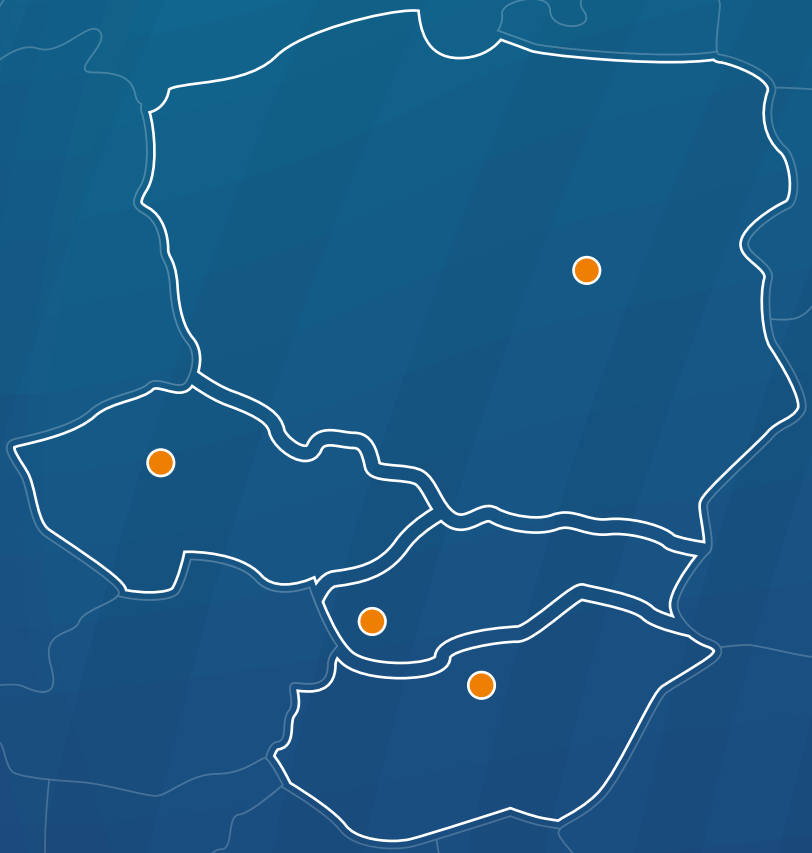
FUTURE

of the Visegrad Group



ABBREVIATED VERSION:

THE FUTURE OF ENEGRY

GLOBAL SHAPERS COMMUNITY WARSAW

Lesław A. Paga Foundation

Visegrad Fund

FOREWORD

Wojciech Przybylski
Editor-in-chief
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Chairman of Res Publica Foundation

2016 marks a quarter of a century in a pro-Western trajectory of four Visegrad countries. The group, formally established on February 15th, has had two basic goals. One was to join NATO to increase security and independence from Moscow. The second was to join the common European (Western) project for prosperity and security of our societies. Both goals seemed to have been fulfilled in 2004.

The Visegrad countries have been co-coordinating their diplomatic efforts to facilitate the withdrawal of the Red Army from their territories, finally accomplished in 1993 - at first, before the formal establishment of the cooperation. Then, parallel efforts to meet harsh criteria of accession were made. One may argue which of those processes have been more transformative. There is no doubt, however, the economy and infrastructure would not be developed without the process of EU enlargement, if not an unprecedented effort by Central European societies to reform, rebuild, and modernize that has been met by support comparable only to the Marshall Plan funds for Germany launched in 1948.

One may compare the process of change to a train trip. The departure station has been somewhere in the east, the next station was in the west, but currently the destination is unknown. We had to speed up the train and set up its tracks to get to where we are. Once set in motion, the train is still on the move. The growing ambitions and appetites reinforce and push the European project further, with its economic, infrastructural, and political potential. Today, the New Europe does not mean solely that much of a political struggle for independence in geopolitical terms, but more a search for new engines of growth and development. The Visegrad Group is exploring this direction and seeks to improve its own, hence European competitiveness. Under the EU strategy, the V4 countries seek development through innovation, healthy fiscal policies, and bettering energy and transportation infrastructure. Often, those efforts are blurred and overshadowed by current political developments. But by any means, they are not supposed to be disregarded. They are one of cornerstones to secure the fundamental accomplishments of those last 25 years.

Therefore, it must be stressed this report explores the key areas of future cooperation. It is an explorative and informative reading, prepared by the future leaders, who at an early stage of their careers, demonstrate how a visionary approach may meet excellent analytical skills. If one wondered about the future after 25 years of cooperation, one finds many answers in this report. It is a must read for all interested in prospects of the European project from the Central European perspective.

ACKNOWLEDGMENTS

This publication originates from a sincere concern about the region's future. Being proud of the region's development over the last 25 years we were looking for ways to influence its development in future. Seeking for like-minded supporters, we have found exceptional people, who supported us in our endeavours of creating this report.

First of all, we would like to recognize the invaluable contribution of the Lesław A. Paga Foundation, which daily inspires us to thrive for the best in our professional and personal lives. The Foundation has constantly supported us throughout all stages of the project – from finding an appropriate team to enabling us to contribute to the public debate with our findings. This report would not be possible without the Lesław A. Paga Foundation.

We wish to thank Global Shapers Warsaw Hub, which supported us with providing us with an exceptional network of brilliant minds. We hope that the ongoing feedback on our ideas helped the report to become visionary and practical at the same time. We highly appreciate the support of all the reviewers engaged from across the region, who generously invested their time and ideas in our initiative. We would like to thank you in detail at the end of our report. We wish to acknowledge the support provided by our partners Aspen Institute Prague, Republikon Institute form Hungary, Res Publica from Poland and the International Visegrad Fund, which funds this publication. We are looking forward to further initiatives to facilitate the collaboration of Visegrad.

Finally, we give our sincerest thanks to the whole team of V4 Future: Joanna Rycerz, Petra Kaciakova, Damian Szewczyk, Sebastian Wieczorek, Zsombor Incze, Tomasz Nisztuk, Ondřej Dvouletý, Dominik Keil and Piotr Krzemiński. The debates from across the region proved not always to be easy, but worthwhile!

Sincerely Yours,

Damian Polok and Paweł Michalski
Project Leaders V4 Future

Damian Polok

Paweł Michalski

ABOUT THE LESŁAW A. PAGA FOUNDATION

Since 2003, the Lesław A. Paga Foundation has enabled young leaders to excel their potentials by actively contributing to the shape of the region's future. The foundation aims at creating a network of highly ambitious students and young professionals, who not only seek to advance in their professional lives, but also want to make an impact in their immediate environment and society. Our educational projects cover the fields of:

- Capital markets (Capital Market Leaders Academy, CEE Capital Market Leaders Forum),
- Energetics (Academy of Energy; New Energy Forum),
- Healthcare (Healthcare Leaders),
- Technology and innovations (Young Innovators, Innovation Day)
- Media (Academy of Analysis and Media)

The Alumni of the Foundation are given unique chances to learn from the best experts and gain practical experience in over 70 partner companies. There are about 500 Alumni, who support each other not only professionally, but also on the private ground.

It is also our mission to promote the highest ethical standards and culture among entrepreneurs. This is why, every year, we grant the Lesław A. Paga award to businessmen, activists, and institutions. This honorary distinction constitutes a commemoration of our Patron's work. In previous years, the winners were: Krzysztof Lis, Leszek Czarnecki, Leszek Balcerowicz, Igor Chalupec, Joseph Wancer, Janusz Lewandowski, prof. Grzegorz Domański, Zygmunt Solorz-Żak, prof. Marek Belka, Jacek Siwicki, and Hebert Wirth.

Our vision of promoting the highest ethical standards is not limited to professionals and students. We give secondary school students the opportunity to participate in the Stock Market Game (SIGG), and those who finish their secondary education can apply for the Indeks Start2Star Scholarship, awarded during the whole period of studies.

Apart from our regular projects, we organize conferences, workshops, and lectures, whose speakers are the best specialists of the Polish and European markets.

Lesław A. Paga Foundation

CEE Capital Market Leaders Forum

In 2014, the Leslaw A. Paga Foundation organized, with the Warsaw Stock Exchange as the strategic partner, the first edition of international CEE Capital Market Leaders Forum. We are proud of organizing the first event for bringing together and growing new generations of capital market leaders.

The main idea of the event is to establish a communication platform for regional peers, which enables young leaders to experience and participate in professional workshops that combine theoretical knowledge with capital market practice. The Forum intends to create a framework to create lifetime networks, aimed at developing future international collaboration in the center of Europe.

Lesław A. Paga (24.09.1954 – 02.07.2003)

Lesław A. Paga was one of the forefathers of the capital market in Poland. As an expert in macroeconomics, ownership transformation, and capital market sector, he co-created the Polish Securities Trading Act, the Act on Bonds, and other securities trading acts of law. He specialized in managing enterprises, strategy, and restructuring. He conducted projects related to an enterprise strategic assessment, managing by values, investors' relations, and investigations concerning financial crimes.

Lesław A. Paga was respected by entrepreneurs and all political wings. After 1989, he was advisor to various prime ministers. Faced with corruption scandals in Poland and other countries, he fought for corporate governance, transparency, invitations to tender, and any business activity. He was a tough negotiator, devoted to his mission. Notwithstanding difficulties, he always examined problems holistically.

Lesław A. Paga was a versatile person - having graduated from science studies, he also took interest in the humanistic field. He was fascinated with classical music, contemporary literature, and theatre. He enjoyed directing. Lesław A. Paga was a creative man, whose enthusiasm and positive attitude towards life motivated other people.

FUTURE

of the Visegrad Group

INTRODUCTION INTO THE PROJECT

[We, the young] should develop our vision, we should have a view that in a sense a prescientific of what the game is about, about the way the beast functions, about the way the various parts of economics and social science are related and, yes, about our own maps of Utopia. Once we have a vision, then our control of theory, our command of institutional detail, and our knowledge of history are to be marshalled to support the vision.

- Hyman P. Minsky

The Visegrad Group celebrates its 25th anniversary. The 1991 meeting in the city of Visegrad, old capital of Hungary, provided for a link to a meeting held almost 7 centuries ago at the same place. In 1335, the Visegrad Castle hosted King of Bohemia John of Luxembourg, King of Poland Casimir II, and King of Hungary Charles I of Anjou. The first Visegrad meeting tried to establish closer relationship and cooperation among the three kings and their states. The aim of both were the same – to guarantee peace and facilitate cooperation.

In both cases, the members of the Group agreed on many things they had in common. In the 90s, the former communist countries, with historical enmity often resulting in open struggles, saw a possibility to join forces, once again, to jumpstart their European integration process. And so, on 15th February 1991, at a meeting of the President of the Czechoslovak Republic Václav Havel, the President of the Republic of Poland Lech Wałęsa, and the Prime Minister of the Republic of Hungary József Antall, the Visegrad Group was established. With the dissolution of Czechoslovakia, in 1993, into two independent countries -the Czech Republic and the Slovak Republic, the Group grew into four members. From that time, the Group is commonly referred to as the Visegrad Four or V4.

Before the establishment of the International Visegrad Fund, in 1999, there were no common agendas, nor regular meetings and discussion among the Group Members, except for NATO and European Union enlargement talks. Then, in 2002, the Expert Working Group on Energy commenced its works. After the V4 countries joined the European Union on May 1st 2004, the regional cooperation precipitated. In 2011, the Group formed the Visegrad battlegroup to serve as an EU Battlegroup in 2016 and in 2019. Some successful trade and diplomatic initiatives happened along the way. And so, the 25 years passed.

The fathers of V4 created foundations and new forms of political, economic, and cultural cooperation in the altered Central Europe. They strived to achieve full restitution of state independence, democracy, and freedom after decades of a totalitarian system. And they, we succeeded on many fronts. But these achievements are merely a stepping stone. New challenges lie ahead of us, and we need to aim high, once again. Especially in terms of economic cooperation, there is a lot to be done to reveal the full potential of the V4 countries. In our mid-20s, we are the V4 offspring, and it is our generation that will shape the next 25 years of the Group. We feel responsible for our countries, and that is why we decided to speak up about the future in which we would like to live.

Just as the regional rulers in the XIVth century and democratic presidents in the 1990s, we were looking for ways to join forces and face the upcoming challenges. That is why we prepared recommendations for the next steps to be taken to improve V4 cooperation. Although our ideas are often supported by numerical data, our aim was to be visionary, therefore, more qualitative than quantitative. We hope for this report to start a serious discussion about the future and a true dialogue between generations. In the months following the publication of this report, we plan to build on this idea. We hope to mobilize experts, industry specialists, business leaders, and public officials to help us prepare detailed plans to achieve our goals.

Dear Reader, we wish you an inspiring lecture. And for you, dear Visegrad Group, we wish all the best for the 25th birthday. Let the next 25 be even better!

INTRODUCTION INTO THE REPORT

"Know from whence you came. If you know whence you came, there are absolutely no limitations to where you can go."

- James Baldwin

To shape the future, it is necessary to analyse the past. Therefore, before exploring our potential, we gathered a wide range of information on our economic development over the last 25 years. This data is not exhaustive, but will give our readers a rough picture of what the V4 countries have accomplished so far.

The following chapters present our vision on the V4 economic development in the fields of entrepreneurship, finance, energy, and infrastructure. We also prepared a short case discussion on the matter of adopting EURO as a common currency in all Visegrad countries. We hope, in the months and years to come, we can build upon our recommendations and actively participate in the ongoing transformation of our economies.

1. VISEGRAD GROUP ECONOMIES UNVAILED

Ondřej Dvouletý

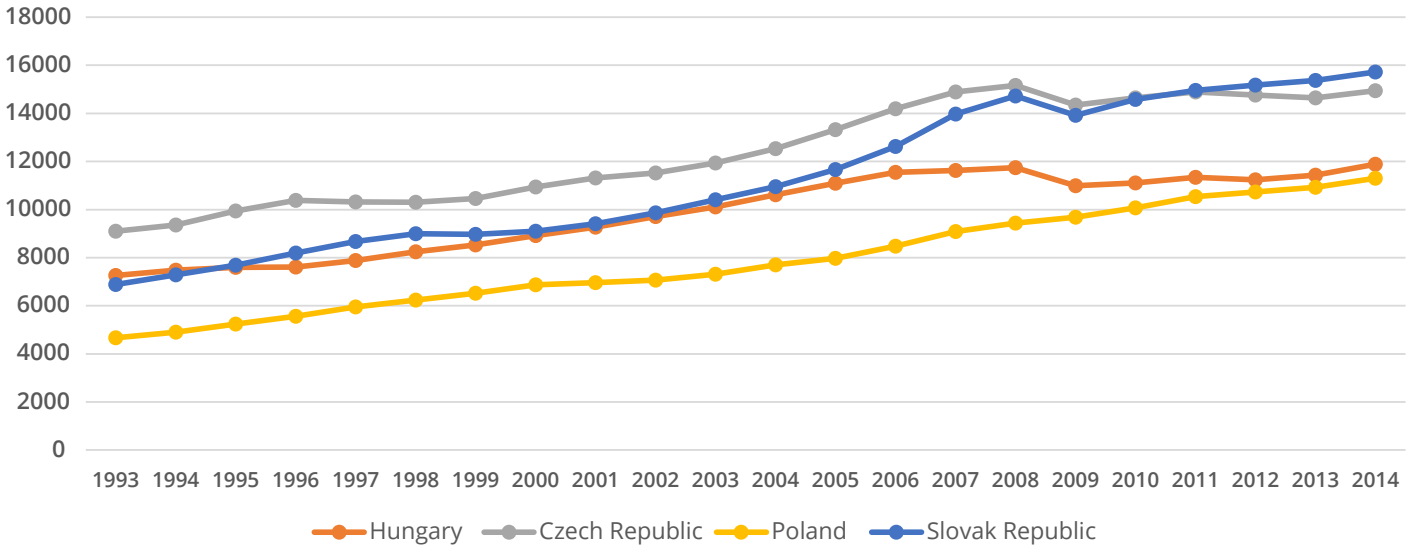
Over the last 25 years, the V4 countries grew significantly and became **richer in economic terms** (Table 1). This can be observed in the development of the life expectancy rates and the GDP per capita (Figure 1). After the fall of communism, the Visegrad Group member states **integrated their economies into international trade**, which contributed to the countries' GDP. The rising number of people obtaining tertiary education indicate the **ongoing transformation into knowledge-based economies**.

Table 1: General statistics of V4 countries

Country	Czech Republic		Slovakia		Poland		Hungary	
Indicator								
Population in 2014	**10 510 566**		**5 418 506**		**37 995 529**		**9 861 673**	
Surface area (sq. km, 2014)	**78 870**		**49 036**		**312 680**		**93 030**	
Average GDP growth for years 1993-2014 (%)	**2,4**		**4,0**		**4,2**		**2,0**	
Year	**1993**	**2014**	**1993**	**2014**	**1993**	**2014**	**1993**	**2014**
GDP per capita (constant 2005 US$)	**9 095**	**14 945**	**6 884**	**15 727**	**4 665**	**11 305**	**7 255**	**11 888**
Unemployment rate (%)	**4,3**	**6,1**	**12,2**	**13,2**	**14,0**	**9,0**	**12,1**	**7,7**
Merchandise trade (% of GDP)	**71,9**	**158,6**	**71,6**	**168,9**	**36,4**	**79,3**	**53,7**	**157,0**
Year	**1993**	**2013**	**1993**	**2013**	**1993**	**2013**	**1993**	**2013**
Life expectancy at birth (years)	**72,8**	**78,3**	**72,4**	**76,3**	**71,6**	**76,8**	**69,1**	**75,3**
Year	**1995**	**2013**	**1993**	**2013**	**1993**	**2013**	**1993**	**2013**
Health expenditure, total (% of GDP)	**6,7**	**7,2**	**6,1**	**8,2**	**5,5**	**6,7**	**7,3**	**8,0**
Year	**1998**	**2013**	**1993**	**2013**	**1993**	**2013**	**1993**	**2013**
Population with tertiary education as a share of population 15-64 (%)	**8,5**	**19,1**	**8,1**	**18,1**	**8,5**	**23,8**	**10,6**	**20,2**

Source: World Bank and Eurostat (2015)

Figure 1: GDP per capita in constant prices (2005)



Source: World Bank and Eurostat (2015)

1.1 Competitiveness

To compare the V4 economies, we used several indices, including political stability, competitiveness, innovativeness, and law enforcement rankings (Table 2). Surprisingly, the Czech Republic, Slovakia, and Hungary worsened their world positions, measured by Global Competitiveness, with **Poland being the only country among the 4 to improve its position slightly.** The **biggest problems** of V4 economies were identified in public sector related areas, specifically, in **tax regulations** and **bureaucracy** (World Economic Forum).

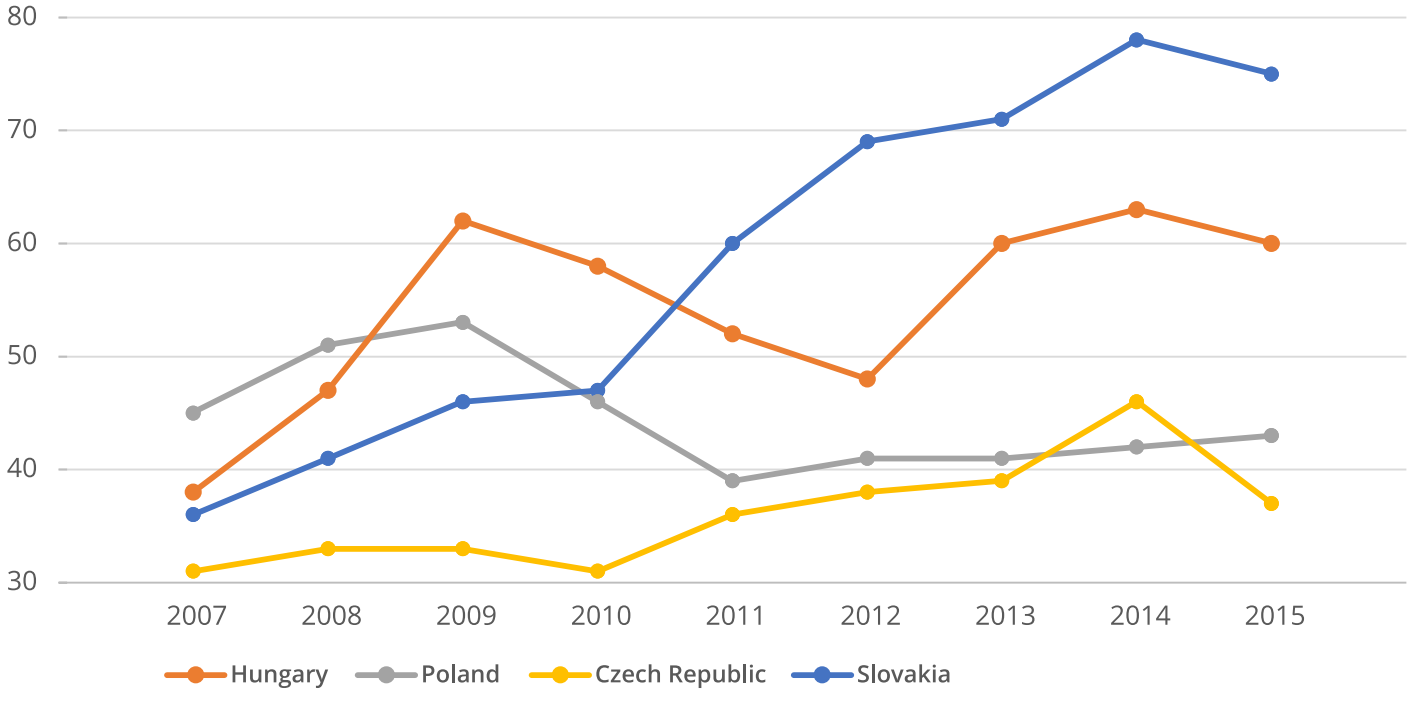
Table 2: Selected indicators representing competitiveness of V4 countries

Country	Czech Republic		Slovakia		Poland		Hungary	
Indicator								
Year	**2006-2007**	**2014-2015**	**2006-2007**	**2014-2015**	**2006-2007**	**2014-2015**	**2006-2007**	**2014-2015**
Global Competitiveness Index	**4,7**	**4,5**	**4,5**	**4,1**	**4,4**	**4,5**	**4,3**	**4,5**
Global Competitiveness Index Rank	**31**	**37**	**36**	**75**	**45**	**43**	**38**	**60**
Year	**1995**	**2015**	**1995**	**2015**	**1995**	**2015**	**1995**	**2015**
Economic Freedom Index	**67,8**	**72,5**	**60,4**	**67,2**	**50,7**	**68,6**	**55,2**	**66,8**
Year	**1998**	**2014**	**1998**	**2014**	**1998**	**2014**	**1998**	**2014**
Corruption Perceptions Index	**4,8**	**5,1**	**3,9**	**5,0**	**4,6**	**6,1**	**5,0**	**5,4**
Year	**1995**	**2012**	**1995**	**2012**	**1995**	**2012**	**1995**	**2012**
Knowledge Economy Index	**7,8**	**8,1**	**7,2**	**7,6**	**6,9**	**7,4**	**7,5**	**8,0**
Year	**1996**	**2014**	**1996**	**2014**	**1996**	**2014**	**1996**	**2014**
National Patent Office Applications per thousand of population 15-64	**0,7**	**0,2**	**0,7**	**0,1**	**0,2**	**0,2**	**0,4**	**0,1**

Source: Heritage Foundation, Transparency International, World Bank, World Economic Forum (2015)

Corruption remains a problem. Looking at the data from the Corruption Perceptions Index, it is fair to conclude that a small step was made, but it is not enough to catch up with the global leaders in law enforcement and public sector efficiency (Transparency International).

Figure 2: Global Competitiveness Index rankings over years 2006-2015



Source: Heritage Foundation, Transparency International, World Bank, World Economic Forum (2015)

The overall **competitive environment seems to be improving**. The Index of Economic Freedom reflects rapid improvements in business, labour market, and trade freedom. Following the World Economic Forum's recommendations, the V4 countries should **improve their infrastructure**, develop **better higher education** and training organizations, and **promote development of financial market and innovative behaviours**[1].

Apart from the already mentioned corruption, the most problematic factors (as reported by the World Economic Forum) include **red tape, tax regulation,** and **rates,** and **restrictive labor regulations** (Table 3).

Table 3: The most problematic factors for doing business

Czech Republic		Slovakia		Poland		Hungary	
							
Inefficient government bureaucracy	**18,6**	Inefficient government bureaucracy	**17**	Tax regulations	**23,2**	Policy instability	**15,1**
Corruption	**16,3**	Corruption	**16**	Restrictive labor regulations	**15,5**	Access to financing	**13,5**
Policy instability	**9,1**	Restrictive labor regulations	**15**	Inefficient government bureaucracy	**14,6**	Corruption	**13**
Restrictive labor regulations	**9**	Tax rates	**10**	Tax Rates	**11,2**	Tax regulations	**11**
Tax regulations	**8**	Tax regulations	**10**	Access to financing	**9,6**	Inefficient government bureaucracy	**10,3**
Inadequately educated workforce	**6,3**	Inadequate supply of infrastructure	**9,3**	Inadequate supply of infrastructure	**5,6**	Tax Rates	**10,1**
Tax Rates	**6,2**	Policy instability	**7,7**	Insufficient capacity to innovate	**4,3**	Inadequately educated workforce	**6,9**
Insufficient capacity to innovate	**5,9**	Inadequately educated workforce	**6,3**	Corruption	**3,4**	Poor work ethic in national labor force	**5,8**
Access to financing	**5,8**	Access to financing	**2,8**	Policy instability	**3,3**	Insufficient capacity to innovate	**4,3**
Poor work ethic in national labor force	**3,9**	Poor work ethic in national labor force	**2**	Inadequately educated workforce	**2,7**	Inadequate supply of infrastructure	**3**

Source: World Economic Forum

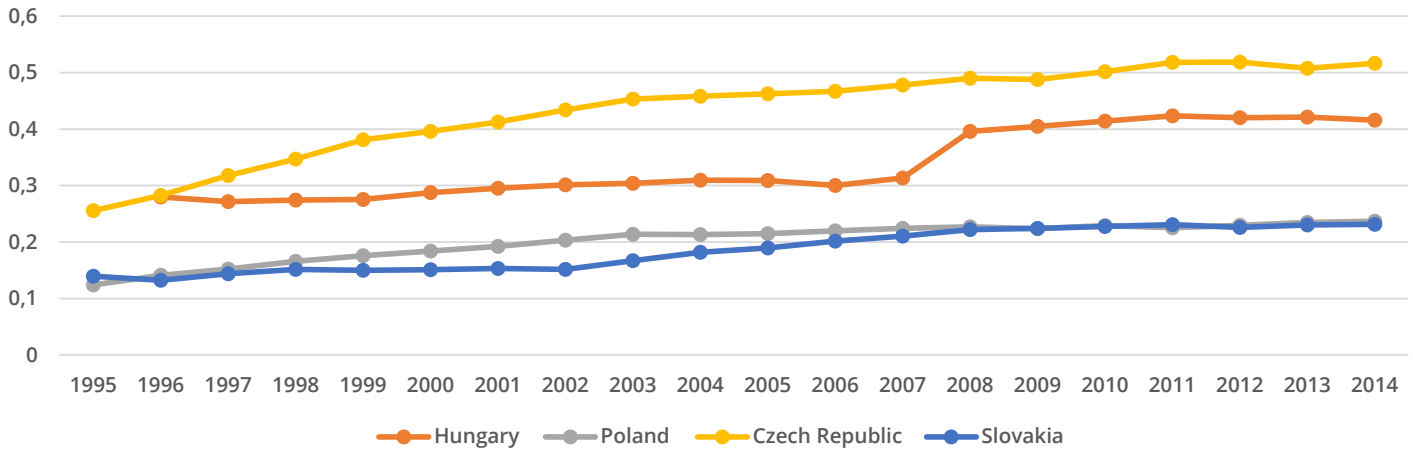
As we will argue in the following chapters, these factors, with **lacking infrastructure** and **inadequately educated** workforce, pose serious threats to our ability to become truly innovative economies and hence, may undermine our competitive position in the future.

1 The number of patent applications dropped significantly in the V4 region after the EU accession, but rebounded after the establishment of the European patent office (according to the EUROSTAT data available).

1.2 Entrepreneurial activity

In order to capture the development of the regional business activity over time, we calculated the rate of registered business entities per economically active population[2]. From the figure below, we may see that business activity grew significantly in all V4 countries (Figure 3).

Figure 3: Registered Entities per population 15-64 during years 1996-2014



Source: Central Statistical Office of Poland, Czech Statistical Office, Hungarian Central Statistical Office, Slovak Statistical Office, World Bank

Time required to start a business is another important indicator of entrepreneurial environment and is treated as an indirect measure of bureaucracy. During the last 20 years, all V4 countries were able to **decrease the number of days required to establish a business by over 100%.** The **costs of starting-up a business venture declined**, and regulatory norms concerning minimum paid-in capital required to start-up a business venture were relaxed. Law enforcement remains a challenge, with costs related therewith remaining at 1996 levels, and in Slovakia's case, increasing over the years (World Bank).

Table 4: Selected indicators representing entrepreneurial environment in V4 countries

Country	Czech Republic		Slovakia		Poland		Hungary	
Indicator								
Year	**1996**	**2014**	**1996**	**2014**	**1996**	**2014**	**1996**	**2014**
Registered Enterprises per population 15-64	**0,3**	**0,5**	**0,1**	**0,2**	**0,1**	**0,2**	**0,3**	**0,4**
Year	**2003**	**2015**	**2003**	**2015**	**2003**	**2015**	**2003**	**2015**
Time required to start a business (days)	**40**	**15**	**103**	**12**	**56**	**30**	**52**	**5**
Year	**2005**	**2015**	**2005**	**2015**	**2005**	**2015**	**2005**	**2015**
Minimum paid-in capital required to start a business (% of income per capita)	**39**	**0**	**41**	**19**	**220**	**11**	**80**	**48**
Cost to start a business (% of income per capita)	**10**	**7**	**5**	**2**	**20**	**12**	**22**	**7**
Cost to enforce a contract (% of claim)	**33**	**33**	**26**	**30**	**19**	**19**	**15**	**15**

Source: Central Statistical Office of Poland, Czech Statistical Office, Hungarian Central Statistical Office, Slovak Statistical Office, World Bank

2 Considering all limitations coming from registered subjects, which may not always be active in economy.

Table 5: Enterprises in V4 countries in 2014 according to size, employees and value added

Country	Czech Republic		Slovakia		Poland		Hungary	
Indicator								
Number of micro enterprises/proportion	**968 998**	**96,1%**	**375 780**	**95,8%**	**1 407 427**	**95,2%**	**497 947**	**94,5%**
Number of small enterprises/proportion	**31 850**	**3,2%**	**13 810**	**3,5%**	**52 676**	**3,6%**	**23 906**	**4,5%**
Number of medium-sized enterprises/proportion	**6 273**	**0,6%**	**2 213**	**0,6%**	**14 850**	**1,0%**	**4 064**	**0,8%**
Number of SMEs/proportion	**1 007 121**	**99,9%**	**391 803**	**99,9%**	**1 474 953**	**99,8%**	**525 917**	**99,8%**
Number of large enterprises/proportion	**1 406**	**0,1%**	**465**	**0,1%**	**2 940**	**0,2%**	**829**	**0,2%**
Number of employees/proportion micro	**1 132 769**	**32,1%**	**537 760**	**37,6%**	**3 007 504**	**36,5%**	**867 316**	**35,7%**
Number of employees/proportion small	**637 865**	**18,1%**	**263 387**	**18,4%**	**1 121 510**	**13,6%**	**447 932**	**18,4%**
Number of employees/proportion medium-sized	**645 056**	**18,6%**	**230 254**	**16,1%**	**1 550 098**	**18,8%**	**404 374**	**16,7%**
Number of employees/proportion SMEs	**2 424 690**	**68,8%**	**1 031 401**	**72,2%**	**5 679 112**	**68,8%**	**1 719 622**	**70,6%**
Number of employees/proportion large	**1 100 327**	**31,2%**	**397 534**	**27,8%**	**2 570 479**	**31,2%**	**708 457**	**29,2%**
Value added billion euros/proportion micro	**16**	**19,8%**	**10**	**29,8%**	**28**	**14,7%**	**9**	**18,5%**
Value added billion euros/proportion small	**12**	**14,5%**	**7**	**19,1%**	**27**	**14,4%**	**8**	**16,2%**
Value added billion euros/proportion medium-sized	**16**	**19,9%**	**6**	**15,8%**	**39**	**20,9%**	**9**	**19,2%**
Value added billion euros/proportion SMEs	**45**	**54,1%**	**23**	**64,6%**	**94**	**50,0%**	**25**	**53,9%**
Value added billion euros/proportion large	**38**	**45,9%**	**12**	**35,4%**	**94**	**50,0%**	**21**	**46,1%**

Source: Eurostat

Of all business entities, small and medium enterprises (SMEs) are perceived as the backbone of the economy. According to the European Commission, they represent about 99% of all businesses in the EU.[3] The SMEs handle about 67% of total EU private sector employment and add over 58% value on an EU-average. These characteristics are similar in Visegrad Group, regarding all but one indicator. Except for Slovakia, the value added by SMEs is below the European average in the V4 countries.

1.3 Innovativeness

We chose several indicators to paint the picture of innovativeness in our economies. The highlighted information in Table 6 points to three main layers of innovative behaviour: the so-called **enablers** (light red) capture the main drivers of innovation performance external to the firm, the **firm activities** (light blue) capture the innovation efforts at the level of the firm, while the **outputs** (light green) capture the effects of firms' innovation activities.

According to the European Innovation Scoreboard's methodology, the V4 countries were described as **moderate innovators**. The innovation performance improved in our countries over the last 7 years, despite some fluctuations (especially for Poland, where the performance fell for 2012 and 2013 and rebounded in 2014). Most of the Visegrad Group countries are performing below the EU average for all dimensions. Poland is, particularly, weak, regarding the number of non-EU doctorate students and public-private co-publications. Hungary shares this characteristic. It also struggles to maintain the sales shares of new innovation and the number of SMEs with product or process innovations. Slovakia is relatively weak in license and patent revenues generated abroad (this indicator is down by 38%), and the non-R&D innovation expenditures are steadily declining. Czech Republic's weaknesses are its research systems and intellectual assets; however, performance has improved in these areas by 7.9% and 6.2%, respectively. A more pressing issue is a 30% decrease in venture capital investments, which might cause widening of the financing gap for innovative enterprises. Human resources are a relative strength, especially in regards to Slovakia and Czech Republic. Hungary is trying to catch up with R&D expenditures (11% growth), community trademarks (10% growth), and license and patent revenue from abroad (9.2% growth).

3 For an exact definition, please refer to: http://ec.europa.eu/growth/smes/business-friendly-environment/sme-definition/index_en.htm

The innovation efficiency ratio[4], which shows how much innovation output a country is getting for its inputs, indicates a huge disparity between the V4 countries, with Czech Republic taking the 11th spot among 141 economies, Poland being ranked at the 93rd place, and Hungary and Slovakia taking places somewhere between (35th and 48th place respectively).

Table 6: Selected indicators representing innovativeness in V4

	EU AVERAGE	PL	CZ	SK	HU
Current performance (2007-2014 growth rates)					
Innovation Efficiency Ratio	-	0,66 (93rd)	0,89 (11th)	0,76 (48th)	0,78 (35th)
Gross Domestic Expenditure on R&D = GERD (% 2014 GDP)	2.03	0.94	2	0.89	1.38
New doctorate graduates per 1000 population aged 25-34*	1.8 (2.6%)	0.6(-7%)	1.7 (6.4%)	2.4 (10.4%)	0.9 (3.7%)
Scientific publications among the top-10% most cited publications worldwide as % of total scientific publications of the country	11 (1.5%)	3.8 (3.2%)	5.6 (4.6%)	4.2 (6.7%)	5.3 (1.5%)
Non-EU doctorate students as a % of all doctorate students	25.5 (3.5%)	1.9 (-4.4%)	4.4 (4.3%)	1.5 (14.4%)	3 (-1.1%)
R&D expenditure in the public sector (% GDP)	0.72 (1.9%)	0.48 (3.8%)	0.87 (8.2%)	0.44 (7.2%)	0.41 (-2.5%)
Number of public-private co-authored research publications	50.3 (2.3%)	4.7 (8.7%)	25.1 (7.9%)	13.7 (8.7%)	26.8 (3.1%)
R&D expenditure in the business sector (% GDP)	1.29 (1.9%)	0.38 (12.2%)	1.03 (4.8%)	0.38 (8.8%)	0.98 (10.7%)
SME introducing product or process innovations (% of SMEs)	30.6 (-1.7%)	13.1 (-6.2%)	30.9 (-0.5%)	17.7 (-2.7%)	12.8 (-3.8%)
Employment in fast-growing enterprises in innovative sectors (% of total employment)	17.9 (0.5%)	19.3 (1.6%)	18.7 (1.9%)	19.2 (-0.1%)	19.1 (0.7%)
Employment in knowledge intensive activities (% of total employment)	13.8 (0.6%)	9.6 (0.9%)	12.9 (2.0%)	9.6 (-0.7%)	12.8 (0%)
Exports of medium and high-technology products as a share of total product exports	53 (-0.8%)	56.6 (-0.2%)	62.5 (0.2%)	63.6 (1.6%)	66.3 (-1.1%)
Knowledge-intensive services exports as % of total services exports	49.5 (0.7%)	26.6 (3.3%)	35.2 (-0.9%)	31.3 (9.2%)	28.8 (3.3%)
Cultural & creative services exports as % of total exports	-	1	0.6	0.4	1.5
Creative goods exports as % of total trade	-	3.9	10.1	10.5	6.2

** The average annual growth rates were calculated with a following formula: AAGR= ((Value end of period)/(Value beginning of period))^((1/(Number of years)))-1 where the number of years = 7*
Source: European Commission, Eurostat, Global Innovation Index

The V4 countries are moving up the ladder of the Bloomberg Innovation Index ("BII"). The BII assesses a country's innovativeness by measuring its R&D intensity[5], manufacturing value-added[6], High-tech density[7], tertiary efficiency[8], research personnel[9], and patents[10]. The Global Innovation Index also ranks the V4 economies among the top 50 innovative countries in the world.

One area in which we had the worst results were so-called "innovation linkages", depicting, among others, university/industry research collaboration and the state of cluster development in a country. Poland was the worst (102 out of 141 countries), while Hungary (83rd), Slovakia (69th), and Czech Republic (53rd) also have room for improvement. R&D does little good if it stays bottled up in the laboratory.

4 A ratio of the so-called Output Sub-Index score (provides information about outputs that are the results of innovative activities within the economy) over the Input Sub-Index score (is comprised of 5 input pillars that capture elements of national economy that enable innovative activities: institutions, human capital and research, infrastructure, market and business sophistication.

5 R&D expenditure as % GDP.

6 Measured as % GDP per capita.

7 Number of domestically domiciled high-tech public companies as a share of world's total high-tech public companies.

8 Total enrolment in tertiary education, regardless of age, as % the post-secondary cohort, % labor force with tertiary degrees, annual new science and engineering graduates as % total tertiary graduates and as % total workforce.

9 Professionals, including PH.D. students, engaged in R&D per 1mn population.

10 Resident patent filings per 1 mn population and per $100bn GDP, patent grants as a share of world total.

Table 7: Innovation indices

	POLAND	CZECH REPUBLIC	SLOVAKIA	HUNGARY
				
BLOOMBER INNOVATION INDEX 2016	**23RD**	**31ST**	**39TH**	**30TH**
GLOBAL INNOVATION INDEX 2015	**46TH**	**24TH**	**35TH**	**36TH**

Source: Bloomberg Innovation Index, Global Innovation Index, Cornell University (2015)

Conclusions

During the past 25 years, all V4 economies have gone through radical changes aimed to transform them into democratic, free market economies. Based on the statistical data presented above, it is fair to say that, on average, our societies are healthier, richer, and more educated. However, in assessing a country's prospects, one should not only look at rankings. A recent example of their misleading nature has been Egypt. In 2008, Egypt was ranked as the top reformer in the World Bank's Doing Business ranking. The country was praised for slashing the minimum capital requirements for companies and halving start-up time and cost. However, many of these reforms remain largely only on paper, with minimal contribution to living conditions of ordinary Egyptians. Having said this, we acknowledge the problems our economies are struggling with (especially the lack of governmental efficiency, regulatory burdens, and taxation), but our focus is on the ideas and solutions that might further contribute to the attractiveness of our region.

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2. THE FUTURE OF ENEGRY

Joanna Rycerz

2.1 Executive summary

Increasing cooperation between V4 Countries in terms of energy is crucial. Both electricity and gas sectors need new capacities in cross-border infrastructure, common markets, and improving investments in new technologies. Therefore, energy cooperation between V4 Countries should aim at implementing joint energy policies, providing secure supplies of natural gas, creating cross-border electricity and gas markets, and developing new technologies.

2.1.1 Natural gas

V4 Countries are more dependent on gas from one supplier than countries from Western Europe. Therefore, cooperation between V4 Countries should aim at further diversifying supplies and developing regional gas markets. Those changes should be done gradually with strong political regulatory support, initially, and cooperation between companies and other market participants, in five core areas:

- **Cross-border infrastructure.** Sufficient infrastructure is a basis for further integration of gas systems. V4 Countries should aim to increase cross-border gas transit capacities within V4 Group and with other regional groups, in particular BEMIP (which may prevent V4's isolation).
- **Regulatory framework.** V4 Countries should take efforts to create a market-friendly environment on national and regional level. This requires harmonisation of existing and (if necessary) establishing new regulations that will facilitate cross-border flows of natural gas. In particular, V4 Countries should provide full and proper implementation of Network Codes and a coordinated, active approach on EU level, while establishing new ones.
- **Increase competition on gas markets.** Changes in regulatory framework should be aimed to increase competition and facilitate regional cooperation. As the first step, V4 Countries should complete the liberalisation of national gas markets by full unbundling of vertically integrated incumbents on national gas markets (unbundling of infrastructure, distribution, storage and supply activities).
- **Alternative sources of supply.** V4 Countries should increase access to alternative sources of supply: LNG and other pipeline supplies (it may require support for TAP, TANAP projects). Due to V4's geographical position, it may be difficult to achieve total independence from Russian gas supplies. However, even minor access to alternative sources may improve V4's bargaining position and decrease potential effects of disruption in supplies.
- **Regional market.** With sufficient cross-border infrastructure, diversified sources, and routes of supply, and with market-friendly regulatory framework, V4 Countries will be best placed to launch a well-functioning regional gas market. This change will bring new quality in V4's gas sector - liquid regional market will attract new market players and diminish political influences on gas trading operations. At this step, establishing a joint platform for gas trading may be helpful.

Increasing the regional cooperation may face several limitations related with the business nature or lack of will for cooperation between companies responsible for maintaining the infrastructure. Therefore, during the whole process, close cooperation between energy regulators and companies will be crucial.

2.1.2 Electricity

Over the past years, the share of electricity produced in renewable energy sources has increased. Electricity generated in RES is intermittent and unpredictable, and in certain situations, the national electricity system may not be dispatched to it (which may cause unplanned electricity flows between two countries). A solution for maintaining stable electricity systems (but ensuring investments in RES) may be closer regional cooperation. In terms of electricity, V4 Countries have the potential to cooperate in three core areas:

1. Increase of cross-border electricity supplies. We observe that V4 Countries have the potential for joint cooperation in terms of electricity. However, it is not as obvious as in terms of natural gas. More interconnected countries can establish a single electricity market within V4, with a joint trading platform (for balancing and trade purposes). Trade activities should be facilitated by creating single licenses for trade in electricity.
2. Decentralised renewable generation. In many EU Countries, Renewable Energy Sources (RES) development is driven by public financial support available for companies operating on national level in support schemes. V4 Countries may consider coordinating investments in RES (e.g., in joint RES support scheme) and, therefore, decrease level of RES subsidies born by single countries and the risk of low investments in the RES sector.
3. Greater digitalisation of electricity systems. Digital solutions in the energy sector may give precise information determining the optimal location of a new plant, reduce costs of operational management during electricity production (e.g., dedicated software will allow for better management of RES production and storage), and improve balance demand with the most affordable supplies (when combined with demand-side management tools).

Similar to the conclusions presented for natural gas, above changes will be done gradually, with strong political regulatory support, to facilitate the cooperation between companies and other market participants.

2.1.3 Coordinated energy policies

All the ideas presented above aim to increase the cooperation between V4 Countries in the energy sector and may be implemented simultaneously with EU-wide solutions, like the Energy Union. The coordination of V4s' energy policies is a milestone for making V4s voice more visible on EU level.

We welcome European Commission's proposal that EU Member States should cooperate in developing their energy policies and conduct regional consultations on their energy and national climate plans as a part of the new system of governance in the Energy Union. Such regional cooperation may help to identify common goals under regional long-term regional energy and climate strategy and increase the predictability of investments. Strong regional cooperation between V4 Countries will allow for achieving important energy goals more efficiently, and a stronger Visegrad would, eventually, translate into a stronger European Union.

This section presents our vision for V4 cooperation in the energy sector. We are convinced that several opportunities for joint development of the energy sector exist in the Visegrad region. As a matter of fact, although we see the differences between our countries, the common objectives should prevail, especially related to security of supplies, environment protection, sustainable development, and energy efficiency. Through joint cooperation between governments and companies, the V4 Countries could improve their gas and electricity markets. Both these sectors need new capacities in cross-border infrastructure, the existence of common markets, and investments in new technologies. **In the following paragraphs, we present solutions for cooperation between V4 Countries in establishing joint energy policies, providing secure supplies of natural gas, creating cross-border electricity and gas markets, and developing new technologies.**

The energy markets in V4 Countries are at a similar stage of development[11]. V4s' economies represent higher energy intensity than EU average (per GDP), so secure and efficient supplies of energy, with access to diversified sources, at an affordable price are vital for their proper functioning. We define the security of supplies as access to sufficient supplies of energy at affordable cost. This definition could be further divided into three core elements:

- security of physical supplies provided by sufficient infrastructure and diversified suppliers;
- purchase security provided by ability to purchase energy; and
- political security, provided on national, regional, and global level.

Looking at these elements leads us to a conclusion that, in our intertwined world, energy security is no longer a national issue. Increasing interconnectivity and complexity of energy systems require solutions going far beyond national borders.

2.2 The similarities of V4's energy mixes, supply dependency, and stage of market development may act as a foundation for further cooperation

The V4 countries rely on fossil fuels (coal, gas, oil) twice more than EU average, while renewable energy sources represent a smaller share of their energy consumption.

Figure 1: The V4 average mix

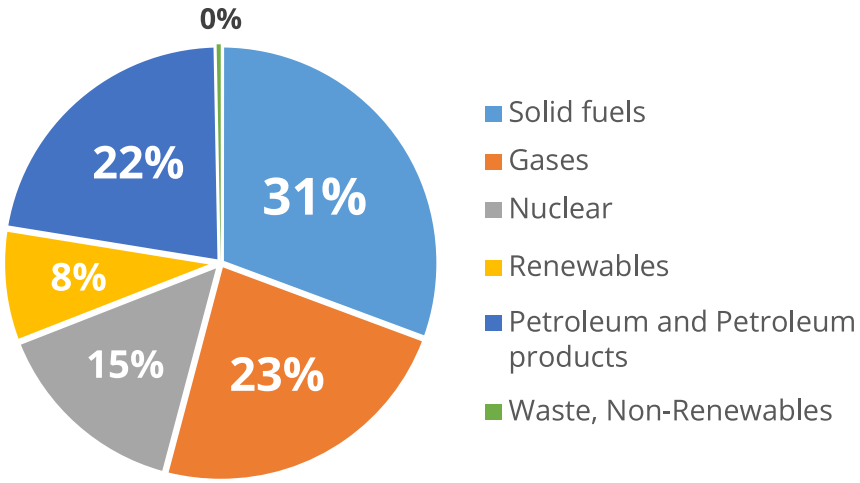
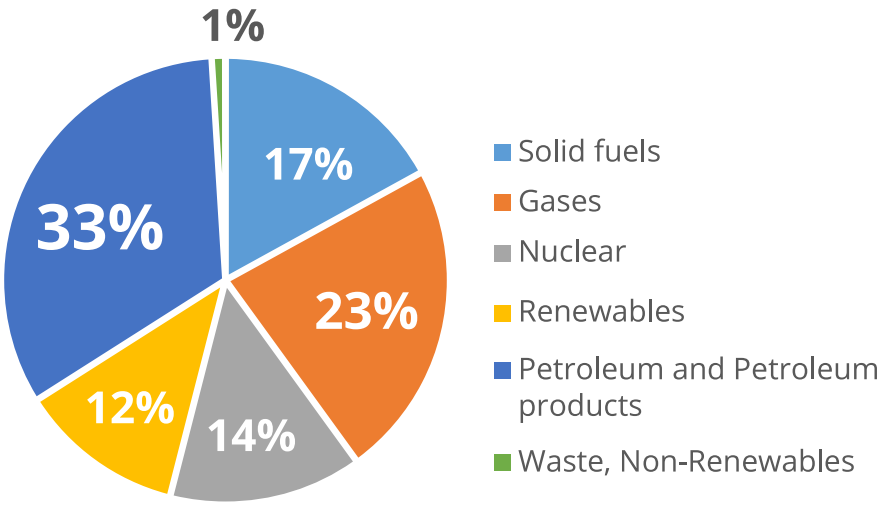


Figure 2: EU28

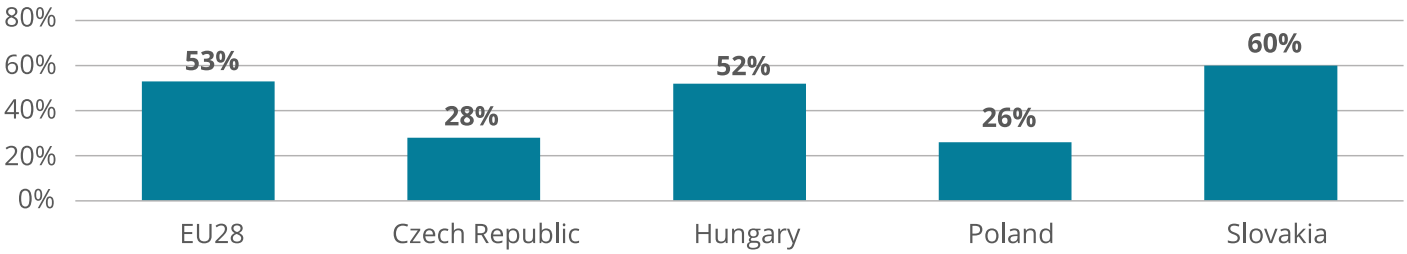


Source: Eurostat (2013), European Commision (2015)

11 Energy markets in Countries of V4 Group may differ e.g. in import dependency and energy mix.

The V4 Countries are also more dependent on gas from one supplier than countries from Western Europe. Large volumes of natural gas are imported from Russia. The more significant this import is for national consumption, the higher the price paid. The dependency on gas imports from one supplier, with limited access to alternative supplies, results in restrictions in switching into alternative roads of supplies. In some situations, cooperation with one supplier may be economically viable; however, in case of V4, this dependency from Eastern supplies is not a matter of choice. In recent years, the situation improved due to new interconnector for reverse gas flows between Czech Republic and Slovakia, Czech Republic and Poland, and between Slovakia and Austria or between Slovakia and Hungary. New interconnection between Slovakia and Poland will be built between 2018 and 2020.

Figure 3: Total energy net imports - % of gross inland consumption

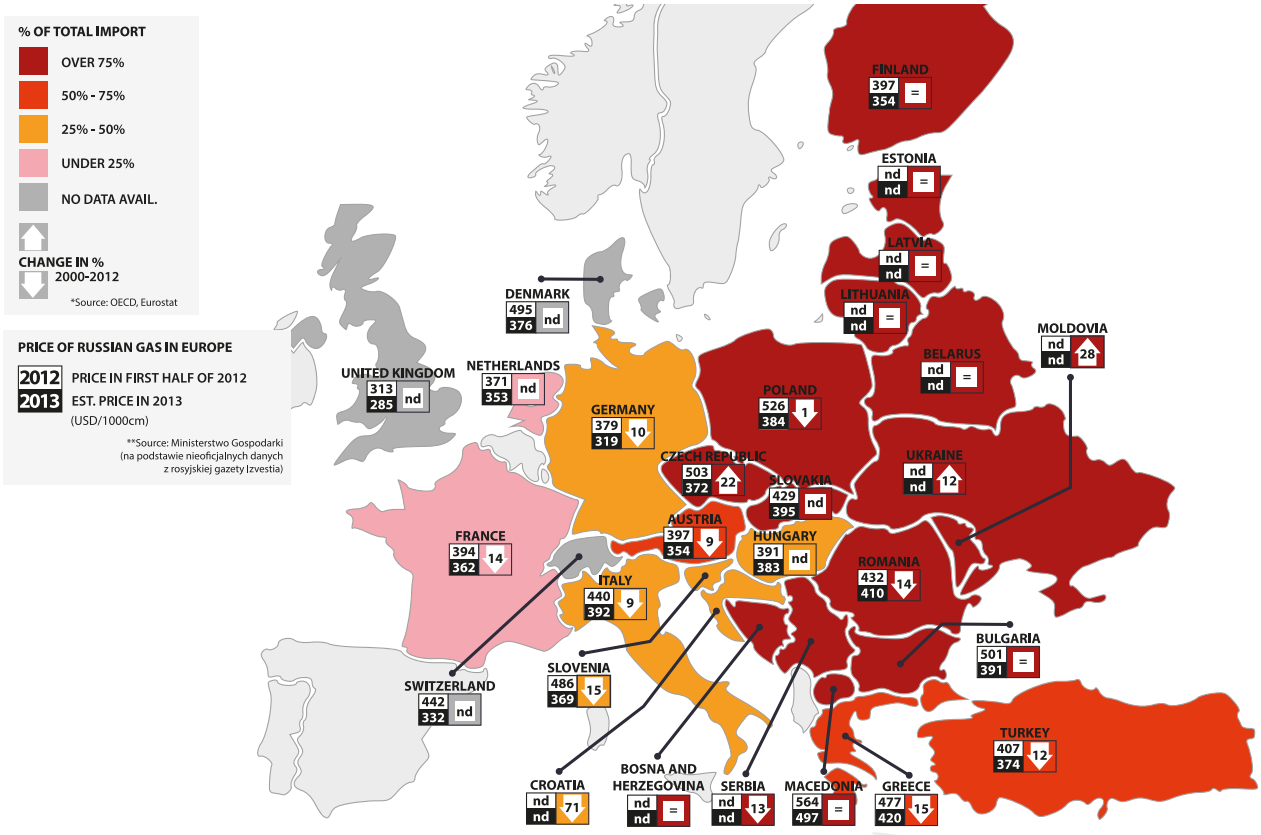


Source: Eurostat (2013), European Commission (2015)

COMMENT

Energy security is one of top priorities in national policies of the V4 countries. Therefore, common approach and cooperation in the area of energy infrastructure, particularly gas interconnections, and RES is crucial for stable development of the region. The solutions, presented by this report, give a clear framework how to set-up a functioning regional market, which will be less "politically" volatile.

Jan Bocora, *Ph.D.*



Source: Polish Ministry of Economy/Lesław A. Paga Foundation (2014)

2.3 Providing secure supplies of natural gas is one of the core areas for cooperation of V4

In our opinion, cooperation between V4 Countries should aim at development of the regional gas market. This change may be done gradually with strong political regulatory support, initially, and cooperation between companies and other market participants, in a five core areas:

1. **Cross-border infrastructure.** Sufficient infrastructure is a basis for further integration of gas systems. V4 Countries should aim to increase cross-border gas transit capacities within V4 Group and with other regional groups, in particular BEMIP (it may prevent from V4's isolation). Intergovernmental cooperation and support from EU administration and financing will be crucial at this stage.
2. **Regulatory framework.** V4 Countries should take efforts to create a market-friendly environment on national and regional level. This requires harmonisation of existing and (if necessary) establishing new regulations that will facilitate cross-border flows of natural gas. In particular, V4 Countries should provide full and proper implementation of Network Codes and a coordinated, active approach on EU level, while establishing new ones.
3. **Increase competition on gas markets.** Changes in regulatory framework should be aimed to increase competition and facilitate regional cooperation. As the first step, V4 Countries should complete liberalisation of national gas markets by full unbundling of vertically integrated incumbents on national gas markets (unbundling of infrastructure, distribution, storage, and supply activities).
4. **Alternative sources of supply.** V4 Countries should increase access to alternative sources of supply: LNG and other pipeline supplies (it may require support for TAP, TANAP projects). Due to V4's geographical position, it may be difficult to achieve total independence from Russian gas supplies. However, even minor access to alternative sources may improve V4's bargaining position and decrease potential effects of disruption in supplies.
5. **Regional market.** With sufficient cross-border infrastructure, diversified sources and routes of supply, and with market-friendly regulatory framework, V4 Countries will be best placed to launch a well-functioning regional gas market. Liquid regional market will attract new market players and diminish political influences on gas trading operations. At this step, establishing a joint platform for gas trading may be helpful.

Increasing regional cooperation may face several limitations related with business nature or lack of will for cooperation between companies responsible for maintaining infrastructure. Therefore, during the process, close cooperation between energy regulators and companies will be crucial.

2.3.1 Need for cross-border infrastructure and access to new sources of supply

Maintaining the existing dominance of a single supplier may bring negative consequences for the whole region in long-term perspective, including higher prices and economic and political impacts. Change of this status quo is strongly supported by European Commission. EC, during Stress Tests in 2014, came to the point that disruptions in gas supplies would have a substantial impact on Central and Eastern Europe, due to lack of infrastructure and alternative supplies, but a cooperative, market-based approach will enable easier gas flows between neighbouring countries[12] and, therefore, bring security. From our point of view, V4 cooperation will be addressing EC's recommendations.

12 Q&A on Gas Stress Tests, European Commission (2014).

We know of ongoing amendments to the Regulation concerning measures to safeguard the security of gas supply(994/2010/EU)[13] that assume establishing special areas in case of gas disruptions. However, an initiative of V4 Countries may be complementary to EC proposal and provide another way of diversification, tailored to regional level needs.

2.3.2 Pipeline supplies

Investments in infrastructure are time- and cost-consuming (cost of PLN-CZ gas interconnector "Stork II" exceeds EUR 63 M); therefore, V4 Countries should try to increase interconnection capacity by sharing cots of new pipeline infrastructure (costs may be shared between TSOs with support from EU funds). New investments may aim to complete North-South Gas Corridor in CEE that will link the LNG Terminal in Świnoujście, through central Poland, the Czech Republic, Slovakia and Hungary, and the Adria LNG terminal in Croatia on the Krk Island (the Corridor will comprise domestic gas pipelines with total length over 1300 km[14] and costs over 3.7-4.2 billion EUR[15]).

An important thing is that crucial cross-border energy infrastructure (included in Trans-European Energy Infrastructure (TEN-E) development plan) may apply for the status of Projects of Common Interest (PCI) and receive financial support Connecting Europe Facility. Projects for investments in necessary infrastructure may be submitted by regional groups. Regional groups may be established between member states, national regulatory authorities, project promoters, and relevant stakeholders (e.g., transmission system operators).

For developing gas cross-border infrastructure, V4 Countries should bring efforts to establish the next regional group and submit proposal of necessary investments for the next call for PCI in 2017. Based on past experiences from Gas Regional Initiative South-South East operating under ACER or group dedicated to V4 issues operating under EC's DG ENER, it is likely that V4 Regional Group, established under existing cooperation within EU bodies, will successfully operate without need for additional administrative bodies.

Example

List of PCIs in 2015 included a set of PCIs for investments in gas infrastructure in the Eastern Baltic Sea region under Gas Baltic Energy Market Interconnection Plan (BEMIP).

V4 Countries should establish a regional group for the purpose of infrastructure development, similar to NSI East Gas Regional Group (established in 2013 for the purpose of gas interconnections allowing bidirectional flows between Poland, Czech Republic, Slovakia and Hungary, linking the LNG terminals in Poland and Croatia).

Source: ACER

2.3.3 Access to supplies of liquefied natural gas (LNG)

Access to LNG, provided by Terminal in Świnoujście, will allow V4 Countries to limit dependency on Russian gas and participate in global market, with a wide range of suppliers and flexible prices.

In recent years, global LNG trade is growing rapidly; it reached a level of 241.1 MT in 2014 with a 4 MT increase over 2013[16]. With increased trade, we may observe decrease in LNG prices (see chart below). This situation is caused, mostly due to expansion of global LNG supplies and decrease of oil price (LNG prices are often indexed to oil prices). Nowadays, due to price differences, most of the world LNG volumes are directed to the Asian markets, but some European companies are negotiating LNG supply

13 Proposal for a Regulation of the European Parliament and of the Council concerning measures to safeguard the security of gas supply and repealing Regulation (EU) No 994/2010, European Commission (2016).

14 Completing Europe. From the North-South Corridor to Energy, Transportation, and Telecommunications Union, Atlantic Council and Central Europe Energy Partners, Grupa LOTOS S.A., Przedsiębiorstwo Eksploatacji Rurociągów Naftowych S.A., PERN "Przyjaźń" (2014).

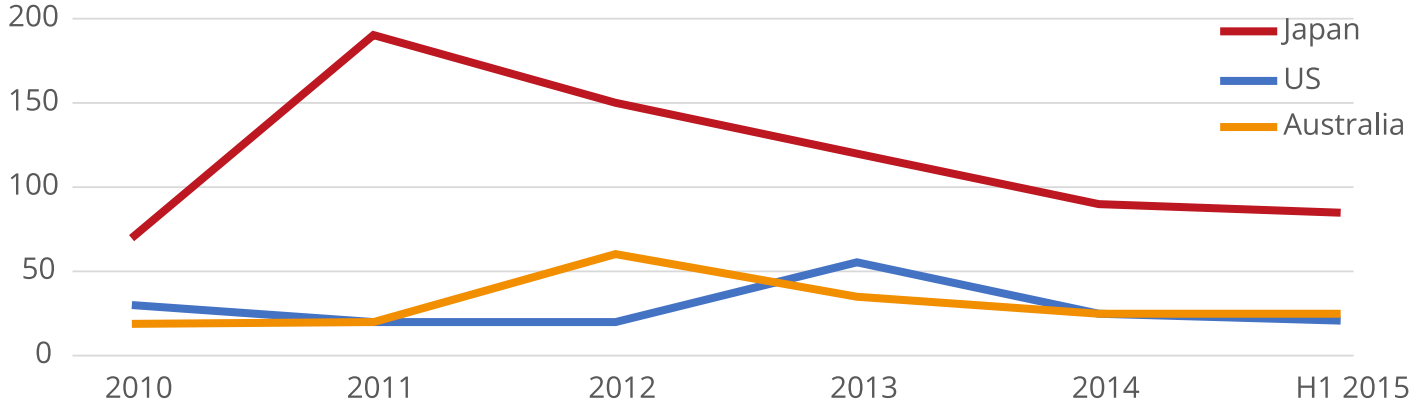
15 Completing Europe. From the North-South Corridor to Energy (as before).

16 World LNG Report - 2015 Edition, International Gas Union (2015).

contract with US LNG producers. New LNG supplies from Northern America, Australia, Qatar, and new discoveries in East-Africa are likely to increase the size and liquidity of the global LNG markets and make LNG a major source of diversification.

For the above reasons, in a short-time perspective, we may expect an oversupply of LNG, but resources of this fossil fuel and liquefaction plants are limited; therefore, in a long-term perspective, prices of LNG will rise again. However, looking in long-term perspective, LNG market will be tightened due to increased global demand that could be higher than global level of supplies (assumed that due to physical conditions, export LNG terminal cannot be built on every gas field). We should remember that in long-term perspective, global supply-demand balance in LNG market will be tightened.

Figure 4: LNG price [EUR/MWh]



Source: European Commission (2015)

LNG may be used by V4 Countries as back-up fuel for traditional gas pipeline supplies, a source for diversification of current gas supplies for V4 Region in case of short-term disruptions. LNG is supplied to terminals by ships and then by trucks or (after regasification) through existing pipelines. This supply chain provides greater flexibility, because gas can be easily delivered to the areas with limited access to pipeline supplies. Recent EU strategies assumes increasing use of LNG as an alternative fuel in heavy transportation, e.g., trucks and ships, which may constitute another field for cooperation for gas companies within V4. With joint development of a map of LNG stations and storage plants, V4 Countries may increase in a short-term security of diversified supplies.

2.3.4 Creating a regional gas market within V4

Investments in cross-border infrastructure and alternative sources of supply increases connectivity and allows for creating a single gas market within V4. The idea of a single market (in any form of its implementation) assumes maximum convergence of gas prices (excluding national taxes) between countries of the region. Price created on liquid regional gas market may act as a reference price for gas supplied to this region.

Creating a regional gas market requires political decisions and strong cooperation between energy regulators, especially abandoning administrative price regulation. In Slovakia, household and SME gas prices are strictly regulated and kept below (probable) market price. The price creation by sellers (there are around 20 independent gas sellers) is limited to very rigid tariff systems, which does not allow for new innovative products. Such a situation discourages households and SMEs from actively searching for better products and makes the whole idea of energy market liberalisation useless. Liberalisation of national gas markets should be the first step towards regional market.

For developing a single gas market, V4 Countries should complete liberalisation of national gas markets – full unbundling of transportation, storage, distribution, and supply companies, and abandoning regulated process on wholesale market. V4 countries may follow guidelines on structural framework provided under Gas Target Model (this non-binding document has been developed by NRAs, TSOs, and stakeholders in cooperation with Agency for Cooperation of Energy Regulators (ACER) and provides

indicators of well-functioning markets with framework requirements). Establishing a regional market may be supported by EU administration, because reviewed Gas Target Model (2015) assumes inter alia integration of regional markets.

As the next step, V4 Countries should aim to establish a regulatory framework that will facilitate operating on the regional gas market. This set of market rules will increase market transparency and energy (both electricity and gas) trading, boost competition, and liquidity, and in consequence, attract new market players and suppliers.

Core regulations within V4 regional market must follow EU rules on gas grid operation - Network Codes (EU secondary law aimed to facilitate the harmonization and integration of European gas markets). Some of Network Codes are already adopted (e.g., Network Code on Capacity Allocation Mechanism[17], Network Code on Gas Balancing of Transmission Networks[18], or Network Code on Interoperability and Data Exchange Rules[19]) and V4 Countries should focus on proper implementation of above regulations. Negotiations on another Network Code on Harmonised Transmission Tariff Structures for Gas are ongoing, which creates another path for cooperation of V4 Countries (between TSO's and national energy regulators under GRI SSE).

Market integration will require strong cooperation on political and governmental levels, aimed to choose the best model for gas market integration. V4 Countries may consider several models of market integration, in particular: (i) single cross-border market zone, (ii) establishing V4 Trading Region, (iii) multiple coupled market zones, or (iv) development of independent connections to external liquid hubs.[20] With access to LNG supplies and increased interconnectivity, V4 Countries may consider establishing a single market zone with joint virtual trading point, where LNG supplies may provide upper price limit (excluding regional transit costs). This virtual trading point may be established as joint energy exchange (similar to Nord Pool Spot for electricity trading on SPOT market in Scandinavia). Market zone of a size of a total sum of Czech, Hungarian, Polish, and Slovakian gas markets would improve negotiating position of V4 countries and give ability for expecting lower prices and attracting new suppliers[21].

Case study

In 2014, PEGAS platform for gas trading in France and Germany was launched. Since 2015, PEGAS allows for trading activities in many European gas hubs: French PEGs, German EEX, as well as on Belgian Zeebrugge, Dutch TTF, British NBP, and Italian PSV. In 2015, PEGAS became the largest gas exchange in EU. On all hubs, PGEAS allows for trading on spot market (except PSV) and futures market. The second largest gas commodity exchange is British ICE (Intercontinental Exchange). ICE allows for acquiring gas on several European gas hubs: British NBP, Dutch TTF (ICE Index), and Belgian Zeebrugge.

V4 Countries may take a lesson from the most liquid European commodity exchanges and establish a single platform for gas trading within V4 Region.

To improve secure and resilient gas supplies, V4 Countries may consider implementation of single rules for gas storage obligation, similar to mechanism required by International Energy Agency of maintaining total oil stock levels equivalent to at least 90 days of the previous year's net imports. Existing national storage obligations should not limit cross-border trading activities (in Poland, storage obligation creates unnecessary market-entry barrier, because the cost of storage is imposed on suppliers importing natural gas to Poland) and should allow for keeping mandatory reserves in storage facilities in different countries within V4 Group. Storage capacity should be more available on a regional level; therefore, V4 Countries may consider creating bundled products (storage and transmission capacity), which could be traded on a regional platform.

17 Commission Regulation (EU) No 984/2013 establishing the Network Code on Capacity Allocation Mechanisms in Gas Transmission Systems (NC CAM).

18 Commission Regulation (EU) 312/2014 of 26 March 2014 establishing a Network Code on Gas Balancing of Transmission Networks.

19 Commission Regulation (EU) 2015/703 of 30 April 2015 establishing a network code on interoperability and data exchange rules.

20 Analysis on V4 Gas Target Model has already been presented in Road Map towards the regional gas market among Visegrad 4 Countries (2013) and The Gas Target Model for the Visegrd 4 Region Conceptual Analysis (2013).

21 S. Ascari, The Gas Target Model in Central Europe: a Study of the V4 Region, European University Institute (2013).

2.3.5 Collective gas purchases

Despite recent political dimensions, V4 countries may consider implementation mechanism of collective gas purchases. Aggregated demand for gas within V4 Group reached 32 mtoe in 2013[22] (gas demand in France in respective period of time reached 38 Mtoe). Market of this capacity will attract new external suppliers and increase negotiating position of V4 with existing suppliers. Polish proposal (*Roadmap towards an Energy Union for Europe. Non-paper addressing the EU's energy dependency challenges presented in 2014*[23]) assumed two models of collective gas purchases: (1) top-down approach with engagement of special agency, or (2) bottom-up approach with engagement of commercial entity. The first solution may be implemented in voluntary participation of each country (with a possibility to purchase a certain share of its total domestic consumption) – for the countries not convinced of this solution. However, its side-effects may negatively affect competition. The second approach, assuming establishing voluntary consortium of interested companies, may be more beneficial, especially for large gas end-users. Entity established for trading purposes may be more transparent and less exposed to political pressures. Despite approach, each consortium established for collective gas purchases should fully comply with WTO rules and EU competition rules[24], and its operation will be assessed by European Commission (due to intergovernmental powers, if wrongly operated, it may create inflexibilities and market disruptions).

If establishing proposed mechanism will raise controversies and resilience of certain countries, V4 Countries should implement unified standards in contracts for gas concluded by national and private enterprises.

Case study

Several mechanisms of joint purchases for energy products are already functioning.

An example of bottom-up approach is two Japanese electricity producing companies: Tokyo Electric Power Co. (TEPCO) and Chubu Electric Power Co. (CEPCO). They signed, in 2014, a preliminary agreement to establish a joint venture for the procurement of fossil fuel resources, especially LNG. JV Company, called JERA, was established as 50:50 partnerships and started operating from 1st October, 2015. Company is responsible for all procurements of thermal coal (20 mln tones yearly) and LNG (more than 10 mln tons is currently delivered under long-term contracts that will expire in 2020, and after that date, JERA will be entitled to negotiate new ones).

An example of top-down approach is Euratom Supply Agency (operating under Euratom), established for collective supplies of nuclear fuel.

In 2015, Lithuania and Latvia signed a governmental memorandum on collective gas purchases. The memorandum stipulates that countries will coordinate their gas purchases with one another and will cooperate in seeking alternate sources of gas, using LNG Terminal in Klaipeda. However, until now, no specific steps have been made.

22 Eurogas Statistical Report (2014).

23 Roadmap towards an Energy Union for Europe. Non-paper addressing the EU's energy dependency challenges, Ministry of Foreign Affairs of the Republic of Poland (2014).

24 Energy Union Factsheet, European Commission (2015).

2.4 Increasing potential of renewable energy sources and new technologies in electricity generation

COMMENT

Cooperation on energy issues successfully started in the V4 Group several years ago, mainly in the gas and electricity infrastructure development. The North-South Corridor is gradually being completed but in order to secure energy supplies in the close future, more effort is needed. Even if I cannot agree with all the suggestions stated in the report (e.g. the proposal for collective gas purchases), the report as a whole correctly addresses the most pressing issues. For instance, the identification of the need for more coordination in the infrastructure development and the need to integrate markets both in electricity and natural gas. Nevertheless, when it comes to electricity market integration, the report could elaborate more on the possibility of Poland joining the existing 4M Market Coupling. In the gas market integration area, the report could serve as a good starting point for future analysis on the gas target model in the V4 region.

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(Opinion expressed is those of the author alone and does not necessarily reflect or represent the views, policies or positions of the author´s employer, the Ministry of Economy of the Slovak Republic)

The model of electricity systems, based on closed national systems, is no longer actual. Over the past years, generation portfolio has changed and increased share of intermitted generation requires closer regional cooperation. Closed electricity systems are more exposed to risk of blackout. Poland may serve as an example, with its 2% interconnection capacity in electricity faced a risk of blackout in 2015. Therefore, cooperation on increasing cross-border electricity supplies, decentralised renewable generation, with its greater digitalisation will be core challenges for the future electricity systems.

We observe that V4 Countries have the potential for joint cooperation in terms of electricity; however, it's not such obvious as in terms of natural gas. More interconnected countries can create single electricity market within V4 with a joint trading platform (for balancing and trade purposes). Trade activities should be facilitated by introducing single licenses for trade in electricity. Another field for cooperation is changing generation portfolio aimed in development of RES generation, smart grids facilitating management of decentralised power plants, and consumer activities. Implementation of above solutions must be supported by cooperation of governments (especially in terms of licensing), national energy regulatory offices, and grid operators.

2.4.1 Need for cross-border electricity infrastructure

An existing model of electricity, based on closed national systems with several large power plants (mostly carbon-fuelled), is now transforming into a new model with a greater share of cross-border supplies and new market participants (self-producers, demand-side). Future electricity systems must be prepared for a greater share of generation from renewable energy sources (RES) and its back-up generation, self-producers of electricity, and for increased participation of demand side and electricity storage. Those new market participants will make a fundamental change for future electricity systems.

Greater share of RES and other intermittent electricity producers will require improved and more interconnected infrastructure across Europe. EU established two targets for increasing cross-border capacity in electricity: until 2020, each EU country should increase its interconnection capacity to 10%, and until 2030, this capacity should be extended to 15%. All V4 countries, but Poland, fulfilled the 2020 target. Poland, with its 2% interconnection capacity (based on 2013 Eurostat data), needs investments in new electricity grids over the borders with Czech and Slovakia. Similar to our analysis on the gas market, financial support for those investments may be acquired, i.e., from Connecting Europe Facility Fund.

2.4.2 Possibilities for integration of electricity markets

More connected systems between V4 countries can diversify and share electricity produced in RES. Poland, due to its geographical conditions, is one of the European leaders in wind electricity generation – total onshore capacity reached over 5 GW in 2015, and Polish energy companies are exploring the potential of offshore wind generation (due to strong winds over the Baltic Sea). In Hungary, good exposure to sunlight and geothermal energy created another opportunity establishing new RES plants and kinetic energy of water, which can be converted into electricity in small hydropower plants located, e.g., in Czech and Slovakia[25].

From our view, the ability to import electricity produced in neighboring countries should be complemented by greater integration of energy markets within V4 Group and facilitating access to cross-border balancing market[26] and transmission services (e.g., simplified capacity booking, transparent capacity fees).

Increasing share of intermittent energy sources, like RES or self-producers, will require more balancing capacity in electricity systems to prevent the risk of disconnection during peak hours, which may cause significant cost of energy – during peak hours, price of energy on Polish Power Exchange spot market may reach almost 70 €/MWh, which is higher than price on futures market. V4 countries should implement tools for facilitating energy purchases on balancing market, in particular, in joint platform for balancing purposes that will provide incentive to supply energy, where it is most needed (to the place with highest price).

This idea is supported by EU energy policy. Under Capacity Allocation and Congestion Management Network Code (CACM NC)[27], European Commission assumes establishing single European market for intra-day (Cross-Border Intraday Initiative Project) and day-ahead electricity trading (European Price Coupling Project). Both projects should be conducted with engagement of TSOs, power exchanges, and market participants.

Example

Price coupling on day-ahead market in North-West Europe (NWE) was implemented by the end of 2012. In 2014, a similar solution was launched between Czech, Slovakia, Hungary, and Romania (project Price Coupling of Regions, PCR). Currently, under PCR project, Poland has the status of observer (and was invited to participate in project). In the next phase, countries participating in PCR project will join NWE and create a single European energy market.

Example

Nord Pool Spot is one of the largest commodity exchanges for electricity trading (spot market), measured in volume traded and in market share. This exchange operates in Norway, Denmark, Sweden, Finland, Estonia, Latvia, Lithuania, Germany, and the UK. Nord Pool Spot is owned by the Nordic and Baltic transmission system operators and regulated by the Norwegian Water Resources and Energy Directorate (NVE). Regional electricity exchange gives the ability to purchase electricity during peak hours, reduces costs of system operation due to efficient use of transmission cross-border capacity, and provides transparency. V4 countries may consider establishing a single platform for the purpose of balancing its regional electricity systems, based on the experience of Nord Pool Spot.

2.4.3 Joint trading licenses

Creating a single electricity market for V4 should be supported by introducing joint trading licenses within V4 Group. In 2014, V4 NRAs agreed to compare their licensing requirements and undertake an analysis. V4 countries should continue this exercise and develop one common trading license/license

25 According to the data provided by Slovenské elektrárne, the national power utility in Slovakia , the total installed capacity in hydro power plants reached in 2015, circa 2400 MW. Slovenské elektrárne assumes that "The actually utilised potential of hydropower in the Slovak republic is about 57.5%." (https://www.seas.sk/hydro-electric-power-plants). The potential for hydro power plants in Czech Republic might me more modest – according to data provided by World Energy Council, technically exploitable capability of hydropower in Czech Republic is 3 978 GWh/yr (https://www.worldenergy.org/data/resources/country/czech-republic/hydropower/).

26 Purchase energy in balancing market is different from regular electricity purchase. Balancing market is used to "last hour" purchase of energy required to balance the electricity system.

27 Commission Regulation (EU) 2015/1222 of 24 July 2015 establishing a guideline on capacity allocation and congestion management.

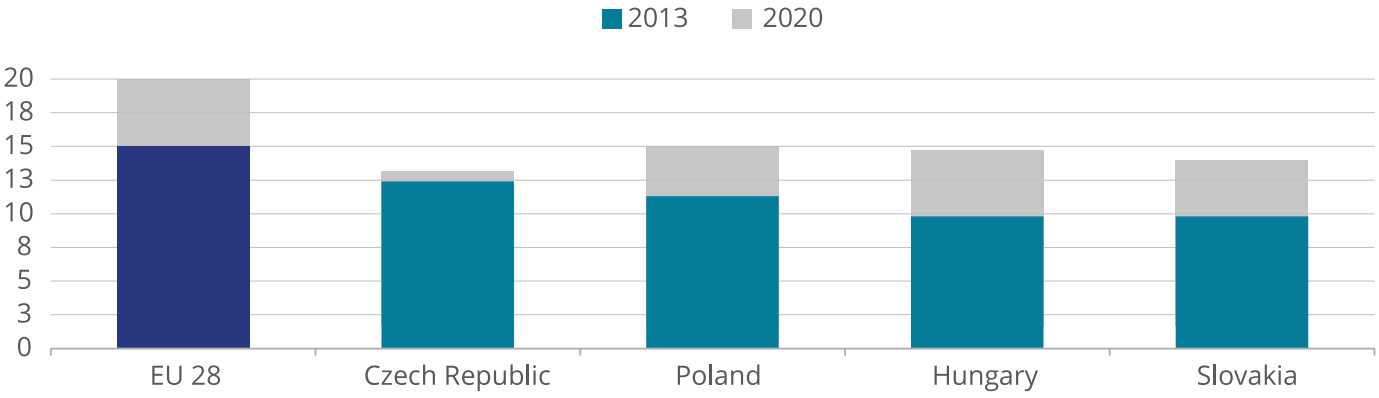
passporting that will give ability to traders registered in one country for trading operations in other V4 countries, without additional administrative burden (applying for administrative regulated prices). Common licensing criteria would facilitate entering new network users and give access to electricity market of a greater zone. Discussion of these issues should be continued under special groups of regulators, operating under ACER and with participation of market stakeholders.

2.4.4 Decentralised generation and digitalisation as the future of electricity

Existing political and regulatory framework provides strong support for developing decentralised generation, mainly in a form of renewable energy sources (RES and increasing its share in final electricity consumption[28]). Under existing RES Directive, EU Countries agreed to set up obligatory national and EU targets of RES share in electricity consumption: in 2020, prospective EU target amounts to 20% and is endorsed to 27% up to 2030[29].

To fulfil EU mandatory targets, each V4 Country brings efforts to promote higher use of renewable sources. From this point of view, RES market is another opportunity for enhancing regional cooperation between V4 Countries, in particular, in a form of cross-border infrastructure development, facilitated cross-border trading, or integration of electricity markets.

Figure 5: Share of renewables in gross final energy consumption, 2013 and 2020



Source: Eurostat (2013)

Deployment of RES may benefit not only with climate targets, but also give value to national economy by creating new jobs and increasing GDP (under recent IRENA study, doubling RES share may increase GDP of EU15 of 1% in a perspective of 2030[30]). It can be estimated that heavily subsidised coal mining (especially in Poland and Slovakia) in the near future may cause social costs greater than RES subsidies.

In many EU Countries, RES development is driven by public financial support available for companies operating on a national level in support schemes. Support schemes can address specific problems arising within given national system; however, when improperly used, they can hinder market integration and reduce cost-efficiency. In Poland, rapid amendments to RES support scheme[31] and proposed legislation on investments in wind generation may result in a potential investment gap in RES sector. Substantial changes are perceived by investors as increased risk of economic viability of RES investments (uncertainty about new RES support scheme forced investors to close RES projects before end of 2015 to participate in previous support scheme[32]). Substantial changes in RES support schemes have been observed in the other V4 Countries. In 2013, Czech Republic cut state subsidies to electricity produced from biomass, bio-methane, bio-liquids, solar panels, biogas, and the heat produced from biomass.

28 Renewable Energy Benefits: Measuring The Economics, IRENA (2016).

29 2030 RES target is binding on EU level only while 2020 RES target has been cascaded into national mandatory targets.

30 Renewable Energy Benefits: Measuring The Economics, IRENA (2016).

31 In 2015 Poland adopted new RES Act which has changed RES support system. Under new regulation green certificates scheme are replaced with RES auction scheme and feed-in-tariff (tariffs are limited to micro-generation). New system will be operational in mid-2016.

32 However, amendment to RES act adopted in last days of 2015 did not improve the situation – RES auctions will be able to start in the second half of 2016.

Slovakia, in 2015, has lowered governmental support for PV by imposing "solar tax"[33] (however, those effects may be reduced by subsidy for biomass heating and small wind turbines for households in total amount of 115 M EUR).

Joint challenges in RES development may act as a starting point for further cooperation. V4 Countries may consider coordinating flow of their investments in RES, thereby decreasing the risk of low investments in RES sector. This approach may benefit not only in more economical fulfilment of EU targets (and decrease level of RES subsidies), but also in facilitating energy trading within V4 Group. Moreover, the regional RES scheme will be more predictable due to limited impact of national politics and, therefore, will be more attractive for long-term investments in new RES technologies. The idea of regional support scheme within V4 may be welcomed by EC, which under EU 2030 policy, the framework remarked on the need for rationalisation, different national support schemes, and closer alignment to internal market, increasing cost-effectiveness, and providing better legal certainty for investors.

Example

Sweden and Norway, on 1st January 2012, launched a joint electricity certificate market (a form of support system). The joint market allows for trading in both Swedish and Norwegian certificates and receiving certificates for renewable electricity production in either country. Certificates for the production of renewable electricity in one country may be used to fulfil a quota obligation in the other.

For the period 2003-2011, RES production in Sweden increased by 240%, corresponding to 13% of total Swedish electricity production in 2011. Average cost of support scheme amounts to approx. 3-5% of total electricity price paid by final energy user.

Norway and Sweden both finance and benefit equally from the increase in new production in terms of the achievement of the countries' goals under the EU Renewables Directive. Compliance of this joint cross-border support scheme with RES Directive has been approved by ECJ in Ålands Vindkraft case (C-573/12).

Due to downfalls in electricity price, the revenues of energy companies were respectively decreased. Nowadays, energy companies are seeking solutions in new technologies to maintain their effectiveness and enable new investments, which can be achieved by implementing digital solutions. For new investment, digital solutions may give precise information, determining the optimal location of a new plant.

Digital solutions can reduce costs of operational management during electricity production and maximise return on investment: dedicated software will allow for better management of RES production and storage, adjust operating parameters to maximize output, reduce emissions depending on used fuel, and provide reliable information on electricity delivery[34].

From the perspective of efficient operation of an electricity system, dedicated software may improve balance demand with the most affordable supplies. It can be combined with demand-side management tools (e.g., demand-side response, energy efficient buildings, lighting, and appliances) and, therefore, reduce assets needed for sustainable operation of electricity systems.

33 European Energy Handbook, Herbert Smith Freehills (2015).

34 The Future of Electricity in Fast-Growing Economies Attracting Investment to Provide Affordable, Accessible and Sustainable Power, World Economic Forum (2016).

2.5 Coordinated energy policies

V4 Counties have common goals in EU energy and climate policy. Coordination of V4s' energy policies is a milestone for making V4s voice more visible. In recent communication on State of Energy Union[35], European Commission came to the point that Member States should coordinate and cooperate in developing their energy policies and conduct regional consultations on their energy and climate national plans as a part of the new system of governance in the Energy Union. Such regional cooperation may help to identify common goals under regional long-term regional energy and climate strategy and increase predictability of investments.

Between 2016 and 2018, Member States and European Commission will cooperate on developing national plans. Under our assumption, in the next months of 2016, V4 countries will be given a great opportunity to re-start regional discussion on energy issues and development of common approach in future energy strategies, in particular, on increasing security of natural gas supplies and electricity production in RES and creating an approach to new trends on the electricity market. Regional plans open up a wide range of possible cooperation between V4 countries and enforce their impact on EU energy and climate policy.

35 Annex Guidance to the Member States on the national energy and climate plans as part of the Energy Union governance to the to the Communication the Commission to the European Parliament, the Council, the European Economic and Social Committee, the Committee of Regions and the European Investment Bank – Sate of the Energy Union (2015).

3. AUTHORS

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Born in Poland, raised in Germany, Damian understood early on in his life about the benefits of cross-cultural cooperation. His career path led him through some of the world's financial centres, including London, Frankfurt, Moscow, Shanghai and Singapore. For his studies in CEMS International Management and International Business he has chosen Cambridge, Berlin, Warsaw and Hong Kong.

As alumni of the Academy of the Leaders of the Capital Market, the American Institute of Political and Economic Systems in Prague and Visegrad School of Political Science, he is largely engaged in Central Europe's integration. He organised the Central and Eastern Europe Capital Markets Leaders Forum in Warsaw and contributes to the public debate on the region's development in finance, education and entrepreneurship through publications and comments in media. In his free time Damian is a passionate football and rugby player and a dedicated passport stamp collector.

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Paweł has two years of experience in project and structured finance with the biggest bank in the CEE. He is also involved in matters relating to infrastructure and energy investments. Prior to his role at the bank he gathered experience in at legal firms, providing capital market related services.

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In his spare time Paweł develops non-governmental and charity projects. He leads the Infrastructure Team at the Young Reforming Poland and is a member of the board at Weimar Triangle Association. Paweł also helps developing several projects of the Lesław Paga Foundation, including the Capital Market Leaders Academy. He also enjoys reading books and playing basketball.

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Dominik is a passionate of analysing varying businesses from financial and strategic perspective. He started his career while pursuing two bachelor faculties at Poznan University of Economics, namely: Strategic Management and Finance & Accounting. During his studies he completed a one year internship in the Valuation and M&A department of Polish branch of international advisory firm Grant Thornton. After exploiting opportunities in Poznan he decided to move to Warsaw, where he completed summer internship at Innova Capital – one of the leading Private Equity firms in the CEE region. The internship sparked his interests in the Private Equity industry, in which he decided to specialize in his further academic endeavours. Currently Dominik is pursuing his two-year master's degree in Finance & Investments at Copenhagen Business School. This year, he will also join Deutsche Bank, as a Summer Analyst at Investment Banking Department in London. In his spare time Dominik enjoys traveling, cinematography and ethnic music.

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Sebastian has over three years of experience in corporate finance. Currently he works as an Analyst in the Investment Banking Division of a leading bank in CEE. Previously engaged in the venture capital sector, the capital market and research on the financial institution regulations. He is an alumnus of the Capital Market Leaders Academy.

Systematically uses professional and academic background to leverage various charity and social projects. He is a member of the innovation policy team in The Young Reforming Poland association. While studying he was the vice chairman of the leading student project in the field of monetary policy in Poland. His passion to share knowledge with others caused him to develop an educational project which aims to increase awareness of economics and finance, especially among young people.

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Petra was born in Slovakia, but moved to Prague, Czech Republic, where she is already living for 6 years. She finished bachelor's degree in economics at University of Economics in Prague and is currently finishing master's degree in Law at Charles University. During her studies she participated in different student NGO projects as a project manager or financial director. She is interested in business and investments and is working for small czecho-slovak investment company as a financial analyst engaged not only in analysis, but also in many legal questions targeting the ongoing business. Her hobbies are fitness, weight lifting and travelling.

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Zsombor was born in Budapest, Hungary. He has a strong interest towards entrepreneurship and capital markets, he has launched his first business as a high-school student. Currently he studies Finance MSc at Corvinus University of Budapest after his BA in Applied Economics. His engagement in student life was topped by serving as the Chief Financial Officer, Member of Directorate at Heller Farkas College of Advanced Financial Studies. He has done several internships in various industries. His most recent internship was at Morgan Stanley's Budapest-based securitized products structuring team where he had focused on residential mortgage backed securities. He still has his business interests in IT/real estate. His scientific achievements include student papers in the topics of SMEs, behavioral finance, FDI or energy. In his free time he likes orienteering, sailing and natural photography.

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Although, during studies he never considered working in rail industry, after graduation he became Business Assistant to the CFO of Polish Intercity Railways and became passionate about railways. As Assistant he helped to coordinate implementation of high-speed railways in Poland and supported CFO in daily activities. Currently works as analyst at EY.

Tomasz took part in multiple extracurricular activities such as Youth Reforming Poland. He has reached the finals of EY Financial Challenger, the most prestigious transaction advisory competition in Poland and is a scholar of the Capital Markets Leaders Academy, prestigious fellowship program for young high-potentials. Privately passionate about travelling and mountaineering. Occasionally Tomasz publishes columns on railways, Warsaw and travelling.

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Ondřej was born in the Czech Republic. Currently he is a doctoral student at the University of Economics in Prague, Faculty of Business Administration, Department of Entrepreneurship. He is interested in entrepreneurship and evaluation of impacts of entrepreneurial policies. Previously he obtained master degree in economic policy at the same University. Ondřej also studies a master degree in Entrepreneurship at Linnaeus University in Sweden. Ondřej is not only theoretically interested in entrepreneurship, he has been also engaged in his own business activity focused on data analysis and econometrics tutoring since 2013. To his hobbies belong sport, geocaching and playing chess.

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Piotr is currently an entrepreneur, running a family business in Bydgoszcz, Poland. Since 2011 he has been working both in private and public sectors. Among others, he took part in consulting projects in PwC, advised Polish Minister of Infrastructure on road, railway and aviation regulations, and co-managed the market analysis department in Polish State Railways. He graduated from ESCP Europe Business School (MSc) and Poznan University of Economics (BA). Piotr is also engaged in numerous non-profit initiatives such as Lesław Paga Foundation, Civil Development Forum, Youth Reforming Poland association and Toastmasters International. He is passionate about mountain trekking, exotic travels and public speaking.

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