GOOD PROSPECTS FOR GREEN ENERGY IN ROMANIA

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Abstract

EU has to attain the strategic objectives for 2020: 20% of energy from renewable sources, cutting the emissions of greenhouse gases by 20% and diminishing the dependence on imported fuels, that is why in the last years European Commission has decided that MS should increase the flexibility of programs to promote green energy and cut subsidies. Although wind and solar energy have become more competitive in terms of cost in the last two decades, many production technologies need to be improved, also storage and transport capacities.

Romania has an important potential of renewable energy resources and has introduced a functional mechanism for supporting their development based on a system of mandatory quotas for electricity, combined with trading a number of green certificates, but all the costs are transferred to the consumers.This system may carry an overcompensation for the investors and also an excessive burden on the consumers. Most investments were made in wind and hydro, the fewest in solar and biomass. Market liberalization may create more competition and stimulate the investments in different renewable resources.

Keywords: *green, renewable, resource, certificate, wind, solar, biomass, hydro, market, liberalization, competition*

JEL Classification: D18, D 43, D 47, L11-13, L 52, L94-95, Q42, Q53

Introduction

The article covers the recent aspects of EU and Romania's policies and developments in the field of green energy. The importance of this subject is related to the implementation of sustainable development concept, energy security concept and the provisions of international agreeements and protocols for environment protection. Green energy is a key factor for increasing the security of energy supply and for decreasing the emissions of greenhouse gases. Development of green or renewable energy resources allows the diversification of energy supply and the reduction of excessive dependence on gas, coal and crude oil, for EU countries, implicity for Romania. The article reflects the content of EU official documents and also the numerous opinions already existing in the foreign and Romanian specialized literature.

1. Recent developments of green energy in EU

EU countries are highly dependent on imports of fossil fuels (especially oil and gas) to cover the fuel needs for the transport and also for electricity. In fact, EU relies on energy imports for

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about half of the energy consumed. Moreover, fossil fuels account for a share of 79% of the gross energy consumption within EU.

The current EU primary energy consumption dominated by fossil fuels generates greenhouse gases during the combustion cycle to produce secondary energy. Instead, during their life cycle green energy resources do not emit greenhouse gases or only small amounts of them. The growth of their share in the energy mix will help to reduce the emissions of greenhouse gases and also the so-called "*carbon imprint"* of the Western European economies. A share of 20% of energy from renewable resources could lead to emissions reduced by 600-900 Mt CO2 by 2020.

EU already benefits from an increased range of available fuels for producing secondary energy and also by more supply sources and suppliers. Such diversity restrains the risks of supply reductions and price volatility and encourages the consumption efficiency by increasing competition within energy sector. A share of 20% of energy from renewable sources could cut the EU imports of fossil fuels and could bring about lower emissions by 200 Mt per year in 2020.

In addition, at a time of economic uncertainty, the industry of renewable technologies remains on an upward trend, providing jobs, development of new technologies and contributing, ultimately, for preserving the EU at the forefront of industrial innovation worldwide.

Green energy has also an enormous potential for stimulating EU industrial competitiveness. Development of new sources of low carbon energy is essential to avoid massive costs of climate changes and pollution, while maintaining the EU at the technological vanguard is crucial to the future of its economy.

Development on industrial-scale of very modern technologies for the production of renewable energy brings added value, new green jobs and strengthens EU position in industrial field. European companies dominate now the green energy sector worldwide, with a workforce comprising 1.5 million people and a turnover of over 50 billion €. Having a lasting strong growth, this sector could offer one million jobs more and a double or even triple turnover in 2020.

The European Commission has regulated the development of renewable sources, in this respect two of the most important documents are: *Directive 2009/28/EC on the promotion of renewables* and *Roadmap for Renewable Energy - Renewable Energies in the XXI century: building a more sustainable future* . They established mandatory national targets for the Member States for 2020, by stipulating a share of 20% of renewables in total energy consumption and a share of 10% of renewables in transport fuel consumption.

In its 2012 analysis, "*Renewable energy: a major presence on the European energy market*" on the stage of development of renewable energy in the EU (COM (2012) 271 final), the European Commission noted that, in recent years, renewable energy sources have developed at a pace faster than expected, driven by the economies of scale and technological progress. Accordingly, the EU has decided that member countries should increase the flexibility of programs to promote green energy and cut subsidies, as technology has developed rapidly, and prices fell to a large extent**.** In the above mentioned Communication (COM (2012) 271 final), European Commission has insisted on the idea that the fields and mature technologies that will operate on functioning markets will not need subsidies, but only reforms of aid schemes, for achieving the set objectives at minimum cost.

Despite the traditional perception, there is more and more evidence attesting that at global level renewable resources are not too far to become a viable alternative at affordable prices for fossil fuels. In many countries, land wind energy and photovoltaic solar panels are already on the verge to compete with coal and gas. In fact, in 2012, investments in

renewable energy (excluding hydropower) have surpassed those for fossil fuels, which indicates a deep change of direction to a global economy based on clean energy.

At global level the investments made in power generation capacities of green energy reached a record of 260 billion $ in 2011, according to Bloomberg New Energy Finance, 5% higher than in 2010 and nearly five times higher than in 2004. Surprisingly, in 2011, USA were the first in the top of investors in renewable energies with almost 56 billion $, followed by China, with about 47 billion $. But the boom of renewable energy is a global phenomenon. In the same year, in the South and Central America investments increased by 39% (13 billion$), in India by 25% (4 billion $), and in Middle East and Africa by 104% (5 billion $).

The factor that seems to motivate the investors is that wind and solar energy have become more competitive in terms of cost, compared with coal and gas**.** Thus, the unit cost of wind energy has dropped by 50% over the past 15 years, and wind turbine capacity has increased 10 times. Also, the solar systems for producing photovoltaic energy are currently over 60% cheaper than in 1990.

However, many technologies for renewable energies need to be improved in order to contribute to the yields increase and cutting the costs. The main investment areas considered are wind energy, concentrated solar power and biofuels of second and third generation. It is also necessary the improvement of existing technologies for the purposes of increasing the size of offshore wind turbines, by resizing the blades to capture more wind energy, and improving photovoltaic panels to collect more solar energy. Storage technologies have a major and critical importance. Storage activity is currently more expensive than additional transport capacity, and conventional storage of hydropower energy is quite limited.

Although current legislative framework of EU on renewable energies seems appropriate, its main instrument - binding targets - expires in 2020, and ***Directive 2009/28/EC on renewable energy*** asks to the European Commission to submit a new *"roadmap"* for renewable energies just in 2018, taking into account the state of technological development and experience gained after the application of the Directive. For the post-2020 period the only quantitative benchmark established at EU level is a very ambitious objective of 45% renewable energy share in the total energy consumption by 2030, which is quite unrealistic in our opinion because it requires huge investments.

2. Development and prospects of green energy in Romania

Renewable energy in Romania has been developed at a fast pace, in line with the objectives and targets set by the EU and objectives of our national energy strategy.
This development was supported by the following favoring factors:

1) Important and diversified potential of the renewable energy sources: *hydroenergic*, technical arranged at approximately 32,000 GWh/year, providing more than a third (35.7%) of the country's electricity production, *wind* , installed capacity of 14,000 MW (17% of total) *photo voltaic (*12% of total*), biomass (agricultural and forest origin)* representing 7% of primary energy demand.

2) Improvement of the legislative framework, which considerably increased the interest in this type of investment. Based on the favorable opinion given by the European Commission, it was adopted Goverment Emergency Ordinance no. 88/2011, amending and supplementing Law no. 220/2008 , to make the Commission's support measures compatible with our legislation. This Ordinance may be considered the unlock signal for green energy projects, fundings and transactions designed to support Romania's efforts to achieve, by 2020, the renewable energy targets.

3) Introducing a functional mechanism in supporting the renewable energy development. Renewable energy is supported in Romania by a 10 billion euro scheme, implemented through a *system of mandatory quotas for electricity, combined with trading a number of green certificate**s.*** The supporting mechanism works as follows: the producers of electricity from renewable sources may sell the electricity to suppliers (distributors) of electricity, under the same conditions as any other producer of electricity but in order to cover the production costs, per MWh delivered in the network, they additionally receive a certain number of green certificates depending on the technology used and the type of energy promoted.

In Romania, most investments were made in wind and hydro, the fewest in solar and biomass. Wind power lies the first, as a share of all projects in progress (40% according to the IHA Annual Activity Report), *hydropower* (in the hedged incomplete segment of microhydro plants) holds 39%, *biomass* 16%, *solar energy* 5%. According to an ANRE report, in 2010 Romania registered 65 manufacturers licensed in renewable energy, of which 32 in hydropower, 28 in wind power, 3 in biomass recovery and one in photovoltaic energy with an installed capacity of 520.4 MW. Such economic operators had produced 20.264 TWh, representing 35.24% of the total gross electricity consumption of Romania. For the year 2012 it was planned to reach an installed capacity of min. 2000 MW, of which aprox.1400 MW wind energy.

The most advantageous internal rate of return was recorded at *solar, biomass and ferment gas,* i.e. the renewable energies where it was invested the least money. The lowest internal rate of return was recorded for old hydro-plants, because they were not retrofitted or included in the support scheme regulated by the Law no.220/2008.

Most of the amount of green electricity is generated by large hydropower plants, but there is still a high potential that may be harnessed by micro hydropower plants**.** Article 3 of the Law no.220/2008 sets that the system to promote electricity, produced from renewable energy sources, is applied to electricity supplied to consumers and produced in hydropower plants with an installed capacity of up to 10 MW, as far as wind energy, solar, geothermal, biomass, bioliquids, biogas, landfill gas, for which there is no upper limit capacity.

Therefore, the Romanian legislation favors, directly, the small renewable energy production capacity, in the case of hydro, while for the rest of renewable energies there is no restrictions on capacity size. This aspect influences the investments in the segment of small hydro plants, which are unlimited in other green energies.

Although it was confirmed that wind power is the first choice of investors in Romania, with more than 1,600 MW put into operation (according to data published by Transelectrica, in 15 November, 2012), in the last time solar energy has become the main actor on the Romanian market for renewable energies. ***Photovoltaic projects*** *tend to overtake on the* ***wind projects,*** *due to several factors/comparative advantages: shorter periods for the return of investment, about 5 years compared with 8 years; the support scheme provided by the State, under which for one MWh of generated electricity based on solar radiation are allocated 6 green certificates, while for each MWh produced and delivered by the wind producers, shall be allocated only 2 certificates until 2017, and one certificate from 2018; considerably lower specific investment costs as compared to the wind, including the lack of moving parts; limited negative impact on biosystem as against wind energy, high reliability over a period that may exceed 25 years; solar panels may provide both electricity to remote areas and in cities where they are easily mounted on any structure, occupying areas that usually are not used.*

For Romania, turning into good use of the high potential of renewable energies is meant to increase the security of energy supply through diversification and decrease of imports of classic energy resources, aiming at a sustainable development of the energy sector and also at environmental protection**.** Reducing dependence on imported energy is a a very

important goal as the strategic documents in the field (including the *Energy Strategy of Romania from 2010 to 2035)* have advanced the prospect of an increased dependence on energy imports from about 35-40% today to 60-70% in the medium term, given that the structure and dynamics of current consumption will remain unchanged.

The shale gas and the new gas resources from the Black Sea are not yet taken into account in this Strategy, because these discoveries are of recent date and their dimension and status need to be confirmed, especially in case of shale gas or negotiated in that of the Black Sea gas (licensed mostly to OMV company).

To achieve this strategic goal, the market of renewable energy sources is supported in Romania through direct state intervention on the supply side. The state supports the promotion of renewable energy by means of support mechanisms such as green certificates, but it does not finance this market: all the costs are transferred to the consumers. This kind of interventionism cannot be included in the usual forms of state aid, because it does not involve public money, although the competition is heavily distorted because the regulatory framework favors some producers at the expense of others. This kind of interventionism that combines the incentive on the supply side with the constrain element on the demand side applies in all other EU countries, the only difference is made of specific financial instruments used by every country. A support mechanism similar to that used in Romania is encountered in Italy, Poland, UK, Sweden, Belgium. Most EU countries have adopted, however, the mechanism of "feed in tariffs" (fixed price system for renewable energies).

According to calculations made by the National Regulatory Authority for Energy (ANRE), electricity consumers in Romania will pay in addition 10 billion euro to their bills until 2020 in order to support investments in renewable energy**.** Green certificate support scheme will be applied until 2021. The greatest impact, according to ANRE, will be felt in 2016-2017, when the consumers could pay for energy bills up to 30% more.

The diversification of support scheme by providing a number of green certificates differentiated by types of sources, under GEO no.88/2011, has favored a very rapid development of wind projects, generating significant profits for the foreign investors in this industry (given that domestic investors have neither the necessary capital for investments nor the modern needed technology) and very high costs for the Romanian consumers.

The large number of green certificates allocated mainly to wind and solar energy was established by the legislative body (the Parliament) in a desire to encourage their development. But the criteria were alleatory, allocation not being made on a cost-benefit analysis. This has resulted in adverse situations:

- ***an overcompensation for the investors,*** although it has been shown that in recent years, costs have perceptible fallen for the 2 sources;
- ***an excessive burden on the consumers.*** In Romania green energy proved to be the most expensive one within EU: in 2011 a producer has sold 1 MWh of wind electricity with 137 euro in Romania, while in France the same megawatt cost only 88 euro.

Green energy subsidies may distort the market because they are too high in relation to the cost of the technologies that have been reduced to less than half in the recent years. Authorities have assimilated with some delay this message, announcing the intention to diminish the aid scheme for energy from solar sources. Most likely, from January 1, 2013, the number of green certificates was supposed to decrease from 6 to 4 for each MW, produced from solar sources and delivered in the system. The reason is, as already mentioned, that the photovoltaic industry has greatly expanded, leading to a dramatic decrease of production costs.

Therefore, although legislation sanctiones (post factum) the cases of overcompensation, it is recommended that the promotion of green energies to be made on the basis of an (ante-factum) cost-benefit analysis and through the more rapid adjustment

mechanisms in the number of green certificates, so as to avoid inflation of projects with high costs for households and the achievment of quick profits for investors. In other words, for Romania will matter at what costs will be able to achieve the targets set by the EU regarding the share of renewable energy in total energy consumption.

Development of various technologies in relation to the used source has a different impact on the environment. If solar energy poses no major environmental problems, instead it has a high production cost and a high rate of deppreciation. Energy from other sources has a lower cost but a higher environmental impact. Under these conditions, building the renewable energy market must take into account not only the exploitable source but also the externalities arising from the technology used, the application of investment (site, intervention procedures) and the operation mode in the future (economic and social impact).

Market liberalization creates competition and stimulates the investment of some kind at the expense of others and benefits domestic market or foreign market**.** The market liberalization also allows the export of electricity from renewable resource.

Producers of electricity from green enegies should be given a priority access to the network in order to be able to distribute and sell the product obtained from renewable resources. Under these conditions, the physical connection is very important and also the price paid for the access to the distribution system. For Romania, it is absolutely necessary to increase current capacity of the National Transit System to takeover the electricity from renewable sources, which is currently well below the productive potential, and under the European Directive on Renewables it may be required to engage in this field the investors in green energy. Renewable energy producers generally sell electricity directly to the distribution system, thus avoiding high voltage transmission systems. Consequently, the cost of electricity supplied by these producers may decline compared with the energy obtained in traditional power plants. Such an economic advantage should be taken into account when the network tariff is established.

Most of the electricity generating plants based on renewable resources are much smaller in size than traditional power plants**.** However, in most EU countries the imposed regulations did not take into account any type of resources used or the size of the producers. In some cases, renewable resources require planning and management activities much more laborious than those for conventional plants. *The Revised Directive on Electricity Market attempts to correct this situation requiring to the Member States to ensure that authorization procedures for small plants will take into account the limited size and the potential impact.* Similarly, Directive on renewables requires expeditious procedures and their simplification at the authorities level ***(Application Guide*** for potential investors in green energy from Romania is a comprehensive document and quite unclear, which helps the perpetuation of bureaucratic procedures and leads to a slow and reduced absorption of European funds).

Romania promoted a financial support scheme seen as too generous for the development of the renewable energies.. The scheme has been very profitable to all foreign investors who wanted to recover quickly the investment (e.g. in seven years) founding a favorable ground in Romania, while in Germany the return of investment period reaches 15-20 years. Although in Romania there have been made major investments, the state has failed to win a lot from the billions invested in green energy, excluding VAT. Moreover, the boom in wind power put into great difficulty the operation of coal or gas plants. There were made some steps in the design, construction, roads and so on, but nothing has been done in the field of equipment. Lack of predictability in promoting some projects led to an immeasurably proliferation of wind parks A planning in due time would have helped the appearance of turbine and solar panels manufacturers in Romania.

Moreover, it was found that there is overcompensation in the fields of wind, photovoltaic, hydro or biomass energies. At least this is the opinion of some official

representatives and consumers. If, at the time of drafting legislation to promote green energy, installing a megawatt from photovoltaic sources had a cost of 4.5 - 5 million euro in some European countries, now the cost fell below one million euro per megawatt.

Although the legislation stipulates that the internal rate of return (IRR) for solar parks is 11.6%, for the wind generators 10.9% and for new small hydropower plants 10.2%, some projects presented to ANRE had an IRR of 25%- 27%. At such a rate, we may say that production of renewable energy reached a speculative area. If the IRR exceeds 10% level, indicated by the specific domestic legislation, it is obvious an overcompensation situation, and ANRE may propose to Romanian Government the reduction of the number of green certificates. Under these circumstances, the authorities have decided to reduce the subsidy scheme for energy renewable resources. Legislation for restraining the support scheme is almost completed and it will be reduced the number of certificates for the green energies that benefited from overcompensation: wind, biomass, hydro and photovoltaic.

Some experts have identified several measures that could preserve green energy sector attractive for foreign and domestic investors, even if the support scheme is reduced significantly.

1) Firstly the state should have in mind an increase of Transelectrica capacity to be able to take over the production of these parks, although experts consider that it cannot take more than 3,000 MW while currently there are just over 2,000 MW installed of green energy.

2) Secondly, Romania may sell green energy in countries where there is a strong demand, like Germany who recently announced the intention to give up nuclear power. Romanian Government may start negotiations with German Government in this regard.

3) Thirdly, another solution would be to make a statistical exchange of green certificates under a legislation similar to that existing for carbon emission certificates. Netherlands is one of the states that can not fulfill its quota.

4) Fourthly Romania should avoid the mistakes made by other states, such as Spain and the Czech Republic, and should limit the subsidies for renewable energy producers in order to slow down the price increases in electricity.

Currently, there is a fierce fight between investors in renewable energy on the one hand and consumers and public authorities on the other hand. Basically, one must be ensured a formula for harmonizing the interests of both sides and for providing a balance between sustainability of investment costs and the supportability of costs by consumers.

Romanian authorities have finally realized that the law on granting green certificates should be amended, mainly to provide opportunities for the most important Romanian power producers, which should not be sacrificed for the sake of renewable industry. On one hand there are the households who support the electricity bill, on the other hand there are industrial consumers, which in turn cannot bear anymore the high cost of green certificates included in the final product costs.

In addition, the industry of renewable energy will not be monitored once a year by ANRE, but every half a year, according to a legal order issued by the regulator. Thus it is created such a legal framework that the subsidy granted by Romanian state (and ultimately by every consumer) to be adjusted in the second half of this year.

Conclusions

Future energy system with low emissions of greenhouse gases, will be based, most likely, on a combination of energies, vectors of energy converters, which will be found in different forms in different regions of the world. Several major trends of our energy future could be as follows:

● Energies based on fossil fuels will continue to be used many decades, being favored low-carbon energies such as natural gas. Dependence on imports from Middle Eastern

countries, which hold 65% of current oil reserves will increase. After 2020-2030 years, economic and political tensions could lead to a reduction of fossil resources easy to exploit and to a shift to politically unstable areas, which may harm the security of supply of EU countries and not only of them.

● Capturing and stocking carbon dioxide under economically acceptable technology is the only option likely to allow the use of fossil resources, while limiting CO_2 concentration in the atmosphere, in anticipation of major technological advances.

● Increasing the share of renewable energies is quite sure and almost indispensable, but their importance will depend on the cost reduction and progress in improving existing technologies in the sense of increasing the size of offshore wind turbines, resizing the blades to capture more wind energy, enhancing photovoltaic panels to collect more solar energy and especially creating massive storage capacities of electricity, which is a prerequisite for integration into electric networks of large amounts of electrical energy produced and distributed discontinuously.

● Romania ranks a high place on the EU energy map and has a significant potential in developing the renewable energies. In 2012, Romania imported only 21% of primary energy resources in order to cover their consumption, which places us among the least dependent MS on energy imports. The rate of EU dependency on energy imports was 54% in 2011.

● Romanian legislation favors, directly, the investments and energy production from renewable sources, like wind, solar, biomass, without capacity restrictions and only in small capacities in the hydro case.

● Eolian energy is the first choice of investors in Romania, with more than 1,600 MW put into operation, but lately, solar energy is becoming the main actor on the Romanian renewable energy market.

● The state supports the promotion of renewable energies by support mechanisms such as green certificates, but does not finance this market: all costs are passed on to the customers. The large number of green certificates allocated mainly to wind and solar energies was established by the Parliament in a desire to encourage their development, but the result was an overcompensation for the investors, although the production costs have emphasized fallen for both sources, also leading to high losses for the consumers, raising up the costs of green energy in Romania.

● It is also advisable that the promotion of green energy to be made on the basis of a (ante-factum) cost-benefit analysis and by faster adjustment mechanisms in the number of green certificates so as to avoid the inflation of projects with high costs for households and quick profits for investors. Achieving the targets set by the EU regarding the share of renewable energy in the total energy consumption may involve high costs for consumers. Although on short term, we are witnessing an increase in energy prices due to increased costs required to purchase annual "green certificates", on medium and long term investments in renewable energy will bring major benefits by eliminating the excessive dependence on conventional resources, reducing CO_2 emissions and increasing the safety in power supply to industrial consumers and households, diversification of energy production sources and beneficial social impact from the development of rural areas where wind plants are built .

● Within the European Union, the European Commission proposed the freeze at current levels of the consumption of biofuels from agricultural crops, which would have the effect of halving the target of 10% set for 2020, relying on the idea that the reduction of emissions in the case of some biofuels offers limited benefits compared to conventional gasoline, and the energy efficiency is only slightly higher than the energy used to produce them. Romania has about 3 million hectares, non-cultivated for 20 years, which are in various stages of decay, but if the farmers will have financial support for the establishment of crop species of forestry with short rotation cycle (up to 5 years) they may contribute to renewable

energy in the form of biomass. Further, after a minimum processing, the biogas, resulting from biomass, may be inserted into the natural gas distribution networks and may be used to produce electricity and heat. Biogas plants may be used also for balancing the electricity system, by compensating the supply disruptions of wind and solar power, dependent on weather factors. Romania has enough uncultivated arable land that may be exploited by cultivating the crops which are raw materials for obtaining the biofuels by means of providing incentives to farmers to grow energy plants (in line with the EU practices) and by providing incentives for collecting the agricultural wastes and also the forest wastes. This should not result in a shortage of agricultural products and foods or in an increase of their prices. Another important source for biogas may be created by means of collecting the organic household wastes and using them in biogas reactors.

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