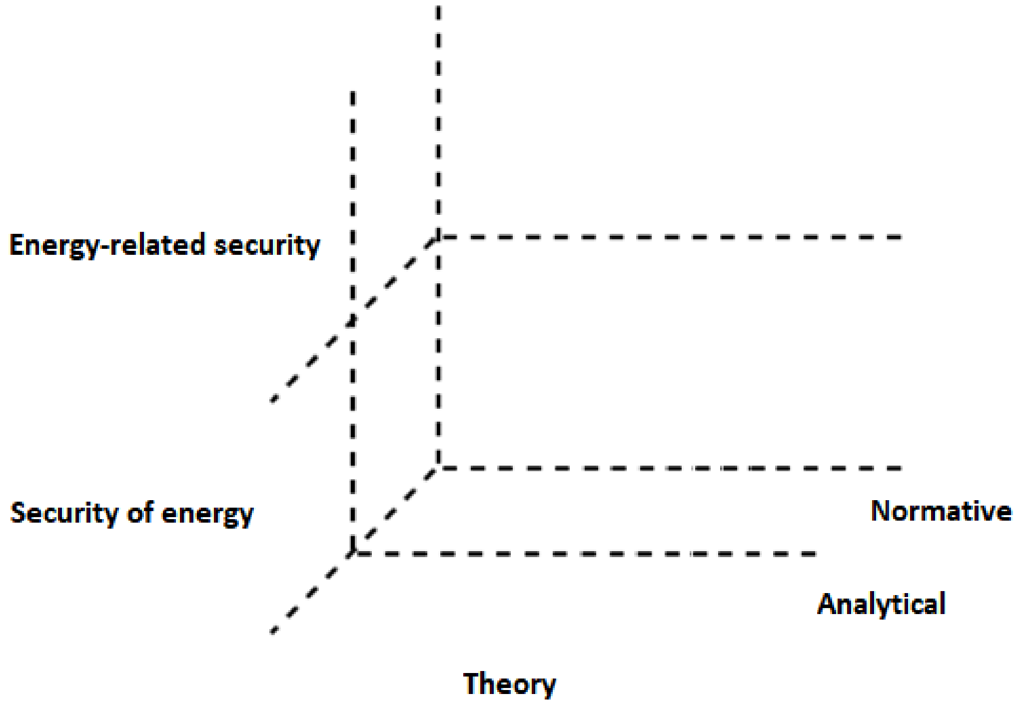
> "Many studies seek to integrate the long and seemingly disconnected lists of energy security concerns by classifying them into 'dimensions' or 'aspects' of energy security with generally understandable names appealing to common sense.… While such classifications help in attracting attention of policy makers and the public to different aspects of energy security, they are only the first step on the way to develop a systematic scientific understanding of energy security challenges. This is because the basis for these classifications is rarely systematically justified: they often seem almost as arbitrary as the lists of energy security concerns which they seek to structure. Moreover, classification is not integration. Placing several concerns in one group does not necessarily help us to understand them better or to develop integrated solutions" Cherp & Jewell (2011).

2.1.2 The "Conceptual Spaces" Alternative

Building on Cherp & Jewell's criticism, I argue that multidimensional conceptualizations, such as Sovacool's Synthesized Approach (2011), have told us much more about the landmarks and boundaries of the "substance" of energy security rather than introducing an analytically useful conceptualization. In this sense, we have reached the point where despite not knowing exactly what "Energy Security" *is*, we have a rather thorough understanding of what it does *consist of*. Moreover, that this is as far as the multidimensional conceptualizations could ever get us. Therefore, instead of introducing yet another set of dimensions/metrics or re-categorizing the existing ones, Energy Security scholars should now turn to the existing decades-long experience with security theorizing that has taken place within parent disciplines in order to proceed further, without having to refight battles which have already been fought and whose outcomes are already known. Notably, the history of "conceptualizing security" generally has not by any means led to a universal conceptualization of security, and there is no reason why Energy Security scholars should be any more successful.

For this reason, I suggest a more pragmatic approach, which would acknowledge that conceptualizations are mere means, rather than ends to, scientific inquiry; and which would be less concerned with the substance and more with the method. In other words, instead of asking "what is 'Energy Security?'" such an approach would pay more attention to "how should we study Energy Security?" In this sense, I suggest that instead of being *driven by* an (universal) conceptualization of "Energy Security," empirical research could be *embedded in* a particular conceptual space (see Figure 6). These spaces emerge along the following points of distinction: normativity (analytical or normative), scope (the security of energy or energy-related security), and a theory, which serves as a guidance for empirical research.

Figure 6. Conceptual spaces



2.1.2.1 Normativity

First of all, one needs to be aware that every conceptualization both stresses and suppresses certain aspects of reality. Conceptualizations – analytical tools that help us to gain knowledge about certain phenomena – at the same time hide other phenomena from us. For this reason, there is a clear need to distinguish between conceptualizations introduced by energy security agents and by Energy Security scholars. A scholar's conceptualization is the outcome of an analytical decision (what *is* there to focus on?), while a conceptualization introduced by an agent is by definition normative, as it reflects both the agent's understanding of the issue (what *is* there to focus on?) and his interests vis-à-vis the issue (what *should* be studied and what *should* be neglected?).

In my view, it is important to acknowledge that only analytical conceptualizations introduced by non-agents should be used as analytical tools in scientific inquiry. Normative conceptualizations, if provided by non-agents, could be employed as an emancipatory tool in critical research (see section 3.3.3); or, if provided by an agent, as a source of data for research that deals with a stakeholder's understanding of energy security matters. A clear example of an agent's conceptualization is provided by Abdalla Salem El-Badri, OPEC Secretary General:

> "Energy security should be reciprocal. It is a two-way street. Security of demand is as important to producers as security of supply is to consumers; It should be universal, applying to rich and poor nations alike, with the focus on the three pillars of sustainable development and in particular the eradication of poverty.… It should allow for the development and deployment of new technologies in a sustainable, economic and environmentally-sound manner; and it should benefit from enhanced dialogue and cooperation among stakeholders" (El-Badri, 2008).

El-Badri's conceptualization, apart from providing a certain analytical value, tells a story in which OPEC, building on the idea of shared energy security, tries to shake off the legacy of the 1970s and positions itself in one boat with energy consumers. It creates a narrative in which OPEC, by stressing concepts such as poverty eradication and economically-sound technological development, effectively builds a justification for higher margins on the price of oil it enjoys due to its cartel behavior. Employing El-Badri's conceptualization in rigorous research would therefore inevitably result in tacit policy advocacy.

Admittedly, the dividing line between (energy security) agents and non-agents is far from being clear. One needs to bear in mind that the borderline between academia and business is not rigid, and that there are scholars who have gained most of their substantive knowledge about energy by working for an industry. Similarly, being an agent does not necessarily mean pushing a self-serving view of energy security. The United Nations and the World Economic Forum, both arguably energy (security) agents, use a normative approach towards Energy Security. The Forum (2015) even suggests securitizing the issue of energy poverty to attract more attention from top-level decision-makers. However, the fact that sharp boundaries between interest-driven, engagement-driven, and rigorous analysis-driven conceptualizations of "Energy Security" do not exist does not mean that we should not endeavor to distinguish them from one another. On the contrary, the more blurred the agent-concept nexus is, the more attention needs to be paid to the resulting conceptualizations in order to prevent tacit policy advocacy.

2.1.2.2 Scope

In general, there is not much sense in sectioning the "Energy Security" matter into pre-existing conceptual segments, as most current conceptualizations do. However, it may be *analytically useful* to differentiate between "security of energy" and "energy-related security." The former focuses on the security of energy supply for the referent object, be it a national state, a community, an individual, an industry, or a "vital energy system." The latter is interested in the security implications of energy transactions, such as environmental impact, the safety of energy facilities, or the political stability of revenue-dependent states. These are issues that undoubtedly deserve scientific attention, but they should not be included in the same conceptual space as the security of energy supply unless they *directly* influence it.

As far as the substance itself is considered, I argue that this conceptual distinction should be the dominant one. First, its boundaries are arguably the clearest and the most comprehensible ones compared to those of the many multidimensional conceptualizations. And second, it is (tacitly or explicitly) acknowledged in most conceptualizations of "Energy Security," and its acceptance is not opposed to the direction in which empirical research is going.

2.1.2.3 Theory

Theoretical fragmentation is another reason why a universal conceptualization of "Energy Security" is unlikely to ever be formulated. According to Sovacool (2014), energy has become the subject of study of as many as twenty scientific disciplines, and nearly a hundred subdisciplines (see Table 1). While no similar meta-research exists for "Energy Security", it is not difficult to find contributions related to the concept coming from nearly all the listed subdisciplines.

Table 1. Disciplines and subdisciplines engaged in energy research

Anthropology	Anthropology, Cultural Studies, Ethnology
Business	Business, Management Science, Finance
Communication	Communication Studies, Rhetoric, Mass Media
Computer Science	Computer Science, Information Technology, Technical Institutes
Development	Development Studies, Area Studies, Social Development
Economics	Economics, Statistics, Mathematics, Econometrics, Industrial Organization
Energy	Energy Institutes, Energy Policy Studies, Energy and Resources Studies, Petroleum and Minerals, Mineralogy
Engineering	Electrical Engineering, Civil Engineering, Mechanical Engineering, etc.
Gender	Feminism, Women's Studies, Gender Studies, Family Studies
Geography	Physical Geography, Remote Sensing, Geographic Information Systems, Human Geography, Cartography
Hard Sciences	Physics, Astronomy, Cosmology, Chemistry, Geology
History	History, Social History, Historiography
Law	Law, Criminology, Penology, Legal Studies
Life Sciences	Biology, Ecology, Epidemiology, Botany, Environmental Sciences
Philosophy	Philosophy, Ethics, Metaphysics, Applied Philosophy, Epistemology
Planning/Architecture	Planning, Architecture, Real Estate, Urban Studies, Landscape Planning, Design
Political Science	Political Science, International Relations, International Affairs, Political Economy, Geopolitics, Civics, Peace Studies, Democracy Studies, Psephology
Psychology	Psychology, Psychiatry, Social Psychology, Applied Psychology
Public Policy	Public Policy, Public Administration, Policy Studies
Sociology	Sociology, Environmental Sociology, Human-Environment Interactions, Human Ecology, Demography, Collective Behavior

Source: Sovacool (2014).

If the subdisciplines listed above generate theories with fundamentally incompatible assumptions, how we are supposed to bring them together? And how can we combine them with theoretical families from the other disciplines? Just within Political Science's subdiscipline of International Relations – one of the most "tribalistic" social science disciplines (Wight, 2002), the width of the theoretical spectrum is substantial. On one hand, there is the state-centric, rationalist, and methodologically individualist neoclassical realism (Lobell, Ripsman, & Taliaferro, 2009; Rose, n.d.; Taliaferro, 2006), which, when combined with neoclassical geopolitics (Bennett, 2007; Kaplan, 2012), results in a traditional strategic approach towards energy security (Dannreuther, 2010); on the other hand, there is humancentric, reflectivist, and methodologically holist Critical Theory (R. W. Cox, 1981; Devetak, 2014), which, when applied to the matter of energy security, questions the very assumptions of the strategic approach (Ciută & Klinke, 2010). Notably, it often happens that where one sees security, the other sees insecurity – for example, massive and lightly regulated development of domestic oil reserves may foster energy security if the reference object is the state (neoclassical realism), but it may as well compromise it if the reference objects are members of the communities living in these production areas (as Critical Theory postulates – see, for example, Watts, 2013, pp. 466–514).

As a result, in conditions where a universal conceptualization of Energy Security cannot be formulated, particular theoretical approaches may nonetheless take over and provide the necessary guidance for empirical Energy Security research. The choice of the guiding theory then depends on the research problem and arguably also on the author's background.

2.1.3 "Energy Security" as Understood in This Research Report

In this text, I approach energy security as the following: along the (1) normativity cleavage line, the research steers profoundly towards analytical conceptualizing of "Energy Security." Despite some parts of this research report being previously published within larger research projects, occasionally funded by energy security/energy policy agents, such as the Ministry of Foreign Affairs of the Czech Republic, the projects were of an exploratory nature and uniformly refrained from adopting the funding bodies' understanding of "Energy Security." With regards to the (2) scope, this research utilizes the relatively wider approach towards energy security, focusing not only on security of energy supply and factors that affect it, but also on the (long-term) price effects associated with integrating natural gas markets. Finally, (3) the theory guiding this research is Social Constructivism (Wendt, 1995), which belongs to the discipline of International Relations.

Social Constructivism holds that social world emerges from interaction between actors (agents) and social arrangements (social structures). Upon interacting with each other, agents and structures *constitute* each other. These constitutive relations are being seen as mediated by rules. On the one hand, rules are made (or acknowledged) by agents who believe that following rules generally help them reach their intended goals. On the other hand, rules help to define every situation in which agents make choices, and in many these rules are directly responsible for presenting agents with choices (Onuf, 2013, p. 5). Constructivism is, therefore, mainly concerned with (1) the rules that make the process by which agents and social arrangements constitute each other continuous and reciprocal. It shows (2) the socially constructed nature of agents or subjects. Rather than taking agents as givens or primitives in social explanation, constructivists are interested in making them an "outcome variable" by examining the ways agency emerges and evolves. Constructivism is based on a research strategy of (3) methodological holism and therefore places social wholes (e.g. structures or arrangements), rather than individual agents, into the center of social scientific explanation (Onuf, 2013, p. 4; Wendt & Fearon, 2002, pp. 56–57).

The constructivist approach can be illustrated using the following example: A country covers 30% of its energy needs with natural gas, of which over 90% is imported from its former colonial master using just two pipelines. As the material factors display high level of import dependence, the security of the gas supply in the country seems compromised. However, things look different when we discover that the country is Ireland (see International Energy Agency, 2014). Despite the situation suggesting a significant power leverage of the UK over Ireland in terms of natural gas dependence, no literature whatsoever exists to reflect it, and there is no discourse to present the UK as an energy security threat to Ireland, as the rules governing their bilateral arrangements leave no room for the emergence of such behavior as a choice of action. The effects of rules and norms seems much more important when we compare the Irish case with structurally similar cases. The Central and Eastern European countries show a similar dependence on natural gas imports and to a limited extent comparable experience with colonial rule through their main gas supplier (Russia). Despite these (material) similarities, the rules governing these relations have cultivated the identity of the supplier as an "energy superpower" (Hill, 2002) and the consumers as "subjects exposed to energy weaponry" (Jirušek, Leshchenko, & Černoch, 2015). These subjects then often securitize energy imports and strive for energy self-sufficiency.

Examples of constructivist research on Energy Security includes the work of Mikko Palonkorpi (2008), who applied the Regional Security Complex Theory by Buzan and Wæver (2003) to various cases of international energy interactions, or discourse analyses by Petr Kratochvíl and Lukáš Tichý (2013), who focused on the EU and Russian discourse on energy relations, or by Petr Ocelík and Osička (2014), who studied the Russian discourse on the possible development of shale gas resources in Europe.

This research report, therefore, treats "Energy Security" as an analytical framework rather than a concept. Within this framework, it does not have any policy advocacy or critical ambitions. It utilizes a broad perspective on Energy Security, acknowledging the importance of energy prices for the referent objects. Finally, this research report approaches energy issues through the lens of Social Constructivism, an International Relations theory by Alexander Wendt, who argued that "the fundamental structures of international politics are social rather than strictly material, and that these structures shape actors' identities and interests, rather than just their behavior" (Wendt, 1995, pp. 71–72). These social structures, according to Wendt, consist of three elements: shared knowledge, material resources, and practices. Shared knowledge (and/or understandings and expectations) constitutes the actors in a situation and the nature of their relationships, whether cooperative or conflictual. Material resources like gold and tanks matter, too; however, they only acquire meaning for human action through the structure of shared knowledge in which they are embedded. Lastly, practices are, according to Wendt, the realm in which social structures exist and through which they are manifested (Wendt, 1995, pp. 72–74). Among these three elements, this research focuses mostly on the material factors (Chapter 4) and the shared knowledge (Chapter 5) associated with the project of market integration. Adding the practices layer into the research would undoubtedly enrich our understanding of the integration project, by connecting the material factors and ideas and interests behind the project to the nature and structure of the V4 negotiation and decision-making structure; however, since integration is an ongoing project, the observatory participation of researchers in the decision-making process is practically impossible.

2.2 Market Integration

2.2.1 What is Gas Market Integration?

Market integration is a process of bringing previously separate markets together, so that the trading activities within the integrated market area cause the prices on homogenous products from different suppliers to follow the same pattern over time (Asche et al., 2001). Essentially, when markets become integrated, the price differences between them should be eliminated, as there are no barriers for traders to buy the product in low-price areas and sell it in high-price areas. As a result, traders stimulate demand in the low-price areas, putting an upwards pressure on the price there, and at the same time facilitate additional supply in high-price areas, reducing the scarcity of the product and pushing the price down.

Market integration is therefore a process of reducing trade barriers between two or more markets. In the natural gas industry, there are two major types of barriers: first, there is a lack of sufficient physical interconnection (pipelines or liquefied natural gas delivery vehicles such as tankers, barges, or trucks) which prevents traders from taking advantage of price differences between individual areas of the market, and therefore also from contributing to price convergence; second, diverging market rules cause a variety of challenges. First, these rules limit the interoperability of TSOs (transmission system operators), which hinders the smooth movement of gas across the integrated region, and they also reduce market efficiency by acting as barriers to entry (for example, more relaxed licensing rules in one area of the integrated market prevent that area's traders from obtaining licenses to operate in other areas as well). Diverging rules also create rent-seeking opportunities (divergence in balancing rules, for example, would either completely prevent the balancing system from working, or incentivize traders to concentrate their balancing measures in one particular market area, causing undesirable money transfers).

As a practical matter, market integration can take many forms, depending mostly on the existing market structure and institutional arrangements of the countries/markets involved. With regards to the V4 region, Ascari (2013) has identified several integration models that could be applied:

The baseline integration scenario would be an independent connection of the four markets to one (or more) liquid hub(s). This solution would avoid any proposal of active market integration, with the exception of those necessary to ensure the standards regarding security of supply as required by Regulation 994/2010/EC (European Parliament/European Council, 2010). This approach postulates that markets can in fact be integrated, with substantial price alignment, by market forces that select one or more favored trading spots, which act as benchmarks for other market zones. This happens if all connected zones can "shop" in that market, even with limited direct interconnection between them. Likewise, V4 countries may limit their interconnection and harmonization to what is justified by market decisions or physical security of supply requirements, but decide to select (e.g.) a German (or a future merged German-Dutch) hub as their natural marketplace. Under this solution, the regulatory strategy would be partly different and focus more on ensuring the viability of connections with the greatest number of liquid hubs and the availability of transmission products to move gas from/to it (Ascari, 2013, p. 4).

Another option is the "multiple coupled market zones" model. This model assumes several zones with formally functional spot markets, though not very liquid, may be connected through market coupling once they are interconnected. The interconnection may be limited, and some congestion may occur; this would be mediated by an algorithm where different prices may emerge after joint bids are presented daily in the coupled zones. This solution requires less interconnection investment, but some effort to harmonize market rules, as for a single price zone. Yet no single tariff or dispatching would be necessary. There may be separate market operators, but a common office for market coupling would have to be designated. The main difficulty is the very limited experience in adopting such a market coupling concept in gas markets (Ascari, 2013, pp. 3–4).

Deeper integration could be achieved through the "trading region" model. This concept has been suggested as an option for the European Gas Target Model (GTM). It envisages a single tariff and price zone (and hence a single market operator) but separate balancing areas, which may coincide with individual (national) TSOs, or parts thereof. Like the previous one (market coupling), this model would be unprecedented in the gas market, and would need to be clarified regarding several aspects. It would still require a remarkable coordination effort on tariff and dispatching issues, but less than with the single zone (Ascari, 2013, p. 3).

The most advanced integration is associated with the single market zone model. The establishment of a single entry-exit and balancing zone has the advantage of ensuring the achievement of the GTM objectives in terms of market size and concentration, and could bring the V4 close to the GTM objective of having access to at least three different significant sources once a sufficient level of interconnection were to be developed. The objective would be fully met if connections to new sources like Caspian gas or Mediterranean LNG were built;

if they are reached by long distance pipelines bringing gas from the Caspian region; or if new unconventional resources are developed inside the V4 countries. On the other hand, this would be a highly demanding solution, as it would require full harmonization of market rules and practices, a lack of internal congestion, and a single market operator. This solution would not necessarily require a complete merger of the region's TSOs, but very close cooperation at the least, and probably the establishment of a coordination body for revenue compensation, dispatching, and balancing related activities. A single market operator would likely emerge once such a merger were completed (Ascari, 2013, p. 3).

2.2.2 Reflecting on Existing Research on Market Integration

The general issue of gas market integration has been covered by a substantial body of literature. It includes issues such as dynamics between market integration and infrastructure development (Dieckhöner, Lochner, & Lindenberger, 2013) as well as the regional specifics of the integration process (Deitz, 2009; Fischlein et al., 2010; Jirušek, Vlček, & Henderson, 2017; Renner, 2009). However, the most attention is arguably devoted to two strands of research: first, the question of how exactly an integrated market comes into existence (Eberlein, 2008; Glachant et al., 2013; Padgett, 1992), and second, the way the market integration process affects the prices of the respective commodity (Asche, Osmundsen, & Tveterås, 2002; Neumann, Siliverstovs, & Hirschhausen, 2006; Siliverstovs, L'Hégaret, Neumann, & von Hirschhausen, 2005).

Within the first strand of literature, significant attention is paid to the EU common gas market – a major integration project that is closely linked to the one that is taking place at the V4 level. The EU model is characterized by the gradual speed of transformation (Ruszel, 2015; Sencar, Pozeb, & Krope, 2014; Yafimava, 2013), and the uneven level of willingness to shift competences from EU Member States towards supranational institutions due to the fact that many European countries (such as Poland or Hungary) view the energy industry as strategically important, putting an emphasis on concepts such as energy as a public service and control over the security of supply (Austvik, 2016; De Jong, 2004; Mišík, 2016). Moreover, the EU is still facing various degrees of development of national markets due to the wide range of ways individual governments comprehended and subsequently implemented market liberalization (Westphal, 2014). Given this situation, creating a Europe-wide market makes less sense, and the gradual regional approach seems to be more realistic (Ascari, 2011). More specifically, the EU model is based on the assumption that the conjunction of neighboring (national) gas markets helps to create small (regional) integrated gas markets. Those markets represent the first step toward a single internal gas market in the EU (Glachant 2011).

2.2.3 Market Integration as Understood in This Research Report

The general view of gas market integration used in this research is associated with greater market interconnection and harmonization of market rules. The integration roadmap issued in 2013 does not specify any specific pathway integration should be pursued, instead, the roadmap calls for “a stepwise, self-learning and open-ended rather than fixed approach to the process and to choose to follow what shall be considered as a ‘no regret’ option which would at any time allow for necessary adjustments to the ongoing progress as regards the physical integration in the region and the development of all relevant potential market externalities” (The Visegrad Group, 2013, p. 3).

However, the roadmap does suggest that the inquiry associated with searching for the optimal solution should start with the multiple coupled market zones model: an operational study to be prepared by the TSOs should include an analysis of the legal and technical prerequisites, preliminary requirements for its implementation, and finally the resulting costs and benefits of the model. The roadmap further states that “if the results of operational study prove that the model is the best suited one to foster market integration in the V4 region it shall be considered by the V4 Ministers of Energy as a first step towards developing the final regional V4 market design” (The Visegrad Group, 2013, p. 5).

Hence, for the purposes of this research, the term “market integration” will denote the “multiple coupled market zones” model. However, given the Visegrad Group’s reluctance to identify and follow one particular model, from the very beginning of the integration process, the issues associated with the deeper integration models, such as transportation tariffs or balancing, will be addressed as well.

3. Methods

3.1 Case Studies

Case studies, as Flyvberg (2006) points out, are central to human understanding of the world (Barnes & Christensen, 1987; Gragg, 1940). Flyvberg notices that a true expertise in specialized skills such as playing chess, composing a symphony, or flying a fighter jet requires an intimate knowledge of several thousands of specific cases in the respective area of expertise, and argues that context-dependent knowledge and experience are at the very heart of any expert activity (Flyvbjerg, 2006, p. 222).

In social research, case study ranks among the most frequently used and at the same time the most discussed methodological approaches, with the question of case studies' theoretical relevance occupying the center of these discussions (George & Bennett, 2005; Gerring, 2007; Rohlfing, 2012; Savolainen, 1994). In addition to a more thorough understanding of what case studies can and cannot be used for (Flyvbjerg, 2006; Savolainen, 1994), these discussions have yielded a division between theory-oriented and case-oriented studies (Elman & Elman, 2001). This distinction is also reflected in Rohlfing's definition of case study – "the empirical analysis of a small sample of bounded empirical phenomena that are instances of a population of similar phenomena" (Rohlfing, 2012, p. 2), which allows researchers to accentuate either the "empirical analysis" itself or its relation to the "phenomena" in their endeavors.

3.1.1 Population and Cases

In this thesis, I follow the pathway of case-oriented studies. The goal is not to generate, modify, or contribute to a hypothesis test, but, by using Ascari's market integration criteria (2013) as a perspective, to explore (a) the characteristics of the V4 countries' natural gas markets, and (b) the export potential and export policies of the existing as well as possible natural gas producers that are or can be relevant sources of supply for an integrated V4 gas market.

In the case of market characteristics, defining population is simple: the cases in question are all members of the Visegrad 4. With regards to the potential to supply the region, the population of possible suppliers is determined by three factors: (1) the physical availability of excess gas production (Ruble, 2017); (2) geographical proximity, ensuring non-prohibitive transportation costs (Demierre, Bazilian, Carbajal, Sherpa, & Modi, 2015; Sadeghi, Horry, & Khazaee, 2017); and (3) favorable market-setting and export policies (Boersma, 2015; Feng, Li, Qi, Guan, & Wen, 2017). Therefore, the gas-producing countries that are (1) able to export gas to (2) the V4 region and have (3) such exports in line with their energy policies, constitute the population of cases of this study.

The first factor – existing or expected export capacity – narrows the population down significantly. Natural gas reserves are relatively unevenly distributed around the world, which makes the gas upstream a matter of just one or two dozen producers (BP, 2017). The population further shrinks when we factor in the means of transportation. With regards to pipeline natural gas, just a handful of exporters lie within a commercially attractive distance: Russia, Northwestern Europe (Norway and the Netherlands), possible new domestic sources of unconventional supply (mainly in Poland), and new foreign sources of supply associated with the Southern Gas Corridor (Ruble, 2017). The situation is different for seaborne trade, where the availability of export capacity seems to be very much ensured and diversified – according to BP (2017), there are close to twenty suppliers of liquefied natural gas currently operating on the market.[1] On the other hand, however, the available capacity of receiving terminals either in the V4 region or in its proximity is fairly limited. The third factor – the compatibility of gas exports to the V4 region with the regional market-setting and national energy policies, most likely rules out the option of supply from the Netherlands and the countries associated with the Southern Gas Corridor.

With regards to the Netherlands, the country's diminishing export potential associated with rapidly depleting reserves was further reduced by more restrictive production ceilings, which the Dutch government imposed on the crucial Groningen field after a series of earthquakes that hit the Groningen area in 2013 (Holz, Brauers, Richter, & Roobeek, 2017). Instead of capturing market share in new markets, the country's energy policy has remained immersed in the question of transforming its gas industry from supplying the commodity to providing transit services between LNG terminals, trading hubs, and consumption centers (Schipperus & Mulder, 2015). Consequently, despite the fact that Dutch gas production will continue to be present in continental Europe for one or two more decades, its presence will likely be limited to established outlets such as Belgium, Italy, France, and Germany, where it would supplement Norwegian supplies and add additional liquidity to the market.

The Southern Gas Corridor countries, broadly defined as the (potentially) exporting countries of Central Asia (namely Azerbaijan, Kazakhstan, and Turkmenistan), the Middle East (Iran and Iraq) and the Mediterranean (Cyprus, Egypt, Israel, Lebanon), face different challenges as they seek to establish themselves as gas suppliers to Europe. In doing so, they are likely to focus on the bigger European markets, such as Italy. There are two reasons behind this: (1) the lack of infrastructure throughout the Balkan region, which increases the marginal costs of supply, and (2) the long-term lock-in of contracts (Henderson & Mitrova, 2015, p. 41), which narrows an open market in which new entrants can compete to the part of consumption that is not covered by take-or-pay clauses common for existing long-term gas supply contracts. Typically, the contract flexibility has traditionally been between 10-15%, which means that the actual available market in countries importing gas on such a basis is

[1] US, Brazil, Peru, Tobago, Norway, Russia, Oman, Qatar, the United Arab Emirates, Algeria, Angola, Egypt, Equatorial Guinea, Nigeria, Australia, Brunei, Indonesia, Malaysia, and Papua New Guinea.

very small (Polo & Scarpa, 2013). For example, the combined consumption of five Balkan countries – Bosnia and Herzegovina, Bulgaria, Croatia, Montenegro, and Serbia, is just 8.5 bcmy. Provided their domestic production is negligible (BP, 2017) and their consumption is entirely covered via long-term contracts, the effective size of their combined market is just 0.9 to 1.3 bcmy, which is less than 2% of Italian consumption. The bigger markets are thus far more interesting for suppliers, as transaction costs are reduced and as it is generally more difficult to cut one's own profits by pouring too much commodity into the market and pushing the price down. In terms of absolute volume, the bigger markets also offer bigger selling opportunities, even if entirely locked in by long-term contracts. For example, if the whole of Italian consumption was to be covered by a standard, take-or-pay clause featuring long-term contracts, it could still accommodate the entirety of Azerbaijani exports within its contract flexibility level.

Hence, the population of cases to be explored in this thesis is as follows:

A) Market characteristics as specified by Ascari (2013)

- Czech Republic
- Hungary
- Poland
- Slovakia

B) Possible suppliers

- Russia
- Norway
- Unconventional gas sources in Poland
- LNG sources

3.1.2 Data Collection and Analysis

With regards to market characteristics, the relevant data concern the size of the individual markets (in bcmy of consumption) and market liberalization data, obtained from national and EU energy statistics, on the competitiveness of national markets. This data includes:

- The number of entities bringing natural gas into country
- The number of main gas entities
- The market share of the largest entity bringing in natural gas
- The number of retailers selling natural gas to final customers
- The number of main natural gas retailers
- Switching rates for gas (domestic)
- Regulated prices for households (yes/no)
- Regulated prices for non-households (yes/no)
- Market concentration in the gas supply market (Herfindahl-Hirschman Index, HHI)
- Market concentration in the gas retail market (HHI)

The case studies focused on supply potential will evaluate the export potential (both in volume and transit options) and export policies of the identified supply sources, mostly using primary data (transport capacities) as well as secondary literature (production/export outlooks, financial and political preferences in exporting gas).

4. Material Factors

4.1 The Current Situation in V4 Markets

The natural gas markets of the V4 countries share a very similar history, which continues to affect their current problems. In his article, Ascari (2013) emphasized that the main characteristics of the V4 countries' gas markets were that the national gas markets had been relatively slow to open up; gas supplies (routes and sources) were insufficiently diversified, and there was limited interconnection in the V4 region. The situation has not changed much in the past four years. Nevertheless, this chapter looks into the characteristics of the individual V4 markets (see Table 4).

Table 4. Opening up the market: natural gas markets in V4 countries

Key indicators (2012)	Czech Republic	Hungary	Poland	Slovakia
Number of companies bringing natural gas into the country	25	20	40	8
Number of main gas entities	1	4	1	3
Market share of the largest company bringing in natural gas	82.3%	32.91%	96.9%	61.8%
Number of retailers selling natural gas to final customers	59	30	120	22
Number of main natural gas retailers	11	6	1	2
Switching rates for gas (domestic)	12.03%	1.5%	0.8%	11.56%
Regulated prices for households	No	Yes	Yes	Yes
Regulated prices for non-households	No	Yes	Yes	Yes for SMEs
HHI[2] of gas supply market	3,358	1,494.26	N/A	N/A
HHI of gas retail market	1,632	1,245.89	9,073	N/A
Gas market value (€ billion)[3]	2.505	2.327	3.658	1.135

Source: European Commission (2014)

[2] The Herfindahl Index, also known as the Herfindahl-Hirschman Index (HHI), measures the market concentration of an industry's 50 largest firms in order to determine if the industry is competitive or nearing monopoly.

[3] Market value is an estimation of the size of the retail gas markets. It is calculated using data on gas consumption in the household and non-household sectors (average bands) and annual average retail prices.

4.1.1 Opening Up the Market

4.1.1.1 The Czech Republic

The Czech market is mature in spite of the relatively small share gas has of the country's primary energy sources. There is some minor domestic production, and Czech consumption was 8.4 bcm in 2013, an increase compared to 8.2 bcm in 2012 (BP, 2014).

Of the V4 countries, the Czech market is also the most open and advanced in terms of competitiveness and organization. On September 3, 2009, NET4GAS was legally unbundled from RWE Transgas, a gas importer and supplier. At the beginning of 2013, the ERO issued a certification decision concerning NET4GAS, which opted for a status as an Independent Transmission Operator. Gas distribution companies are legally unbundled from the transmission system operator, gas trading companies, and gas storage operators.

The lower market concentration compared to other V4 countries is also a consequence of access to cheaper gas from and transiting through Germany. In 2012, 25 entities imported gas into the Czech Republic (BP, 2014), and bidirectional transmission between the Czech virtual trading point and Slovakia was set up. Competition in the retail supply market is increasing as well: In 2012, there were 59 active gas suppliers in the retail market, ten more than in 2011. In 2013, there were 62 active traders supplying gas to customers. Since the retail gas market is now saturated, 2013 did not see such a significant increase in the number of traders compared with 2012 as had been the case in preceding years (European Commission, 2014b).

The Czech Republic has the lowest wholesale market concentration of the V4 (European Commission, 2014). Lately, retail competition has also been developing quickly and the switching rate of smaller customers dramatically increased between 2011 and 2012 to over 12%. Switching rates were the second-highest in the EU, while the ease of switching scored fourth-highest. Supplier switching between 2012 and 2013 decreased to 10.4%. It seems that the boom in switching is over in the Czech Republic (ERÚ, 2014).

Gas prices are generally determined by long-term contracts, but a growing number of suppliers now offer prices that reflect spot market prices. Gas prices for industrial consumers decreased between 2008 and 2012 as network and tax-related components of natural gas prices for industry decreased. The retail gas market was assessed as being below the EU average in 2012, and ranked nineteenth EU-wide (European Commission, 2014b).

4.1.1.2 Hungary

Hungary has a very mature gas market, and because of its limited coal resources has the highest reliance on natural gas for its primary energy requirement (approximately 30%). Consumption is evenly distributed between industry, power generation and the residential sector. Therefore, it is also very sensitive to security of supply as well as gas price issues. In 2013, consumption was 8.6 bcm, which is less than in 2012 (10.2 bcm) (BP, 2014). This decrease was primarily due to problems related to the economic crises. Domestic gas production has been 1.95 bcm per year and this covers approximately 20% of demand. Hungarian imports natural gas (8.17 bcm in 2013) from both an eastern and a western direction. In 2012, imports from the west (4.6 bcm) exceeded imports from the east (3.57 bcm) (Hungarian Energy and Public Utility Regulatory Authority, 2014).

Hungary was an early case of ownership unbundling, when in 2006 MOL, the national oil and gas company, sold its gas supply interests and related Russian supply contracts to Germany's E.ON. The gas TSO is FGSZ Zrt., a publicly traded gas company owned by MOL and certified as an ITO. In 2013, both the former E.ON-affiliated gas storage facility and the former public utility wholesale gas trader became affiliates of MVM Magyar VillamosMűvek Zrt., i.e. they were transferred to public ownership. The latter has a special role in terms of price regulation and security of supply, and possesses a long-term contract for Russian imported sources.

The political and regulatory debates of 2012 and 2013 continued to focus on the price moratorium, on special utility sector taxes, and, after December 2012, on price cuts for household consumers. The Minister of National Development approved a price adjustment equal to annual inflation at the beginning of 2012. Nevertheless, the price increase in gas imports created a mismatch between regulated retail prices and the wholesale import price. The energy sector was subject to an energy tax, a differentiated profit tax, and a crisis tax. The crisis tax was levied on energy companies' taxable revenue (generation and supply) and was due to end in 2013. However, the government then imposed a new tax on infrastructure, dictated by the length of transmission and distribution lines and pipelines. In 2013, regulated prices for household consumers in the gas and electricity sector were cut by 20% and further decreases were announced for 2014 (European Commission, 2014).

Concentration of the gas wholesale market had been decreasing in the first half of the decade, primarily due to more diversified imports and their increased share of a (reduced) domestic demand. In 2013, MVM further increased its presence on the wholesale market, in particular in imports previously dominated by E.ON, GDF and MOL. The gas exchange market, CEEGEX, owned by MVM, became operational in early 2013 (Hungarian Energy and Public Utility Regulatory Authority, 2014).

In 2012, 3.66 bcm of natural gas was purchased under regulated prices, 88% of which was sold to household consumers. Almost all households remain under the regulated price regime. The retail market is relatively concentrated, with six companies covering almost the entire retail market. The 2012 switching rate for household consumers was 1.5%, down from 10.4% in 2011. The high figure for 2010–2011 was probably due to the liquidation of EMFESZ, a supply company with a considerable number of retail accounts. Data for 2012 is much more typical for the market. Industrial consumers on the wholesale markets switch more frequently (ratios for consumers equipped with metering devices above 20 m^3/h vary from between 18.2% and 31.5%). Non-household prices are only regulated for consumers with gas meters below 20 m^3/h (European Commission, 2014).

The retail gas market ranks lowest in the EU (with a score of 65.9 points compared to the EU average of 74.1 in 2012) and 28th among 31 domestic service markets. It has also seen a 4.9 point decrease in its score since 2012 (highest in the EU). As of 2014, the market was rated lowest in the EU in terms of overall consumer satisfaction, and the second-lowest on the comparability of offers, while the incidence of complaints has been the highest in the EU (European Commission 2014).

4.1.1.3 Poland

Natural gas has played a relatively minor role, and per capita consumption is the lowest in the V4 and among the lowest in Europe, which is a consequence of the predominance of cheap local coal in the country's energy industry. However, Poland is still the largest gas consumer by volume of all the V4 countries. In 2013, consumption amounted to 16.7 bcm. Poland's own production was 4.2 bcm and the remaining demand was covered by imports, 9.6 bcm of which was purchased in Russia, while 1.8 bcm came mainly from Germany. Poland is among the least advanced EU Member States in terms of market liberalization. This is especially because of slow diversification and the slow opening up of the market (BP, 2014).

The TSO is Gaz-System, which was certified as an ownership unbundled TSO over the course of 2014. The rules on certification of independent system operators were only adopted in 2013. In the same year, gas was distributed by 40 system operators, including one incumbent system operator subject to legal unbundling.

In legislative terms, the Polish gas sector has yet to complete its liberalization process. Market conditions have improved. Progress so far includes the implementation of the European Network Codes, with the introduction of a virtual trading point, pilot projects with bundled capacities, a capacity auctioning platform, market-based balancing, the establishment of a gas exchange, etc. However, although these measures have improved Polish chances of developing a competitive wholesale gas market, they have proven insufficient so far in boosting competition on the market and changing the current market structure.

The Polish wholesale market has not been very attractive so far, not only because of its price- regulation status and its almost monopolistic structure, but also because of the composition of demand. The domestic market is monopolized by PGNiG, which, in practice, controls 100% of imported gas and accounts for over 95% of domestic production. PGNiG is also the sole operator of the country's underground gas storage system.

Since 2013, the gas exchange obligation has provided grounds for competition in the Polish gas market, but PGNiG failed to trade the mandatory 30% share on the exchange as there were too few buyers (European Commission, 2014). The prices available under bilateral agreements were temporarily lower than prices offered on the exchange and the overall demand for gas was insufficient to drive sales up. However, in 2014, the situation changed – the volume of gas traded on the gas exchange is now increasing.

Gas prices for households and industry were still regulated in 2012 (99.5% of households were supplied with gas under regulated prices). Poland's referral to the European Court of Justice for its regulated gas prices for non-household customers has resulted in Poland deciding to introduce changes in the way prices are determined for non-household customers. Prices for households and small commercial consumers are expected to be deregulated at a later stage. In this context, the Energy Regulatory Office published a *Roadmap of Natural Gas Prices Liberalization* in February 2013. This did not translate into the deregulation of gas prices to non-household customers, and derogations are still decided by the President of ERO. This has since been subject to a court case, which is now pending before the ECJ (European Commission, 2014).

A high level of concentration on the Polish gas market, mainly because of the dominant position of PGNiG, continues to have an impact on the structure of the retail market and the pace of change in the market. In 2013, PGNiG SA had about 94.42% of natural gas sales, while the remaining 5.58% belonged to other trading companies active on the market. In 2012, PGNiG SA's share in the sale of natural gas was 95.22%, while the share of other companies amounted to 4.78%, which is proof of slow changes occurring on the retail gas market. In 2013, the scale of supplier switching recorded on the retail market was similar to that in 2012, when 219 gas consumers switched suppliers, and the total number since monitoring began was 429 (Energy Regulatory Office of Poland, 2014).

4.1.1.4 Slovakia

Slovakia is the smallest V4 country in terms of population and gas market size. It has a very mature market with a high gasification level (second in Europe after the Netherlands). Moreover, domestic consumption is growing (5.4 bcm in 2013 and 4.9 bcm in 2012), but the country produces little gas itself (0.15 bcm in 2013). All the remaining gas is imported from Russia (approximately 5.3 bcm in 2013) (BP, 2014).

In terms of unbundling, Eustream is the only gas transmission system operator in Slovakia; it was certified as an independent transmission system operator (ITO) in 2013. SPP-distribúcia is the only operator of the gas distribution system, and was legally unbundled from SPP in 2006.

Concentration of the gas wholesale market remained very high in 2012. SPP has almost 70% of the gas supply and it has a long-term contract with Gazprom to import gas. The contractual price SPP has to pay to Gazprom was renegotiated, and fell in 2014 in order to better reflect the lower prices on spot markets. Other gas traders purchased gas from various, mostly foreign, gas suppliers on the power exchange or from Slovak suppliers operating as gas traders. Since 2013, it has become more common for smaller suppliers to purchase natural gas from larger suppliers. This allows larger suppliers to deal with problems of excess gas that arise when consumers switch gas suppliers.

Retail market concentration in Slovakia is high. In 2013, SPP, the traditional gas supplier had the most significant share in the market supplying gas to final gas consumers with a 63.2% share, followed by RWE Gas Slovensko with an 18.7% market share and ELGAS with a 4.0% market share. An additional 23 gas traders held 14.1% of the total gas consumed by final gas consumers. Prices for households remained regulated (European Commission, 2014). The process of household gas liberalization began in 2010 with an assessment of the impact of the associated regulatory measures. The position of new suppliers in the gas market was substantially more difficult in 2013 than it had been in previous years, when households tended to switch suppliers.

The number of household consumers who switched gas suppliers in 2012 was over 131,000 (9.25% of all households), six times the number of those switching in 2011. In 2013, the situation changed. For the first time, the open gas market recorded a decrease in the numbers changing gas suppliers, with a total of 6.31% switching in 2013, which amounted to a decrease of 2.86% compared with 2012. There was no significant transfer of households in 2013 from a traditional supplier to competing suppliers, as there had been in previous years. This was because there was no major difference between suppliers' offers and because when switching to a more competitive supplier, households had signed up for a number of years in order to obtain greater discounts (Regulatory Office for Network Industries Slovakia, 2014).

4.1.2 Cross-border Interconnection[4]

4.1.2.1 Import Capacity from Non-V4 Countries

There are multiple interconnection points between the V4 countries and their neighbors. Together they provide ample import capacity for the whole region, although a few weak spots remain: import capacity from Germany to Poland, and from Croatia, Serbia, and Romania to Hungary. The existing import capacity at individual cross-border points is indicated in Table 5.

Table 5. Import capacity into the V4 region

Interconnection	Indicated capacity (bcmy)
AT => SK	10.3
DE => CZ (HSK, Brandov)	51.0
DE => CZ (Waidhaus)*	18.9
DE => PL (Mallnow)	4.9
DE => PL (Lasów)	2.0
UA => SK	87.2
UA => PL	5.7
UA => HU	25.4
BY => PL (Tietierowka)	0.3
BY => PL (Kondratki)	43.0
BY => PL (Wysokoje)	7.1
HR => HU	0
RS => HU	0
AT => HU	6.4
RO => HU	0.1
LNG PL	5.0

*No firm capacity to exit from the DE side

4.1.2.2 Interconnection within the V4

Within the V4 area, there are essentially three types of cross-border interconnections: the legacy connections of the pre-1989 gas trade, such as Slovakia-Czech Republic; newly added connections, such as Slovakia-Hungary, or the Czech Republic-Slovakia physical reverse; and interconnections that have yet to be built – this is the case of Poland-Slovakia, and, to a large extent, Poland-Czech Republic (Table 6).

Table 6. Cross-border capacity within the V4 region

Interconnection	Indicated capacity (bcmy)	Reverse capacity (bcmy)
CZ => SK	29.2	61.3
SK => HU	5.0	5.0
CZ => PL	0.5	0.0
PL => SK	0.0	0.0

[4] This chapter draws on data from the ENTSOG Transmission Capacity Map (2017) and from a thorough data analysis of regional interconnections by Osička, Černoch, Dráb, Martanovič, & Vlček, (2015).

4.1.2.2.1 Czech Republic-Slovakia

The construction of interconnecting pipelines took place as part of the gas transit system delivering Russian gas to Austria, Germany, and further into Europe in the late 1960s and early 1970s. The interconnection pipeline appeared as such only after the breakup of Czechoslovakia in 1993. The Lanžhot cross-border point proved to be very important during the 2009 gas crisis, and since that time, capacity in the direction Czech Republic-to-Slovakia has been raised significantly, up to today's 29.2 bcmy. To achieve this, the Czech transmission system needed to be upgraded. Adaptation of the Lanžhot interchange station was part of the Reverse Flow West-East project; its goal was to raise gas transport capacity from the direction of the Czech-German border towards the Czech-Slovak border. This change further diversified gas flows for Slovakia, Austria, Hungary, and South Germany as well.

4.1.2.2.2 Slovakia-Hungary

The gas grids of Hungary and Slovakia had not been connected until recently. The interconnection between both countries was accomplished in 2014. The pipeline as a whole has been among a group of Projects of Common Interest (PCI) and is part of the North-South Gas Corridor. The pipeline was constructed by the Slovakian TSO (Eustream) in Slovakia, and MGT, operator of the Hungarian part of the pipeline, in Hungary. The main purpose of the interconnection is to increase the security of the gas supply in both countries, enabling solidarity with regards to cross-border actions in the case of a gas crisis, while also contributing to future diversification of gas supply sources (via the LNG terminal in Croatia).

4.1.2.2.3 Czech Republic-Poland

The two countries have connected since 2011 by the STORK pipeline. With a capacity of just 0.5 bcmy, its potential for significant cross-border exchange is fairly limited. Another leg of the pipeline, STORK II, has been planned to increase the overall capacity by 5.0 bcmy since STORK came online, but despite being placed on the EU's list of Projects of Common Interest and thus getting funded from the EU, the project has failed to proceed beyond the planning stage.

4.2 Sources of Supply

4.2.1 Russia

With 32.5 tcm of proven gas reserves, Russia possesses the second-largest reserves of gas in the world. It is also the largest gas exporter in the world (190 bcm in 2016), the largest exogenous supplier to the EU (140 bcm in 2016), and the single largest source of supply for the V4 region (23 out of the 38 bcm of the region's overall consumption) (BP, 2017).

4.2.1.1 Exportable Quantity

An analysis of Russian gas export potential from 2010 by Bengt Söderbergh et al. argues that the major producing Russian gas fields are in decline, and that in the future, much larger supplies from the (high-cost) Yamal Peninsula and the Shtokman field will be needed in order to avoid a decline in production. The authors concluded that the discourse surrounding the EU's dependence on Russian gas should thus not only be concerned with geopolitics, but also with the issue of resource limitations (Söderbergh, Jakobsson, & Aleklett, 2010). Only four years later, a paper by Sergey Paltsev argued that in terms of natural gas availability, resources would not be a constraint on Russia's ability to cover both the domestic and export needs for a substantial period of time, and that the limiting factors were existing infrastructure and its expansion, production costs, global market conditions and pricing, and political considerations (Paltsev, 2014). Paltsev's line of reasoning well illustrates the recent shift in the overall perception of the gas market, where the financial crisis, the shale gas revolution, and oversupply triggered by energy efficiency have, together with climate concerns embodied in the concept of a carbon budget (Fischer & Salant, 2017; Grasso, 2017; Ribas, Lucena, & Schaeffer, 2017), replaced the supply availability concerns that dominated the gas trade discourse throughout the second half of the 2000s.

Figure 8. Russia's gas production areas and supply routes

Source: Paltsev, Prinn, & Reilly (2011).

Other authors and reports are in agreement with Paltsev. Despite the expected gradual shift away from the low-cost, super-giant fields in the Nadym-Pur-Taz region such as Urengoy (Yermakov & Kirova, 2017) – see Figure 8, the initial development of which took place in the 1960s, Russian pipeline gas is expected to remain highly competitive at least until 2030, and the share of Russian gas (LNG supply included) is not about to change significantly in any way in the upcoming decades unless a major political shift takes place (Mitrova, Boersma, & Galkina, 2016). Therefore, at least for the coming decade, the question of Russian supply to Europe seems to be detached from the physical availability of gas and instead connected to the political acceptability of Russian deliveries (Mitrova et al., 2016) and the market dynamics that will likely affect the margins that the Russians extract from their European exports (Henderson & Mitrova, 2015, pp. 29–75).

4.2.1.2 Export Transport Capacity

Other than the Russia-Finland interconnector, Russian gas is delivered to the EU via three major routes: through Ukraine to Slovakia and also, to a lesser extent, to Hungary, Poland and Romania; through Belarus to Poland via the Yamal pipeline; and via the Nord Stream offshore pipeline that crosses the Baltic Sea and connects Russia directly with Germany. All these routes are also used for supplying the V4 region; two of these pipelines pass directly through V4 countries, and the Nord Stream's adjacent infrastructure – the Gazelle and OPAL pipelines – either already pass through the Czech Republic (Gazelle) or are slated to do so (OPAL), and are used to deliver gas to the Czech Republic and, occasionally, also further east to Slovakia – see Figure 9 (Osička et al., 2016; Pirani & Yafimava, 2016).

Figure 9. Russian export routes to Europe

Source: Pirani & Yafimava (2016).

The companies authorized to export gas from Russia include Gazprom (pipeline natural gas), as well as Rosneft and Novatek (LNG). Recently, Rosneft has publicly questioned the Gazprom pipeline export monopoly in a move considered to be a manifestation of a broader discussion about non-Gazprom entities' role in Russian gas exports (Henderson & Mitrova, 2015, pp. 22–27). Despite the fact that similar clashes among energy companies in Russia are not rare, the strong grip the government has over the gas industry continues to be its main formative factor. As a result, any change of trading parties on the Russian side of the bilateral agreements with their European/V4 counterparts can be expected to be driven by domestic discussion in Russia and to be performed without any significant consequences for the Russian gas export strategy.

With regards to the transport capacity of the export pipelines to the EU, the available (rated) capacity exceeds actual flows recorded in 2014 by nearly 100 bcm (Vatansever, 2017) – see Table 7. This translates to utilization of just 60%, which is unusual for large, international pipelines, whose operators are incentivized to maximize their utilization to repay the loans needed to cover the vast upfront costs that such projects usually require.

Table 7. Russia's gas export routes to the EU: rated capacity and actual flows in 2014 (bcm)

Transit route	Rated capacity	Actual gas flow
Ukraine (via Soyuz and Brotherhood)	142.0	59.4
Belarus (Yamal)	33.0	33.0
Nord Stream	55.0	36.5
Russia-Finland interconnector	8.0	3.1
Total	238.0	144.8

Source: Vatansever (2017).

Apart from the commonly designed overcapacity that acts as a buffer for cases of unusually high demand for gas (triggered, for example, by exceptionally cold winters) and regulatory issues such as 50% capacity of the infrastructure adjacent to the Nord Stream pipeline being reserved for third parties, which prevents Gazprom from using the pipeline at its full capacity, there are also other reasons for this extraordinary surplus in export capacity. One of them is the old paradigm of the ever-growing consumption of gas in Europe combined with decreasing domestic production, leading to a steep increase in imports (Bilgin, 2009; Söderbergh et al., 2010; Umbach, 2010), which was the mainstream understanding of the regional market outlook at the time that the final investment decision for the Nord Stream I pipeline was made. Vatansever (2017) provides three more reasons: First, the institutional setting, characterized by the state's dominant role in decisions on pipelines, has alleviated the financial constraints typical for purely commercial projects. Second, with its clear preference for stable flows to the West, Russia has focused on reducing the transit risk that has been associated with the ambiguous relations between Russia and its main transit partners – Belarus and, mainly, Ukraine. Third, the competition among Russia, China, and the West for Caspian and Central Asian sources has required Russia to maintain greater flexibility for the transit/export capacity of its pipelines.

While it is clear that there will be enough transport capacity for Russia to continue supplying the V4 region (or even increase its market share there) well beyond 2020, the exact routes the Russians will be using remain unclear. The gas transit contract between Russia and Ukraine is valid until 2019, but there is a lot of uncertainty connected to the post-2019 transit arrangement, given the ongoing military conflict between the two parties (Pirani &

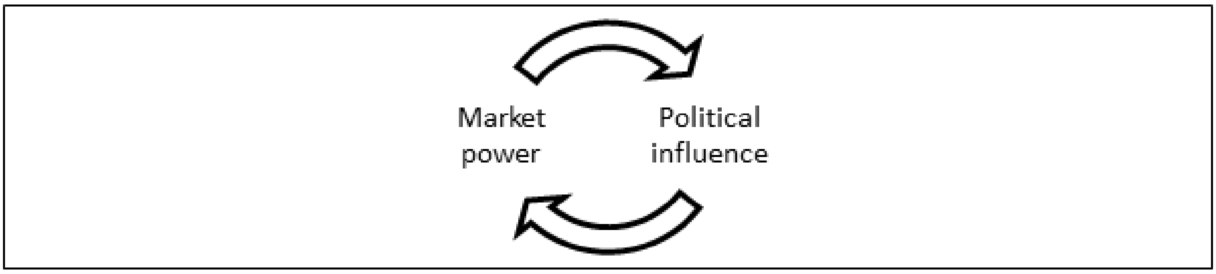
Yafimava, 2016; Stulberg, 2017). Furthermore, the future of the Nord Stream 2 pipeline, which is expected to take on a substantial amount of gas that had continued to be transported via Ukraine after the introduction of Nord Stream 1, is unclear (Pirani & Yafimava, 2016). On the one hand, the status quo situation of continued, albeit mediocre, utilization of the Ukrainian route would mean preserving the current arrangement of transit through the V4 region; on the other hand, we can see a very different arrangement if Nord Stream 2 is built and together with its predecessor becomes the most important Russian export route. In such a case, gas transit through the V4 to Austria and Italy could shift from the Ukraine-Slovakia-Austria-Italy route to Germany-Czech Republic-Slovakia-Austria-Italy route or even to Germany-Czech Republic-Austria-Italy, should the Austrian and Czech markets be directly connected. The unclear future of regional transit flows has far-reaching consequences for gas market integration – an arrangement of sharing transit fees among the four regional TSOs will be needed if the four markets are to become one, and this uncertainty makes it rather difficult to draft such an arrangement.

4.2.1.3 Export Policy

Russian foreign energy policy and, more specifically, gas export policy has been interpreted using a number of perspectives, among which the most influential ones have been geopolitical and market-based ones. The geopolitical perspective emphasizes the role of energy in Russian foreign policy and tends to see international energy transactions in which Russia is involved as vehicles for spreading Russian power and influence (Baran, 2007; Bradshaw & Connolly, 2016; Khripunov & Matthews, 1996; Nygren, 2008). The market-based approach, on the other hand, focuses on the commercial dimension of these transactions, emphasizing the financial incentives behind the trade and welfare gains that both parties gain from it (Adelman, 2004; De Jong & Van der Linde, 2008; Noël, 2007).

In this thesis, I build on a synthesis of these approaches developed by (Černoch, 2011, pp. 274–279) and argue that the current arrangement of the regional gas market (i.e. limited interconnection, limited sources of supply, the netback pricing system, inflexible long-term take-or-pay contracts, and destination clauses), which represents a legacy of the two formative decades of the regional natural gas industry, is now helping Russia to achieve the highest possible financial margins. Conveniently enough, the dominant market position that results from this arrangement also enables Russia to exert the highest amount of political influence on the respective countries. As such, and contrary to geopolitical explanations, I argue that the Russian foreign energy policy towards the region is consistent with profit-seeking behavior (Henderson & Mitrova, 2015, p. 34). At the core of Russian business activities, however, lies in the need to maintain the current market arrangement – and to maintain that, the Russians have not and will not hesitate to use the political power that stems from it. The nature of the Russian gas export policy can be therefore seen as a vicious circle of market power leading to high margins and political influence, which in turn contribute to greater market power (see Figure 10).

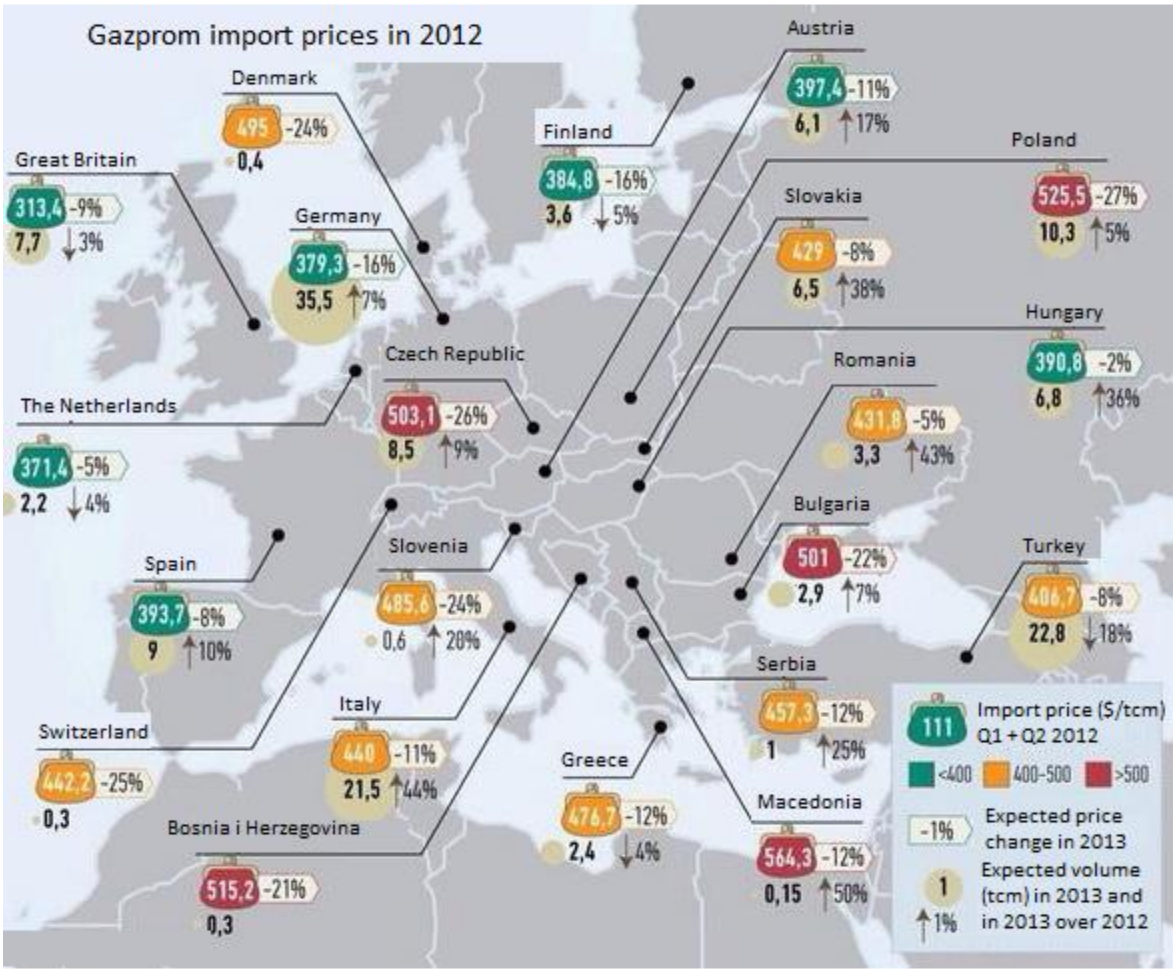
Figure 10. The two-sided coin of Russia’s gas export strategy in the CEE region



Source: Osička & Ocelík (2017).

Naturally, the export strategy outlined here can only work in countries where access to alternative sources of supply is limited and competing suppliers cannot target the market to challenge Russia’s position. Since such is or has long been the situation in Central and Eastern Europe, the region represents an important source of Gazprom’s revenue. A closer look at prices that Gazprom has charged its European counterparts (Figure 11) is a practical manifestation of its export strategy, and indicates the economic importance of source diversification for gas-consuming countries and, vice versa, the economic importance of prevention such diversification for Russia’s Gazprom.

Figure 11. Gazprom import prices in 2012



Source: Business New Europe (2014).

Hence, both from the commercial and political perspective, the CEE markets are important outlets for Russian gas (Henderson & Mitrova, 2015, p. 34, 35), and it can be expected that Russia will continue to be interested in exporting gas to the region and in defending its market share against the competition, which has recently risen in association with the rapid development of competitive, hub-based trading in continental Europe (Melling, 2010; Zajdler, 2012).

4.2.2 Norway

Norway is the third-largest gas exporter in the world after Russia and Qatar. Petroleum activities have been crucial for Norway's economic growth, and for financing the Norwegian welfare state. In 2012, the petroleum sector represented more than 23% of the country's total value creation. The state's income from petroleum activities is transferred to a separate fund, the Government Pension Fund – Global. The main consumer of Norwegian gas is the European market.

4.2.2.1 Exportable Quantity

Norway's production stood at 112.4 bcm in 2013 (compared to 114.7 bcm in 2012). All of Norway's supplies are sourced directly from domestic production on the Norwegian Continental Shelf (NCS). According to estimates from the Norwegian Petroleum Directorate, Norway's largest gas field, Troll, produced 28.3 bcm in 2013, which accounted for 27% of Norway's total gas production that year. Three other major producing fields in 2013 were Ormen Lange (21.5 bcm), Asgard (9.62 bcm), and Kvitebjorn (6.7 bcm). These four fields produced over 60% of Norway's total dry gas in 2013. (Ministry of Petroleum and Energy, 2014)

Gas exports in 2013 totaled 107 bcm (representing 96% of its production). Of this, 103 bcm was transported via pipelines, and 4 bcm as LNG from the Snøhvit facility. In addition, about 1.5 bcm was delivered for domestic consumption. Some of the gas produced is reinjected to improve recovery of oil fields: last year this accounted for about 30 bcm. Gas sales are expected to reach a level of between 105 and 130 bcm in 2020 and between 80 and 120 bcm in 2025. Norwegian gas production is forecasted to reach a plateau and possibly decline by the end of this decade. (Ministry of Petroleum and Energy, 2014) This could be reversed if more reserves are discovered, particularly in the Barents Sea where exploration is still at an early stage. But gas exports – whether by pipeline or LNG – from the far north are likely to be more costly.

Norwegian gas covers about 20% of total European gas consumption. Most of the exports go to Germany, the UK, Belgium, and France, where Norwegian gas accounts for between 20 and 40% of total gas consumption. (Gassco, 2014)

All licensees on the Norwegian continental shelf are responsible for selling their own gas. The Norwegian company Statoil sells oil and gas owned by the state, along with its own petroleum. Overall, Statoil sells about 80% of all Norwegian gas. Upstream companies on the Norwegian Continental Shelf sell gas to buyers in e.g. Germany, France, the UK, Belgium, the Netherlands, Italy, Spain and Denmark. The Snøhvit facility primarily delivers LNG to countries in Europe and Asia (Ministry of Petroleum and Energy Norway, 2014). The Norwegian Continental Shelf (NCS) has until recently been dominated by traditional producers such as Statoil, Shell, ExxonMobil, ConocoPhillips, Total, and ENI. Recently, new generations of producers have entered the NCS. These include European utilities moving upstream, such as Centrica Energy, RWE, E.ON, Bayerngas, and DONG, and newly established or small-scale upstream companies such as Noreco and Core Energy.

The future trend of Norwegian production depends on the discovery of new fields. The general consensus is that production will peak in the early 2020s, and by 2030, total production will decline below even today's figures.

4.2.2.2 Export Transport Capacity

Norway's natural gas reaches the EU mainly via its extensive export pipeline infrastructure, while a small fraction is exported as LNG. Major investments in transport solutions are characteristic of gas production. The Norwegian pipeline system currently has a transport capacity of about 120 bcmy (Ministry of Petroleum and Energy Norway, 2014). There are four receiving terminals for Norwegian gas on the continent: Two in Germany, one in Belgium, and one in France. In addition, there are two receiving terminals in the UK (see Table 8). The Norwegian gas transport system includes a network of pipelines with a total length of more than 8,000 km (see Figure 12). Treaties have been drawn up that govern rights and obligations between Norway and countries with landing points for gas from the Norwegian shelf.

Table 8. Norwegian natural gas exports in 2013 by delivery point

Country	Delivery point	Gas exports (%)
Germany	Europipe 2 Terminal	18.5%
Germany	Europipe 1 Terminal	16.8%
United Kingdom	Easington	15.7%
France	Dunkirk	14.4%
Belgium	Zeebrugge	13.2%
United Kingdom	Other terminals	11.5%
Germany	Norsea Gas Terminal	5.5%
LNG	-	4.0%
Denmark	Nybro	0.4%

Source: Ministry of Petroleum and Energy Norway (2014).

Figure 12. Norwegian Gas Pipelines

Source: Statoil (2014)

Liberalization of the gas market has led to the emergence of two important players in Norway: Gassled and Gassco. Gassled provides transportation services, with third-party access on a non-discriminatory basis to producers on the NCS. To transport gas to the market, a producer needs to book capacity in the Gassled system and hence become a shipper. Most shippers are also producers, but recently a few non-producers (traders) have entered the market. Gassled operates an Entry-Exit system. For each area, there are designated entry and exit points where the gas is delivered to Gassled and redelivered from Gassled. The entry points are typically the field connection points to the pipelines and the exit points are typically the landing terminals such as Kårstø in Norway and the receiving terminals in the UK and on the Continent (Gassco, 2014).

Gassco is the Independent System Operator (ISO), and is 100% state-owned and funded by the shippers. Gassco is the operator for the integrated system for transporting gas from the NCS to the landing points such as Emden in Germany, Easington in the UK, and Zeebrugge in Belgium (Gassco, 2014).

4.2.2.3 Export Policy

The Norwegian petroleum sector is now characterized by a high level of state involvement and an overall sense of optimism. Development has been driven by years of high oil and gas prices, good exploration results and a stable regulatory environment. According to *the White Paper on Petroleum Activities* (Ministry of Petroleum and Energy, 2011), the main challenges involved in Norway's petroleum policy are improved recovery from fields, the development of discoveries, and the confirmation of new discoveries. This document also dealt with the future of the Norwegian gas supply to the EU. In this context, the Norwegian government has striven to be one of the key suppliers to European countries. In particular, the government has drawn attention to its image as a "stable and predictable energy supplier in the EU." Norwegian gas will help meet the European gas demand, and "will be an attractive and valued energy source for many decades to come" (Ministry of Petroleum and Energy Norway, 2011). This means there will be a basis for profitable exploration, development, and production of the gas resources on the Norwegian Continental Shelf.

In its export strategy, the government has also stressed the connection between growing gas consumption and EU environmental targets. There has also been acknowledgement of the special role played by gas-fired power plants in balancing the electricity grid. The core of the Norwegian export strategy therefore has comprised a growing need for more and cleaner energy in Europe and Norway's image as a "stable and predictable energy supplier" (Ministry of Petroleum and Energy, 2011).

A potential increase in exports of Norwegian gas to the EU has been discussed in connection with the Ukrainian-Russian conflict. This option is also strongly preferred by the European Commission but has its limitations. Growing production and regulatory stability make Norway the preferred gas supplier to the EU, suggesting it could once again overtake Russia. This indeed happened in 2012 but it did not last long. In 2013, after renegotiations of contracts resulting in a price reduction, Gazprom returned to the leading position, replacing part of the supply of liquefied natural gas on the EU market. At the same time, the sale of Norwegian gas decreased by 5%, due to technical problems in the production of gas from the largest field, Troll (PISM, 2014).

There is also a visible game change in EU-Norway energy relations. On September 25, at the *In-depth Energy Partnership with Norway* Energy Conference, Commissioner Günther Oettinger tried to secure increased gas supplies from Norway to Europe. This was a qualitative change in the bargaining position between the parties. As Lidia Puka states in her paper, before the Russian-Ukrainian conflict, Norway had to fight to maintain its market (as the EU receives 98% of the country's gas exports). Now it is Norway that is approached and asked to produce and sell more (PISM, 2014).

In the short term, Norway could probably increase gas supplies to Europe to make up for the amount lost if Russia were to cut off flows through Ukraine. In March 2014, Gassco, the Norwegian pipeline operator, announced it could provide up to 130 mcmd (45 bcmy) of extra gas for a short time, which was slightly more than Russia was then pumping to Europe via pipelines that pass through Ukraine (Reuters, 2014a).

The most important factor in the Norwegian export strategy is the price. In the next five years, the Norwegians will try to maximize profits via increased exports. These profits are to be invested in exploratory drilling in the Barents Sea, which is where the core of the Norwegian production will move after 2030 (PISM, 2014). Norway can therefore be expected to gradually increase its production as long as prices are sufficiently high. On the other hand, it cannot be expected to enter into any price wars for higher market share, as such a policy would decrease the profit per unit sold.

This is consistent with the current slow expansion of Norwegian exports to Eastern Europe, where prices are higher. New contracts with Eastern European states include:

1. Statoil – Litgas (21 August 2014)

Statoil and Litgas signed a five-year agreement (2015-2019) to supply 540 million cubic meters of gas annually to Lithuania's new LNG terminal in Klaipeda (The Wall Street Journal, 2014).

2. Statoil – Naftogas (3 October 2014)

Statoil and Naftogas announced the signing of a contract for the supply of gas to Ukraine through Slovakia. The terms of which have not been revealed, but the press has speculated about a volume of between 2 and 6 bcmy (Reuters, 2014d).

4.2.3 UNG Poland

For quite some time, Poland has been considered the most likely case for unconventional natural gas production in the EU. Starting in 2009, when the US shale gas revolution began taking greater shape, the eyes of energy corporations, governments, and analysts turned beyond North America in their search for the next "game to be changed" by unconventionals.

4.2.3.1 Production Outlook

Initial estimates of the Polish shale gas reserves were for 5.3 tcm in 2011, but were later reduced by approximately 20% to 4.1 tcm because of the lower than expected total organic carbon (EIA/ARI, 2013). The Polish Geological Institute, in cooperation with USGS, assessed the recoverable reserves, taking into account some preliminary exploration work, and produced estimates with conservative figures of 346-768 bcm and optimistic ones of as much as 1.9 tcm (Polish Geological Institute, 2013). Although the reserves may be substantial, achieving economically sound extraction will take time, especially in an environment with no recent experience of developing an industry of such scale.

Over the past years, two main arguments have emerged regarding Polish UNG. While official authorities have stressed the anticipated benefits of potential UNG production, mainly independence from Russian gas imports and reduced coal consumption, analysts and other officials have focused on endeavoring to estimate future Polish UNG production. Interestingly enough, both groups have based their arguments on an analogy with US UNG development. Florence Gény, who authored the first thorough evaluation of UNG development in Europe, compared the key geological characteristics of the US and European shale plays, arguing that the Polish Lublin and Baltic basins are most similar to the US Barnett, Fayetteville, and Marcellus basins. However, she concludes that despite certain structural similarities, European unconventional gas basins tend to be smaller, and tectonically more complex, and the geological units seem to be more compartmentalized. Furthermore, the shale tends to be deeper, hotter, and more pressurized. The quality of the shale is also different, generally having more clay content in Europe. Specific to Poland and Germany is a certain degree of nitrogen contamination of the shale, affecting the quality, and thus the value, of the gas (Gény, 2010).

Factors that are likely to determine the level of production in the future include technology and operating practices, land access, economic profitability, policies and regulation, and the availability of service industries. In light of this, Poland is highly unlikely to develop any significant UNG production before 2020 mainly due to its substantial lack of experience in developing an industry of such scale, the unavailability of equipment and an underdeveloped service industry to support the rig operation, an unfriendly regulatory and as-yet-unknown tax regime, and the as-yet-unknown environmental regulations at both national and European levels.

Similar conclusions were presented by Černoch et al., who looked at European Union policies on unconventionals, and, most importantly, provide a network analysis of the key actors involved in Polish UNG development. In this context, it is noteworthy that rather surprising coalitions and confrontations have emerged in the Polish UNG industry stakeholder area – such as PGNiG, the Polish state-owned and government-controlled oil and gas incumbent, pursuing strategies that almost directly contradict those of the Polish government (Černoch, Dančák, et al., 2012). Yet, there are signs of significant preferential treatment of domestic energy companies in government policies. The international oil companies interviewed by Smyrgala, Černoch et al., often acknowledged that regulatory issues were the greatest threat to the development of shale gas production in Poland. Specifically, public administration and the management of large state companies have been accused of ignorance and laziness, which partly results from their monopolist (or at least very strong) positions in the system. Interestingly enough, a public administration representative confirmed that there were protectionist practices favoring Polish companies, who obtained approximately half of the licenses (Černoch, Kister, et al., 2012).

4.2.3.2 Production Policy

The idea that there may be regulatory instability seems to be further supported by recent developments in the area. In November 2013, Donald Tusk, then Polish Prime Minister, replaced his environmental minister, Marcin Korolec, with Maciej Grabowski, a former deputy finance minister. This move was part of a larger government reshuffle that was probably intended to stop the decline in popularity that the government was facing (The New York Times, 2013). However, with regards to shale gas exploration, it may also be seen as the prime minister's reaction to the slowed-down exploration pace in 2013, when only 12 new wells were completed, half the number drilled in 2012. The new minister immediately stated that his top priority would be to streamline shale gas exploration, and expressed the hope that the first commercial well would be launched in 2014 (Reuters, 2014b).

On December 19, 2013, a month after taking up office, Grabowski replaced Piotr Wozniak, who was the deputy environment minister in charge of preparing draft shale regulations and overseeing licensing procedures, with Slawomir Brodzinski. The licensing procedures have faced heavy criticism from the industry for being overly complicated. According to company insiders, licensing that takes 21 days in Canada takes more than a year in Poland. (Osička, Plenta, et al., 2015)

To address these concerns, the Polish authorities worked intensively on new legal provisions. Between 2010 and 2014, several regulatory drafts were introduced. However, each one tended to reject the preceding one instead of building on it. The key issues concerning the new regulatory arrangement proved to be the degree of state involvement in the upstream sector and the tax regime. In this regard, developing exploration has been further hindered by the envisaged obligatory state participation in the form of a national agency called the National Energy Minerals Operator (NOKE), which raised significant opposition among industry representatives, particularly since the NOKE's powers were not made clear (News.pl, 2013; Prime Minister of Poland, 2012). Similarly, the industry become preoccupied by the government's declarations regarding the Norwegian tax model, which was considered the one to follow for a certain period of time (Cleantech Poland, 2012; Natural Gas Europe, 2010; The Economist, 2014). In the Polish context, this would have increased royalties and the overall burden substantially, since the pre-shale legislation had been created for an upstream sector dominated by publicly owned companies. In such an environment, royalties and taxes are almost irrelevant, since the money would only be transferred between state institutions.

At the same time, the Polish authorities decided to focus on other aspects that could be considered obstacles to exploration. First, in June 2013, the authorities decided to ease the environmental requirements for exploration drilling by amending national laws to allow shale drilling at depths of up to 5,000 meters, without first having assessed the potential environmental impacts. According to the authorities, the amendment to the EIA law limits shale drilling to 1,000 m in “sensitive” areas such as Natura 2000 sites. But as shale gas reserves in Poland are located mostly at a depth of 1,000 m to 4,500 m and the “sensitive” areas cover only 23% of Polish territory, the new thresholds *de facto* exclude most shale gas exploration projects in Poland from the scope of the EIA directive. Naturally, the European Commission opened a case against Poland for violating the Environmental Impact Assessment (EIA) Directive (EurActiv.com, 2014) This is especially interesting given the fact that after realizing that no EU-wide pro-shale coalition was going to emerge, Poland lobbied heavily to prevent the EU from regulating the environmental impact of hydraulic fracturing.

Second, in early 2014 the authorities decided to block local opposition movements before they had even emerged. Under a Ministry of Environment proposal that would have formed part of Poland’s legal framework for the planned extraction of shale gas, environmental organizations would only be able to participate in the consultation process for decisions on new investments if they had been active in relation to the issue for at least twelve months before the consultation began (Natural Gas Europe, 2013). This would have effectively prevented any citizen initiative wishing to take part in decisions over the future of its neighborhood from doing so. Later, the proposal was withdrawn.

In developing the regulatory framework, Polish legislators thus seem to be trapped in pursuing too many, often opposing, goals at the same time. Reluctant to give up control over an energy industry that is still considered the nation’s “family silver,” the Polish authorities have continuously neglected the EU commission’s liberalization and market competition measures (Office of Competition and Consumer Protection, 2012), underperformed in interconnecting the regional networks and introduced protectionist practices as far as shale gas concessions licensing is concerned (Černoch, Kister, et al., 2012).

Underlying this reluctance is fear of the Russians ultimately taking over the energy sector if the Polish government voluntarily gives up control. Importantly, on the one hand, this sentiment encourages public support, praising the “energy independence” framing of shale gas that is heavily pushed by the government. On the other hand, it allows others to capitalize on the willingness of the government to burden end-users with higher energy prices (stemming from a lack of competition) in order to keep the state in charge of the strategic industries. A perfect example is PGNiG, a company which, in terms of setting the market, shares more interests with Gazprom than with the Polish government (Černoch, Dančák, et al., 2012).

Realizing that strong state involvement and a competitive market are hardly compatible, the Polish government narrow-mindedly focused on the Norwegian model that seems to somehow successfully combine these two elements, despite the fact that Poland lacks Norway's credibility. As a result, drafting regulation has been quite a difficult process, giving IOCs yet another reason to leave Poland: by November 2014, four major oil companies had ceased doing business in Polish UNG: Exxon-Mobil, Marathon Oil, Talisman Energy, and Eni. The companies generally stated that this was because of the unsatisfactory results of exploratory analyses and drills; however, there have also been unofficial leaks about administrative inefficiency (Alberta Oil Magazine, 2014; BBC, 2013; International Business Times, 2014).

Despite some good news surfacing in 2014 (for example, BNK announced promising results from its Gapowo B-1H well (UPI, 2014), the key factors limiting the industry's development have remained: the shale is deeper and of a different geological composition; there is a lack of infrastructure, technology and personnel, maintenance, and other services; and profitability is dependent not only on marginal production costs, but also on market price. That price is largely determined by the Russians, who at the moment enjoy a rather comfortable margin. However, it is hard to imagine them sitting and watching their market share shrinking as UNG gradually develops. In other words, if economically recoverable gas reserves are found, the Russians will most likely adjust the price to make them non-competitive.

To summarize, I fully agree with Gény, who states that there will be no significant UNG production in Poland in 2020. According to Howard Rogers, a shale play analogous to the Barnett shale could produce 8 bcmy (about 80% of Polish imports from Russia) if 300 wells were drilled per year during a period of over 10 years (Rogers, 2013). Considering that just 72 wells were drilled during the 2010-2017 period, Polish UNG is extremely unlikely to affect the regional gas market anytime during the next decade.

4.2.4 LNG

4.2.4.1 Sources of LNG

Before the silent revolution, the world LNG market was characterized as a rather rigid venture involving only a few players. The technology that enabled the global reach of LNG vehicles was pioneered during Qatar's transformation from a marginal player to the world's largest LNG exporter, which happened in less than a decade. Consequently, a twofold market structure has emerged: (1) Well-established regional trade in two consuming basins (the Atlantic and Pacific) with limited price convergence supplied by four source areas (Central America, the Middle East/North Africa, West Africa, and Australasia); and (2) Emerging global trade based on the geographical as well as the economic reach of suppliers such as Qatar. This trade was based on the following model: first, the premium markets, such as Japan and South Korea, received their supplies. Second, any spare export capacity was distributed within the Atlantic Basin according to the principle of arbitrage. When storage levels in the US were low, the price at Henry Hub rose and attracted available LNG deliveries. When storage levels were high, prices declined and the quantities were re-routed to Europe, where it outcompeted pipeline deliveries up to an amount set by long-term contract flexibility. Europe, therefore, played a balancing role between supply and demand.

The silent revolution put a sudden end to this balancing structure. The US left the picture all of a sudden, and considerable amounts of LNG previously allocated for the US market had to be marketed well below the expected price elsewhere. In Europe, this led to two years of exceptionally high LNG imports (2010 and 2011), during which many long-term PNG contracts were renegotiated to reflect the new situation on the market. However, the years that followed brought the import level down to below even pre-2005 levels. This decline can be attributed to the following factors: low gas demand due to a weak economy, renewed competitiveness of PNG contracts, the growth of renewables, and a drop in carbon prices and in coal import prices, which together led to a mini-renaissance of coal at the expense of gas (International Gas Union, 2014, p. 13).

Meanwhile, the demand pull from Asia and South America seemed to help the supply-demand nexus to regain balance after several years of an LNG glut. However, the 2013–2014 supply additions are only the first wave of the final phase of the current investment cycle. In the mid-decade, around 83 bcmy of export capacity was under construction or in commissioning in Australia, and a 9.7 bcmy terminal started operation in Papua New Guinea (BG Group, 2014).

Demand was mainly driven by South Asia and Latin America. In South Asia, China, and South Korea accounted for most of the year-on-year growth, supplemented by LNG newcomers such as Singapore, Malaysia, and Thailand. In Latin America, Brazil and Mexico demonstrated the strongest annual demand growth. Next year, four new LNG importers are expected to enter the market: Jordan, Egypt, Lithuania, and of course Poland (BG Group, 2014) – see Table 9.

Table 9. LNG capacity additions (bcmy)

	Liquefaction capacity		Regasification capacity		LNG Delivered
Year	Existing[6]	New	Existing	New	(at 5% growth p.a.)[5]
2013	389.4	10.7	904.4	44.6	331.0
2014	400.1	22.0	949.0	45.1	347.6
2015	422.1	54.3	994.1	48.7	364.9
2016	476.4	41.9	1042.2	2.8	383.2
2017	518.3	25.8	1045.0	NA	402.3
2018	544.1	9.7	1045.0+	NA	422.4
2019	553.8	7.6	1045.0+	NA	443.6
Total	-	175.1	-	141.2	-

Source: International Gas Union (2014)

Apart from growth in capacities and deliveries, the market is undergoing a significant qualitative change as well. Before 2004, less than 5% of LNG was traded -on the basis of long-term contracts. Hence, it was available, but only under rigid conditions and strict commitments. Since 2004 and especially since 2010, flexible trading has emerged as yet another game changer in the global gas industry: in 2013, as much as 33% of LNG was traded under flexible arrangements. The International Gas Union (2014) has attributed this growth to the following factors:

- The growth in LNG contracts with destination flexibility, chiefly from the Atlantic Basin and Qatar (allowing LNG to be re-exported according to the arbitrage principle);
- The increase in the number of exporters and importers, which has amplified the complexity of the trade and introduced new permutations and linkages between buyers and sellers;
- The lack of domestic production or pipeline imports in Japan, Korea, and Taiwan, which means that they have needed to resort to the spot market to cope with any sudden changes in demand;
- The surge in global regasification capacity;
- The availability of volumes from destination-flexible producers, which has facilitated diversion to high-demand markets;
- The continued disparity between prices in different basins, which has made arbitrage an important and lucrative monetization strategy;
- The large growth in the LNG fleet, which has allowed the industry to sustain the long-haul parts of the non-long-term market (chiefly the trade from the Atlantic to the Pacific);

[5] Based on the BG Group's projections (BG Group 2014).

[6] Excluding capacity that is likely be decommissioned by the end of this decade in Algeria, UAE, and Egypt: the worst case scenario expects shutdown of all UAE and Egyptian exports and of aging terminals in Algeria, resulting in 37.5 bcmy decrease in global liquefaction capacity.

- The decline in competitiveness of LNG relative to coal (chiefly in Europe) and shale gas (North America), which has freed up volumes to be re-directed elsewhere;
- The large increase in demand in Asia and in emerging markets (Southeast Asia and South America).

To summarize, in the LNG industry we can observe a combination of long-term and short-term trends, overall accelerating the emergence of the global natural gas market. Every year, there are more actors involved in the trade; more countries and more companies are bandwagoning onto the LNG business, making the market more robust and resilient. The profound growth of a flexible market in both absolute and relative numbers has made LNG more accessible and has increased liquidity at receiving terminals. A reduction in the use of destination clauses has also been very important, introducing LNG re-export possibilities that have led to higher liquidity and deeper price convergence. Following the first wave, in which the US and the full-scale development of Australian exports entered the picture, flexible trading is again expected to rise. However, continuously growing demand with several new premium markets entering the same picture has meant that it is unlikely that the global spot price or average contract price will decline significantly. Similarly, with capital costs per liquefaction unit nearly twice as high as in the previous round of the LNG investment cycle,[7] the high marginal costs of LNG exports via the new infrastructure will keep LNG prices above the average import price paid by European traders for the foreseeable future.

4.2.4.2 Import Terminals

4.2.4.2.1 Poland

The Polish LNG terminal begun operating in 2016. The project was initiated by PGNiG in 2007, with Gaz System taking over after Poland adopted EU unbundling rules in 2008. In 2010, Polskie LNG was created by Gaz System to construct, own, and operate the terminal. At the time of writing, the regasification capacity is 5 bcmy, with possible expansion to 7.5 bcmy.

The terminal is run under a regulated TPA regime. The contract signed in 2010 between Polskie LNG and PGNiG allocates 65% of initial capacity to PGNiG. The remaining 1.75 bcmy is available to other traders according to the terminal codes. According to Jan Chadam, chief executive of Gaz-System, preliminary interest in capacity booking exceeded the regasification potential of the terminal. If this translates into binding agreements, a decision about building the third container might be made, with additional capacity of 2.5 bcmy coming on stream within 3-4 years after the decision (Reuters, 2014c).

The only existing shipping contract was signed between PGNiG and Qatargas in 2009. The contract encompassed deliveries of 1.6 bcmy for a 20-year period starting in 2015 (Reuters,

[7] Liquefaction terminal average CAPEX increased by nearly 100% from 2000-2006 to 2007-2013 due to higher material costs, labor competition, and mitigation costs for project delays (International Gas Union, 2014).

2014c). As the contract features a take-or-pay clause, and the terminal was not ready to receive the first deliveries, the parties agreed to sell the contracted amount elsewhere, with PGNiG paying only the price difference instead of the penalties stipulated under the take-or-pay clause.

4.2.4.2.2 Croatia

The idea of an LNG terminal in Croatia dates back to the period of elevated energy prices between 2004 and 2008. A single purpose company, Adria LNG, was established by OMV, E.ON Ruhrgas, Total, INA, HEP, and Plinacro in 2007, with the intention of building a terminal with a robust regasification capacity of 10-15 bcmy. The driving force behind the project was an expectation of the growing competitiveness of LNG over pipeline natural gas and increased regional demand. The terminal was expected to serve the markets of Romania, Hungary, Austria, and Slovenia, as well as Italy (Adria LNG, 2014).

However, after 2008, many large investment projects were postponed due to the financial crisis and the lack of clarity about the future of gas demand, and the Adria LNG project was also affected by this. During the next six years, the project was only revamped in connection with the emerging North–South Gas Corridor and the search for diversification options in Central and Eastern Europe. However, due to the delicate relations between Croatia and Hungary over natural gas interconnection and over privatization of INA, the project has remained idle.

The Croatian government seemed to be losing interest in closer cooperation with Hungary. This includes a reluctance towards building a physical reverse flow on the Hungary-Croatia interconnector, which would very likely drain gas technically belonging to MOL but pipe-locked in Croatia from the Croatian market. This is not good news for the LNG terminal. In response, the European Commission has criticized the Croatian government for not encouraging investors to deliver the project and for sending contradictory signals (European Commission, 2014a, p. 36).

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Appendix 1: Statements of Authorship

Statement of Authorship 1

Title of the Publication	Diversity of gas supplies as a key precondition for an effective V4 gas market
Publication Status	Published
Publication Details	Osička, J., Plenta, P., & Zapletalová, V. (2015). *Diversity of gas supplies as a key precondition for an effective V4 gas market* (1st ed.). Bratislava: Research Center of the Slovak Foreign Policy Association.

Leading Author

Name of Leading Author	Jan Osička
Contribution to the Publication	Drafting the overall research design and the following chapters: Conceptual framework; Theoretical assumptions; Current situation on V4 markets - Opening up the market; Availability and accessibility – Norway, UNG Poland, LNG; Contributing to the following chapters: Introduction; Conclusions; Recommendations.
Date and Signature	[redacted]

Co-Author Contributions

By signing the Statement of Authorship, each author certifies that:

(1) the Leading Author's stated contribution to the publication is accurate (as detailed above);

(2) permission is granted for the Leading Author to include the parts of the publication drafted by the Leading Author in the thesis.

Name of Co-Author	Peter Plenta
Contribution to the Publication	Drafting the following chapters: Availability and accessibility – Southern Gas Corridor; Contributing to the following chapters: Introduction; Conclusions; Recommendations.
Date and Signature	[redacted]

Name of Co-Author	Veronika Zapletalová
Contribution to the Publication	Drafting the following chapters: Current situation on V4 markets – Cross-border interconnection; Affordability; Accessibility; Contributing to the following chapters: Introduction; Conclusions; Recommendations.
Date and Signature	[redacted]

Statement of Authorship 2

Title of the Publication	Natural Gas Market Integration in the V4 Countries
Publication Status	Published
Publication Details	Osička, J., Lehotský, L., Zapletalová, V., & Černoch, F. (2017). *Natural Gas Market Integration in the V4 Countries*. Masaryk University Press. https://doi.org/10.5817/CZ.MUNI.M210-8901-2016

Leading Author

Name of Leading Author	Jan Osička
Contribution to the Publication	Drafting the overall research design and the following chapters: 2. Research design, 5. Intergovernmental level, 6. State level, 7. Interpretations, 8. Conclusions, 10. Methodology Annex; contributing to the following chapter: 1. Introduction.
Date and Signature	[redacted]

Co-Author Contributions

By signing the Statement of Authorship, each author certifies that:

(1) the Leading Author's stated contribution to the publication is accurate (as detailed in the Disclaimer);

(2) permission is granted for the Leading Author to include the parts of the publication drafted by the Leading Author in the thesis.

Name of Co-Author	Lukáš Lehotský
Contribution to the Publication	Coordinating the data-collection procedure; contributing to the data collection and processing; drafting the following chapter: 3. Research limits; contributing to the following chapter: 1. Introduction.
Date and Signature	[redacted]

Name of Co-Author	Veronika Zapletalová
Contribution to the Publication	Contributing to the data collection and processing; drafting the following chapter: 4. European level; contributing to the following chapter: 1. Introduction.
Date and Signature	[redacted]

Name of Co-Author	Filip Černoch
Contribution to the Publication	Contributing to the data collection and processing; contributing to the following chapter: 1. Introduction.
Date and Signature	[redacted]

Statement of Authorship 3

Title of the Publication	Natural gas market integration in the Visegrad 4 region: An example to follow or to avoid?
Publication Status	Published
Publication Details	Osička, J., Lehotský, L., Zapletalová, V., Černoch, F., & Dančák, B. (2018). Natural gas market integration in the Visegrad 4 region: An example to follow or to avoid? *Energy Policy*, *112*. https://doi.org/10.1016/j.enpol.2017.10.018

Leading Author

Name of Leading Author	Jan Osička
Contribution to the Publication	Drafting the overall research design and the following chapters: 2. Theory and literature, 3. Method, 4. Data collection and processing, 5. Data analysis, 6. Results, 7. Discussion, 8. Conclusions and policy implications; contributing to the following chapter: 1. Introduction (approximately 20%).
Date and Signature	[redacted]

Co-Author Contributions

By signing the Statement of Authorship, each author certifies that:

(1) the Leading Author's stated contribution to the publication is accurate (as detailed in the Disclaimer);

(2) permission is granted for the Leading Author to include the parts of the publication drafted by the Leading Author in the thesis.

Name of Co-Author	Lukáš Lehotský
Contribution to the Publication	Contributing to the data collection and processing by: coordinating the data collection procedure, interviewing the representatives of the stakeholder institutions, transcribing the recorded interviews, reconstructing the unrecorded interviews from the notes and coding the data corpus.
Date and Signature	[redacted]

Name of Co-Author	Veronika Zapletalová
Contribution to the Publication	Contributing to the data collection and processing by: interviewing the representatives of the stakeholder institutions, transcribing the recorded interviews, reconstructing the unrecorded interviews from the notes and coding the data corpus.
Date and Signature	[redacted]

Statement of Authorship 3 (continued)

Title of the Publication	Natural gas market integration in the Visegrad 4 region: An example to follow or to avoid?
Publication Status	Published
Publication Details	Osička, J., Lehotský, L., Zapletalová, V., Černoch, F., & Dančák, B. (2018). Natural gas market integration in the Visegrad 4 region: An example to follow or to avoid? *Energy Policy*, *112*. https://doi.org/10.1016/j.enpol.2017.10.018

Leading Author

Name of Leading Author	Jan Osička
Contribution to the Publication	Drafting the overall research design and the following chapters: 2. Theory and literature, 3. Method, 4. Data collection and processing, 5. Data analysis, 6. Results, 7. Discussion; 8. Conclusions and policy implications; contributing to the following chapter: 1. Introduction (approximately 20%).
Date and Signature	[redacted]

Co-Author Contributions

By signing the Statement of Authorship, each author certifies that:

(1) the Leading Author's stated contribution to the publication is accurate (as detailed in the Disclaimer);

(2) permission is granted for the Leading Author to include the parts of the publication drafted by the Leading Author in the thesis.

Name of Co-Author	Filip Černoch
Contribution to the Publication	Contributing to the data collection and processing by: interviewing the representatives of the stakeholder institutions, transcribing the recorded interviews, reconstructing the unrecorded interviews from the notes and coding the data corpus.
Date and Signature	[redacted]

Name of Co-Author	Břetislav Dančák
Contribution to the Publication	Reviewing the overall research design; contributing to the following chapter: 1. Introduction (approximately 80%).
Date and Signature	[redacted]

Appendix 2: Sources of Data

Table 26. Official communications

Communication link	Date
http://www.visegradgroup.eu/calendar/2016/joint-statement-on-the	5/4/2016
http://www.visegradgroup.eu/calendar/2016/ostrava-hosted-v4	4/8/2016
http://www.visegradgroup.eu/calendar/2016/joint-statement-of-the	2/15/2016
http://www.visegradgroup.eu/calendar/2016/joint-statement-on	2/15/2016
http://www.visegradgroup.eu/calendar/2016/joint-declaration-of	1/19/2016
http://www.visegradgroup.eu/calendar/2015/joint-statement-of-the-151221-1	12/17/2015
http://www.visegradgroup.eu/calendar/2015/v4-countries-progress-in	12/17/2015
http://www.visegradgroup.eu/calendar/2015/senior-group-of-v4	12/11/2015
http://www.visegradgroup.eu/calendar/2015/joint-statement-of-the-151204	12/3/2015
http://www.visegradgroup.eu/documents/official-statements/joint-statement-on-the	12/3/2015
http://www.visegradgroup.eu/calendar/2015/v4-ministers-in-joint	11/11/2015
http://www.visegradgroup.eu/calendar/2015/memorandum-of	10/12/2015
http://www.visegradgroup.eu/calendar/2015/joint-declaration-of	10/6/2015
http://www.visegradgroup.eu/calendar/2015/meeting-of-the-defence	9/20/2015
http://www.visegradgroup.eu/calendar/2015/joint-communique-of-the-150911	9/11/2015
http://www.visegradgroup.eu/calendar/2015/joint-statement-of-the-150904	9/4/2015
http://www.visegradgroup.eu/calendar/2015/bratislava-declaration	6/19/2015
http://www.visegradgroup.eu/calendar/2015/joint-statement-of-the	6/19/2015
http://www.visegradgroup.eu/calendar/2015/press-statement-on-the	6/19/2015
http://www.visegradgroup.eu/calendar/2015/joint-statement-v4-us	6/18/2015
http://www.visegradgroup.eu/calendar/2015/the-visegrad-group-joint	5/15/2015
http://www.visegradgroup.eu/calendar/2015/v4-and-turkey-shared	5/12/2015
http://www.visegradgroup.eu/calendar/2015/joint-communique-of-the	4/23/2015
http://www.visegradgroup.eu/calendar/2015/final-declaration-of	3/20/2015
http://www.visegradgroup.eu/calendar/2015/co-chairs-statement	3/13/2015
http://www.visegradgroup.eu/calendar/2015/the-visegrad-group-v4	2/26/2015
http://www.visegradgroup.eu/calendar/2015/conclusion-from-the	2/25/2015
http://www.visegradgroup.eu/calendar/2014/joint-statement-of-the-141217	12/16/2014
http://www.visegradgroup.eu/calendar/2014/joint-press-statement-of	12/12/2014
http://www.visegradgroup.eu/calendar/2014/bratislava-declaration	12/9/2014
http://www.visegradgroup.eu/calendar/2014/joint-statement-of-the-141211	12/9/2014
http://www.visegradgroup.eu/calendar/2014/visegrad-group-joint	10/31/2014
http://www.visegradgroup.eu/calendar/2014/joint-statement-of-the	10/30/2014
http://www.visegradgroup.eu/calendar/2014/the-joint-statement-of	10/30/2014
http://www.visegradgroup.eu/calendar/2014/joint-statement	9/30/2014
http://www.visegradgroup.eu/calendar/2014/joint-press-statement	7/17/2014
http://www.visegradgroup.eu/calendar/2014/budapest-declaration-of	6/24/2014
http://www.visegradgroup.eu/calendar/2014/memorandum-of	6/24/2014
http://www.visegradgroup.eu/calendar/2014/statement-of-the	4/29/2014
http://www.visegradgroup.eu/calendar/2014-03-14-ltv	3/14/2014
http://www.visegradgroup.eu/documents/official-statements/joint-v4-ministers	3/5/2014
http://www.visegradgroup.eu/calendar/2014/statement-of-the-prime	3/4/2014
http://www.visegradgroup.eu/calendar/2014/11th-meeting-of-the	2/28/2014

http://www.visegradgroup.eu/documents/official-statements/v4-interior-ministers	2/25/2014
http://www.visegradgroup.eu/joint-statement-of-v4	2/24/2014
http://www.visegradgroup.eu/calendar/joint-statement-of-the	1/29/2014
http://www.visegradgroup.eu/calendar/2013/joint-statement-of-the-131107	10/31/2013
http://www.visegradgroup.eu/calendar/2013/budapest-joint-statement	10/15/2013
http://www.visegradgroup.eu/calendar/2013/joint-statement-on	10/15/2013
http://www.visegradgroup.eu/calendar/2013/v4-customs-director	10/4/2013
http://www.visegradgroup.eu/calendar/2013/joint-declaration-of-the	6/26/2013
http://www.visegradgroup.eu/calendar/2013/visegrad-group-plus	6/16/2013
http://www.visegradgroup.eu/calendar/2013/v4-cult-min-14062013	6/14/2013
http://www.visegradgroup.eu/calendar/2013/joint-statement-of-the	5/17/2013
http://www.visegradgroup.eu/calendar/2013/joint-statement-on-the	5/17/2013
http://www.visegradgroup.eu/calendar/2013/2013-03-06-mio-v4-fra	3/6/2013
http://www.visegradgroup.eu/calendar/2013/press-statement-of-the	3/6/2013
http://www.visegradgroup.eu/documents/official-statements/meeting-of-foreign	2/20/2013
http://www.visegradgroup.eu/calendar/2013/joint-statement-v4-si-hr	1/29/2013
http://www.visegradgroup.eu/calendar/2012/joint-statement-of-the	10/25/2012
http://www.visegradgroup.eu/calendar/2012/joint-statement-by-the	9/25/2012
http://www.visegradgroup.eu/calendar/2012/summit-of-the-heads-of	6/22/2012
http://www.visegradgroup.eu/calendar/2012/v4-letter-ec-june-2012	6/22/2012
http://www.visegradgroup.eu/calendar/2012/cult-min-prague-01062012	6/1/2012
http://www.visegradgroup.eu/calendar/2012/joint-communique-of-the	5/4/2012
http://www.visegradgroup.eu/calendar/2012/v4-statement-on	4/19/2012
http://www.visegradgroup.eu/documents/official-statements/declaration-of-the	4/18/2012
http://www.visegradgroup.eu/joint-statement-v4-ee-lv-lt	3/5/2012
http://www.visegradgroup.eu/on-v4-ivf-activities-twrds-eap	3/5/2012
http://www.visegradgroup.eu/v4-and-eastern	3/5/2012
http://www.visegradgroup.eu/czech-representation	2/2/2012
http://www.visegradgroup.eu/calendar/2011/meeting-of-v4-ministers	11/15/2011
http://www.visegradgroup.eu/calendar/2011/joint-statement-of-the	11/4/2011
http://www.visegradgroup.eu/calendar/2011/visegrad-group	10/14/2011
http://www.visegradgroup.eu/calendar/2011/joint-statement-cultmin	10/7/2011
http://www.visegradgroup.eu/calendar/2011/conference-of-presidents	9/16/2011
http://www.visegradgroup.eu/about/the-delegations-of	8/24/2011
http://www.visegradgroup.eu/about/the-delegations-of-110912	8/24/2011
http://www.visegradgroup.eu/declaration-agriculture	8/24/2011
http://www.visegradgroup.eu/2011/joint-statement-on-the	6/16/2011
http://www.visegradgroup.eu/2011/joint-press-statement	6/6/2011
http://www.visegradgroup.eu/official-statements/documents/resolution-of-the-senate	3/17/2011
http://www.visegradgroup.eu/official-statements/documents/joint-statement-of-the	3/8/2011
http://www.visegradgroup.eu/2011/common-declaration-of	3/3/2011
http://www.visegradgroup.eu/2011/the-visegrad-group-and	3/3/2011
http://www.visegradgroup.eu/2011/declaration-of-v4-energy	1/25/2011
http://www.visegradgroup.eu/2010/visegrad-group	10/22/2010
http://www.visegradgroup.eu/2010/joint-statement-summit	7/20/2010
http://www.visegradgroup.eu/2010/joint-statement-of-the	3/2/2010

http://www.visegradgroup.eu/2010/declaration-of-the	2/24/2010
http://www.visegradgroup.eu/2010/press-statement-of-prime	2/24/2010
http://www.visegradgroup.eu/2010/communique-from-the-20th	2/5/2010
http://www.visegradgroup.eu/2010/experts-report-on-the	2/5/2010
http://www.visegradgroup.eu/2010/consultation-of-the-v4	2/2/2010
http://www.visegradgroup.eu/2009/the-visegrad-group	10/6/2009
http://www.visegradgroup.eu/2009/meeting-of-presidents-of	9/2/2009
http://www.visegradgroup.eu/2009/joint-statement-of-the-110412	7/10/2009
http://www.visegradgroup.eu/2009/press-release-the-16th	7/10/2009
http://www.visegradgroup.eu/2009/the-meeting-of-the	6/25/2009
http://www.visegradgroup.eu/2009/joint-declaration-of	6/3/2009
http://www.visegradgroup.eu/2009/press-release-of-the	6/3/2009
http://www.visegradgroup.eu/2009/culture-ministers	5/29/2009
http://www.visegradgroup.eu/2009/culture-ministers-110412	5/29/2009
http://www.visegradgroup.eu/2009/joint-statement-of-the	5/23/2009
http://www.visegradgroup.eu/2009/meeting-of-ministers-of-110412	5/21/2009
http://www.visegradgroup.eu/2009/meeting-of-ministers-of	4/29/2009
http://www.visegradgroup.eu/2008/joint-statement-of-the-110412-4	11/24/2008
http://www.visegradgroup.eu/2008/joint-statement-of-the-110412-3	11/5/2008
http://www.visegradgroup.eu/2008/press-release-of-the	11/5/2008
http://www.visegradgroup.eu/2008/joint-statement-of-the-110412-2	9/19/2008
http://www.visegradgroup.eu/2008/the-presidents-of-the-v4	9/13/2008
http://www.visegradgroup.eu/2008/communique-from-the-18th	6/20/2008
http://www.visegradgroup.eu/2008/press-release-the-18th	6/20/2008
http://www.visegradgroup.eu/2008/press-release-official	6/16/2008
http://www.visegradgroup.eu/2008/conclusions-from-the	6/4/2008
http://www.visegradgroup.eu/about/conference-of-six	6/4/2008
http://www.visegradgroup.eu/2008/press-statement-from-the	5/14/2008
http://www.visegradgroup.eu/2008/joint-statement-of-the-110412-1	4/25/2008
http://www.visegradgroup.eu/2008/joint-statement-of-the	4/23/2008
http://www.visegradgroup.eu/2008/joint-statement-of-the-110412	4/23/2008
http://www.visegradgroup.eu/2007/joint-statement-v4	12/10/2007
http://www.visegradgroup.eu/2007/joint-statement-by-the	10/25/2007
http://www.visegradgroup.eu/2007/joint-statement-of-the	10/25/2007
http://www.visegradgroup.eu/2007/communique-of-the-17th	9/28/2007
http://www.visegradgroup.eu/2007/conclusions-of-the	6/26/2007
http://www.visegradgroup.eu/2007/press-statement-v4	6/18/2007
http://www.visegradgroup.eu/2007/press-statement-v4-prime	6/18/2007
http://www.visegradgroup.eu/2007/press-statement-v4-japan	5/29/2007
http://www.visegradgroup.eu/jointstatement	5/25/2007
http://www.visegradgroup.eu/2007/international-workshop	4/19/2007
http://www.visegradgroup.eu/about/presidents-of	4/18/2007
http://www.visegradgroup.eu/about/visegrad-group-becomes	4/18/2007
http://www.visegradgroup.eu/2007/joint-communique-of-the	4/12/2007
http://www.visegradgroup.eu/2007/statement-of-the-5th	1/16/2007
http://www.visegradgroup.eu/2007/communique-of-the-16th	1/12/2007

http://www.visegradgroup.eu/official-statements/documents/declaration-of-the-110412	11/13/2006
http://www.visegradgroup.eu/official-statements/documents/statement-of-the	11/13/2006
http://www.visegradgroup.eu/official-statements/documents/declaration-of-the	10/10/2006
http://www.visegradgroup.eu/cultminikrakow	9/4/2006
http://www.visegradgroup.eu/2006/joint-statement-of-the	5/5/2006
http://www.visegradgroup.eu/2006/declaration-of-the	2/3/2006
http://www.visegradgroup.eu/2006/press-conference	2/3/2006
http://www.visegradgroup.eu/2005/declaration-of-the-v4	12/2/2005
http://www.visegradgroup.eu/2005/joint-declaration-of-the	6/10/2005
http://www.visegradgroup.eu/2005/joint-declaration-of-the-110412	6/10/2005
http://www.visegradgroup.eu/2005/communique-on-the-13th	4/29/2005
http://www.visegradgroup.eu/official-statements/documents/soubor	3/18/2005
http://www.visegradgroup.eu/2005/fields-of-cooperation	2/12/2005
http://www.visegradgroup.eu/2004/meeting-of-prime	12/8/2004
http://www.visegradgroup.eu/2004/statement-of-the	12/7/2004
http://www.visegradgroup.eu/2004/the-rules-of-preparation	12/7/2004
http://www.visegradgroup.eu/2004/communique-on-the-12th	11/11/2004
http://www.visegradgroup.eu/2004/memorandum-quadripartite	9/20/2004
http://www.visegradgroup.eu/2004/declaration-of-visegrad	7/19/2004
http://www.visegradgroup.eu/2004/joint-statement-adopted	6/22/2004
http://www.visegradgroup.eu/2004/joint-statement-of-the	5/21/2004
http://www.visegradgroup.eu/2004/declaration-of-prime	5/12/2004
http://www.visegradgroup.eu/2004/guidelines-on-the-future	5/12/2004
http://www.visegradgroup.eu/2004/declaration-on	3/5/2004
http://www.visegradgroup.eu/2004/joint-declaration-of-the	2/6/2004
http://www.visegradgroup.eu/2003/meeting-of-the-deputy	12/5/2003
http://www.visegradgroup.eu/2003/communique-on-the-10th	11/14/2003
http://www.visegradgroup.eu/2003/joint-statement-of-the	10/3/2003
http://www.visegradgroup.eu/2003/statement-of-the	9/11/2003
http://www.visegradgroup.eu/2003/summit-of-prime	6/25/2003
http://www.visegradgroup.eu/2003/minister-of-transport-of	4/3/2003
http://www.visegradgroup.eu/2003/ministers-of-culture	2/7/2003
http://www.visegradgroup.eu/2003/chairmen-of-the	1/13/2003
http://www.visegradgroup.eu/2002/joint-statement-adopted	2/1/2002
http://www.visegradgroup.eu/2001/summit-meeting-between	12/5/2001
http://www.visegradgroup.eu/2001/joint-statement-on	10/19/2001
http://www.visegradgroup.eu/2001/joint-statement-sixth	8/31/2001
http://www.visegradgroup.eu/2001/report-on-youth-meeting	7/15/2001
http://www.visegradgroup.eu/2001/regional-legal-meeting	7/9/2001
http://www.visegradgroup.eu/2001/joint-statement-of-the	6/25/2001
http://www.visegradgroup.eu/2001/communique-of-the	6/23/2001
http://www.visegradgroup.eu/2001/prime-ministers-meeting	6/1/2001
http://www.visegradgroup.eu/2001/ministers-of-culture-10	5/11/2001
http://www.visegradgroup.eu/2001/visegrad-youth	4/29/2001
http://www.visegradgroup.eu/2001/presidents-of-the-v4	1/19/2001
http://www.visegradgroup.eu/2000/geological-surveys-10-12	2/12/2000

Table 27. Annual reports

Annual reports	Date
Omitted – not acceptable due to timeframe – Czech presidency	*1999-2000*
Polish presidency	2000-2001
Document missing – Hungarian presidency	*2001-2002*
Slovak presidency	2002-2003
Czech presidency	2003-2004
Polish presidency	2004-2005
Hungarian presidency	2005-2006
Document missing – Slovak presidency	*2006-2007*
Czech presidency	2007-2008
Polish presidency	2008-2009
Hungarian presidency	2009-2010
Slovak presidency	2010-2011
Czech presidency	2011-2012
Polish presidency	2012-2013
Hungarian presidency	2013-2014
Slovak presidency	2014-2015

Table 28. Presidency programs

Presidency program	Date
Polish presidency	2000-2001
Hungarian presidency	2001-2002
Slovak presidency	2002-2003
Czech presidency	2003-2004
Polish presidency	2004-2005
Hungarian presidency	2005-2006
Slovak presidency	2006-2007
Czech presidency	2007-2008
Polish presidency	2008-2009
Hungarian presidency	2009-2010
Slovak presidency	2010-2011
Czech presidency	2011-2012
Polish presidency	2012-2013
Hungarian presidency	2013-2014
Slovak presidency	2014-2015
Czech presidency	2015-2016

Appendix 3: Interview questions

(1) What is your position in the institution and what is the agenda you are mainly responsible for?
(2) How significant is the regional market integration in the agenda of your institution?
(3) If we take a closer look at the market integration, what are the main objectives of your institution?
(4) What means does your institution employ to achieve the objectives? Which actions does it undertake or plan to undertake?
(5) Which factors, that are important for the future of the integration process, are beyond the control of your institution? In what way will they influence the process?
(6) What other actors are influencing the process? What are their objectives and actions?

Appendix 4: Degree Centrality Scores

In this annex, all outcomes of the analysis of degree centrality are provided. Three different kinds of degree centrality – absolute, percentual and normalized, were calculated. Absolute degree centrality expresses the number of connections of the concept with all other concepts – number of ties. Percentual representation of the degree expresses the percentual number of the connections the code has compared to all connections of all codes (sum of all ties). Normalized degree is a weighted measure which takes into account the size of the network – it captures the number of actual ties compared to number of all possible the node could have. Codes that have a score of 0 have not appeared in the discourse of that particular country or type of actor.

Table 29. Centrality of the network of concepts: Czech Republic

Code	Absolute degree	Degree in % of all	Normalized degree
goals-security_of_supply	24	0.051948	0.888889
goals-trade_incentive	24	0.051948	0.888889
obstacles-harmonization	24	0.051948	0.888889
obstacles-insufficient_liberalization	24	0.051948	0.888889
obstacles-price_regulation	24	0.051948	0.888889
uncertainties-doubts-lack_of_will	23	0.049784	0.851852
goals-building_EU_market	22	0.047619	0.814815
obstacles-state_involvement	22	0.047619	0.814815
goals-new_infrastructure	21	0.045455	0.777778
uncertainties-doubts-EU_regulations	21	0.045455	0.777778
goals-predictability	20	0.04329	0.740741
goals-infrastructure_utilization	17	0.036797	0.62963
goals-regional_leader	17	0.036797	0.62963
questioning-target_unclear	17	0.036797	0.62963
solutions-EU_first	17	0.036797	0.62963
solutions-look_elsewhere	17	0.036797	0.62963
uncertainties-doubts-buzzword	17	0.036797	0.62963
uncertainties-doubts-future_transit_flows	17	0.036797	0.62963
uncertainties-doubts-opposition_isolation	17	0.036797	0.62963
obstacles-missing_infrastructure	16	0.034632	0.592593
uncertainties-doubts-political_assignment	14	0.030303	0.518519
goals-diversification	13	0.028139	0.481481
obstacles-costs_allocation	12	0.025974	0.444444
obstacles-LTCs	12	0.025974	0.444444
solutions-redefinition	10	0.021645	0.37037
goals-stronger_together	0	0	0
solutions-security_focus	0	0	0
uncertainties-doubts-non-V4_integration	0	0	0

Table 30. Centrality of the network of concepts: Hungary

Code	Absolute degree	Degree in % of all	Normalized degree
obstacles-harmonization	16	0.076923077	0.592592593
obstacles-missing_infrastructure	16	0.076923077	0.592592593
goals-infrastructure_utilization	15	0.072115385	0.555555556
uncertainties-doubts-future_transit_flows	15	0.072115385	0.555555556
uncertainties-doubts-lack_of_will	15	0.072115385	0.555555556
goals-trade_incentive	14	0.067307692	0.518518519
obstacles-costs_allocation	14	0.067307692	0.518518519
obstacles-state_involvement	14	0.067307692	0.518518519
goals-diversification	12	0.057692308	0.444444444
goals-new_infrastructure	12	0.057692308	0.444444444
goals-building_EU_market	11	0.052884615	0.407407407
goals-security_of_supply	11	0.052884615	0.407407407
questioning-target_unclear	11	0.052884615	0.407407407
uncertainties-doubts-non-V4_integration	11	0.052884615	0.407407407
obstacles-price_regulation	8	0.038461538	0.296296296
uncertainties-doubts-EU_regulations	7	0.033653846	0.259259259
solutions-look_elsewhere	6	0.028846154	0.222222222
goals-predictability	0	0	0
goals-regional_leader	0	0	0
goals-stronger_together	0	0	0
obstacles-insufficient_liberalization	0	0	0
obstacles-LTCs	0	0	0
solutions-EU_first	0	0	0
solutions-redefinition	0	0	0
solutions-security_focus	0	0	0
uncertainties-doubts-buzzword	0	0	0
uncertainties-doubts-opposition_isolation	0	0	0
uncertainties-doubts-political_assignment	0	0	0

Table 31. Centrality of the network of concepts: Poland

Code	Absolute degree	Degree in % of all	Normalized degree
goals-new_infrastructure	16	0.072727	0.592593
goals-trade_incentive	16	0.072727	0.592593
obstacles-harmonization	16	0.072727	0.592593
goals-diversification	15	0.068182	0.555556
goals-security_of_supply	15	0.068182	0.555556
obstacles-missing_infrastructure	15	0.068182	0.555556
uncertainties-doubts-EU_regulations	15	0.068182	0.555556
goals-infrastructure_utilization	14	0.063636	0.518519
uncertainties-doubts-future_transit_flows	14	0.063636	0.518519
uncertainties-doubts-non-V4_integration	14	0.063636	0.518519
solutions-redefinition	13	0.059091	0.481481
goals-stronger_together	12	0.054545	0.444444
uncertainties-doubts-lack_of_will	12	0.054545	0.444444
obstacles-LTCs	9	0.040909	0.333333
questioning-target_unclear	9	0.040909	0.333333
obstacles-insufficient_liberalization	8	0.036364	0.296296
goals-regional_leader	7	0.031818	0.259259
goals-building_EU_market	0	0	0
goals-predictability	0	0	0
obstacles-costs_allocation	0	0	0
obstacles-price_regulation	0	0	0
obstacles-state_involvement	0	0	0
solutions-EU_first	0	0	0
solutions-look_elsewhere	0	0	0
solutions-security_focus	0	0	0
uncertainties-doubts-buzzword	0	0	0
uncertainties-doubts-opposition_isolation	0	0	0
uncertainties-doubts-political_assignment	0	0	0

Table 32. Centrality of the network of concepts: Slovak Republic

Code	Absolute degree	Degree in % of all	Normalized degree
uncertainties-doubts-future_transit_flows	20	0.073529	0.740741
obstacles-harmonization	19	0.069853	0.703704
uncertainties-doubts-lack_of_will	19	0.069853	0.703704
uncertainties-doubts-opposition_isolation	17	0.0625	0.62963
goals-infrastructure_utilization	16	0.058824	0.592593
goals-trade_incentive	15	0.055147	0.555556
obstacles-costs_allocation	15	0.055147	0.555556
obstacles-missing_infrastructure	15	0.055147	0.555556
solutions-EU_first	15	0.055147	0.555556
uncertainties-doubts-EU_regulations	15	0.055147	0.555556
goals-building_EU_market	12	0.044118	0.444444
goals-diversification	12	0.044118	0.444444
goals-security_of_supply	11	0.040441	0.407407
solutions-redefinition	11	0.040441	0.407407
goals-predictability	10	0.036765	0.37037
goals-stronger_together	10	0.036765	0.37037
questioning-target_unclear	9	0.033088	0.333333
solutions-security_focus	9	0.033088	0.333333
uncertainties-doubts-buzzword	9	0.033088	0.333333
uncertainties-doubts-political_assignment	9	0.033088	0.333333
goals-new_infrastructure	4	0.014706	0.148148
goals-regional_leader	0	0	0
obstacles-insufficient_liberalization	0	0	0
obstacles-LTCs	0	0	0
obstacles-price_regulation	0	0	0
obstacles-state_involvement	0	0	0
solutions-look_elsewhere	0	0	0
uncertainties-doubts-non-V4_integration	0	0	0

Table 33. Centrality of the network of concepts: MFA

Code	Absolute degree	Degree in % of all	Normalized degree
goals-infrastructure_utilization	19	0.055556	0.703704
goals-new_infrastructure	19	0.055556	0.703704
goals-regional_leader	19	0.055556	0.703704
goals-trade_incentive	19	0.055556	0.703704
obstacles-harmonization	19	0.055556	0.703704
solutions-look_elsewhere	19	0.055556	0.703704
uncertainties-doubts-future_transit_flows	19	0.055556	0.703704
uncertainties-doubts-lack_of_will	19	0.055556	0.703704
goals-building_EU_market	18	0.052632	0.666667
goals-predictability	17	0.049708	0.62963
goals-security_of_supply	17	0.049708	0.62963
obstacles-insufficient_liberalization	17	0.049708	0.62963
obstacles-price_regulation	17	0.049708	0.62963
obstacles-state_involvement	17	0.049708	0.62963
solutions-EU_first	17	0.049708	0.62963
uncertainties-doubts-buzzword	17	0.049708	0.62963
uncertainties-doubts-EU_regulations	17	0.049708	0.62963
uncertainties-doubts-opposition_isolation	17	0.049708	0.62963
goals-diversification	10	0.02924	0.37037
obstacles-missing_infrastructure	9	0.026316	0.333333
goals-stronger_together	0	0	0
obstacles-costs_allocation	0	0	0
obstacles-LTCs	0	0	0
questioning-target_unclear	0	0	0
solutions-redefinition	0	0	0
solutions-security_focus	0	0	0
uncertainties-doubts-non-V4_integration	0	0	0
uncertainties-doubts-political_assignment	0	0	0

Table 34. Centrality of the network of concepts: MoE

Code	Absolute degree	Degree in % of all	Normalized degree
goals-security_of_supply	19	0.062092	0.703704
goals-trade_incentive	19	0.062092	0.703704
obstacles-harmonization	19	0.062092	0.703704
obstacles-missing_infrastructure	19	0.062092	0.703704
goals-diversification	17	0.055556	0.62963
goals-infrastructure_utilization	17	0.055556	0.62963
questioning-target_unclear	17	0.055556	0.62963
solutions-redefinition	17	0.055556	0.62963
uncertainties-doubts-EU_regulations	17	0.055556	0.62963
uncertainties-doubts-future_transit_flows	17	0.055556	0.62963
uncertainties-doubts-lack_of_will	17	0.055556	0.62963
uncertainties-doubts-non-V4_integration	16	0.052288	0.592593
goals-building_EU_market	15	0.04902	0.555556
goals-new_infrastructure	15	0.04902	0.555556
goals-stronger_together	12	0.039216	0.444444
obstacles-costs_allocation	11	0.035948	0.407407
obstacles-state_involvement	11	0.035948	0.407407
uncertainties-doubts-opposition_isolation	11	0.035948	0.407407
obstacles-insufficient_liberalization	10	0.03268	0.37037
obstacles-price_regulation	10	0.03268	0.37037
goals-predictability	0	0	0
goals-regional_leader	0	0	0
obstacles-LTCs	0	0	0
solutions-EU_first	0	0	0
solutions-look_elsewhere	0	0	0
solutions-security_focus	0	0	0
uncertainties-doubts-buzzword	0	0	0
uncertainties-doubts-political_assignment	0	0	0

Table 35. Centrality of the network of concepts: NRA

Code	Absolute degree	Degree in % of all	Normalized degree
obstacles-harmonization	21	0.068627	0.777778
goals-trade_incentive	20	0.065359	0.740741
obstacles-missing_infrastructure	20	0.065359	0.740741
uncertainties-doubts-lack_of_will	20	0.065359	0.740741
obstacles-costs_allocation	18	0.058824	0.666667
goals-security_of_supply	17	0.055556	0.62963
obstacles-insufficient_liberalization	17	0.055556	0.62963
goals-infrastructure_utilization	15	0.04902	0.555556
uncertainties-doubts-EU_regulations	15	0.04902	0.555556
uncertainties-doubts-future_transit_flows	15	0.04902	0.555556
goals-building_EU_market	12	0.039216	0.444444
obstacles-LTCs	12	0.039216	0.444444
obstacles-price_regulation	12	0.039216	0.444444
obstacles-state_involvement	12	0.039216	0.444444
questioning-target_unclear	12	0.039216	0.444444
uncertainties-doubts-political_assignment	12	0.039216	0.444444
goals-new_infrastructure	11	0.035948	0.407407
goals-predictability	10	0.03268	0.37037
goals-stronger_together	10	0.03268	0.37037
solutions-EU_first	10	0.03268	0.37037
solutions-redefinition	8	0.026144	0.296296
goals-diversification	7	0.022876	0.259259
goals-regional_leader	0	0	0
solutions-look_elsewhere	0	0	0
solutions-security_focus	0	0	0
uncertainties-doubts-buzzword	0	0	0
uncertainties-doubts-non-V4_integration	0	0	0
uncertainties-doubts-opposition_isolation	0	0	0

Table 36. Centrality of the network of concepts: TSO

Code	Absolute degree	Degree in % of all	Normalized degree
obstacles-harmonization	20	0.079365079	0.740740741
questioning-target_unclear	18	0.071428571	0.666666667
goals-diversification	16	0.063492063	0.592592593
goals-trade_incentive	16	0.063492063	0.592592593
obstacles-costs_allocation	16	0.063492063	0.592592593
goals-new_infrastructure	13	0.051587302	0.481481481
obstacles-missing_infrastructure	13	0.051587302	0.481481481
uncertainties-doubts-lack_of_will	13	0.051587302	0.481481481
uncertainties-doubts-political_assignment	13	0.051587302	0.481481481
goals-security_of_supply	12	0.047619048	0.444444444
obstacles-LTCs	9	0.035714286	0.333333333
solutions-EU_first	9	0.035714286	0.333333333
solutions-security_focus	9	0.035714286	0.333333333
uncertainties-doubts-buzzword	9	0.035714286	0.333333333
uncertainties-doubts-EU_regulations	9	0.035714286	0.333333333
uncertainties-doubts-future_transit_flows	9	0.035714286	0.333333333
uncertainties-doubts-non-V4_integration	9	0.035714286	0.333333333
uncertainties-doubts-opposition_isolation	9	0.035714286	0.333333333
goals-infrastructure_utilization	8	0.031746032	0.296296296
obstacles-price_regulation	8	0.031746032	0.296296296
obstacles-state_involvement	8	0.031746032	0.296296296
goals-predictability	6	0.023809524	0.222222222
goals-building_EU_market	0	0	0
goals-regional_leader	0	0	0
goals-stronger_together	0	0	0
obstacles-insufficient_liberalization	0	0	0
solutions-look_elsewhere	0	0	0
solutions-redefinition	0	0	0

Appendix 5: Frequency Analysis

Table 37. Frequency Analysis

Code/Stakeholder	CZ_MFA	CZ_MoE	CZ_NRA	CZ_TSO	HU_MFA	HU_MoE	HU_NRA	HU_TSO	PL_MFA	PL_MoE	PL_NRA	PL_TSO	SK_MFA	SK_MoE	SK_NRA	SK_TSO	Total
building_EU_market	1	0	1	0	0	2	0	0	0	0	0	0	2	2	0	0	8
buzzword	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	4
costs_allocation	0	0	1	0	0	1	0	1	0	0	0	0	0	0	3	5	11
diversification	0	1	0	1	1	0	2	2	4	3	0	4	3	1	0	0	22
EU_first	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	4
EU_regulations	1	1	0	0	0	0	1	0	0	1	1	3	0	1	1	0	10
future_transit_flows	1	0	0	0	2	1	1	0	1	1	1	0	10	2	2	1	23
harmonization	2	1	1	0	3	2	4	5	1	1	3	1	0	1	2	5	32
infrastructure_utilization	1	0	0	0	0	2	1	1	2	1	3	0	3	1	4	2	21
insufficient_liberalization	3	2	3	0	0	0	0	0	0	0	1	0	0	0	0	0	9
lack_of_will	6	0	2	1	1	3	1	1	0	2	0	0	0	3	1	5	26
look_elsewhere	5	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	6
LTCs	0	0	1	0	0	0	0	0	0	0	0	2	0	0	0	0	3
missing_infrastructure	0	1	1	0	1	2	1	4	1	2	0	4	0	3	1	0	21
new_infrastructure	2	3	0	0	2	0	1	1	1	1	1	6	3	0	0	0	21
non-V4_integration	0	0	0	0	0	1	0	0	0	3	0	1	0	0	0	0	5
opposition_isolation	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	3
political_assignment	0	0	4	2	0	0	0	0	0	0	0	0	0	0	0	1	7
predictability	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1	4
price_regulation	2	1	1	0	0	0	0	1	0	0	1	0	0	0	0	0	6
redefinition	0	1	0	0	0	0	0	0	0	3	1	0	0	1	0	0	6
regional_leader	2	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	4
security_focus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
security_of_supply	6	2	1	1	0	2	0	0	0	3	2	3	0	2	0	0	22
state_involvement	1	0	3	0	0	2	0	4	0	0	0	0	0	0	0	0	10
stronger_together	0	0	0	0	0	0	0	0	0	2	0	0	0	0	1	0	3
target_unclear	0	1	1	3	0	3	0	0	0	0	0	3	0	0	0	1	12
trade_incentive	3	1	1	2	0	1	0	2	3	2	3	6	0	2	2	0	28
Total	40	15	21	11	11	22	12	22	15	25	17	33	21	20	19	28	332