THE INFLUENCE OF GREEN CERTIFICATE SYSTEM OVER THE ELECTRICAL ENERGY MARKET

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Abstract

Electricity market liberalization determined specific competition which may lead to irreversible environmental degradation if environmental costs insourcing fails. Therefore, the creation of an internal electricity market was supported by legal requirements and standards passed at European level designed to integrate environmental issues into market mechanisms. Thus, we witnessed the passing of regulations promoting "clean" electricity production, which used renewable energy sources. Green certificates are issued for this type of energy, which entitle producers to sell them to suppliers that do not reach the set quota in their own production process. The main purpose of these certificates is to stimulate green energy production, whereas the green certificate transaction system focuses on two aspects. Firstly, it checks whether demand is met or, when there is no demand, it measures the amount of electricity coming from renewable sources. Secondly, it enhances trade by creating a specific market where green certificates are sold and bought and which functions in parallel with the traditional electricity market. The goal of the European Union is that by 2020 20% of the energy consumption in the EC countries be provided by renewable sources. Thus, the EU countries implemented a set of measures meant to encourage investment in renewable energy sources. In Romania, the renewable sources energy promotion system applies to electricity generated by wind energy, solar energy, geothermal energy, biomass, waste and wastewater treatment sludge fermentation gas, as well as electricity produced by hydroelectric power plants with generating station capacity below 10 MW. Our research dwells on an analysis of the Romanian transaction system of marketable green certificates and on the way these transactions are recorded in the annual books of accounts.

Key words green certificate, green energy, sustainable development

The traditional economic development was aiming at maximizing profit and meeting human necessities, yet it overused environmental material and energy resources and it overburdened nature as a receiver of waste and polluting emissions. From this perspective, a reconciliation between humans and nature is required, and the use of renewable electrical energy sources becomes more and more important.

The European Union is aiming that until 2020, 20% of the member states energy consumption should be provided by renewable energy. For that purpose the EU states applied certain measures for stimulating investments in renewable energy. In the UK, for instance, subsidies are provided to citizens as well as to companies that install solar panels. Solar energy was also partially subsidized by Greece, Sweden and Spain until 2012. In Germany, wind energy is one of the chief renewable energy sources, recording a 29,060 MW per year production. The second place is held by Spain, with 21,674 MW, followed by France, Italy, the UK, and Portugal. Beginning with 2011, Romania has emerged on the alternative energy market, reaching the European top 10 in wind energy, due to a 520 MW installed power [GWCE, 2011].

MATERIALS AND METHODS

The present paperwork is the outcome of an approach of investigation various regulations regarding the electrical energy generation by means of renewable sources (RES-E). In this sense, we've been focusing on EU level regulations and their specific implementation in Romania. We analyzed the system adopted by our country and the method of issuing and trading green certificates. Thus, we checked the websites of different institutions responsible, ANRE and OPCOM, analyzing the evolution of the RES-E market throughout the period 2005-2010.

RESULTS AND DISCUSSIONS

For the purpose of encouraging the use of renewable energy sources for generating electrical energy, the EU has issued the directives 2001/77/CE and 2003/30/CE, modified by the 2009/28/CE directive, which states that until 2020, 20% of the energy utilized at community level

should be generated by renewable sources (24% for Romania), whereas the prevalence of bio-fuel by using gasoline and diesel fuel in transpiration should be only 10%. These objectives are correlated to commitments by EU member states of reducing green house effect gas emissions, commitments made by signing the Kyoto Protocol [Directive 2009/28/CE]. Romania applied the EU directives to its national legislation and committed that until 2015, the percentage of renewable energy should be 35% of its final gross electrical energy consumption, and 38% until 2020 [by-law 139/2010]. Fig. 1 illustrates the proportion of RES-E at the EU level for the interval 2006-2010.

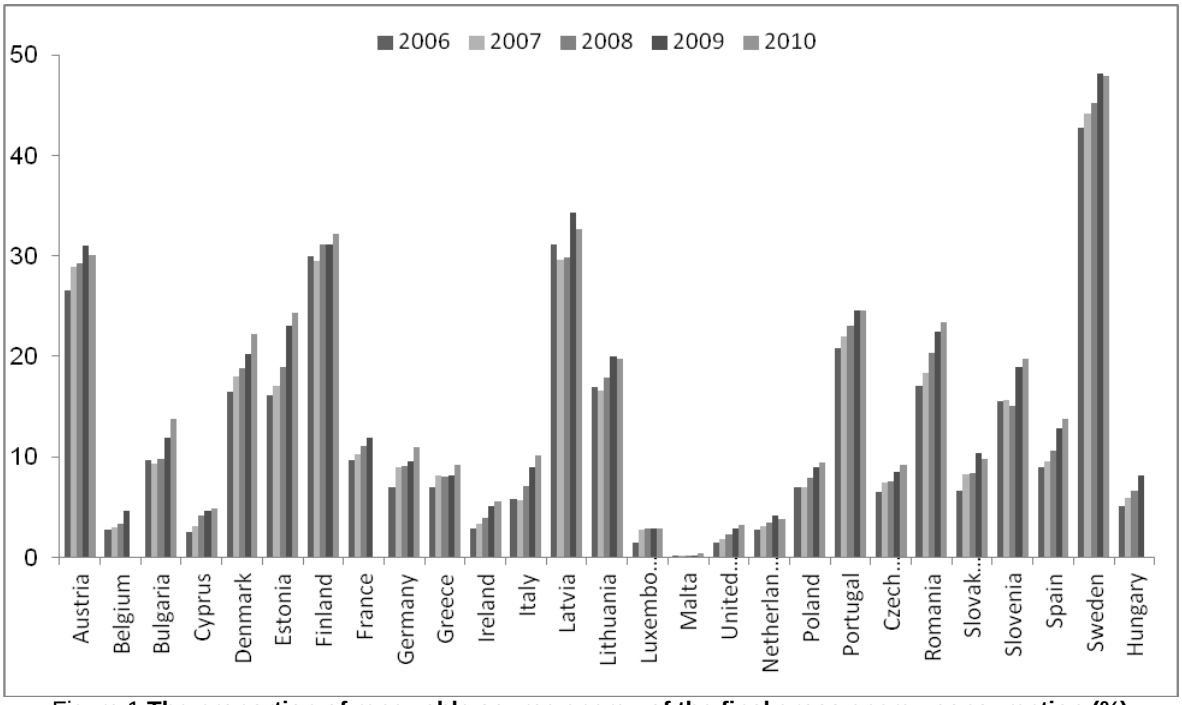

Figure 1 **The proportion of renewable source energy of the final gross energy consumption (%)**
Source: Eurostat, 2010

Romania's present regulations are in accordance with the point of view expressed by EURELECTRIC, which advocates the trading of green certificates (Green Certificate- GC)- is a document that certifies the generation of a certain quantity of electrical energy from renewable sources). These documents are being issued monthly by the transportation and system operator-OPCOM - for the quantity of renewable energy generated and delivered to the electrical grid. The green certificates are being issued in electronic format and are tradable, the producer being allowed to sell them for extra money beside the income generated by selling the electrical energy on the market. In the report issued by EURELECTRIC for 2011 is emphasized that in 1980 the renewable energy was representing 22.2% (the largest prevalence being hydropower), whereas in 2010 31.5%.

Also, in 2001, at the initiative taken by large energy companies, an international organization was created for the purpose of establishing a unified framework in regard to energy generated by renewable sources RECS (Renewable Energy Certificate System). That organization's objective was creating a harmonized green energy market, which is already operational in 16 EU member states. Romania has not yet joined this organization.

We derived from the analysis that at the EU level more support instruments are being exerted for stimulation renewable energy production (Table 1).

Table 1.

Instruments for renewable energy in the EU 27

	FIT	Quota obligation	Premium	Investment grants	Tax exemptions	Fiscal Incentives
Austria	x					
Belgium	x	x		x	x	
Bulgaria	x					X
Cyprus	x			x		
Denmark			x			

Estonia	x		x			X
Finland				x	x	
France	x					
Germany	x					X
Greece	x			x	x	
Ireland	x					
Italy	x	x				
Latvia	x			x	x	
Lithuania	x			x		
Luxembourg	x			x		
Malta	x			x		X
Netherlands			x		x	X
Poland		x			x	X
Portugal	x					
Czech Republic	x		x	x		
Romania		x				
Slovak Republic	x				x	
Slovenia	x		x			X
Spain	x		x		x	
Sweden		x			x	
Hungary	x			x		
United Kingdom	x	x			x	

Source: Ecofys, 2011

Yet, the most utilized schemes for promoting renewable energy sources are (Ford A. and al., 2007):

- *the fixed price system* (feed-in tariff), which means the acquisition by the producers, suppliers or consumers, of renewable energy at a fixed price, whose rate is established according to the source of the renewable energy in use;
- *the mandatory annual quota system*, combined with the *green certificates system.* For this system, governments set the renewable energy quota that is to be purchased by producers, suppliers or consumers, whereas the price is set by the market. Romania adopted this system as well.

The system of promoting the use of renewable energy adopted by Romania is being used for both electrical energy produced by wind power, solar power, geothermal energy, biomass, gas produced by fermenting waste and mud in wastewater treatment facilities, as well as energy produced by hydropower of installed power of 10 MW at most.

For every MW generated by renewable sources and delivered to the electrical grid a certain number of green certificates is granted, as follows:

- Hydropower of an installed power of 10 MW at most; 3 green certificates for the newly constructed ones, set in operation after January 1st 2004, 2 green certificates for those upgraded on or after January 1st 2004, and 0.5 green certificates for those not yet upgraded.
- Wind power; 2 green certificates until 2017 and 1 green certificate until 2018;
- Geothermal, biomass, fermentation gas, 3 green certificates;
- Solar power, 6 green certificates.

Regarding the preponderance of renewable energy produced throughout 2010, 40,3% was hydropower, 43,2 % wind power, 16,6 % biomass, and 0,001% photovoltaic energy.

The green certificates market operates in Romania since August 2005, when the first green certificates were issued, whereas in November of the same year the first green certificates were traded on the centralized market. The renewable energy producers may sell the green certificates awarded for supplying energy to the electrical grid. These are being sold on the market and are not subject to trading the corresponding energy generated, therefore the green certificates are being traded thus:

- On a *bilateral market*, in which both the producers and the suppliers sign bilateral contracts and where the green certificates price is settled by open negotiation between the two contracting parties, and/or
- On a *centralized green certificates market*, organized and managed by the electrical energy market operator (OPCOM), in its role as the operator of green certificates market.

In 2010, every green certificate was offered and sold on the two markets aforementioned (ANRE, 2010):

- 39.06 % on the centralized green certificates market
- 59.61% on the bilateral (produces-suppliers) contracts market;
- 1.33% were transferred prom the producer's account into the supplier's account, for the same business operator,

that assumes both roles, that of producer, and that of supplier;

A certain green certificate may be the object of a single transaction and it is deemed "used" at the moment the supplier utilizing it for proving the completion of his own mandatory quota. The green certificate's trade value is established by competition mechanisms specific to the two markets , being subject to price limits stipulated by law (minimum- maximum price), which are in the range 27-55 €/GC. The minimum price is enforced for protecting the producers, whereas the maximum price is enforced for protecting the consumers.

The electrical energy suppliers are compelled to purchase a minimum number of green certificates annually, equal to multiplying the value of mandatory quota with the quantity of energy supplied annually to the final consumer. Failure to comply brings upon the supplier penalties of 110 €/GC, and license suspension until the full value of un-purchased green certificates is reimbursed. The evolution of renewable energy market price is shown in table 2.

Table 2

The evolution of renewable energy market price for the interval 2005-2010 (Euro)

	2005	2006	2007	2008	2009	2010
Green certificate	38	42	42	45,9	55	55
RES-E	36,42	37,45	39,55	35,8	31,15	31,35
Penalties	6,2	9,38	8,65	-	-	-
Total	80,62	88,83	90,2	81,7	86,15	86,35

Source: ANRE, 2010

At the end of each year ANRE decides, based on the purchased green certificates, each supplier's compliance with the mandatory energy quota purchase. The renewable electrical energy producers would be able to export green certificates for trading upon the green certificates European market, subject to the terms and conditions enforced by ANRE, provided that the local national objectives have been met. Until fulfilling the national requirements, the green certificates may only be traded on the local market.

The first green certificates were traded on the local market in November 2005, when 289 green certificates were traded, yet by December of the same year the transactions dropped to 56 GC. In 2010, 676,606 were traded on the green certificates market, the largest transaction being recorded in January (64,290), and the smallest transaction in February (2,154). The largest volume of transactions on the centralized market were recorded in 2012, namely 229,915 green certificates. The status of green certificates transactions for the interval November 2005- May 2012 on the centralized market is presented in fig. 2.

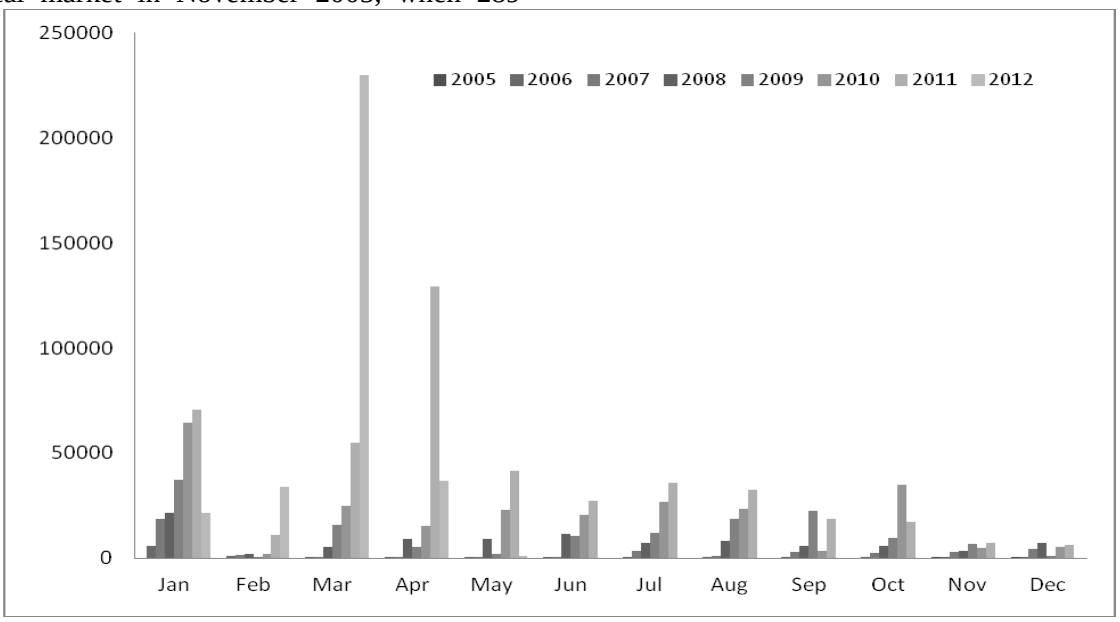

Figure 2 **Certificates traded by OPCOM in the interval November 2005- May 2012**

Source**:** OPCOM, 2012

The report published by ANRE for the year 2010 emphasizes that each supplier was required to purchase one green certificate for every 65 MW of energy supplied (Fig. 3).

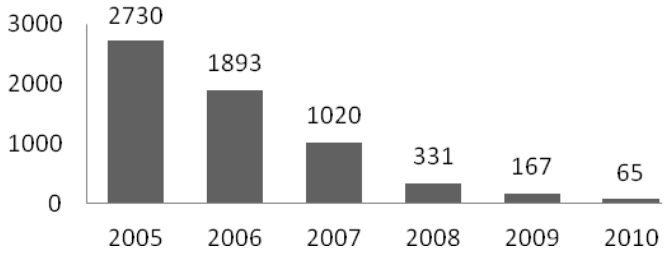

Figure 3 **The evolution of the minimum quantity of renewable energy produced for which the supplier is required to purchase one green certificate**

Source: ANRE, 2010

The increase in prevalence of electrical energy generated by renewable sources contributes to the reduction in CO_2 emissions (fig. 4).

Throughout the period 2005-2010 Romania succeeded in attaining its objectives merely in the years 2005 and 2010 (Table 3).

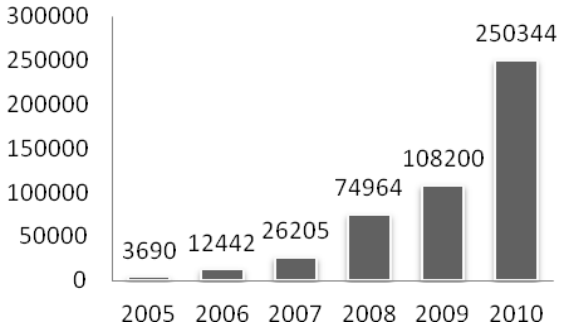

Figure 4 **The evolution of CO_2 emissions avoided corresponding to the renewable energy production advertised via green certificates throughout the period 2005-2010**

Source: ANRE, 2010

Table 3

The prevalence of renewable energy within the gross internal consumption (%) and target achieving i

	2005	2006	2007	2008	2009	2010
The prevalence of renewable energy within the gross internal consumption (%)	35,8	31,6	27,3	28,3	27,9	35,2
The degree of achieving the target (%)	108	96	83	86	85	107

Source: ANRE, 2010

By analyzing the data supplied by the ANRE, we noticed that in regard of achieving the targets set for the evolution of renewable energy production, the growth wasn't constant. When the trading of green certificates began, back in 2005, the target was met, in the following four years, however, the evolution was fluctuating, the lowest value being recorded in 2007. In 2010, the production of renewable energy increased due to investments in wind energy, therefore the target for that year was met.

CONCLUSIONS

By the liberalization of electrical energy market, competition was created, therefore, unless an internal evaluation of the impact on the environment is being made, there's the risk irreversible consequences over the environment. Therefore, alongside the creation of an internal electrical energy market, the European legislation issued regulations aiming at integrating environmental issues and market mechanisms. Thus, regulations were issued for the purpose of promoting clean energy production, CO_2 emissions-free, by applying the Kyoto agreement stipulations, and for reducing the fossil-fuel based energy production. Companies that produce electrical energy from renewable sources are being granted green certificates. The system mainly encourages policies of avoiding the total depletion of conventional energy sources and the reduction in CO_2 emissions.

These certificates are also used for stimulating investments in renewable energy, the demand being created by requirements enforced and by the fines established, so the price of these certificates should be stable and high enough, so as

to attract investors. Romania has succeeded so far in developing the trading of green certificates, merely on its internal market, though. So far these certificates have not been traded on the European market, being solely utilized for reaching the goals assumed. Throughout the period monitored, according to data from ANRE for 2005-2010, the targets were met solely in 2005 and 2010. In the past few years, a market boom was recorded, more and more investments being made. Thus, in 2011, Romania entered the European top 10 wind energy producers. At the same time, renewable energy sources help prevent energy imports, as well as they provide increased safety in energy supply.

AKNWOLEDGEMENT

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