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Success and Failure of Renewable Energy Policies in the EU: a Comparative Study of Bulgaria and Poland

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Abstract:

The development of renewable energy sources is central to the goal of gaining independence from conventional fossil fuels and achieving a sustainable energy supply. As these technologies are not yet fully developed and due to multi-dimensional selection environments cannot always compete with conventional energy sources in the market, renewable energy sources initially require temporary protective space. Although some research has identified important factors with regard to the development of renewable technologies, there have not been any clear empirical studies, especially focusing on the new Member States of the European Union. Bulgaria and Poland in particular showed divergent results with regard to the deployment of the renewables. One, Bulgaria, achieved an outstanding increase in the share of energy coming from renewables since its target was set in 2009, while another, Poland, has seen a sluggish result with regard to its policies. The aim of this paper is to identify the factors leading to the successful promotion of renewable energy in the new Member States by using a comparative study of the cases of Bulgaria and Poland. The comparative study is conducted based on the three protective spaces advocated by Smith & Raven (2012). As a result, two main factors can be seen as the determinants of the success of renewable energy policies; "improvement of connection to grid networks in shielding process" and "schemes for a transition from a niche space to a socio-technical regime in an energy industry structure in empowering process." Additionally, the delay of effective renewable energy policy implementation, which in the case of Poland, led to a failure of policy.

Key words: Bulgaria, Empowering, EU, Evolutionary theory, New Member States, Nurturing, Protective space, Poland, Renewable energy policy, Shielding

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1. Introduction

The development of renewables is crucial in the pursuit of an energy supply which is both sustainable and free from the reliance on conventional fossil fuels. However, as renewables are not yet fully developed and cannot always compete with conventional energy sources in the marketplace due to multi-dimensional selection environments, renewables initially require a temporary protective space (Smith & Raven, 2012). Path-breaking technologies, such as renewable energies, need multi-dimensional forms of protection from the rejection in the existing socio-dimensional regime.

Bulgaria and Poland were two of the countries against ambitious renewable energy target setting at the national level in the discussions around the EU 2030 framework in 2014. For 2020 they already have relatively low renewable energy targets in gross final energy consumption compared to the other EU Member States (MS). With regard to the target setting for 2020 in 2009, more than 80% of energy was generated in conventional energy sectors in both countries (Eurostat, 2018a). However, between the two countries, there is a huge gap in the achievement of targets for 2020 as of 2016.

Table 1: Renewable energy share in final energy consumption in 2009, 2016 and achievement rate of targets for 2020 at the EU level, in Bulgaria and Poland (Eurostat, 2018c)

	2009	2016	Target for 2020	Achievement rate
the EU	12.4%	17.0%	20.0%	85.0%
Bulgaria	12.1%	18.8%	16.0%	117.5%
Poland	8.7%	11.3%	15.0%	75.3%

According to Table 1, Bulgaria has a higher renewable energy share than the average at the EU level. Its increase in the share between 2009 and 2016 is the third biggest with 6.7 percentage points in gross final energy consumption, following Denmark and Finland (Eurostat, 2018c). On the other hand, Poland increased 2.6 percentage points over eight years, which is the fourth-worst result among the MS. It is likely to miss the target for 2020 with the achievement of 75.3% as of 2016.

Although the effort of the new MS is crucial to solving issues in the energy strategy, their renewable energy policies have not been researched frequently. Therefore, the aim of this paper is to find out the determinants of success and failure in renewable energy policies in similar energy structures among the new MS by comparing the different outcomes of policies in Bulgaria and Poland between 2009 and 2016, two countries which have very similar attitudes and targets at the starting point. This research chose Smith & Raven (2012) as a theoretical background to find the answer to the question. This theory explains the transition of energy structure through three phases in a protective space from selection environments by adding a third process, “empowerment", to the ordinary protective space in the evolutionary theory. Also, the theory is related to the political aspects of renewable energy sources (RES) promotion. Smith & Raven (2012) mentioned six dimensions of selection environments in socio-technical regimes, to which renewable energy technologies have to be exposed and where their development is hindered. They also suggested three important processes to develop renewable energy technologies in those selection environments which lead to different outcomes of renewable energy policies; naturing, shielding and empowering. This research assesses through this theory, what the determinants of the success of renewable energy policies are in similar energy structures among the new MS. Based on the theory, three main factors are assumed: 1) improvement of connection to grid networks in shielding processes, 2) support schemes for network building and market formation in nurturing processes, and 3) schemes for a transition from a niche space to a socio-technical regime in an energy industry structure in empowering processes.

This research paper consists of seven sections. Section one is the introduction. Section two is the literature review, which explains the role and the need for national energy policies for the development of renewable energies and research regarding the determinants of different outcomes in the renewable energy share. Section three provides a theoretical background, which explains the possible obstacles and the processes for the development of renewable energies by mainly referring to Smith and Raven (2012) and complementing it with other related literature. The fourth and fifth sections show the case studies in two countries, Bulgaria and Poland. They mention the current energy situation and national renewable energy policies between 2009 and 2016. The sixth section analyses what led to the different outcomes of the renewable energy situation in two countries by comparing the national renewable energy policies, selection environments, and three processes of protective space. In the last section, the research question and hypothesis are concluded based on the former sections.

2. Literature review and the role of renewable energy policy

2.1. The need for protection of and policies promoting renewable energy

Greenhouse gas is the largest contributor to global warming, which causes severe climate change all over the world (Loiter & Norberg-Bohm, 1999). It is mainly generated by conventional energy generation, such as the combustion of fossil fuels in electricity generation. Although cost-effective solutions in the conventional energy sector through the improvement of efficiency and demand-side management can be immediate ways to reduce emissions, new generation technologies, which do not emit greenhouse gas, have to be developed as a long-term strategy. However, there is not just one, but many barriers, which hinder the diffusion of renewable energy technologies, such as "economic, institutional, political legislative, social and environmental barriers" (Haas, et al., 2011, p. 2186). Those barriers do not work individually, but interact with each other. Especially, the economic aspect can be the superior barrier and proper financial support schemes are needed to overcome it. The private sector remains uncertain about the market development of new technologies and is unlikely to invest in the emerging competitive energy market (Loiter & Norberg-Bohm, 1999). Therefore, proper support from government is necessary to develop renewable energies. However, insufficient policies and frameworks by government can spur on more uncertainty due to the lack of a clear view for the future to guide technological developers, planners and investors (Kemp et al., 1998).

Kemp, et al. (1998) also suggested some factors to hinder the development of new technologies. Firstly, new technologies do not fit the established system in the industry and society. They need complementary technologies to survive in the existing system, which is not available or too expensive to utilise. They also assumed that new technologies need to be developed further, since they are not often well-developed in terms of user needs and costs due to low scale production in the early phase (Kemp, et al. 1998). A related factor is that consumers have not yet tried the new technologies on a large-scale. Market niches and user demands are not ready to accept new innovations due to their huge difference from existing technologies (Schot & Geels, 2008).

Smith & Raven (2012) advocated the need for a "protective space" as initial protection within selection environments in the incumbent regime, with which new technologies are able to compete with conventional energy successfully. This protective space helps renewable energy generators to develop their technologies until they become broader and more competitive in the market, so that they run the business sustainably without any support.

2.2. Possible determinants of different outcomes of renewable energy policy among EU Member States

Some researchers have already suggested the possible reasons for the differences between countries in terms of energy policies and their outcomes. Reiche & Bechberger (2004) pointed out four possible conditions, which influence the success of the promotion of renewables among the MS. First, each MS has a different definition of RES (Reiche & Bechberger, 2004). They have different stances regarding hydropower and waste incinerators, for which some MS have limitations of generation or they simply do not regard them as RES. Second, geographical conditions and the starting point of energy policies also lead to different outcomes in the promotion of renewable energy (Reiche & Bechberger, 2004). Countries with high shares of renewables benefit from high levels of rainfall, which generates a high amount of hydropower. Also, solar energy is more successful in the southern region than any other area in the EU, since the region has high levels of solar irradiation. Not only renewables, but also the affordability and dependency on conventional energy sources are deeply related to the promotion of RES, which is affected by existing energy policies. Third, each MS has varied targets in the EU directives and international obligations (Reiche & Bechberger, 2004). Especially, some MS economic development leads to increasing electricity demand and giving rise to difficulty in increasing the share of RES or decreasing greenhouse gas emissions. The progress of energy market liberalisation also contributed to the difference, because it attracts new entrants to the energy market, who offer green electricity. The European Commission already required the MS to liberalise their energy markets by 2007 at the latest with the second liberalisation directives in 2003 (European Commission, 2012), but some have not completely liberalised their markets yet. Fourth, each MS has a different planning culture with regard to the installation of renewable energy generators (Reiche & Bechberger, 2004). In some countries, new renewable energy generators have to pass a longer permit procedure than the others due to its different framework, such as the need for environmental permits in advance. Moreover, they experience protests from members of the public during the long permitting procedure, which negatively influences the motivation of new businesses and investors. Fifth, public interests in each Member State are also a condition for the success of renewable energies (Reiche & Bechberger, 2004). Some local residents protest the installation of wind power generation due to the noise, visual intrusion, land devaluation, although they have positive opinions toward RES as far as it is "Not-In-My-Back-Yard" (NIMBY). Also, another point is whether customers accept higher prices for RES. Lastly, the existing grid capacity leads to the different share of renewable energies between the MS, especially in the field of photovoltaic (PV) (Reiche & Bechberger, 2004). The grids are centralised to distribute produced electricity or the grids in the local area do not afford to accept a higher level of electricity in some MS. Therefore, they need a financing scheme to enlarge and reinforce the grids.

The research of Held, et al. (2006) suggested that the effectiveness and the economic efficiency in the policies make a difference to the success of renewable energy policy strategies. As an example, Feed-in Tariff are among the most successful instruments in the promotion of renewables with higher levels of effectiveness than quota obligations in terms of lowering the cost, since the investment is highly secured, and the administrative barriers are low (Held, et al., 2006). But Feed-in Tariffs have also caused different outcomes among the MS. According to Reiche & Bechberger (2004), Germany, Spain and Denmark had very successful stories, while Finland and Greece could not achieve as much progress as expected. In Germany, for example, the Feed-in Tariff system guaranteed not only the purchase of the energy at the preferable price, but also access to the grid for 20 years, which motivated investment in renewable energies. Another reason for the success of the German model is the strong financial support programs for PV. On the other hand, Greece had high administrative hurdles with respect to construction permitting, strong NIMBY effect and limited grid capacity (Reiche & Bechberger, 2004).

Held, et al. (2006) mentioned that the difference comes from a long-term and stable policy environment. Also, the level of financial support should be higher than the average costs. The lower the costs of renewable energies are, "the better the public acceptance and larger the amount of additional renewable energy generation".

In this field of study, each author mentions possible factors determining the success of renewable energy promotion. However, none conducted a comparative study nor a deep policy analysis based on those criteria. Besides, the lack of study on renewable energy policies in the new MS also can be seen. Therefore, this research identifies the determinants of the effectiveness of the policies based on comparative study with analysis of the policies.

3. Theoretical background to the development of renewables

This research chose Smith & Raven (2012) as a theoretical part and other literature to support the theory. Socio-technical regime theory, which they advocated based on evolutionary theory, argues that multiple socio-technical dimensions are mutually interdependent and path-dependent (Smith & Raven, 2012). Path-breaking technologies such as renewable energy technologies have structural disadvantages, since they have to be integrated into existing regimes, which were structured based on the existing technologies. The regimes are resilient (Smith & Stirling, 2010) and elements are connected and aligned to each other (Geels, 2002). In addition, the different selection environments lead to a divergent developing path of RES (Schot & Geels, 2008). This shielding process also influencing the subsequent nurturing process (Smith, et al., 2014).

In order to develop the selection environments, RES need an initial protective space, otherwise they cannot compete with existing technologies. They can develop further and be diffused while they are under protection from mainstream competition, and they replace the conventional technologies in the end (Schot & Geels, 2008). The replacement does not only consist of technology, but also in user practices, regulations, industrial networks (Geels, 2002). The protection from selection environments is categorised by Smith & Raven (2012) into three processes: shielding, nurturing and empowerment.

3.1. Possible selection environments and shielding renewables

Selection environments extend to a wide range of fields, such as markets, users and policies (Geels, 2002). Shielding is the process for renewable energy technologies evolving over time in a protective space which insulates them from the pressure of such a wide range of selection environments not to be eliminated by the existing socio-technical regime (Smith & Raven, 2012). This process provides the space away from the selection environments, where the niche technologies can be nurtured and further developed. Since the election environments are multi-dimensional, the form of shielding is also required to be multi-dimensional. The Shielding process can be distinguished into two spaces; passive shielding which exploits the pre-existing situation, and active shielding which is used by political power (Smith, et al., 2014). Passive protective space is spontaneous and generic usually for initial niches. An example is geographical spaces, such as regions outside the reach of the conventional energy grid, where new energy generators are unlikely to survive due to the high costs or small capacity. As another example, an institutional space is also a passive space, including the investment of general financial support in renewable energy technologies. On the other hand, active spaces are "the result of deliberate and strategic creation by advocates of specific path-breaking innovations" to protect them from selection pressures (Smith & Raven, 2012). In the active spaces, technological policies play an important role which has two types of means. Supply-side means compensate cost gaps between existing and new technologies (e.g. regulations, tariffs, and taxes), while demand-side means changing preferences of players in the market (e.g. quotas, public purchasing). Not only technology policies, but non-policy actors also play a role to intervene in the existing environments in the active shielding, such as the case of private, bottom-up and civil society initiatives.

3.1.1. Established industry structures

Existing industry structures through incumbent network relations, platforms in industries, strong interactions between user and producer and existing capabilities are one of the dimensions of the selection environments which hinder the development of renewable technologies. If the new technologies "do not fit with existing industry structures and decision-making processes that have emerged in co-evolution with the dominant design", they are likely to be rejected in the market (Smith & Raven, 2012).

As an example of a passive shielding from this selective environment, Smith & Raven (2012) advocated the mobilisation of solar PV companies outside the conventional energy regime. Farmers, who utilise conventional energy technologies, are potential initial customers for solar PV companies if they are willing to broaden their sources of income. Another example is renewable energy technologies locating in the "regions outside the current reach of centralised energy grid infrastructures" such as rural areas, islands or developing countries (Smith & Raven, 2012, p. 1027). Then, the high costs are unnecessary to expand the existing centralised infrastructures for renewable energies in order to enter the market. Building incubator units of renewable energies can be an active shielding, since it provides shorter decision-making processes within their mother-firms.

This research picked up this manner of shielding process among six different means to conduct a comparative study. In the incumbent industry structures, new technologies are unlikely to have the access to the grid system and obligatory access to the grid is often applied as an initial protective space as can be seen in the case of Germany in 1990 (Lauber & Jacobsson, 2016).

Thus, “improvement of connection to grid networks” is assumed as one of the factors to differentiate the result of renewable energy policies in Bulgaria and Poland.

3.1.2. Dominant technologies and infrastructure requirements

The second dimension of selection environments is dominant technologies and infrastructure through technical standards and requirements of infrastructure (Smith & Raven, 2012). New technologies are exposed to this environment once they are launched in the market. Since this existing environment was established from the incumbent socio-technical regime, new technologies need different standards and infrastructure, so that they can technically and economically perform effectively.

The shielding from this dimension of selection environments could come in the form of geographical spaces as initial and passive protection (Smith & Raven, 2012). By setting up a business outside the current reach of existing infrastructure, such as rural areas, new comers are able to elude current infrastructure requirements based on the existing technologies. As an example of active protection, new technologies can be temporally exempted from existing technological standards (e.g. power quality standards), so that the technical standards are not able to hinder their diffusion.

3.1.3. Guiding principles and socio-cognitive process in the established knowledge base

Renewable energy technologies are also rejected by the dimension of selection environments of guiding principles and socio-cognitive processes in the existing knowledge base through formal research programs, review procedures, etc. (Smith & Raven, 2012). Because of insufficient resources, they are unlikely to develop new knowledge and R&D. Also, a lack of related journals, conferences and research groups leads to demotivation for academic and private research institutions.

One case of passive protective space for this selection environment is to transfer general innovation support schemes of R&D to renewable energy technologies (Smith & Raven, 2012). Implementing the support schemes of R&D for the development of renewable energy technologies can be an example of active shielding.

3.1.4. Markets and dominant user practices

Existing markets and dominant user practices, such as market institutions, supply and demand, price mechanisms and preferences of users, can reject the development and the entrance of renewable energy technologies into a market (Smith & Raven, 2012). Conventional energies appear to have a lower cost than renewable energies, because the external environmental costs of conventional energies are not visible in the energy price for end-users. In addition, users' behaviouris accustomed to conventional energy sources and adopting new technologies is inconvenient for users. Therefore, renewable technologies are unlikely to compete with conventional energy sources in the marketplace.

Geels (2002) also mentions the need for integration of users to new technologies in their own regime including the process of learning adjustments and domestication. As a passive protective space from this selection environment, new players have to find environmentalists, who have different cultural values and pay high prices for renewable energies or accept low performance at the early stage of development (Smith & Raven, 2012). An active shielding in this case can be the implementation of support programs to lower investments of renewable energy technologies.

3.1.5. Public policies and political power

Public Policies and political power work as a selection environment through dominating regulations, policy networks and relationships within existing industries (Smith & Raven, 2012). Political power tends to maintain the existing state of jobs, tax base and votes. This attitude works as a disadvantage for renewable energy technologies, since they need new policies, regulations, and new political economies in order to develop. Verhees, et al. (2013, p.277) refer to policy as "constituting, supporting and disrupting the other spaces."

The new technologies can use the gaps in existing regulations or adapt themselves to the existing political objections as a passive protective space (Smith & Raven, 2012). Lobbying and white papers for promises and claims about renewable energy technologies in political programs are a possible form of active shielding. Another possibility is to build a network by different agents independent from the incumbent policy-making networks along with the interests of existing technologies (Smith & Stirling, 2010).

3.1.6. Cultural significance attached to a specific regime

The last dimension of selection environments is the cultural significance attached to a specific regime, such as media preferences, symbolic meanings of technologies and cultural value of innovation (Smith & Raven, 2012). This is produced in the interaction between, for instance, users, median and societal groups (Geels, 2002). Since new technologies present new cultural values and lack the existing representations, the existing cultures give them disadvantages in the market.

To protect renewables from this dimension of the selection environment passively, new players can introduce influential values of environmentalists or civil society groups (Smith & Raven, 2012). Media discourses about RES and their high-tech values in society can be an active protective space.

3.2. Nurturing renewables

While they are protected by the shielding process, new technologies obtain competitiveness through the nurturing process, which enhances experimental innovation through the development of the learning process and institutional networks. Under the nurturing process, the protective spaces gradually become less necessary than at the beginning. Smith and Revan (2012) mentioned nurturing as a process that supports the development of renewable energy technologies and the space needed in order to maintain the learning process. This process has two frameworks: “the strategic niche management approach” and “the technological innovation systems approach (TIS)” (Smith and Revan, 2012, p. 1027-1030).

Kemp, et al., (1998, p. 186) defined strategic niche management approach as “the creation, development and controlled phase-out of protected spaces for the development and use of promising technologies by means of experimentation” in order to learn the ideal of the new technology, and to encourage the further development and increasing application of the new technologies. The learning process is the most important aspect of this approach. The main processes here are “assisting learning processes, articulating expectations, and helping networking processes” (Smith & Raven, 2012, p. 1027). Schot & Geels (2008) claimed that this approach contributes to sustainable development, which requires interrelated social and technical change rather than simple radical technological innovation. However, Smith & Raven (2012) pointed out the narrow approach of strategic niche management, because it focuses only on experimental projects so far.

The TIS approach, which Smith & Raven (2012) evaluated more highly than strategic niche management approach, brings knowledge of users and other actors into the development process of technology, generation of interactive learning processes and achieves institutional adaptation (Kemp, et al., 1998). Despite the name of TIS, it does not only apply to the dedication to the technology, but also all factors which can influence the nurturing process for the technology (Bergek, et al., 2008). This process mainly consists of two stages of system evolution. The "formative stage" can be defined as a phase for the formation of rudimentary structure, including entry of firms and organisations and formation of networks. This process is under high uncertainty as regards the development of technologies, markets and applications (Jacobsson & Bergek, 2004). In such a condition, experimentation and variety creation have key roles. The main features in the early process are the start of a process of legitimation, and knowledge development dependent on cooperation between actors through the market formation. The second stage, "growth stage", focuses on "system expansion and large-scale technology diffusion through the formation of bridging markets and subsequently mass markets" (Bergek, et al., 2008, p. 26). This process needs resource mobilisation, broad entrepreneurial experimentation and legitimation, such as research programs, industrial policy, and labour market deployment in energy policy. However, Bergek, et al. (2018) also emphasised that this development pattern does not fit all TISs. The success of TIS is decided by how much political process was involved and the realisation of wider social and economic values of new technology.

As we already mentioned, the TIS approach is evaluated by Smith and Raven (2012) and network building and market formation are fundamental in this process. Therefore, in this nurturing process, this research suggests that "support schemes of network building and market formation" are a factor of the different outcomes in Bulgaria and Poland based on the formative stage in the TIS approach.

3.3. Empowering renewables

After renewable energies become competitive through the nurturing process, a new process, empowering, is needed for further development of new technologies through the transition from a niche space to a part of a social-technical regime in the energy structure, namely, to integrate renewable energy technologies into the energy market. According to Smith & Raven (2012), there are two patterns of empowerment. Fit and conform empowerment allows renewable energy technologies to become more competitive with existing technologies in the incumbent socio-technical regime and in the selection environments. This type of empowering might be conducted by "research and development activities, training for key stakeholders, or shielding policies such as subsidy" (Bush, et al., 2017, p. 138). But there are two challenges to overcome for renewable energy technologies. Firstly, while it makes them more competitive in the existing regime, this type of empowerment process can disempower sustainable values of renewable energy technologies, since they have been exposed to pressure through the narrow economic, technological, organisational criteria during the development of the incumbent regime (Smith & Raven, 2012). Also, Smith & Raven (2012, p. 1030) mentioned that "aggregate rebound effects and economic growth can counteract these relative performance improvements in the long run". Secondly, it is difficult for providers of protective spaces to control performance improvement, since it can remove or reduce the protective spaces (Smith & Raven, 2012). Thus, fit and conform empowerment needs institutional reforms of existing regimes establishing selection environments. Also, political power is another key factor to keep protective space away from sectional interests and to ensure that the protective space effectively supports renewables for sustainable development.

On the other hand, another type of empowering process "stretch and transform" changes existing selection environments, which leads to re-structured or extended regimes driven by new technologies and to the diffusion of new technologies under the new regime (Smith & Raven, 2012). Renewable energies can subsequently develop with sustainability in this type of empowering process, since they can influence the selection environments through the activities, such as "institutional changes, the use of political narratives to advocate for the introduction or reform of regulations or establishing a supportive and long-term policy approach" (Bush, et al., 2017, p. 138). Empowered niches have an influence over the political economy in the institutionalisation of social values through a realistic resolution to the possible issues in a new regime in order to create more sustainable alternatives. Lauber & Jacobsson (2016) give the Feed-in Tariff in Germany as an example of stretch and transform. In this case, the Feed-in Tariff is the outcome of political powers to overcome the existing networks of German utilities and creates a new regime driven by renewable energy technologies. Stretch and transform niches can promote participation in political debate, which leads to control policies, such as environmental regulations and fiscal measures or quotas (Smith & Raven, 2012). However, niche empowerment is sometimes problematic, since the process depends on the power relationship between different actors and the way a politics of the public interest asks new technologies the responsibility.

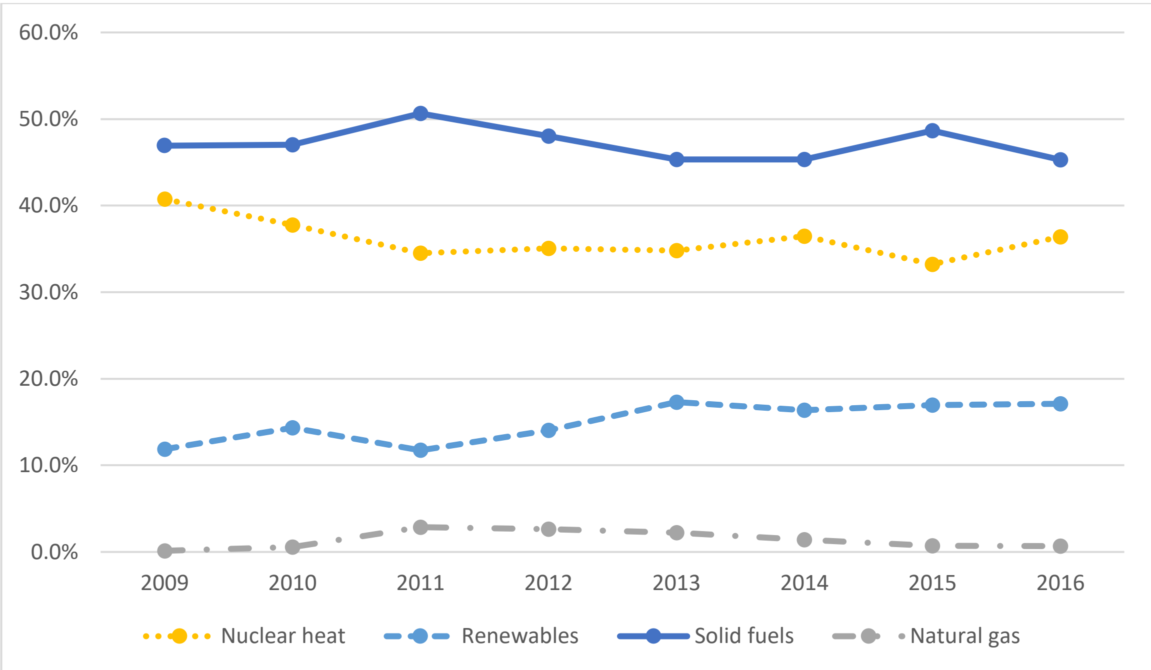
The stretch and transform process is superior to the fit and conform process in terms of the radical change of the regimes. This fact leads to the hypothesis that the effective renewable energy policies include the stretch and transform process, which is namely “schemes for a transition from a niche space to a socio-technical regime in an energy industry structure.”

4. Case of Bulgaria

4.1 Renewable energy share and the state of the energy mix

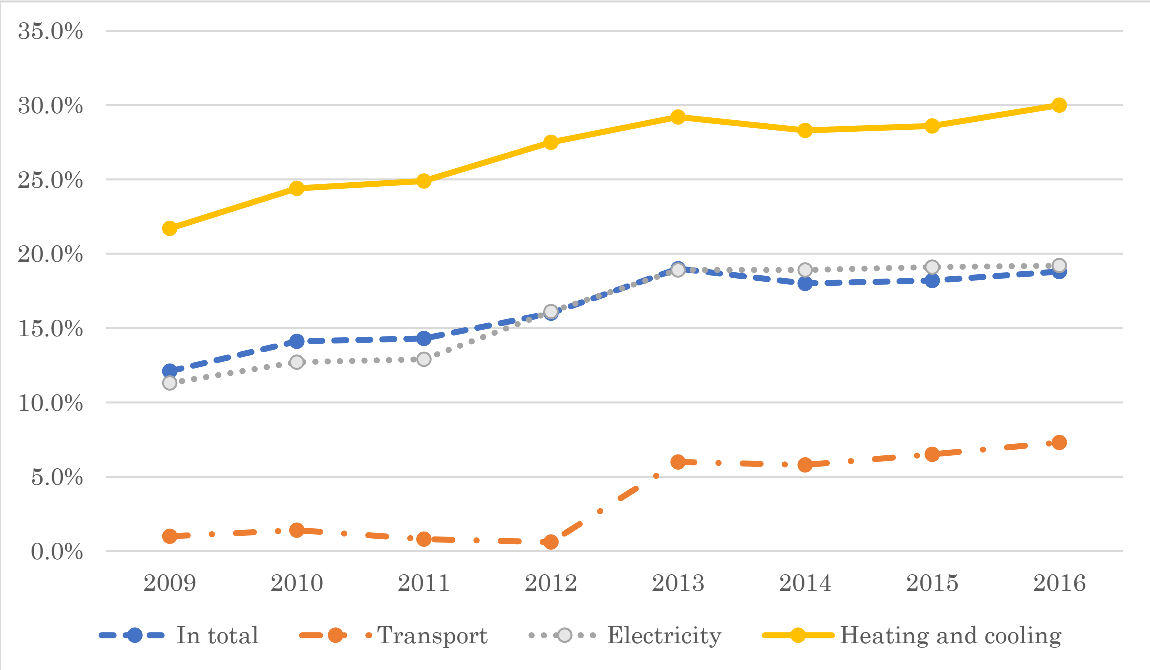
Bulgaria started renewable energy promotion, including the establishment and implementation of the institutional and legal framework, only in 2007, which is far later than the old MS (Ministry of Economy, Energy and Tourism of the Republic of Bulgaria, 2010). But since 2007, Bulgaria experienced the strong development of RES in two periods (2007-2012 and 2012-2016) and increased its share dramatically. In the discussions surrounding the climate & energy package for 2020 in 2009, the EU set the national target of Bulgaria (15.0%), which is one of the lowest additional increases compared to most of the MS (The Republic of Bulgaria, 2011). Accordingly, Bulgaria is expected to reach 23.8% in heat and cooling, 20.6% in electricity and 7.8% in transportation in the scenario of National Renewable Energy Action Plan (Ministry of Economy, Energy and Tourism of the Republic of Bulgaria, 2010).

Figure 1: Primary production of energy by solid fuels, nuclear heat and renewables in Bulgaria between 2009 and 2016 (source: Eurostat, 2018a, author's elaboration)



The energy production in Bulgaria highly depends on conventional sectors, whose resources mainly came from Russia (Georgiev & Aleksandrova, 2007). In 2009, the energy produced in solid fuels, including hard coal, dominated 46.9% in primary energy production, followed by nuclear power (40.7%) (Figure 1). Renewable energies generated only 11.9% in primary production. However, the share of renewables gradually developed over eight years. It increased dramatically between 2011 and 2013 and has remained at more than 15% since 2013. Accordingly, the share of solid fuels and nuclear heat has dropped from 87.6 % to 81.4% in total. Natural gas increased during the time period, but remained below 1%.

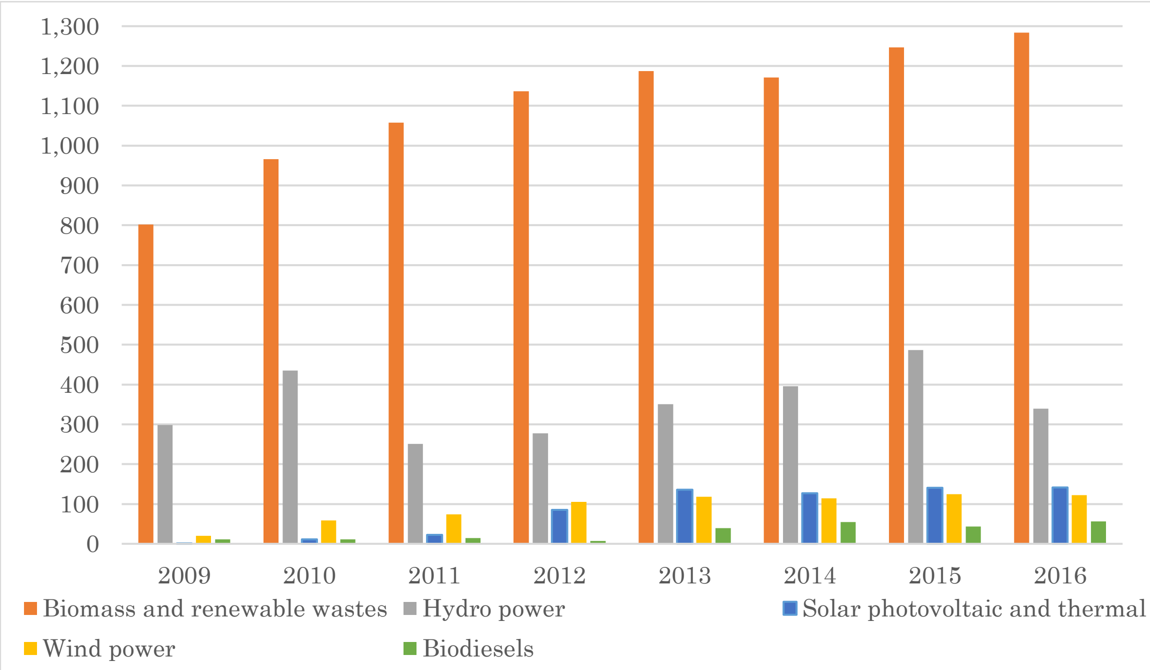
Figure 2: Share of energy from renewable sources in gross final energy consumption by sectors in Bulgaria between 2009 and 2016 (source: Eurostat, 2018b, author's elaboration)



The renewable energy share of final consumption has also increased similarly to the one in the primary production of energy. The share of renewables was only 12.1% at first, led by the high share in heating and cooling (21.7%), middling share in electricity (11.3%) and extremely low share in transport (1.0%) (Figure 2). Bulgaria consumed more than 44.1% of energy in the heating and cooling sector as of 2010, followed by electricity (30.3%) (Ministry of Economy, Energy and Tourism of the Republic of Bulgaria, 2010). With regard to electricity, energy suppliers and consumers were not accustomed to renewable energy technologies and the high prices led to less demand compared to the other MS as of 2010. Also, renewable energy technologies in heating and transport sectors slowly developed due to the insufficient regulatory framework, which undermined the potential of renewables in Bulgaria. The transition renewables in the transport sector was delayed until 2011, since citizens and the transport sector protested the transition from conventional energy generation (Pacesila, 2013).

However, Bulgaria achieved 18.8% renewable energy share in gross final energy consumption in 2016, which overreached the national target for 2020. While the share in final energy consumption and other sectors gradually increased, the share in transport achieved an outstanding result. It increased 5.4 percentage points for one year, between 2012 and 2013, and became 7.3% in 2016. The share reached 19.2% in the heating and cooling sector and 18.8% in electricity.

Figure 3: Supply, transformation and consumption of renewable energies in Bulgaria between 2009 and 2016 (TOE) (Source: Eurostat, 2018d, author's elaboration)



When we look into the energy sources, Biomass and renewable wastes contribute to a large part of renewable energy share, which is mainly used in heating (Ministry of Economy, Energy and Tourism of the Republic of Bulgaria, 2010). It has increased by more than 400 TOE for eight years (Figure 3). Hydropower is the dominant RES in electricity generation. Although hydropower kept second place from 2009 to 2016, the amount of energy generation fluctuated and increased only less than 50 TOE. Solar PV and thermal generated only a few in 2009 but reached 141.6 TOE in 2016, which is the third-largest number among the resources of renewables, following biomass and renewable waste, and hydropower. Wind power and biodiesels also gradually increased to 122.5 and 56.4 TOE.

4.2. National renewable energy policies in Bulgaria between 2009 and 2016

Bulgaria issued National Renewable Energy Action Plan (NREAP) in 2010, aiming to promote the transition towards a low-carbon economy through the usage of RES and modern technology (Ministry of Economy, Energy and Tourism of the Republic of Bulgaria, 2010). This plan took into account the lower level of economic growth in Bulgaria compared to the other MS. Considering the development of the economy, the protection of the environment and human health, this plan is based on an integrated approach, which harmonises development in various fields by reducing the existing gaps between them (European Union, 2010). Bulgaria has focused on small scale hydropower, solar and wind energy due to their most promising technologies in the RES promotion (Norton Rose Fulbright, 2012). Bulgaria has three lines to promote renewables in the NREAP along Directive 2009/28/EC, which are 1) increase of energy consumption from wind, solar and geothermal energy, hydropower and biomass in electricity, 2) increase of energy consumption from solar and geothermal energy and biomass in heating and cooling, 3) increase of energy consumption from biofuels and electricity from renewable resources in transport (Ministry of Economy, Energy and Tourism of the Republic of Bulgaria, 2010). The main tools in the NREAP are regulatory, economic financial and soft measures.

Bulgaria set "Energy Strategy of the Republic of Bulgaria until 2020 for reliable, efficient and cleaner energy" in 2011 in order to achieve the target for 2020 based on the NREAP. This is the basement of the national energy policies in Bulgaria. The five main aims of this strategy are;

1) "to guarantee the security of energy supply"
2) "to attain the targets for renewable energy"
3) "to increase the energy efficiency"
4) "to develop a competitive energy market and policy for the purpose of meeting the energy needs"
5) "to protect the interests of the consumers"

(The Republic of Bulgaria, 2011, p. 4)

The strategy suggested the implementation of seven sections to overcome the existing barriers to promote RES in the section of Policy (The Republic of Bulgaria, 2011). "Regulatory support" includes the flexibility in order to reflect the changes in the market and technological progress through, clear regulations regarding renewable energy generators and network operators. “Trade preferences, tax and post-investment support” is conducted by the creation of clear rules to keep a profit for all renewable energy producers equally and the decrease of the generation cost in the long run. One of the measurements of “Direct financial support” can be the support for individuals in the private sector to construct solar, thermal and geothermal installations for households. “Information and administrative support” will improve the procedures of administration by removing barriers to develop renewable energies, such as “creation of a single coordinating administrative body.” “Enhancement of the local authorities’ role” can be achieved by access of regional authorities, companies and citizens to financing, financial schemes for renewable energy technologies. Last section, “Management of risks related to environmental protection” set up sustainability criteria for biofuels and liquid fuels from biomass production and consumption in accordance with Directive 2009/28/EC.

Bulgaria’s main renewable energy policies as of 2009 were the Energy Act (ZE) and the Renewable and Alternative Energy Sources and Biofuels Act (ZVAEIB) (Ministry of Economy, Energy and Tourism of the Republic of Bulgaria, 2010).

The ZE came into force in 2006, which was mainly amended in 2007 and 2012 (Ministry of Energy of the Republic of Bulgaria, 2018). The main object of this Law is “to create a legal framework for energy activities”, “to encourage combined heat and power generation” “and to ensure more conditions for energy production from renewable energy sources” (Georgiev & Aleksandrova, 2007, p. 31). One of the measurements in the ZE is the support for the construction of a new grid related to the connection of renewable energies, which was implemented since 2011 (Ministry of Economy, Energy and Tourism of the Republic of Bulgaria, 2010). The new transmission and distribution network companies in the area, which have a high potential for the development of renewable energies, are likely to be given the status as national infrastructure facilities. Since grid companies with the status obtain property rights or permission to build facilities for renewable energy generation in advance under the Spatial Planning Act (ZUT), this measurement can accelerate the investment process and reduce investment costs, which lead to attracting more investors on grid networks for renewable energies.

The ZVAEIB laid down the general principals of renewable energy policies in Bulgaria and “regulates the public relations pertaining to the promotion of the production and consumption” of energy from renewable energy resources based on Directive 2001/77/EC and 2003/30/EC (Ministry of Economy, Energy and Tourism of the Republic of Bulgaria, 2010, p. 12).

Specifically, this Act supported renewable energy generators through incentives and obligations in terms of prices, mandatory purchase of renewable energies and long-term agreements, such as:

1) priority access of renewable energy generators to the transmission and distribution network;

2) mandatory purchase of renewable energy, except the large scale of hydropower plants over 10 MV;

3) preferential purchase prices for renewable energy, except the large scale of hydropower plants over 10MV;

4) transmission and distribution networks businesses have to invest in network development for renewable energy

(Ministry of Economy, Energy and Tourism of the Republic of Bulgaria, 2010, P12).

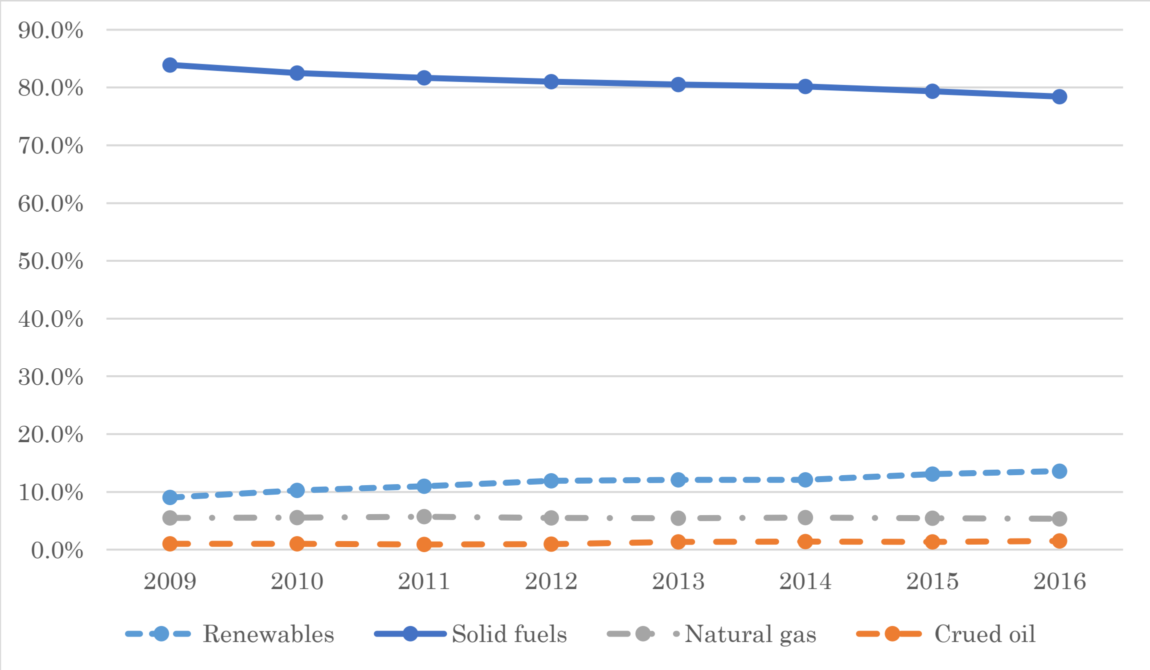
The incentive mechanisms promoted investment in renewable energies and the establishment of a favorable business environment, where businesses are more eager to construct renewable energy plants. Priority access to the grid obliged the grid operator close to the renewable energy generators to guarantee priority with regard to connection, if they comply with the requirements in the connection agreement (Ignaciuk, 2019). In the case they did not prioritise the renewable energy generators, the grid operator had to pay the penalty. Another measurement, Feed-in Tariff in ZVAEIB under the State Energy and Water Regulatory Commission (SEWRC), especially contributed to the increase of RES from 2007. Feed-in Tariff obliged the public provider to purchase electricity generated from RES at preferential prices, which also affected electricity prices on end consumers (International Energy Agency, 2018). Feed-in Tariff rates were updated by the end of March every year by SEWRC. This law applied for PV, wind, biomass, bioenergy, geothermal and hydropower. It especially led to the increase of wind energy projects and solar PV firms, while it offered limited support for biomass projects due to the already existing high potential in Bulgaria (Winkel, et al., 2011). The duration of the agreements was 12 years for all RES upon introduction of the Feed-in Tariff was introduced, but it was extended to 25 years for geothermal and solar energy, and to 15 years for other RES in the amendment in 2008 (Ministry of Economy, Energy and Tourism of the Republic of Bulgaria, 2010). The price for purchase of renewable energy are decided based on the Ordinance on regulation of electricity prices, which amounts to 80% "of the average selling price of the Public Supplier or Public Retailers in the previous calendar year plus a surcharge determined by the SEWRC" (Ministry of Economy, Energy and Tourism of the Republic of Bulgaria, 2010, p. 13). The Feed-in Tariff contributed to the increase of the renewable energy share of electricity production, but the Feed-in Tariff was decreased dramatically in 2012 and was amended in 2015 limiting it to only a few projects (Kotseva-Tikova, 2016). After the amendment, only a small capacity of solar energy and indirect use of biomass were eligible to apply for Feed-in Tariff (Naydenova, 2017b).

5. Case of Poland

5.1. Renewable energy share and the situation of the energy mix

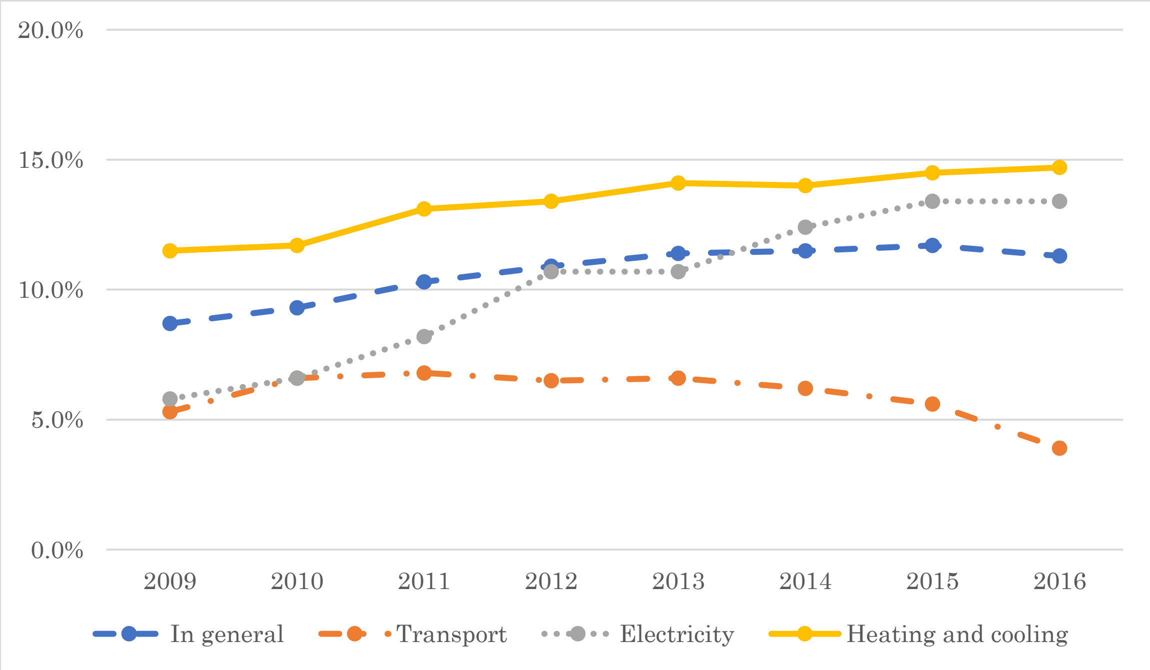
Poland adopted its first national legal regulation of renewable energies in 1999, “The regulation of the Minister of Economy of 2 February 1999 on the obligation to purchase electricity and heat from unconventional sources and scope of this obligation” (Ministry of Economy of Poland, 2010, p. 10). Since then, Poland has encouraged the development of RES, but the result of the promotion has not been successful so far. Although Poland has been influenced byEU policy since prior to joining the EU in 2014, the influence over Polish renewable energy policy has been decreasing (Szulecki & Ancygier, 2015). Poland indeed is regarded as a major veto player with regard to EU energy and climate policy. Poland vetoed the reform of the Emission Trading System (ETS) and the suggested EU’s 2050 Low Carbon Roadmap in 2012. This is not only because Poland is dependent on the coal industry, but also the government tries to protect its interests (Szulecki, 2017), since state-owned energy companies play a large role and are influential on the national energy policy. European Commission set the renewable energy share target for 2020 in Poland (15%), which is split between the target for electricity (17%), heat and cooling (17%) and transport (10%) by the Polish government (International Energy Agency, 2017b).

Figure 4: Primary production of energy by solid fuels, crude oil, Natural gas and renewables in Poland between 2009 and 2016 (source: Eurostat, 2018a, author's elaboration)



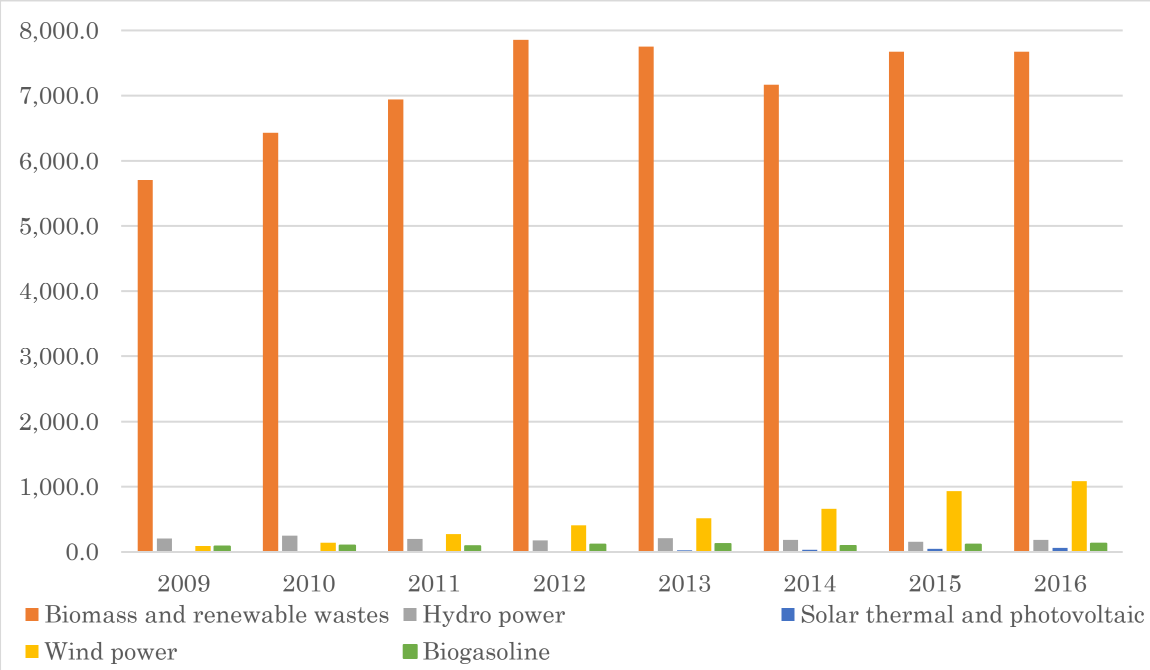
The energy structure in Poland has been highly dominated by the solid fuels industry, namely the coal industry. As of 2009, 83.9% of energy was generated by solid fuels, while renewable energies had only 9.0%, crude oil had 5.5% and natural gas had 1.0% of share in primary energy production (Figure 4). Although Poland gradually decreased the energy generation in the coal industry for eight years, it ended up with 78% of the share. The share of renewables increased 4.6 percentage points, but it is difficult to say the result is successful compared to the other MS. The share of crude oil and natural gas only slightly changed.

Figure 5: Share of energy from renewable sources in gross final energy consumption by sectors in Poland between 2009 and 2016 (source: Eurostat, 2018b, author's elaboration)



The renewable share in Poland is likely to miss the targets for 2020. It gradually increased from 2009 to 2015 and reached a peak in 2015 with 11.7%, but dropped to 11.3% in 2016, which is even lower than the share in 2013 (Figure 5). Thus, Poland is 3.7 percentage points behind the target for 2020. Poland has a relatively successful story in the electricity, heating and cooling sector, though. The share in electricity increased 9.9 percentage points and the share in the heating and cooling sector also increased 4.2 percentage points. On the other hand, the transport sector was unable to increase its share. Poland aimed at 8.45% of biofuels in transports by 2016, 10% by 2020 through the implementation of a long-term program (Enerdata, 2013). Although it reached 6.8% in 2011, the share dropped 2.7 percentage points for three years after 2013, which also affected the law renewable energy share in total.

Figure 6: Supply, transformation and consumption of renewable energies in Poland between 2009 and 2016 (TOE) (Source: Eurostat, 2018d, author's elaboration)



Poland has slowly increased its share of renewables as above, but more than 55% of renewables are generated from biomass co-firing and 14% from the large scale of hydropower (Szulecki, 2017). Among all RES, biomass and renewable wastes generated more than 85 % of renewable energy in primary production for eight years (Figure 6). Their amount of generation has fluctuated but increased 1923.2 TOE. The second position as of 2016 was wind power with an increase of 989.8 TOE. Hydropower, biogasoline and solar thermal and PV followed wind power but they show a small increase for eight years.

5.2. National renewable energy policies in Poland between 2009 and 2016

As Paska & Surma (2014, p. 293) pointed out, the lack of long experience to promote renewable energies, such as "long experience in renewables utilisation", "low stability and unpredictable political framework" and "long-term vision for the energy sector", has negatively affected the development of RES in Poland. Even after the issue of Directive 2009/28/EC, Poland did not make progress concerning its renewable energy policies. The government avoided the change of the existing system and just weaken the EU directives by the implementation at the national level (Szulecki, 2017). Finally, Polish National Renewable Energy Action Plan (NREAP) was adopted in 2010, a half year after the deadline, in order to follow the EU Directive. The main tools of the implementation of the NREAP are support schemes, financial and non-financial incentives for green energy generators (International Energy Agency, 2013), but Poland aimed at increasing the share of RES only with the improvement of existing legislation rather than with new measurements (Ministry of Economy of Poland, 2010). Poland mentioned policies and measures for wind energy development, biomass co-firing and small scale of a hydropower plant in the NREAP (Szulecki, 2017), but did not present large scale hydropower, geothermal and PV generation due to legal constraints in Poland and current cost of technologies (Paska & Surma, 2014).

In the Polish NREAP, the core of the support scheme for renewable energies is "Energy Policy of Poland until 2030", which was adopted in 2009. The framework of this policy mentioned six main directions of the polish energy strategy as below:

1) Energy efficiency improvement;
2) Enhancement of security of fuel and energy supplies;
3) Diversification of the electricity generation structure by the introduction of nuclear energy;
4) Development of the use of renewable energy sources, such as biofuels;
5) Development of competitive fuel and energy markets;
6) Mitigation of environmental impact of the power industry

(Ministry of Economy of Poland, 2009, P4).

In this policy, Poland defined the development of RES as a tool to increase the diversity of energy mix and to gain independence from imported energy sources by means of the energy generation based on locally available raw materials (Ministry of Economy of Poland, 2009). This policy sets clear targets of renewable energies in order to achieve the four directions. 1) "Increasing the use of renewable energy sources in the final energy use to at least 15% in 2020 and further increase in the following years", 2) "Increasing the share of biofuels in the market of transport fuels to 10% by 2020, and increasing the use of second-generation biofuels", 3) "Protecting forests against overexploitation in order to obtain biomass, and balanced use of agricultural areas for production of renewable energy sources" "so as not to allow competition between renewable energy," 4) "Using the existing weirs owned by the State Treasury for power generation", 5) "Increasing the diversification of supply sources and the creation of optimal conditions for distributed power generation based on locally available resources" (Ministry of Economy of Poland, 2009, p. 18). This Policy mentioned some measurements for specific RES along with the targets, such as the creation of good conditions for investors on building off-shore wind farms. In order to pursue these support schemes, Poland especially put forward biomass, wind, and hydropower due to the energy prices and status of state aid at that time (Paska & Surma, 2014).

Another pillar of renewable energy policies is the Energy Law Act which was first adopted in 1997, then amended in 2005, 2007, 2010, 2013, 2014, 2015 and 2016 (International Energy Agency, 2017a). As of 2009, there were two main obligations in this policy to support the use of RES, namely "a system of certificates of origin" and "suppliers of last resort" (Ministry of Economy of Poland, 2009, p. 18). The amendment in 2005 introduced a quota obligation for utilities and a certificate system, which is called certificates of origin for renewables or "green certificates" (International Energy Agency, 2017a). Green certificates oblige generators and suppliers and specified end-users, who sell electricity to end-users, to reach a specific quota of electricity from renewable energies annually (International Energy Agency, 2017b). One MWh of generated electricity is counted as one green certificate (Ignaciuk, 2018). They have to submit the certificates of origin from RES for cancellation to the government or have to pay a fee as a substitution (Paska & Surma, 2014). If they cannot reach the target, they have to pay a penalty. This system applied to wind, solar geothermal, biogas, the small scale of hydropower and an amendment to the Energy Act in 2010 introduced certificates for biogas as well (International Energy Agency, 2017b). Until 2012, the quota level of renewable shares was 10.4%, but it became 12% for 2013 and increased one percentage point annually until 2020 by the amendment of the system in 2013 (International Energy Agency, 2015). It could support reaching the national goal of electricity generated from RES and to stimulate demand for green certificates and electricity generation from RES. This obligation was replaced by an auction system. The government set the preferable price, based on which tenders for specific volumes of renewable energy are organised (Szulecki, 2017). An auction system was expected to be a more balanced and comprehensive approach without distorting the market, since the quota-based system worked better only with onshore wind and biomass use for co-firing (International Energy Agency, 2017b). The second obligation, "suppliers of last resort", which is mentioned as a negative feed-in premium, was also introduced in the amendment in 2005 (International Energy Agency, 2017a). Given last resort suppliers, local electricity transmission and distribution companies, have to purchase renewable energy at the average price, which is calculated by the Energy Regulatory Authority (URE) based on the price in the energy market from the previous year (Paska & Surma, 2014).

In accordance with the amendment of the Energy Law Act in 2016, Renewable Energy Sources Act came into force in 2016 after a long debate (Norton Rose Fulbright, 2015). The former legislation did not have any time limitation for the green certificates and suppliers of last resort, which means the installation could keep receiving the certificate and the benefit of obligatory purchase as long as it was operated. The new legislation, however, set a time restriction to 15 years from the date, on which the installation starts feeding to the grid (Norton Rose Fulbright, 2015). Also, this new legislation and "suppliers of last resort" replaced the green certificate system with an auction system for new projects while they remain only for the existing projects. Green certificates system no longer applies to the new projects starting from the beginning of 2016. Instead, the auction system with the cap was introduced to the renewable energy support scheme. The auction system divided RES into five baskets and allow the winners in the auction to sell renewable energy at a guaranteed price (pay-as-bid) for 15 years (Ignaciuk, 2019b). Along with the auction system, the new projects can be eligible for Feed-in Tariff or Feed-in Premium through an auction mechanism, depending on their size (Norton Rose Fulbright, 2015). An installation with lower than 500 kW installed capacity is eligible for Feed-in Tariff, which obliges the purchase of the electricity produced by biogas and hydropower at 90% of the reference price (Cichocki, et al. 2018). Larger plants, which have an installation with 500 kW or more to lower than 1 MW installed capacity, are eligible for Feed-in Premium, which allows renewable energy generators to get the compensation of the electricity actually delivered to the grid 1) at 90% of the reference price or 2) at market value of the same electricity depending on the ability to pay of a state-controlled company. The local obliged suppliers have to buy the generated electricity at the price offered in the auction if the renewable energy generator is successful in the auction. The new auction system does not apply to co-firing biomass and a large scale of hydropower installation (over 5MW). Small capacity installations (up to 3kW and between 3kW and 10 kW) could benefit from guaranteed tariffs depending on the type and scale of installation before, but this system was replaced by in-kind payment system in the amendment in 2016, in which small generators can get 0.35-0.7 kWh back if they send 1 kWh to the grid (Szulecki, 2017). Also, the new Act obliged distributors and transmitters to prioritise renewable energy generators to connect to the grid if the technical and economic conditions for connection are satisfied (Paska & Surma, 2014). Under this obligation, small capacity renewable energy generators (up to 5MW) pay only 50% of the actual connection costs and micro capacity generators (up to 50 kW) can connect to the grid for free (Ignaciuk, 2019a).

6. Assessment

6.1. Comparison of the state of the energy industry in Bulgaria and Poland

The energy industry structures in Bulgaria and Poland were quite similar at the beginning of the time frame between 2009 and 2016. Both countries were highly dependent on conventional sectors and had a low renewable energy share as of 2009 due to the delay in introduction of binding legislation. While solid fuels in Poland had more than an 83.9% share of primary energy production, solid fuels in Bulgaria generated 46.9% of energy, but nuclear heat also occupied more than 40% (Eurostat, 2018a). This led to a low share of renewable energy in primary energy production in Bulgaria (11.9%) and Poland (9.0%) as of 2009. Considering the energy and financial situation, the EU set similar renewable energy share targets for 2020 for the two countries; 16% for Bulgaria and 15% for Poland in gross final energy consumption. The high dependencies on conventional energy sectors in both countries have not dramatically changed for eight years and the sectors still accounted for around 80% of primary energy generation in 2016, but the gap in primary energy production between Bulgaria and Poland has gradually appeared. Bulgaria considerably increased its share of renewables between 2011 and 2013, although it stagnated after the period. The share reached 17.1% in 2016, which is 5.2 percentage points more than the share in 2009. On the other hand, the increase in the renewable energy share in Poland is moderate. Poland gradually raised the renewable energy share except for a period of stagnation between 2012 and 2014, but the share in 2016 increased 4.6 percentage points compared with the share in 2009 and ended up at 13.6%.

When it comes to gross final energy consumption, the gap seems bigger than the data in primary energy production. Comparing renewable energy share, Bulgaria had 3.4 percentage points higher share in total than Poland in 2009 (Eurostat, 2018b). Especially in the heating and cooling sector, the renewable energy share accounted for 21.7% in Bulgaria, while Poland had only 11.5%. But in some areas, Poland was more successful than Bulgaria as of 2009 such as in the transport sector, where the share in Poland was 4.3 percentage points higher than in Bulgaria. However, the situation changed after eight years. Bulgaria increased the share of renewables dramatically and achieved the highest share in all sectors in 2016; 30.0 % in heating and cooling, 19.2% in electricity, 7.3% in transport and 18.8% in total. Bulgaria is the third country that reached the target for 2020 in 2012, following Sweden and Estonia (Kotseva-

Tikova, 2016). Poland also increased the share in electricity and heating and cooling and total, but the one in the transport sector dropped 1.4 percentage points (Eurostat, 2018b). Poland had only 11.3% of the renewable share and was defeated by Bulgaria in all sectors in 2016. Thus, while Bulgaria already surpassed its target for 2020, Poland is still 3.4% below the target as of 2016.

As regards RES, both countries have almost the same renewable energy generation structure with the high occupation by biomass and renewable wastes. In Bulgaria, more than 60% of renewable energy in 2018 is generated from biomass and renewable wastes and more than 85% in Poland (Eurostat, 2018d). The most increased generation among renewable resources is also biomass and renewable wastes in both countries. The support for hydropower was not significant in both countries. Bulgaria had higher energy generation from hydropower constantly compared to other RES, but increased only 13% of the amount of energy supply from 2009 to 2016. Poland also had relatively higher energy generation from hydropower in 2009, which decreased 10% for eight years. On the other hand, wind power and solar dramatically increased in both countries compared to the starting points.

Thus, the energy industry structures in Bulgaria and Poland were similar in terms of high levels of dependency on conventional energy sectors and had almost the same and robust regime with high selection environments. Also, both countries exhibited similar tendencies to increase RES and have similar potential for renewable energy. However, Bulgaria was more successful than Poland in the promotion of renewable energy over a period of eight years.

6.2. Protective Space for renewable energies

6.2.1. Grid connection of renewable energies

As mentioned in the theoretical part of this paper, renewable energy technologies are unlikely to fit the existing industrial structure in terms of the grid networks in the industry. One of the main problems for renewable energies in the market is the existing rules in the industry, but Bulgaria has set effective policies to protect RES from the selection environment created by the existing regime. The main incentives and obligations were priority access for renewable energy generators to the transmission and distribution network as per the amendment of the Renewable and Alternative Energy Sources and Biofuels Act (ZVAEIB) in 2011 (Ignaciuk, 2019). Through this policy, renewable energy can be protected from the selection environment of low capacities of grid networks or low grid connection possibilities. The renewable energy share increased by 5.9 percentage points in total since 2011. Therefore, it can be assumed that the grid connection priority for renewables contributed to the increase in the share of renewables.

One of the reasons for the failure in Poland is due to the undeveloped grid connection. The capacity of the electric power grid was limited, and new generation companies had difficulties to get access to the grid (Paska & Surma, 2014). Also, connection capacity was blocked due to a large number of applications. Although Poland promoted wind power as a high potential RES, new generators from wind energy were unlikely to connect to the grid. Poland did not have the policy of priority access to the grid for renewable energies for a long time and the lack of effective policy undermined the development of them due to the pressure of existing regimes. It firstly adopted it in 2016 through a new Act on Renewable Energy Sources (Paska & Surma, 2014). The law obliges distribution and transmission companies to connect RES to the grid networks with priority, whenever the generators meet technical and economic conditions, and small and micro capacity renewable energy installations can connect to the grid at half of the actual connection costs or for free. However, the change was conducted seven years after the Directive 2009/28/EC was issued, which means there were only four years left during which the new policy was implemented.

6.2.2. Investment in networks and market formation of renewable energies

As the second process of a protective space, renewable energies should be nurtured through the development of industrial networks and market formation. Bulgaria invested in the grid network, which contributed to the network building of renewable energies through the legislation of the Energy Act in 2006. It required the owner of transmission and distribution networks to invest in network development relating to renewable energy support. Bulgaria also had a supportive measurement in the Energy Act (ZE), which promotes the construction of new grid networks areas of greater potential for renewable energy development by giving status as national infrastructure facilities and ensuring the fast investment process and cost reduction (Ministry of Economy, Energy and Tourism of the Republic of Bulgaria, 2010). The Feed-in Tariff also supported the entry of new RES generators, although its main aim was to integrate renewables into the energy market via the empowering process as Smith & Raven (2012) mentioned. The obligation to purchase and accept transmission of renewable energies at a guaranteed price by the grid operator could attract new business to the renewable energy generation. However, Bulgaria did not have specific policies aimed at market formation of

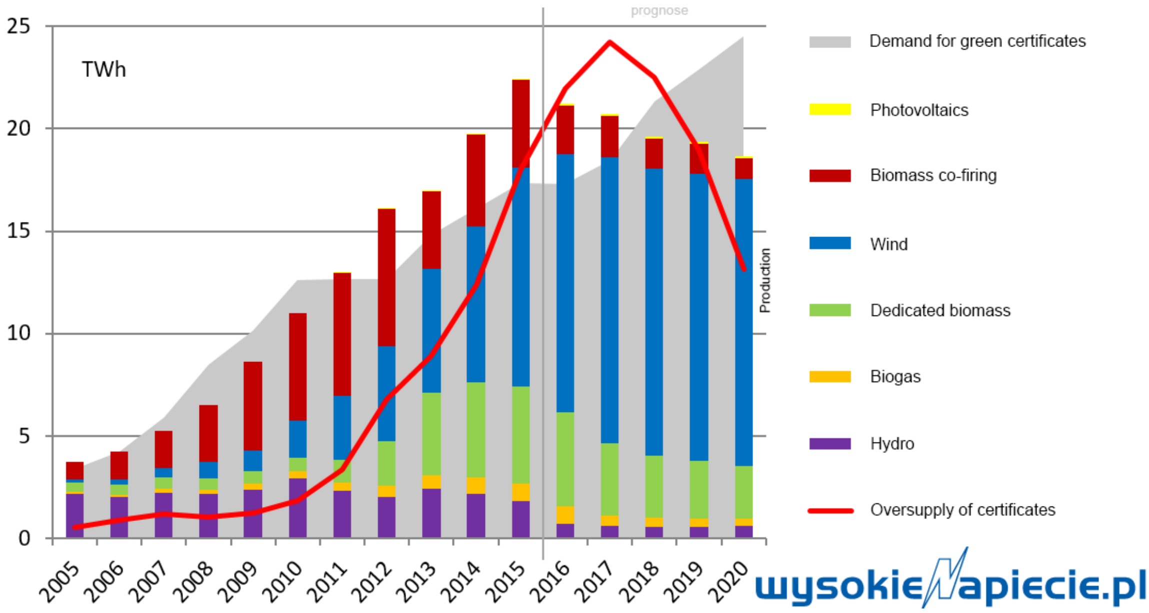
renewable energies representing the growth stage in the nurturing process.
Poland did not have any specific support for networks and market creation of renewable energies as well. The two main obligations in the Energy Law Act, “green certificates system” and “suppliers of last resort”, could also work as incentives for businesses to enter the renewable energy market (Ministry of Economy of Poland, 2009). Green certificates could be traded and benefit the renewable energy generators and suppliers of last resort could ensure the obligatory purchase of renewable energy from the distribution and transmission companies. Also, the new legislation in 2016 creating a Feed-in Tariff for renewable energies, attracted new entrants as same as in Bulgaria. But Poland did not legislate any specific policies for networks market formation of renewable energies.

6.2.3. The transition of renewable energies from a niche space to a long term regime in the energy market

At the end of a protective space, renewable energies should transition from a niche space to a permanent regime in energy structure in the empowering process. Bulgaria adopted Feed-in Tariff for renewable energies in 2006 (Ministry of Economy, Energy and Tourism of the Republic of Bulgaria, 2010), which is identified as a representative scheme of stretch and transform by Smith & Raven (2012). Renewable energies were integrated into the energy market through the obligatory purchase at a preferred price by the public provider under this policy, which works as “the first sign of a breach into an old structure” (Jacobsson & Lauber, 2006, p. 272). Between 2009 and 2013, when the Feed-in Tariff was a strong incentive to invest in renewable energies, Bulgaria increased 7.6 percentage points of renewable energy share in electricity. The most installed RES electricity was PV, followed by wind power and hydropower (Kotseva-Tikova, 2016). The Feed-in Tariff in Bulgaria successfully structured a new regime for renewable energy technologies, judging from the role of empowering process. On the other hand, Poland implemented a green certificate system instead of the Teed-in Tariff. This mechanism promoted wind power and biomass but did not contribute to the investment in other technologies. This mechanism is more favourable for co-firing biomass with coal since generators could keep using existing power plants and do not have to invest so much money on new technologies in order to oblige the system (International Energy Agency, 2017b). The unbalances of the energy mix led to the short-lived increase of renewable energy share, since the old coal plants, which generated the energy from co-firing biomass, will retire in 2020 along with the EU regulations. Moreover, the oversupply of the certificates has increased between

2009 and 2016 (Figure 7).

Figure 7: Demand, production and oversupply of green certificates in Poland between 2005 and 2020 (Palusiński, 2017)



The number of green certificates in the market started increasing in 2009 and reached 24 TWh in 2017 due to the investment in co-firing biomass mainly, although the demand was 17 TWh (Palusiński, 2017). Accordingly, the price of green certificates remained relatively low and new technologies were unattractive for investors (International Energy Agency, 2017b), since the green certificates were traded at the low price and were unlikely to bring benefits to renewable energy generators. Poland introduced a Feed-in Tariff based on the tender system in 2016 and predicted the increase of renewable energy share, but Poland had only four years to achieve the target for 2020 at that time.

7. Conclusion

This paper researched the difference in renewable energy policy between Bulgaria and Poland across three aspects, connection to grid networks, support schemes for network building and market formation, and schemes for a transition to an energy industry structure, in order to find the determinants of success of the policies among the new MS.
The first main factor in the hypothesis, "improvement of connection to grid networks in the shielding process", contributed to the difference of share of renewable energy in two countries based on the assessment of grid connection situations. Bulgaria provided priority access to grid networks from 2011, which was a key factor in increasing the renewable energy share (Ministry of Economy, Energy and Tourism of the Republic of Bulgaria, 2010). On the other hand, Poland had a problem with a grid connection for a while due to the limited capacity of the electric power grid and the volume of applicants for grid connection (Paska & Surma, 2014). Poland delayed the policy of according priority-status for grid connection to renewable energy sources, which was finally introduced in Renewable Energy Sources Act of 2016.
The second main factor in the hypothesis, "support schemes of network building and market formation in nurturing processes", could be the determinant of the success of renewable energy policies, but it is difficult to be judged based on the assessment of this research. Both countries did not have specific policies to support network building and market formation. Bulgaria promoted new grid networks in the areas, which have a high potential for renewable energy technologies, since they were able to have more capacity to connect to the grid (Ministry of Economy, Energy and Tourism of the Republic of Bulgaria, 2010). Also, Feed-in Tariffs could act as an incentive for new entrants to the renewable energy market with respect to market creation. Green certificates system and suppliers of last resort in Poland could attract new entrants as well. In sum, Bulgaria has relatively better supports for network building and market formation, but it is hard to say those policies made a difference in the promotion of renewable energy, since neither of them had specific policies for the nurturing process.
The third main factor in the hypothesis, "schemes for a transition from a niche space to a socio-technical regime in an energy industry structure in empowering process" are related to different outcomes of renewable energy promotion according to the assessment of specific obligations in the policies in both countries. The Feed-in Tariff in Bulgaria was quite effective in increasing the renewable energy share between 2009 and 2013 via the purchase obligation at a preferred price. On the other hand, the green certificates system in Poland only contributed to co-firing

biomass and not to other new technologies. Also, the oversupply of certificates decreased their market price, which discouraged the generation of renewable energies (Palusiński, 2017).

To answer the research question based on the assessment and hypothesis, this research concludes that connection of renewable energies to the grid networks via the shielding process and the strong scheme to integrate renewable energy technologies into a socio-technical regime via the empowering process were the determinants of the success of renewable energy policies in Poland and Bulgaria. Network building and market formation in the nurturing process could also be determinants, but this was not clear from the comparative research of renewable energy policies between Bulgaria and Poland.

Also, another important factor found through this research is the delay in effective renewable energy policy setting. Bulgaria started the implementation of new policies to reach the renewable energy share target for 2020 at the latest by 2011. On the other hand, Poland just slightly changed the existing policies after the issue of the EU Directive in 2009, and started new measurements in 2016, such as the priority of renewable energy generators to grid connection, Feed-in Tariff or Premium, which is far later than Bulgaria. This delay could contribute to the gap between Bulgaria and Poland as well.

It is, however, too early to say that Bulgaria is a successful country in terms of renewable energy promotion. Overall, Bulgaria achieved a high increase in its share of renewables with better support for the grid system and a high Feed-in Tariff, while Poland had difficulties in implementing renewable energy policies. But what this research found was that Bulgaria abolished many of effective policies since they achieved the renewable energy share target for 2020. The amendment of the Energy from Renewable Sources Act in 2017 removed the priority connection of renewable energies to grid networks. (RES LEGAL Europe, 2015). Also, Bulgaria abolished the Feed-in Tariff for new renewable projects in order to reduce the deficit and the burden on end consumers in terms of electricity costs (Enerdata, 2015). Although Feed-in Tariff improved wind and solar capacity and contributed to achieving the renewable energy share target for 2020, the incentive increased the deficit of the national electricity company (1.65 billion Euro) and electricity prices. As a result, Feed-in Tariffs only apply to a small number of project types, a certain type of small PV installation and biomass since the amendment in 2015 (Naydenova, 2017a). On the other hand, Poland introduced the Feed-in Tariff, Feed-in premium and the priority access to the grid connection for RES since Renewable Energy Sources Act in 2016 and they are still in force as of 2019. Also, Kotseva-Tikova (2016) pointed out that the renewable energy policies in Bulgaria did not allow households the opportunity to realise the environmental benefits of RES and they keep using conventional energies, since the renewable energy policies in Bulgaria did not include such kind of measurements.

As conclusion, the EU needs to increase the share of renewable energies further in order to tackle the issue of global warming and energy security. While the new MS tend to oppose the progressive proposals around environmental policies, their efforts are necessary for the EU to achieve its goals. However, even Bulgaria, which seemed very successful among the new MS in terms of renewable energy promotion, has still suffered from many issues. At the same time as the promotion of renewables, new MS should experience economic growth as they catch up to old MS in terms of development, from which it is assumed that the determinants of success in renewable energy promotion could differ from the old MS. The research of technological transformation is mainly based on the cases of the old MS and the research of the new MS is still not well developed as this research showed in the literature review and theory. Hence, further research of the new MS should be conducted for a deeper understanding of renewable energy promotion in the EU.

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