Abstract. *One of the main issues of designing strategies in renewable energies domain is the one of estimating the effects that different support mechanisms may have on investment flows. When designing these strategies, public authorities aim to achieve maximum efficiency by attracting local and foreign investors over the entire value chain of the branch and at the same time minimizing the overall cost of energy infrastructure. However, despite the good intentions underlying their origin, these efforts can sometimes lead to energy projects that are not technically, economically and socially feasible. The previous experience of pioneer countries in the field and a careful analysis of the context in which these practices have been developed can contribute to making more realistic and effective strategies. Therefore, in the first stage, this paper aimed to do a literature review regarding policies to encourage the renewable energy sector, then a comparative study has been conducted, in order to analyze the context and the key strategic decisions grounded by several EU pioneer countries in the field and effective ways of action for emerging economies such as the one of Romania have been identified. In order to study how public policies and other factors are particularly influencing the investors' strategies, the last stage consisted in a thorough interview with an expert consultant in renewables. Based on the information received, a questionnaire has been sent to three international companies in the renewable field, in which different investment scenarios have been proposed. It was found that the structure of the initial energy mix has a significant influence on the possibilities for further action. Thus, the reorganization of the energy sector requires considerable efforts in developing the technological, financial and legal framework. Among the multitude of financial mechanisms that can be used, a Feed-In-Tariff combined with green certificates and a guaranteed access to the grid appear to be by far the most attractive measures.*

Keywords: renewables, strategies for the development of renewables, sustainable development, emerging markets (Romania), energy mix, Feed-In-Tariff.

A COMPARATIVE STUDY ON THE EUROPEAN RENEWABLE ENERGY SOURCES FACING GLOBALIZATION

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1. Renewables in the age of globalization

Globalization is the central phenomenon of our time, entailing flows of capital, business products and applicable intellectual property. It has a sweeping cross-border environmental impact and it implies trade-offs in natural resources utilization. Renewables must find their place in this world-wide changing economy as a solution to growing energy demands and as a competitive source of capital attraction. This paper focuses on several key ways in which renewable energy can be more fully integrated into the national and global energy markets.

1.1. Encouraging the renewable sector through state policies

If in many industries the production and application of new technologies is entirely left to market forces, in those industries on which the national autonomy and security depend - as is the case with the energy industry - the public policy makers become important stakeholders. This leads to an additional complexity, added to the one caused by the technological uncertainty. In these situations, the implementation of new technologies cannot be understood without a thorough investigation of the role of the state. An interesting context is the one of those technologies which have already proven to be technologically and economically feasible in industrialized countries and which successful entrepreneurs might be interested (under certain conditions) to apply in emerging markets (Nemet, 2009; Leitner et al., 2010; Huberty and Zysman, 2010). In this case, we can practically ignore the technological uncertainty and remain with the following main question: *"What factors of a national energy strategy can influence a firm's strategic decisions, causing it to invest in building renewable capacities on that market?"*. The investment context in renewable infrastructure in Romania allows a focus on such a market.

Renewable technologies have been already present for more than two decades in some highly industrialized European countries. Although its EU membership obliges it to the same "energy-climate" commitments for the 2020 horizon, the Romanian renewable market is still in a stage of emergence. In this context, this paper will analyze the relationship between policy makers and potential investors on the renewable market, based on the study of strategic supporting policy measures undertaken by the first and the reaction of the second.

The scientific literature identifies various models of the development of renewables. There is thereby a variety of political mechanisms that can be used to promote the use of renewables, some of which relate to the development of a national industry to manufacture renewable technologies, and other to the assurance of the necessary conditions for an effective implementation of production capacities, based on such technologies. This paper will focus on the second category. As several researchers have shown (Johnson and Jacobsson, 2003; Connor, 2004), the effective use of renewables does not require the development of a local technology industry for

renewables: in other words, in many countries that have succeeded in this area, the renewable branch is not 100% national, technologies often being bought from abroad.

National and local authorities can promote two types of measures to support the renewable industry development: direct and indirect. Direct measures refer to those policies that specifically target the industry development of renewables, while indirect measures are those policies that support the use of renewables in general and in this way create a suitable environment by creating important and stable markets for renewables (Butler and Neuhoff, 2008). In Romania's case, given the constraints for an immediate progress imposed by the EU 2020 objectives, the crisis which calls for a more efficient use of some already rare financial resources, and the strong barriers to entry faced by new enterprises on the market of renewable technology manufacturers, it is assumed that direct measures addressed to stimulate the emergence of national renewable technology will be, at least initially and on medium term, extremely timid, if not absent. Therefore this article will not address the issue of national production of renewable technologies, but only the one regarding the stimulation of EnR developer and operator, who are using technologies from abroad. Thus, in the following lines, some direct measures, followed by some indirect policies are presented.

1.2. Support mechanisms for the renewable sector

1.2.1. Direct support mechanisms

Financial incentives can include providing low interest loans or subsidies to local constructors and exploiters of renewable energy. *Fiscal facilities* can be used to encourage local companies to get involved in the renewable industry, for example through tax credits or deductions for investments. Tax deductions can be granted with regard to salary costs in order to encourage companies to become interested in this field.

Financial and fiscal incentives of various types, based either on the production of electricity, or on capital investment or paid as direct cash incentives or as favorable loan programs, are often used to encourage the development of renewables. Even in the absence of a long term power purchase agreement, this financial incentive mechanism can play an important complementary role in relation to that of other policies, by encouraging the formation of stable and important markets in the renewable field. All countries practice incentives, even if of a very different type.

Most governments propose a variety of tax incentives to support investment in renewables. Most of the time it is about deductions or credits on income tax, based either on the invested capital, or on the accomplished production, about the accelerated depreciation, incentives regarding property taxation, discounts on excise duty and sales tax, VAT reductions etc. As in the case of financial incentives, the taxing ones usually play a complementary role towards other policies. Their exclusive and abusive use may lead, on the contrary, to the installation of unstable markets.

An important way to promote quality and credibility of a local renewable market is by participating in a quality testing and certification program that meets the

international quality standards (e.g. ISO 9000). These standards enable the increase of the consumer confidence in a product, otherwise unknown, participate in the differentiation between higher and lower quality products, and if they are internationally recognized, allow or prohibit access to a market that requires them.

Globally there are effectively four levels of standards bodies: international, regional, national and standards developing organisations. The international standards bodies relevant to renewable energy are the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC). In Europe the regional standards-making organisations potentially involved in renewable energy and energy efficiency are the European Committee for Standardization (CEN), the European Committee for Electrotechnical Standardization (CENELTEC) and the European Telecommunications Standards Institute (ETSI). Those are often closely integrated with European Union directives (International Renewable Energy Agency, 2013)

All developed countries and a significant number of developing countries in the world have their own national standardisation body or bodies (NSB) for example Asociația de Standardizare din România (ASRO) in Romania. This body, represented by two technical committees ELECTRIC and ENELECRIC, develops and implements, or in some cases, approves standards either at a national level or by providing the experts to engage in the development process of standards. ASRO works together with the international and regional standards bodies above mentioned and with the Romanian Government, which cooperates with the European Commission. Examples of relevant standards for "Smart Grids": "Connecting the generators to the electricity grid" (ASRO/CT 167) and "Smart systems for electricity metering" (ASRO/CT 164).

1.2.2. Indirect support mechanisms

"Feed-In-Tariffs", namely the use of fixed prices for renewables in order to encourage their development, has been historically the most commonly used method, because it can simply ensure a stable and profitable market for the development of renewable sources (Lauber, 2004; Rowlands, 2005; Sijm, 2002; Cerveny and Resch, 1998). The price level and the characteristics of its structure vary from one country to another. If well designed, including a long term action range and a sufficient profit margin, the method proved to be extremely important to create a stable signal of future markets for investors in renewable capabilities (Hvelplund, 2001). As seen below, countries like Germany, Denmark, Spain, Italy or England, which managed to create stable and important renewable markets, have a stable and profitable "Feed-In-Tariff" policy tradition which has significantly contributed to the development of renewables.

The existence of *mandatory renewable targets*, in Anglo-Saxon literature MRET – Mandatory Renewable Energy Targets, or RPS – Renewable Portfolio Standards, is a relatively recent political mechanism that has begun to be developed in several countries. This policy requires that a fixed percentage of electricity from each provider's retail portfolio to be generated by renewables. Beyond this general common

principle, many of these policies are tailored to the specificities of different national markets. For example, these policies were implemented as RPS in 21 states of the USA (Wiser et al., 2005), as national MRET in Australia, as Renewables Obligation in the UK (Mitchell et al., 2006) and as a Special Measure Law in Japan (Nishio and Asano, 2006). Being only recently implemented, their impact on the development of renewables has been, until now, quite modest. The existence of this impact cannot be denied, however, at least in the USA and in the UK (Langniss and Wiser, 2003; Bird et al., 2005). Various questions have been raised regarding the competitive mechanisms generated by these policies and the possible long-term political uncertainty, which may lead to market uncertainty and an overall reduced profitability of the industry, and thereby to little support for a localization of renewables (Finon and Menanteau, 2003; Mitchell et al., 2006). However, the determination of the frequency of occurrence of this type of problems requires a long experience in using this mechanism, which at the moment remains a positive one.

Another way to facilitate the development of renewables is by having the government organize *auctions* for potentially important renewable capacity projects, auctions accompanied by benefits such as long term power purchase agreements. For the moment it could not be proved that this type of program ensures the long term stability and profitability of the market, on the one hand because the frequency of such auctions is reduced and on the other because between the auction participants there is a fierce competition, that significantly reduces profit margins. The British "Non-Fossil Fuel Obligation" program which organized periodic auctions for renewable energy generation during the 1990s is an example of such government auctions. The contracts were not profitable enough to give rise to a particular interest (Mitchell, 1995). However, such auctions are used, even if not systematically, in Europe, but also in Canada, India, Japan, USA and China.

2. Research method and objectives

In the current context of globalization, in general, and the "climate-energy" package (European Commission, 2008), in particular, this paper aims to identify and analyze the key elements of a successful national strategy in the renewable field.

During the first section, this paper presented the results of a literature review concerning policies to encourage the renewable sector performed in search for elucidation of the different mechanisms used for this purpose. This first stage allowed the proposal of some general hypotheses regarding the mechanisms that can raise the interest of an exploiter/developer in the renewable field. A country can maximize its attractiveness by establishing a combination of direct and indirect policies favoring the renewable industry. The selection of an appropriate set of policies depends on the fundamental objectives that the country sets (see the comprehensive energy strategy, with the structure of the energy mix, the national energy security considerations, the economic and financial situation etc.). A gradual approach in stages is often suggested,

in order to ensure that policy objectives and local specific requirements are clearly identified and met.

The next section of the article therefore consists of a comparative study of the experiences in several European countries in the field of the energy mix renewal. The study of some EU states, pioneers in the renewable energy sector (Denmark, Spain, Germany, Italy, UK), will highlight the strategic leverages used by various decision makers to encourage the development of renewable branches, together with their outcomes. In a following section we present the results of a qualitative analysis of the different strategic leverages used in different contexts in order to formulate some general assumptions on the most effective strategic measures that governments and local administrations can adopt in order to sustainably support the implementation of renewables on their territory.

To effectively study how public policies and other factors influence the investors' strategies, several steps were followed: In a first step, for a better understanding of the approached subject, we have conducted a 90 minutes semi-structured interview with an expert consultant in renewable emerging markets. The questions concerned two topics: What are the challenges you face in renewable projects in emerging countries? and What criteria underlie the choice of an emerging market for new projects?. Based on this interview, a preliminary list of important topics for project developers (this list was further refined based on the literature review) has been obtained. The aim consisted, on the one hand, in understanding the decision process of project developers and, on the other, in the identification of criteria that significantly influence the strategic investment decision.

Four indispensable factors were identified: the availability of adequate renewable resources; the political stability (of government and local authorities) for a foreseeable time horizon; the financial viability of the project (the existence of a financial supporting mechanism in the favor of renewables, or the presence of sufficiently high and stable electricity tariffs, which ensure a secure income for the investor); and grid access. The absence of either of these four elements cause the renewables market in that country to remain in an early stage no matter how developed the other three elements are. Further, a second set of elements, consisting of criteria with significant impact on the attraction exerted by an emerging market, has also been identified: supporting mechanisms (Feed-In-Tariff, quota system with green certificates, support in the investments field etc.), various financial aspects (currency risk, inflation risk, access to attractive financing etc.) or non-financial, and the grid connection mode.

Based on the results of the interview, and taking into account the results of the analysis regarding the development mechanism used in specific EU countries pioneers in the EnR (Énergies Renouvelables), 24 different scenarios were defined for the questionnaire subsequent sent to project developers from three large international companies (Iberdrola Renovables, EDF Energies Nouvelles and Vattenfall).

A questionnaire has been obtained, which can confirm both the attractiveness of various factors, as well as the interest of potential investors for different scenarios

built on their bases. The first part of the questionnaire aimed to gauge the respondents' views regarding the importance for Romania of the key factors identified in pioneer countries in this sector. The second part asked about which combination of factors may lead them to invest in Romania.

The identification of the respondents has been made in two stages. Firstly, based on Internet searches, several European companies that develop renewables in developing countries were identified and three of them (from different countries: Iberdrola from Spain, EDF from France and Vattenfall from Sweden) have been further selected. The current strategies of the three companies mentioned above are largely focused on 'traditional' wind markets (EU and U.S.). BRIC countries and small emerging markets are however seen as important opportunities and companies are already active in these markets. Thanks to the interviewed consultant, 10 potential respondents were identified in each company.

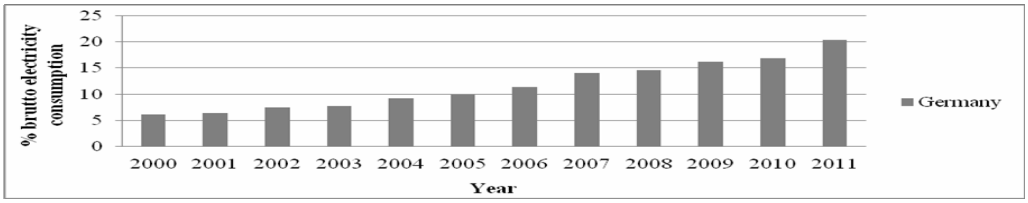
The survey was conducted between February-March 2013 and ended up with 25 completed questionnaires from all three companies, which translates into an 83% answer rate. The majority of respondents worked in top management, business development and project management.

Based on the results of all these steps some direction proposals, which the national strategy in the renewable field can follow are made, in order to efficiently and sustainable increase and support the attraction of successful companies in implementing renewable capacities in Romania.

3. The evolution of renewables in the EU

3.1. Renewables in Germany

In 2010, the German primary energy consumption consisted of about 80% fossil fuels, 10.9% nuclear and only 9.4% renewables. Regarding the electrical mix, it was based on 58% fossil fuels, 20% nuclear and 18% renewables (Figure 1). Due to the important share of hydrocarbons, this mix was emitting large amounts of CO_2 (almost 5 times more than the French one).



Source: Developed by the author based on data taken from Eurostat.

Figure 1. **The development of electricity generation from renewable energy sources in Germany**

In October 2010 the federal government committed *to reduce CO_2 emissions by 80% in 2050 compared to 1990*. This required a radical evolution of the energy mix in favor of renewables, which in 2050 will have to cover 80% of the electricity production and 60% of the final energy consumption. In order to meet these objectives, the federal government relied on the nuclear keeping until 2036. In reality, on 30 May 2011, after the accident in Fukushima, Angela Merkel, the German chancellor, decided *to speed up the exit from nuclear energy* by immediately stopping eight reactors and progressively closing other nine reactors between 2015 and 2022. As a result, the Germans decided to develop *modern thermal power plants on coal and gas*, which will have to replace nuclear energy and ensure a transition with lower costs to a "renewable era". As result of a global political agreement (Agora Energiewende, 2013), these measures are enjoying a very broad consensus in the civil society, but can be risky for German competitiveness (additional costs for supporting renewables, the grid's fragility, delays in construction of new coal plants, uncertainties regarding the profitability of new gas plants, etc.).

The target set for renewables assumes that they will cover *35% of the electricity production in 2020, 55% in 2030 and 80% in 2050*. The restructuring of the German electricity sector requires considerable efforts in the field of technology development: new renewable technologies, increased energy efficiency, storage and smart grids. This bet is not free of risks for the industrial competitiveness, but on the long run it can allow Germany to achieve a technical, industrial and commercial leadership position in this sector.

In order to succeed, Germany has created *favorable investment conditions* (priority capital investment at a guaranteed purchase price) as well as *an investment fund* (especially for offshore wind energy). *Grid development* (indispensable for enabling the integration of renewables) was accelerated based on the acceleration of authorization procedures and the improvement of the remuneration rate of investments. Wind energy development will largely be accelerated (according to the law proposal from July 2012 on a new responsibility regime and a new grid-connection system), in order to ensure greater safety for investors, especially by providing compensations in case of delay in connection to the national grid, and by having consumers bear a part of the development costs of wind electricity (an additional cost of 0.25 cts € / kWh, or 0.05 for electro-intensive clients). The support for onshore wind power will be strengthened and the one for solar photovoltaic will be reduced and adapted to market growth.

The renewable energy support granted, particularly to photovoltaics, already represents an important additional cost (3.6 cts € / kWh in 2012). These figures have re-launched the debate regarding the level of support granted to the German solar industry, which is facing additional difficulties due to the Asian competition (almost half of the new solar panels installed today in Germany are manufactured by Asian producers).

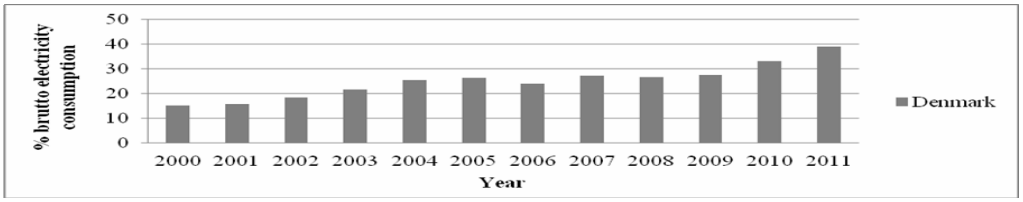
The government has therefore drastically reduced the promotion of photovoltaics since July 2012. There is also concern that the development of wind

energy will reach a too high expansion rate, endangering the acceptance of this type of energy as a whole. *A bill aiming at a significant reduction of the guaranteed purchase tariff* is debated between the Bundestag and the Bundesrat. On 17 August 2012, Peter Altmaier, the federal Minister for the Environment, stated the need for a fundamental reform of *the EEG law* (Erneuerbare-Energien-Gesetz) on renewables and their market (Schultz, 2012). The EEG law has not been enacted by December 2013, but the new government is planning this reform by summer 2014.

3.2. Renewables in Denmark

Although the Danish energy consumption has remained stable (Figure 2), Denmark currently being the only net energy exporter in the EU, the Danish government practices a voluntarism policy in favor of energy efficiency and renewables. In order to counteract the consequences of own hydrocarbon resources waste (2018 horizon), Denmark has developed a strategy aiming *a complete independence from fossil fuels* (2050), based on three axes: *improving energy efficiency by using the existing technologies, increasing the use of renewable energies*, whose estimated theoretical potential is 10 times greater than the one used today (These will be integrated in the electricity system through smart grids, which allows for demand modulation depending on the production) and *connecting to the European grid* through compression stations (Meyer, 2004).

In 2009, the Danish energy mix contained 19.7% renewables, 27.4% of the electricity production was from renewable sources (of which 0.5% wind and 18.3% photovoltaic).



Source: Developed by the author based on data taken from Eurostat.

Figure 2. **Development of electricity generation from renewable energy sources in Denmark**

Today, Denmark is the country with the largest share of its total wind power (20% of its total produced electricity) and the first worldwide manufacturer of wind power equipment (35% of the market in general and 90% for offshore turbines) in the EU. The Danish electric system is however overwhelmingly based on the 80% electricity production achieved with the help of thermal plants (43% coal, 22% gas, 9% biomass and waste), whose flexibility allows the compensation of wind intermittence without excessive additional costs.

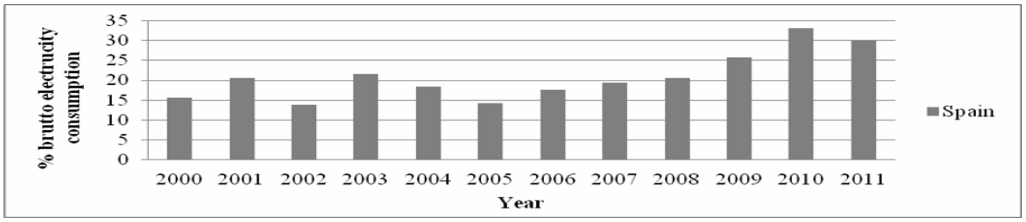
The new Danish energy policy was adopted in March 2012 and states that 35% of the energy consumed in 2020 will come from renewable sources. On that date, half of the electricity will be produced using wind power. The coal power plants will be converted in order to use only renewable energy (biogas, biomass or waste). 67 Mio € in form of public credits will be allocated each year to enterprises, which will invest in energy efficiency and green energies. Nuclear energy, excluded from the Danish energy mix since 1985, will remain absent, except for the nuclear energy imports from Germany and Sweden, which represent about 10% of the electricity consumption in Denmark. However, this energy transition has a cost: tariffs for the use of electricity grids will increase, as well as various fees on energy consumption.

The KWh price, the highest in the EU, already raises the issue regarding the cost of wind energy (The wind is the main renewable source in Denmark, with great development potential in the future. The country does not have hydraulic power, does not accept nuclear energy, therefore a higher price increases the resistance against wind energy development.). In reality, this high price is mostly the result of the energy taxation system (more than half of the kWh price corresponds to a 25% VAT and a green tax designed to encourage the reduction of energy consumption altogether). The technological production cost is one of the cheapest: it reflects, beyond the wind regime, the favorable financing conditions granted to the Danish supply chain. Wind farms are considered a reliable investment which benefits from a consistently strong public support.

3.3. Renewables in Spain

The need to reduce energy dependence and the environmental requirements is the main reason for a significant development of the Spanish renewable sector in the last decade (Figure 3). The economic crisis and the legal uncertainty climate caused by the recent regulatory texts (on renewables) regarding the premiums and remuneration, have affected this development. However, the Renewable Energy Plan (REP) 2011-2020 provides the exceeding of the EU requirements in this field. In 2010, renewable energy represented 13.2% of the final energy (compared to 8.2% in 2005) and the electricity production from renewables had reached 32.3% (14.1% hydro, and wind 14.6%).

Taking into consideration its strong external dependence on fossil fuels (in 2010, 47.3% of the total primary energy consumption was represented by oil, 23.5% by gas and 6.3% by coal), the low competitiveness of its economy, and the significant CO_2 emissions, Spain has been relying for many years on the development of clean and local energy sources. The PER 1999-2010 measures have therefore focused on reducing the energy dependence, improving the energy efficiency and supporting renewables. The results obtained were, however, very uneven from one renewable technology to another. Today, Spain is the 1st in Europe and 2nd in the world at thermoelectric power installed, the 2nd in Europe and 4th in the world for wind power, and the 1st in Europe and 2nd in the world for photovoltaic power.



Source: Developed by the author based on data taken from Eurostat.

Figure 3. **Development of electricity generation from renewable energy sources in Spain**

The Spanish renewable industry development is based on technological innovation and on a good cooperation between administrations and enterprises. The main success factor has been a regulated system of premiums and tariffs, with continuous improvements and adjustments depending on the technologies' level of maturity. The confidence of investors was achieved through a coherent system of laws that provided concrete objectives for each technology, and an analysis and update every 5 years. The "Feed-In-Tariff" remuneration model chosen by Spain has significantly contributed to the successful development of renewable sources. The reverse side was a speculative bubble, particularly in the photovoltaic sector, where the premiums initially granted were so advantageous, that the capacity created from 2005 to 2010 was almost 10 times higher than the planned target.

In order to meet the "3 x 20" objectives in 2020, Spain's new energy policy relies on three axes: *the new PER on 2011-2020*, which sets a target of 20.8% renewables in the primary energy consumption in 2020; *the law of energy efficiency and renewables*, which emphasizes the development of self-consumption and *the sustainable economy law* (March 2011). For the 2020 horizon, the new PER provides the duplication of installed power in the renewable field, mainly due to some premiums: these will increase gradually from 529 Mio € in 2011 to 2658 Mio € in 2020, in order to reach a total of 18534 Mio € for the whole period. The premiums will be financed through the electricity tariff (therefore by consumers) and to a lesser extent through subsidies (1068 Mio €), funding and fiscal measures (961 Mio €). It is estimated that the sector will become profitable from 2018.

3.4. Renewables in Italy

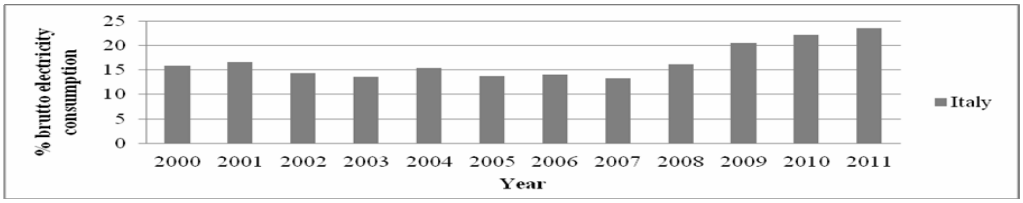
Italy depends significantly on external energy inputs (86%), therefore the energy policy is a priority for any government. Its main objectives are to increase the security of supply and to improve the competitiveness (the Italian energy is on average 30 to 40% more expensive than in the rest of the EU), both in restrictive terms of environmental compliance. In this context, Corrado Passera, the Economic Development Minister, presented on 26th of April 2012 an energy strategy with five priorities: *the improvement of energy efficiency*; *the development of the gas "hub" in*

Southern Europe; *sustainable renewable development* (the increase of their share alongside with their final cost reduction); *the restart of the national production of hydrocarbons*, particularly for oil and gas, in order to cover up to 20% of the total consumption (compared to 10% today); *the implementation of a clear and coherent energy strategy shared by all economic actors*.

Italy exited the nuclear energy industry in 1987, after the Chernobyl disaster, but it imports electricity of nuclear origin from France (13% of the consumption in 2010). The referendum from 12 and 13 June 2011 confirmed the opposition of the majority of the population (94%) to the return to nuclear power production. Thereby, the long run strategic intentions, which suggested that a reaction to the significant increase in oil prices, but also in CO_2 emissions, will lead to a 25% nuclear power of the total electricity production in 2030, were disrupted. In 2010, 64.8% of the energy consumed in Italy came from fossil fuels (mainly gas) and 22.2% from renewable sources (hydrocarbon 14.9%, 2.7% biomass, 2.5% wind, 1.6% geothermal and solarium, with only 0.5%, presents the largest growth potential) (Figure 4). Furthermore, today, Italy's renewables are expensive and the country fears an increase in its energy dependence on its main gas suppliers (Russia, Algeria and Libya).

Therefore Italy wants a more balanced growth of its renewables, which would achieve the EU's 2020 targets and at the same time limit the costs associated with its incentive system. Thus, two decrees from 13 April 2012 set the following objectives: *increasing the support for renewables, along with a stabilization in 2014 for photovoltaic and in 2020 for other renewables*; *narrowing the difference between the higher Italian inciting tariffs and the EU average*, in order to gradually reach a "grid-parity" of these technologies; supporting *innovative and/or economically efficient technologies*, which have a beneficial impact on the environment and the economy, and are easily to be integrated into the electrical system; *strengthening competition and controlling the investment volume.*

Applying the "energy-climate" package on national level stated that the Italian energy mix will reach 17% renewables in 2020. In 2011 the reached level was 12%, but the renewable sector, was still fragile, mainly due to the limited development potential.



Source: Developed by the author based on data taken from Eurostat.

Figure 4. **Development of electricity generation from renewable energy sources in Italy**

Hydroelectricity (currently holding about 2/3 of the Italian renewables) presents only a limited growth potential. The other renewables register significant increases, but their final contribution to the energy mix remains modest. Photovoltaics have seen an exponential growth, investors being attracted mainly by a great incentive system (the purchase price is substantially subsidized over a period of 20 years). Starting from almost zero in 2006, Italy became in 2012 number 2 in Europe after Germany in photovoltaic sector.

From the industrial point of view, Italy tries to develop its own production pathway to reduce panel imports. The Italian wind farm develops fairly quickly, in 2010 Italy ranked the 3rd in Europe and the 6th in the world in this field. Several factors still hinder the development of renewables, including: the instability of the incentive systems; the absence of a clear, stable and coordinated development strategy; an infrastructure network little adapted to the new market needs; a limited storage capacity.

3.5. Renewables in England

The British energy mix is made up mostly of fossil fuels (90%), compared to only 9% nuclear energy and about 1% renewables. In 2011 the installed electricity production came 40% from gas, 2% from petroleum, 30% from coal, 19% from nuclear and a historical level of 9.5% from renewables. The main explanation of the above mentioned mix structure is the abundance of hydrocarbons in the North Sea until the early 2000s. Subsequently, the energy security problem (the significant decrease in gas reserves in the North Sea in the last ten years) and the obligation to reduce important CO_2 emissions have determined England to define *a new Energy Policy based on the restart of nuclear energy sector, the development of renewables and "clean" technologies*. The need for investment in energy infrastructure is important (about 200 Md £ until 2020): many power plants have reached the end of their life cycle, especially the nuclear reactors, which with small exceptions (10 GW out of 82 GW), must be progressively closed between 2014 and 2023; other power plants, especially the ones on coal (12 GW), will no longer be compliant with the European directives after 2015.

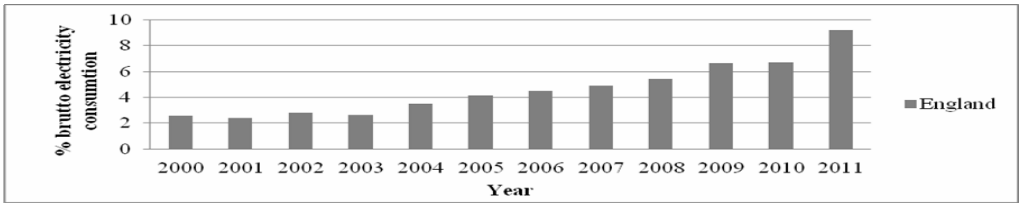
At the same time, the reduction commitments regarding CO_2 emissions (- 34% in 2020 compared to 1990 and - 80% in 2050) complicate the situation of energy security, while the Brits occupy the antepenultimate place in Europe in renewable energy production (Figure 5).

In response, the British government announced in 2008 a revival of the civil nuclear energy sector and a development strategy for renewable energy (Woodman and Mitchell, 2011). The time required for the entry into service of new power plants (not earlier than 2018) creates a significant risk of electricity penury around 2016. There is thus a stringent need for investments in new power plants on gas, or even on coal, able to provide the transition towards nuclear and to compensate the intermittent

shortages generated by renewables. Finally, the electrical grid is old and will also require significant investments in the future.

The Electricity Market Reform (EMR), from 22 May 2012, aims *to conciliate the objective of energy security at an affordable price for consumers, with the necessary rebalancing of the energy mix* in favor of renewables and nuclear energy (Department of Energy and Climate Change, 2012). It provides in particular a system of purchase prices with long-term contracts *(Feed-in-Tariffs with Contract for Difference)* for all forms of low in carbon emissions energies, tariffs that guarantee investors a stable income, and encourage the renewable energy market.

The targets fixed for England by the EU "energy-climate" package require a renewable consumption level of 15% in 2020 compared to only 1.3% in 2005. In July 2011 the British government has published a roadmap for renewables, which identifies eight technologies with development potential: the onshore and offshore wind sector and biomass are the most important (Departament of Energy and Climate Change, 2011). In 2020 the estimated allocation of various renewables capabilities will include: 14.89 GW onshore wind power, 12.99 GW offshore wind power, 4.24 GW biomass, 2.68 GW solar, 2,132 GW hydraulic and 1.3 GW tidal force.



Source: Developed by the author based on data taken from Eurostat.

Figure 5. **Development of electricity generation from renewable energy sources in England**

On 26th of April 2012, the Prime Minister David Cameron insisted on the need for renewables to become *"financially sustainable"* based on three measures: *reducing the cost of renewables*; *the development of networks and needed interconnections in order to promote the trade with renewables*; and *focusing investments on areas with comparative advantage* (e.g. the North Sea).

In recent years various measures have been implemented in order to support renewable energy sources, mainly financial support measures (subventions and loans), and an incentive mechanism (renewable obligations), which obliges the energy distributors, either to produce a part of the green electricity, or to purchase green certificates from companies that dispose of surplus of such electricity type. Because the effectiveness of this system is reduced, the government also introduced from April 2010 a buying mechanism on differentiated charges (Feed-In-Tariffs) for certain renewable energy sources.

4. Strategic directions in the renewable field in the EU

4.1. The (in)direct importance of the energy sector for the national economy

The economic development model of a country has a direct influence on its energy consumption needs. In this equation the type and level of a country's own energy resources and the one of imported resources (extensive factors) intervene, as well as the energy production and utilization efficiency (intensive factors). The more a country depends on external energy inputs, and/or the more its energy competitiveness is lower, the more pressing is the energy restructuring issue (e.g. Italy). However, *security and energy efficiency* is a key concern for any government, either from the immediate perspective of today and tomorrow, or due to the anticipation of a distant future (Denmark). In EU countries, both these government energy strategy goals must be achieved under the restrictive terms of environmental protection policies and in particular of the (3 x 20) Energy-Climate package adopted by the European Commission on 23 January 2008.

Energy security can be achieved either by developing new technologies and production capabilities, or by increasing electricity imports. Usually the first solution is preferred, even if the second one also has its own role (allowing redistribution of excess). Today the hydrocarbon resources in the EU member states are either close to depletion, expensive, or politically sensitive (difficult to access or involve the risk of a too much dependence on exporter's interests). In this context, each country has a different approach considering its fossil fuel dependence. Their energy security is assured largely through the identification and exploitation of new types of energy, the renewable ones occupying an important place.

At the same context, the improvement of energy efficiency for both energies used today as majority and for future energy types, can also contribute to the achievement of a better energy security. In order for renewables to become *"financially sustainable"* three means of action seem indispensable according to David Cameron, Prime Minister of England: *cost reduction of renewables*, *grids and interconnections development* and *investments concentrated in the most profitable regions and technologies* (E2B pulse, 2012).

4.2. Final situation desired: On the way to "the third industrial revolution"

Beyond the economic and technological aspects related to the need to reduce energy dependence, the requirements of a sustainable development (environmental concerns, in general, and the foresights of the Climate-Energy Agreement in 2008, which stipulate a "3 x 20%" horizon until 2020, in particular) also contribute to the significant boom of the renewable energy sector in recent years.

The renewables era seems therefore to be the final destination for most EU countries. In reality, behind this overall objective lay hidden very different energies in nature, technology, and also in current exploitation. For most of them the potential exists, but it is not fully utilized. These new energy sources combine obvious advantages (take advantage of the existing local potential, participate in a *sustainable development* and contribute significantly to the reduction of greenhouse gas emissions) and disadvantages (especially the consequences of their intermittent nature, which make a 100% renewable energy mix difficult or even impossible to achieve; the important costs related to the incentive system, at least until the maturity of new technologies; as well as the relatively high unit price of electricity produced based on them, with consequences for the national industrial competitiveness). Their integration into the electrical system can be done through smart grids which allow demand modulation depending on the production process.

After a first "free" development period, the EU countries want to encourage a more balanced growth of renewables, able to ensure the achievement (or even the exceeding) of the EU objectives for 2020, and at the same time to rationalize and limit the costs associated to incentive systems and structural investments. After an initial target, which was essentially quantitative in nature, it seems we are moving towards an additional quality: the priority support of innovative and/or economically efficient technologies, with a beneficial impact on the environment, but also on the related strategic sectors; the harmonious and coordinated development of renewable energy sector and its efficient integration in the electrical system.

4.3. The initial energy situation

To this day, the main sources of energy used in the EU are fossil fuels and nuclear power. This situation can be seen in the composition of the national energy mix (primary energy consumption), but also in the electric mix. It can be noticed that the starting point differs significantly from one country to another.

Regarding the fossil fuels, an important share of hydrocarbon causes the national mix to generate large amounts of CO_2. The respective governments are therefore forced to take depollution measures, by involving a more or less radical evolution in favor of renewable energies.

Regarding the nuclear energy, it is an important alternative for the depollution process. On one hand, the nuclear development doesn't pollute and is also cheaper, but the risk of nuclear accidents materialized in the past in Chernobyl and recently in Fukushima can introduce a special constraint regarding the decision to resort to this type of energy: the usually less favorable pressure exercised by the civil society.

The existence of a global political agreement on nuclear power exit, even if it enjoys broad consensus in the civil society is not without risk to a country's competitiveness. Between these two, the modern thermal power plants on coal and gas can complete (e.g., in the UK) or substitute the nuclear (e.g., Germany) to ensure

the "energy transition" that would allow the achievement of a "renewable era" with lower costs.

It should be noted that today a complete depollution of a countries power system seems an utopia or, in any case, a technically and economically unjustified objective: thermal power plants remain necessary because they provide the flexibility that allows the intermittence compensation of renewable energies without excessive additional costs.

4.4. Strategies to achieve the desired situation

The restructuring of the energy sector and the electricity sector in particular, requires considerable efforts in the field of:

Technological development: developing a range of energy/renewable technologies, improving energy efficiency, improving storage, developing and connecting the current electricity grids, creating smart grids and capturing and storing of CO_2 emissions. In the short run, the technological development objective is not free from risks for the industrial competitiveness, but on the long run it can allow that country to attain a technical, industrial and commercial leadership position, in this sector. The explanation is simple: the research and development and then the implementation of renewable technologies is risky and especially expensive. Higher implementation costs will determine the electricity costs, which underlie the production of most goods and services in a country, to grow. Therefore the prices of goods and services will also increase. At the country level, this means that the same products will be more expensive than now, without having a better quality. Therefore, industries using these energies lose their competitiveness on national and especially international level.

Finance: creating favorable investment conditions (guaranteed purchase price, various fiscal measures), creating a central investment fund (public loans for the development of new renewable energies and improvement of energy efficiency). Based on the comparative analysis, it is difficult to pinpoint an optimal solution, as the initial energy mix presents very different structures, the economic, social and political situation of the analyzed countries differ and the context in which these evolutions occur is specific and complex. It seems that the Feed-In-Tariff remuneration model chosen by Spain, Germany and Denmark has significantly contributed to the success of developing renewable energy sources.

This model consisted in the support of the renewable electricity purchase price, either based on a fixed amount (different for each technology, maintained for a sufficiently long period of time, and simultaneously updated depending on the evolution market of that particular technology) or on charging a premium that is added to the market price to favor producers. The premiums match the strategic and environmental advantages that renewables bring, as the respective governments perceive them: reduction of gas and fuel imports, the derived benefits of technological development and the savings brought by the decrease in CO_2 emissions.

In most cases the premiums are financed through the electricity tariff (therefore by consumers) and to a lesser extent through subsidies, financing and fiscal measures. These premiums try to guarantee an acceptable return on investment throughout the entire timeframe required for the maturity and consolidation of the new technologies, so that they can coexist with the cheaper conventional energies in the best possible way.

The legislative framework: designing a secure legal climate (a coherent system of laws and regulatory texts: liberalization of the electricity sector, planning the renewable energy sources development), and establishing a good cooperation between administrations, enterprises and professional organizations. The support granted to renewables often represents an important additional cost for the state as well as for its citizens as consumers. In the short run, this means a relative loss of competitiveness for the respective country.

Also we must not forget that an important part of the costs for the development of the renewable electricity will be sustained by consumers. The tariffs for using the power grids will increase as well as the various taxes on energy consumption. The decision regarding the structure of the renewable mix is therefore very sensible. The support for a specific form should be adapted according to the market growth in order to avoid speculative effects. Although it looks like a paradox, a too high growing rate of renewables is undesirable because it could endanger the acceptance of this type of energy as a whole. Therefore, a regular analysis and an update of the plans and associated measures is required (the initial bonuses sometimes prove to be too advantageous and are at the origin of a speculative bubble, for example the photovoltaics in Spain and Italy).

Clearly, the renewable energy group comprises a wide range of energies and technologies. Each country, depending on its natural potential and its technological advance, will focus on certain energy and technology forms in order to maximize energy efficiency and ensure energy security. It is practically difficult to identify an optimal and a general valid growth strategy.

4.5. Investment chances for emerging markets

The development and especially the use of renewable energy are very uneven from one technology to another and from one country to another. The reasons for this diversity are both objective and subjective: the development potential of various renewable energy sources is limited by specific conditions of each country, but also by its global political, economic and social choices. Several factors still hinder the development of this sector, including: the inherent limitations imposed by the natural potential, the intermittency of most renewables, the assumptions of certain technologies; but also organizational boundaries that can be overcome, such as the instability of the incentive systems, the absence of a clear, stable and coordinated development strategy, the existence of a physical or immaterial network infrastructure less adapted to the new needs of the market, a limited capacity of energy storage etc.

Far from being a pioneer in the renewable energy sector, but having an emerging renewable sector, Romania may reduce its accumulated delay by drawing inspiration from the most successful European experiences in this area. As seen before, in countries like Germany, Spain, Great Britain and Denmark there are already well defined and efficient EnR policies. Those usually combine, in a more or less specific way, different elements corresponding to the following success factors:

- the existence of a renewable portfolio standard (RPS) which indicates the companies obligations regarding the amount of renewable energy produced/distributed;
- the existence of a high and stable Feed-In-Tariff on renewable energy introduced in the grid;
- the existence of a proactive strategy on providing transportation and storage to interconnect renewable resources (intermittent by definition) to the global energy grid;
- the ability to pass on most, if not all, of the interconnection costs on intermediates and/or final customers;
- the existence of a favorable tax regime, including investment tax credits, production tax credits, accelerated depreciation etc.

Some of these macroeconomic factors can also be found in Romania, but under very different manifestation forms and intensities.

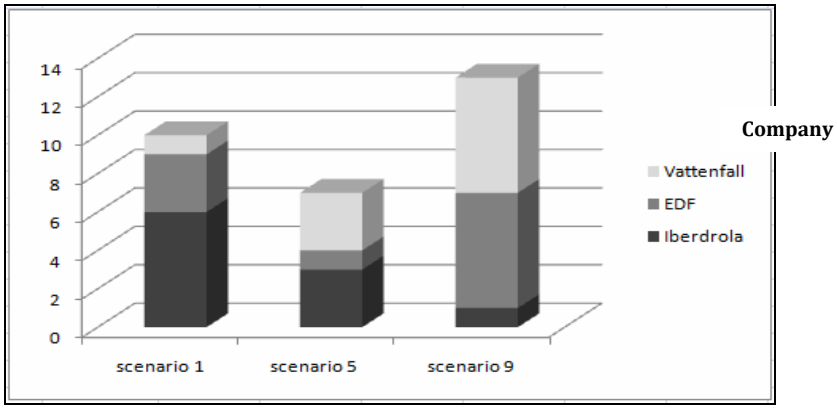
The final results of the research on various factors are grouped into four categories: supporting mechanisms, financial aspects, non-financial aspects and grid connection have confirmed the identified trend at EU level:

- Feed-In-Tariffs enjoy a very positive appreciation compared to the other support mechanisms, as they reduce the investment risk and can guarantee a stable income. Another widely voted support mechanism has proven to be the establishment of a quota system accompanied by tradable green certificates.
- Among the financial matters that seem to present a medium or even a lower attractiveness compared to other criteria, the government's transfer of the inflation risk and the existence of attractive financial funding conditions from local and international banks should be highlighted.
- The non-financial aspects (particularly the legal security, the necessary duration to obtain approvals, and the process transparency), although less attractive than Feed-In-Tariff, Green Certificates and the guaranteed access to the grid, are more important than any other criterion in the research.
- Ensuring access to the distribution grid, as well as the total distribution of the produced energy, is considered as one of the most attractive investment conditions.

Regarding the scenarios identified as the most expected, in a Europe in crisis, scenarios that favor the easy access to resources, the reduction of investments reduction by immediately valuing the existing infrastructure, the sustainable reduction of production costs and the long term insurance of an interesting margin, seem to be the most attractive. The other factors, although they were given some importance in

the answers from the first part of the questionnaire, do not seem to have a fundamental role in choosing a particular scenario.

The best three investment scenarios presented in Figures 6 and 7 are the ones that include a Fid-In-Tariff system, a financial supporting system offered by the government to investors, a good infrastructure, and the overall cost reduction. Of course, the first scenario is desired by any investor, but in reality is very hard to find a country with an emerging market that has it all. Therefore the 9th scenario reflects the most realistic expectations that an investor can have in deciding whether to invest or not in a particular market.



Source: Developed by the author based on the questionnaire results.

Figure 6. **The best three investment scenarios for each questioned company**

Scenario	FIT	Legal objective	Fiscal incentives	Financial support	Infrastructure	Cost reduction
1	+	+	+	+	+	+
5	+	+	-	+	+	+
9	+	-	-	+	+	+

Source: Developed by the author based on the questionnaire results.

Figure 7. **Expectations of foreign investors from EnR emerging markets**

Taking into account the obtained results, it can be said that the overall objective of strategic measures that Romania and other countries with emerging renewable markets should take in order to support their renewable emerging market attractiveness includes: the insurance of stability and transparency, the efficient intermittency management, the reduction of various costs as well as the interconnection improvement.

Effective **measures** can include:

• Developing **Smart grids –** are electric distribution networks, that use new information and communication technologies to optimize the entire production, transportation and distribution chain as well as the electricity consumption (with the help of *smart homes* and *smart metering*).

• Introducing a **FIT system** – the purchase of wind farms produced electricity at a fixed tariff decided by the government and guaranteed over a certain period of time.

The purchase price ensures the project profitability of investors while also allowing the aeolian chain development. However, the system does not provide any guarantee on the amount of wind power produced and is often costly for consumers.

Another solution for Romania can be the **decentralized quota system attached to a green certificate market**.

• **Geographic Information System (GIS)** – Nowadays, 80% percent of the wind farms present in regions like Banat, Moldavia and mainly Dobrudja are located within the "Natura 2000" protection program, because Romania has not made clear limitation of these regions. Nevertheless, the country has offered further approvals for the construction of wind farms in the region. This translates to wind farm developers as a big investment risk, because their building permits can be any time canceled by the state.

GIS defines the location of suitable sites for wind projects and predicts their economic exploitable energy production. The purpose is to estimate the average Annual Energy Production (AEP) based on physical factors (environmental and anthropological constraints), the wind resource distribution and the technical specifications of the large-scale wind turbines.

• **Photographic simulations** – illustrate landscape changes by using simulations. This can omit parts of the wind project that would, in real life, be seen' or that occluding or mitigating objects such as trees may be simulated but not actually present. The system can help in decreasing the NIMBY (Not In My Backyard) phenomenon.

5. Conclusions

The Romanian renewable energy market is still in an emerging stage. In this context, this paper analyzed the main strategic policy measures to encourage investments. In the first chapter, based on a literature review, several general hypotheses regarding the factors that could ensure the success of a renewable project developer have been issued. The third chapter focused its attention on the experiences of several European countries in the field of the energy mix renewal. Based on this information, different strategic policy leverages, that can be used by policy makers in order to support the renewable chain development and their acceptability degree for potential investors have been analyzed in the fourth chapter. The qualitative

suggestions that have been made may encourage investments in the Romanian renewable energy sector.

Renewables are inevitably associated with major costs such as production capacity, interconnection, transport and storage. The Romanian government's capacity to support the renewable energy development alone is limited: a large part of this effort will therefore be passed in the kWh price paid by the end-consumer. Or, in the current situation, the real priority of the Romanian consumer is more the economic considerations and less the general interest and fight against climate change. The relative cost of implementation of new technologies compared to the classic ones should therefore be an essential input in the decision to invest. Its level is a major acceptability factor of renewables.

In Romania the acceptability of certain technological developments is not insured, which means a focus of government measures on those factors that allow attracting foreign investors in the best efficiency conditions. Beyond this efficiency aspect, the Romanian government must take into account the fundamental considerations of a technical, but also socio-economical feasible energy mix. Such a mix requires meeting several criteria: environmental preservation, supply security and competitiveness, and flexibility.

The validity of the present research results is limited by the small number of companies participating in the survey, as well as by the EnR specificities. Therefore, in order to generalize such results, future researches should make a large scale study by systematically involve the majority of companies active in the European renewable energy sector.

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