

POLICY PAPER

Support for renewable energy in the V4: what went wrong?

Eliška Trmalová

- **The Visegrad countries – Poland, the Czech Republic, Slovakia and Hungary – despite their differences in geography and economy, share certain aspects in common when it comes to the use of renewable energy sources (RES).**
- **In particular, the frequent changes in legislation and the level of government support for RES are creating instable investment environments in the countries and are hampering their chances at a more widespread use of RES.**



Introduction to the energy sector in the Visegrad Group with emphasis on the RES

When talking about the Visegrad Group, we have to realize that these are separate states with their specifics. However, when it comes to energy, we can find common characteristics. All states of the Visegrad Group are in the Central Europe and have joined the EU in 2004. They all count as the post-communist states and this heritage influences their present significantly. There is a big difference between an institutional “hardware”, which is to a considerable extent inherited from the state-socialist period, and cultural “software”, which is rather hybrid, i.e. based on the long-established traditions and the pressures of globalization and Europeanization of the 1990s.¹

Historically, there has been a strong tradition of big, state-owned energy companies and poor tradition of public consultation and deliberation which is mirrored into today’s lack of the culture of dialogue. There is also limited legitimacy for a plurality of competing interests. In the field of energy, national action plans and strategies affirmatively talk about energy efficiency, reduction of energy imports and energy security. Despite savings and efficiency efforts, the demand for energy is likely to grow. Although the states of Visegrad Group agree on the diversification as one of the approaches for higher energy security, there is a lack of finances invested into new technologies. It gives the impression that government representatives underline RES development as necessary only due to the EU membership and not for the sake of the climate.

The question of governance is crucial, for its instability causes the instability of the regulatory environment as well. So while the EU pushes for stronger RES support policies, the Visegrad Group struggles with the instable political fields that are unable to handle this issue. It is a major challenge because states have to come up with their own ways of implementing the RES directives due to the different environmental possibilities of each state.

The potential of RES across the Visegrad Group

In Poland, there is a big potential for onshore and also offshore wind² (the Baltic Sea region has the average wind speed of 2-3 meters per second).³ In 2015, Poland was 7th in the world in the new installed wind capacity and 12th in the overall installed capacity.⁴ In terms of electricity generation, wind energy is, thanks to its rapid growth, the largest renewable energy source. It increased by 550 % between years 2010 and 2015.⁵

The share of renewable sources in TPES (Total Primary Energy Supply) doubled from 2010 to 2015 from 5 % to 10 %. In terms of TPES and TFC (Total Final Consumption), biofuels and waste replaced the historically dominating hydropower in 2007 and are now the main RES, mainly due to co-firing – biomass⁶ is co-fired with coal in the existing coal power stations. This represents cheaper alternative than building new biomass power plants. However, biomass burning in often out-dated power plants is one of the least effective uses of biomass.

In case of the Czech Republic, biomass is the only widely available RES. For the future there are plans for

¹ Szulecki, Kacper, Poland’s renewable energy policy mix: European influence and domestic soap opera, ResearchGate, May 2017, p. 8, Available at: <https://www.researchgate.net/publication/316740570>

² Onshore wind potential accounts to 10.9 GW by 2020 (PWEA) and offshore wind potential accounts for 500 – 1500 MW by 2020 (PWEA, EWEA). We have to take into account that building offshore wind plants costs about twice as much as onshore.

³ REmap renewable energy prospects for Poland, IRENA, October 2015, p. 9, Available at: http://www.irena.org/DocumentDownloads/Publications/IRENA_REmap_Poland_paper_2015_EN.pdf.

⁴ Energy Policies of IEA Countries: Poland 2016 Review, Organisation for Economic Co-operation and Development/International Energy Agency, 2017, p. 97, Available at: <https://www.iea.org/publications/freepublications/publication/energy-policies-of-iea-countries---poland-2016-review---executive-summary---polish.html>.

⁵ Szulecki, Kacper, Poland’s renewable energy policy mix: European influence and domestic soap opera, ResearchGate, May 2017, p. 4, Available at: <https://www.researchgate.net/publication/316740570>.

⁶ Primary solid biofuels.

solar, geothermal energy and also for biomass as a way to make use of the large forests and agricultural waste (the so-called waste biomass). Among others, there is also a potential for biomass from fast-growing crops⁷.

Slovakia has a large share of hydropower in energy mix where it accounts for 17 %.⁸ This great deal of hydropower is used despite relatively few large-scale projects. Apart from hydropower, there is a small contribution of biomass. Until 2011, there was no role of solar energy but since mid-2011 it started to grow significantly. There is also a plan for the development of wind power, even though biomass is still prioritised.

Situation in Hungary indicates very small penetration of RES. In the terms of electricity generation, biomass accounts for 6 % and wind for 3 %.⁹

The Europe 2020 Strategy Targets

The Europe 2020 Strategy emphasizes smart, sustainable and inclusive growth as a way to overcome the structural weaknesses in Europe's economy, improve its competitiveness and productivity and underpin a sustainable social market economy. Its climate and energy targets are for the whole EU to lower greenhouse gas emissions by 20 % compared to 1990 levels, have 20 % of energy coming from RES and increase energy efficiency by 20%, all until 2020. These overall targets are then modified for each country. The Czech Republic and Hungary already

gained their target of share of energy from RES, while Slovakia is very close and Poland has still a long way to go.

Poland's target is to have 15 % share of RES in gross final energy consumption, which is then split into 10 % transport target, 19 % electricity target and 17 % heating and cooling target. Other binding target is to limit greenhouse gas emissions (GHG) in sectors not covered by the EU ETS to 14 % above 2005 levels. The non-binding target for Poland is to reduce its energy consumption by 20 %.¹⁰ Polish share of RES in electricity generation remains 6th lowest among the IEA countries.¹¹

The Czech Republic has to gain 13 % share of energy from RES in gross final energy consumption, while achieving 10.8 % transport target, where it lacks biofuels of the second and third generation.¹² In 2015, RES accounted for 9.4 % of TPES but it is not likely to grow significantly.¹³ This struggle is present also in the other Visegrad countries as they handed over the declaration to the European Commission asking for reconsidering its proposal of phasing-out first generation of biofuels after 2020.

Targets for Slovakia are 14 % of RES in gross final energy consumption. In 2015, RES accounted for 13 % of gross final energy consumption and 22.6 % of the electricity generation in 2014.¹⁴

Hungary's target in RES in gross energy consumption is 13 %. The forecast predicts 14.7 % which still means the

⁷ For example hybrid willow and Japanese poplar.

⁸ Sepova, Veronika, col., Energetický trh 2015: Market Report, Energy Analytics, 2016, p. 36, Available at: http://www.energia.sk/fileadmin/user_upload/EA-ENERGETICKY-TRH-SR-2015.pdf.

⁹ Energy Policies of IEA Countries: Hungary 2017 Review, Organisation for Economic Co-operation and Development/International Energy Agency, 2017, p. 67, Available at: <https://www.iea.org/publications/freepublications/publication/EnergyPoliciesofIEACountriesHungary2017Review.pdf>.

¹⁰ Energy Policies of IEA Countries: Poland 2016 Review, Organisation for Economic Co-operation and Development/International Energy Agency, 2017, p. 95, Available at: <https://www.iea.org/publications/freepublications/publication/energy-policies-of-iaa-countries---poland-2016-review---executive-summary---polish.html>.

¹¹ International Energy Agency member countries are most of the European countries, Turkey, the USA, Canada, Australia, New Zealand and Japan.

¹² First generation lacks attractiveness because it uses food crops. The second generation concentrates on non-food crops, alternatively on inedible parts of the food crops. The third generation uses algae or microbes which live in places unsuitable for growing food crops. Second and third generation are called advanced biofuels.

¹³ Energy Policies of IEA Countries: The Czech Republic 2016 Review, Organisation for Economic Co-operation and Development/International Energy Agency, 2017, p. 63-64, Available at: <https://www.iea.org/publications/freepublications/publication/energy-policies-of-iaa-countries---czech-republic-2016-review.html>.

¹⁴ Assessment of climate change policies in the context of the European Semester, Country Report: Slovakia, Ecologic Institute and eclareon, 2014, Available at: <https://www.ecologic.eu/11022>.

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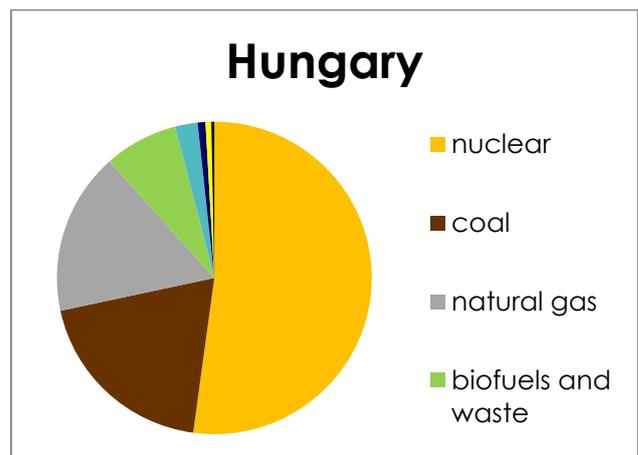
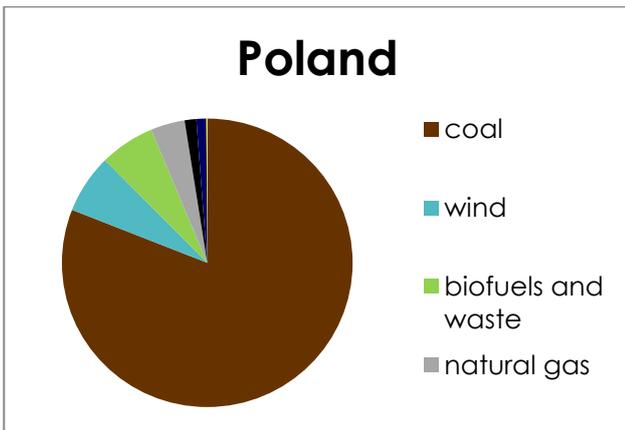
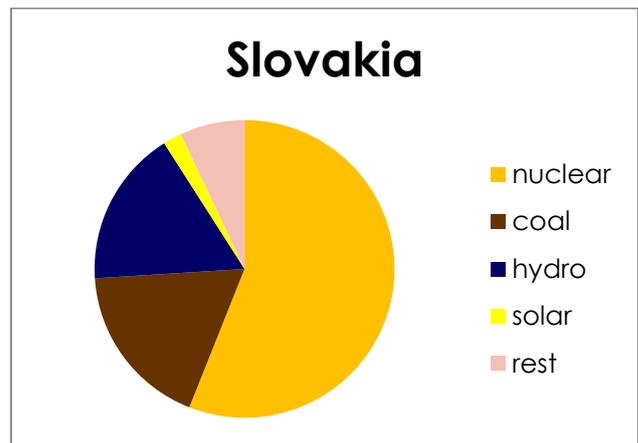
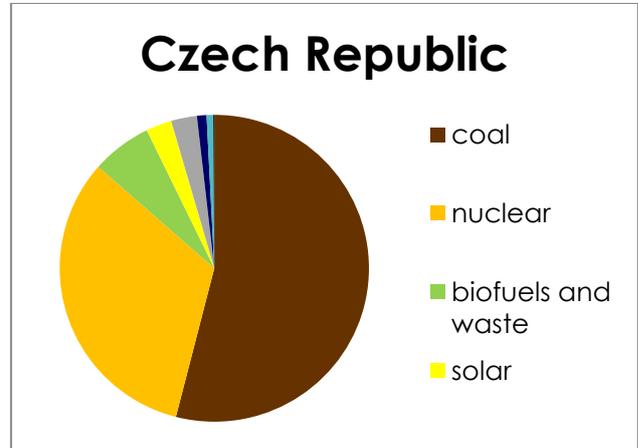
smallest forecasted penetration of RES of the EU's electricity demand.¹⁵

Key data for renewable energy in the V4

Figure 1: Installed capacity (in electricity):

Poland (2015)	37.3 GW
Czech Republic (2014)	22.4 GW
Slovakia (2015)	8.09 GW
Hungary (2015)	8.6 GW

Figure 2: Electricity generation sources by country:



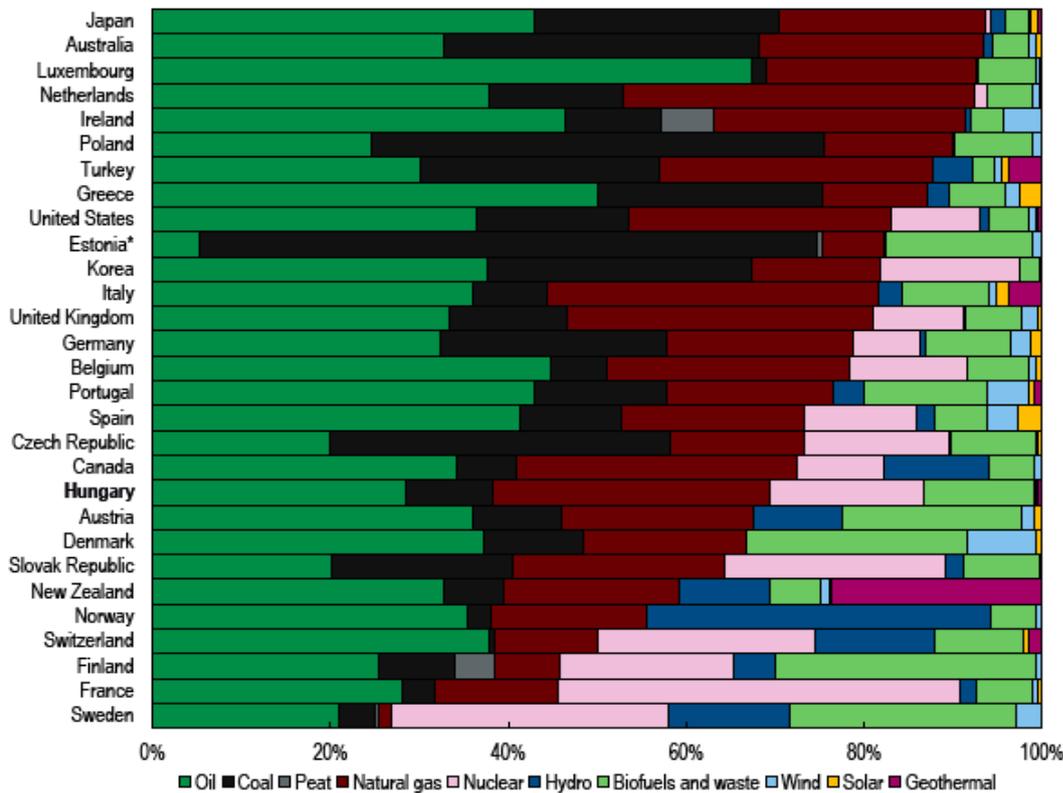
Source: IEA Reports, 2015

¹⁵ Europe 2020 targets: statistics and indicators for Hungary, 2017, Available at: [https://ec.europa.eu/info/strategy/european-](https://ec.europa.eu/info/strategy/european-semester/european-semester-your-country/hungary/europe-2020-targets-statistics-and-indicators-hungary_cs)

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Figure 3: Breakdown of TPES in IEA member countries (2015):

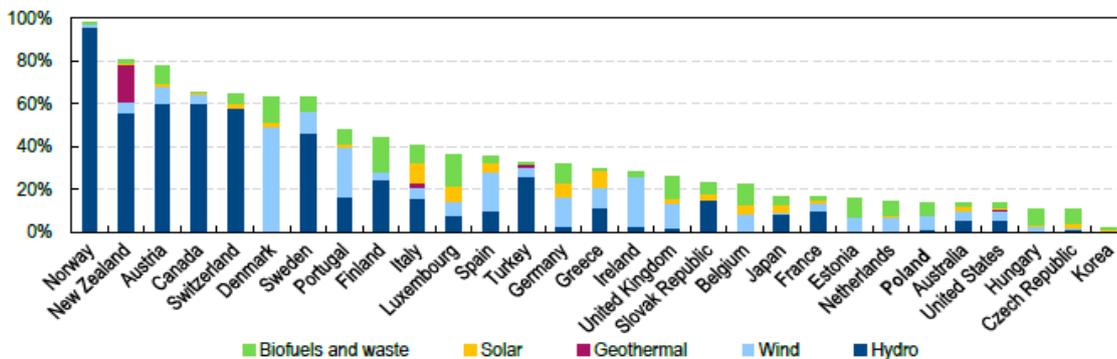


Notes: Data are provisional for 2015. Electricity imports are not included.

* Estonia's coal represents oil shale.

Source: IEA (2017a), *World Energy Balances - 2017 Preliminary edition*, www.iea.org/statistics/.

Figure 4: Electricity generation from renewable sources as a percentage of all generation in Poland and IEA member countries (2015):



Note: Biofuels and waste may include shares of non-renewable waste.

Source: IEA (2018a), *Energy Balances of OECD Countries 2016*, www.iea.org/statistics/.

Based on this data, one question becomes clear: Is the low penetration of RES in the V4 caused by limited natural conditions or is it partly due to the poor systems of support mechanisms?

Main struggles of the Visegrad Group in the energy sector

Poland is struggling with the problem of state-owned energy monopolies which have a strong position and influence the shaping of energy policy, mainly in coal, electricity, gas and oil sector. The biggest challenge remains coal dependency. In 2014, coal accounted for 88 % of energy mix, in 2015 this number decreased to 81 %. Two biggest coal-fired power plants are Bełchatów (lignite) and Kozienice (hard coal) which together account for 28 % of Poland's electricity supply. The problem is that current government led by Prawo i Sprawiedliwość (PiS) sees coal as national treasure allowing for its low import dependency. Poland indeed is one of the least energy dependent EU member states. However, coal causes air pollution and is in contrary to the Europe 2020 Strategy.

Moreover, high costs of domestic coal extraction and decreasing coal prices at the global market make large parts of the Polish coal sector uncompetitive, thus without economic sense. Poland gained the exception contained in the Article 10c of Directive 2003/87/EC as amended by Directive 2009/29/EC, which ensures allocation of free emission allowances to the operators of installations for electricity production.¹⁶ Nevertheless, this provision should run only for transitional period and under certain conditions.¹⁷ Another major challenge is the integration of increasing share of RES into system which is dominated by large coal-powered plants with limited flexibility.¹⁸ Polish Transmission System Operator (TSO) is contracting "must-run" services and arranges bilateral agreements with neighbouring TSOs. Also, while previous mechanism of RES

support (mentioned below) succeeded in developing wind capacity, it did not spur investments in new types of technologies. It was more favourable to use co-firing biomass with coal in existing power plants to comply with the RES obligation than to invest big amounts of money into new technologies. As a consequence, the renewable energy mix is unbalanced.

In the Czech Republic, carbon intensity is also a significant problem which is visible in high emission numbers per capita. Share of coal among electricity generation exceeds 50 % which makes it 4th highest number in the IEA countries, but still behind Poland. Attempts at battling local pollution experienced a setback in October 2015 when the government partially revoked the limits on coal mining from 1991. It is in contrary to the EU's commitment to low-carbon transition but the risk of high levels of unemployment in certain regions is seen as a priority. However, since 2005 energy produced from coal has decreased and the position of coal should be gradually replaced, probably mainly by nuclear energy.¹⁹

Slovakia struggles mainly with its import dependence on primary energy sources which lies at approximately 90 %. It is also the 5th most energy intensive country in the EU. Furthermore, taxes on energy are significantly below the EU average. The introduction of a carbon tax for the non-ETS sectors has been considered but so far no progress has been made. Another problem is that there are, regardless of the efforts of the EU, little efforts at changing the electricity suppliers among the households²⁰. This trend can be seen also among other Visegrad states. Its causes may be found in the increasing share of the regulated part of the electricity price which makes the change of supplier less

¹⁶ Derogations from a transition – Free EU ETS allowances for the electricity sector in Poland, A 2015 ClientEarth Report, p. 6, 20-23 Available at: <https://www.documents.clientearth.org/wp-content/uploads/library/2016-06-13-derogations-from-transformation-ce-en.pdf>.

¹⁷ EU member states can apply for this exception to the EC when they obey following conditions – their GDP per capita was in 2013 under 60 % of the EU average, their energy mix is at least 1/3 dependent on one type of fossil fuel and they have to hand in a plan of investments for the modernization of energy sector.

¹⁸ Energy Policies of IEA Countries: Poland 2016 Review, Organisation for Economic Co-operation and

Development/International Energy Agency, 2017, p. 27, Available at: <https://www.iea.org/publications/freepublications/publication/energy-policies-of-iea-countries---poland-2016-review---executive-summary---polish.html>.

¹⁹ Energy Policies of IEA Countries: The Czech Republic 2016 Review, Organisation for Economic Co-operation and Development/International Energy Agency, 2017, p. 18, Available at: <https://www.iea.org/publications/freepublications/publication/energy-policies-of-iea-countries---czech-republic-2016-review.html>.

²⁰ It is paradoxical because of the dissatisfaction of mainly large industrial customers with the high electricity prices.

attractive, abusive practices of door-to-door sellers causing concerns and mistrust of people and also contracts of several years with existing contractor that don't allow change. This leads to fading of the trade aspect from energy sector and to the question whether regulations are able to replace this.²¹

Hungary, similarly to Slovakia, has the main electricity generation from nuclear energy. Paks power plant has four operating reactors and Paks II is before its construction phase. This means that more than 1/2 of the country's generation depends on the single nuclear power plant. Natural gas is the largest primary energy source, heavily dependent on imports. While domestic production is decreasing, electricity demand remains stable which increases the import dependency. Similarly to Poland, there is a big problem of state-owned energy monopoly. There is an unclear strategy on the future power plants, causing uncertainty for investors. As a result, the growth of RES has levelled in the recent years. Increasing regulatory uncertainty and erosion of profits in the regulated businesses causes exit of foreign-owned companies from the Hungarian energy sector.

Overall in the EU, the rapid developments of RES technologies and their falling costs have pushed down the wholesale prices of electricity, making many conventional sources unprofitable.²² However, RES are not yet able to replace all the conventional sources in the EU, mostly due to their unpredictability.

The RES support schemes and their changes

The evolution of Polish support schemes is a good example of an instable setting. Since 2005,²³ there has been a system of mandatory quotas for utilities that specified the annual quota of RES electricity and a certificate system. It

caused an unbalanced RES mix where it was more favourable to use co-firing biomass than any alternative sources. However, year 2015 was full of changes when the PiS party gained the majority in Sejm and Senate. Among others, at the end of the year the Ministry of Energy was established. PiS does not agree with the EU ETS system and almost halted the transition towards RES.²⁴

The changes started and were driven through amending the Renewable Energy Act (from 2015) in June 2016. The so-called Amending Act introduces a new auctioning system. It introduces "tendering", i.e. selected auctioning, as the main RES support scheme. It divides auctions into groups based on the efficiency of an installation rather than the technology and it divides them also by their capacities. It means that a regulator sets reference prices for different technologies and issues tenders for particular volumes of renewable energy to be produced.

The second important act is the Act on Investments in wind power plants. It determines where new wind farms can be located. It establishes the minimum distance required between a wind farm and residential buildings, forests or national parks in ten times of the height of a wind turbine (ca. 1.5-2 km). Moreover, the new definition of a wind farm leads to an increase in property tax.

Apart from this, there are also subsidies for heating/cooling from RES, biofuels, low interest loans, guaranteed reduced prices for connection to the network etc. The PiS government believes that quota-based system favours onshore wind and has led to the increase in biomass use for co-firing. Moreover, it sees wind and solar as less stable sources. The lack of clarity around the recent legislative changes deters new investments; since 1997, the Energy Law has been novelized 60 times and grew 10-fold in length.²⁵

²¹ "Čo sú najpálčivejšie problémy slovenskej energetiky?", energia.sk, November 2016, Available at: <http://energia.sk/dolezite/elektrina-a-elektromobilita/co-su-najpalcivejsie-problemy-energetiky/21771/>.

²² Mainly photovoltaic installations.

²³ Dominant since 2012.

²⁴ Szulecki, Kacper, Poland's renewable energy policy mix: European influence and domestic soap opera, ResearchGate, May 2017, p. 9, Available at: <https://www.researchgate.net/publication/316740570>.

²⁵ Szulecki, Kacper, Poland's renewable energy policy mix: European influence and domestic soap opera, ResearchGate, May

In the Czech Republic, the legislature changed the opposite way which shows rather difficult predictability of the system modifications. The original system of feed-in tariffs (FIT) and feed-in premiums (FIP) was replaced by the green bonuses system. Green bonuses are anchored in the Law Supporting Electricity Generation from the RES from 2005. Amount of the green bonuses is adjusted yearly for each RES. More changes in 2014 foreshadowed the decline in the new installation of RES. First of all, a multi-annual programme to support biofuels in the transport sector was introduced for 2015-2020. This programme was abandoned already in 2015 with the restriction on the use of 1st generation of biofuels which was agreed by the European Parliament.

The Czech Republic faces a lack of 2nd and 3rd generation biofuels that creates a question how to reach the 10.8 % RES share target in the transport sector. Another change of legislature touched mainly solar but also wind industries. In 2010, a solar tax was introduced because of the so-called solar boom. It imposed the tax of 26 % (resp. 28 % in case of green bonuses) on solar PV installations with the capacity over 30 kWp²⁶ that were commissioned between 2009 and 2010. This amendment was in force from 2011 until 2013 when it was replaced by a new one in 2014 that lowered the tax to 10 % (11 % in case of green bonuses) which applied only on solar plants commissioned in 2010. Before 2014, two thirds of subsidies for the RES were going to the solar plants. However, solar makes only 5 % of the Czech renewable energy.²⁷ In reaction to this and to the rapid decline in photovoltaic system prices, a new bill was introduced in 2013. It meant the end to FITs from the beginning of year 2014 for new capacities of RES except for hydropower. So there are no longer FITs for solar, wind and biomass.²⁸ These changes have had a very negative effect on the confidence in the government, whose unpredictability introduces uncertainty in the market.

Between 2010 and 2012 massive installation of solar panels started in Slovakia which activated the process of implementing regulations. In 2013, a development plan for small scale RES was introduced. It aims at reducing the administrative barriers and at making certain micro-regions more energy independent through diversification. In the same year, the Amendment to the Renewable Energy Act changed the FIT mechanism which since then applies only to the photovoltaic installations on houses with a maximum capacity of 30 kW. All larger installations are no longer covered by the support mechanism. FITs for all technologies were gradually reduced from 2013. In 2014, the New Energy Policy was adopted which counts on building new nuclear reactors (in Mochovce and Jaslovské Bohunice) but also increasing the capacity of Slovak hydro sources. In 2014, there was a major change in the Law Supporting Electricity Generation from the RES (from 2009) which tightened up sanctions for failing the obligations from the electricity producers. The effect of this law was that in 2015, support was denied to over 30 % of electricity producers of RES who have failed legislative and/or administrative obligations.

Carbon tax on the non-ETS sectors is now under consideration but so far without any progress. Nevertheless, with Maroš Šefčovič holding the position of the Vice-President of the European Commission in charge of the Energy Union Slovakia, is trying hard to show its best image.

Hungary's main goal, set in its National Energy Strategy 2030 (from 2012), is to decrease energy dependency. In 2013, the government started mandating end-user prices cuts by 10 % for residential consumers that are benefiting from the universal natural gas, electricity and district heating services. Electricity prices for households are among the lowest in Europe but prices in the industrial sector are far closer to the EU average. As a matter of fact, the state-owned Hungarian Development Bank and state-

2017, p. 4, Available at: <https://www.researchgate.net/publication/316740570>.

²⁶ Kilowatt peak.

²⁷ Energy Policies of IEA Countries: The Czech Republic 2016 Review, Organisation for Economic Co-operation and Development/International Energy Agency, 2017, p.13, Available

at: <https://www.iea.org/publications/freepublications/publication/energy-policies-of-iea-countries---czech-republic-2016-review.html>.

²⁸ There is a certain support for biomass in form of biogas stations – support is set on heat, plus electricity from these stations will newly be sold only at market prices.

owned energy holding company bought privately owned gas retailers (RWE, GDFJ) and other foreign-owned retailers (E.ON, ENI) so that end-users have no other option other than being supplied by the state-owned supplier. In the electricity sector, electricity is supplied at regulated prices by three universal service providers – RWE, E.ON and ENKSZ.²⁹ This creates an unprofitable market segment because the set level fails to recover the full costs.

Year 2016 meant a significant change for the wind farms, comparable to Poland. An Amendment to the Energy Law established a new regulation to limit installations of new wind capacities. It bans building wind farms within a 12 km radius of populated areas. This significantly hinders the penetration of wind energy which will make it more difficult for Hungary to reach its Europe 2020 Strategy Targets.

Conclusion and recommendations

- Frequent changes in RES support schemes caused decreasing trust in governments which is crucial for higher investments and stable business environment that can be attractive also for the foreign investors.
- Adjustments of legislatures of RES are necessary, especially because of very rapid changes in this field (e.g. the fast drop in the prices of photovoltaic installations) but states should always avoid radical changes. They should involve possibility of moderate yearly support prices adjustment directly to the legislature and not to scare investors with often radical ad-hoc amendments.
- The use of RES is a relatively new phenomenon pushed forward by the EU and some international organisations³⁰ and it is natural to experience trials and errors. Nevertheless, states should keep in mind the

urgency of climate change and not take regulations and targets purely as orders from the EU that have to be fulfilled.

- The Visegrad Group foresees the future in a nuclear-coal-green scenario. However, its options in RES are so far limited, therefore it is not likely the V4 would give up on coal without other stable source substituting the volatility of RES. Nuclear energy is thus often mentioned as the possible capacity mechanism.³¹ (An often discussed alternative is energy accumulation. Mostly used is pumped-storage hydroelectricity that represents about 99 % of energy accumulation but it demands often high capital costs and has limited options of suitable locations. The one remaining percent is represented by hydrogen which struggles with low-efficiency, CAES³² that is not in commercialization phase yet and batteries that on today's levels are not able to provide a long-term storage.³³)
- States should gradually cover also non-ETS sectors (buildings, transport, agriculture, and waste) in their regulation schemes. The 2030 Climate and Energy Framework foresees a reduction of emissions from the non-ETS sectors by 30 %.
- Renewable energy policies should focus on various sources and new technologies and thus limit the risk of an unbalanced RES mix.
- Especially for Poland, tax should reinforce the government's subsidy programmes to move towards district heating.
- The Czech Republic should consider auctioning or quota obligations and co-operation mechanisms for the RES support schemes.

²⁹ Energy Policies of IEA Countries: Hungary 2017 Review, Organisation for Economic Co-operation and Development/International Energy Agency, 2017, p. 83, Available at: <https://www.iea.org/publications/freepublications/publication/EnergyPoliciesofIEACountriesHungary2017Review.pdf>.

³⁰ The UN, IEA, World Bank, etc.

³¹ Poland is the only Visegrad state without a nuclear power plant (post-Chernobyl referendum agreed to exit construction of

the nuclear power plant in Żarnowiec), but its plan is to have one in operation between 2021-2022. Poland also participates in the development of the Visaginas Nuclear Power Plant in Lithuania.

³² Compressed air energy storage.

³³ Technology Roadmap – Energy Storage, OECD/IEA, 2014, p. 19, Available at: <https://www.iea.org/publications/freepublications/publication/TechnologyRoadmapEnergyStorage.pdf>.

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- Slovakia should try to increase its diversification of energy sources through higher implementation of RES, especially wind power and biomass.
- Hungary should introduce market-based energy prices by phasing out the access to the universal service. End-user prices need to reflect costs, while burden of high energy prices would be solved through social measures.
- Municipalities should be in position of defining binding regulations on air quality, carbon economy plans, emission mitigation plans and spending on energy efficiency.³⁴ Municipalities have to be more active and effective.

Prague Climate Talks is a new project aimed at establishing a platform for continued high-level discussion on the complex issue of climate change. Throughout a series of debates it will bring together experts and professionals from varying relevant fields as well as members of the general public.

The project is co-organised by **EUROPEUM Institute for European Policy** and **Glopolis** in cooperation with **Heinrich-Böll-Stiftung Prague** and under the auspices of the **UN Information Centre Prague**.

Eliška Trmalová

Studies Master Degree Programme in International Relations and Energy Security at the Masaryk University in Brno and holds a BA in International Area Studies from the Charles University in Prague. She spent two semesters at universities abroad at the University of Regensburg and the Sapienza University of Rome. Her research focuses on renewable energy sources, climate change and on nuclear energy.



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³⁴ Energy Policies of IEA Countries: Poland 2016 Review, Organisation for Economic Co-operation and Development/International Energy Agency, 2017, p. 30, Available

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