

# THE ROLE OF GREEN CERTIFICATES IN BUILDING A SUSTAINABLE ENERGY FUTURE

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## Abstract

*The purpose of this paper is to harness green certificates that represent an additional gain gained by renewable energy producers and delivered to the grid to achieve a desirable outcome in the energy future. In this paper we start from the meaning of green certificates and we end up creating the analysis of the evolution of the green certificate market in Romania, but also seen from a European point of view. Descriptive analysis has been used to carry out this research in order to delineate a number of concepts, such as the importance, the role of green certificates trading and their evolution using the historical method. The historical method was used through the evolution of the number of green certificates traded and their price on the market. The main results are the slight increases in the annual mandatory green certificates purchase quota, which can demonstrate the profitability of a good trading of these certificates on the market, since the market demand for certificates is high, the number of trades increases thus determining the price due to the demand. The state provides green certificates to electricity producers, support schemes from which they can benefit and promote renewable energy on the Romanian market.*

**Keywords:** green certificates, renewable sources, trading green certificate, green energy

## Introduction

According to the legal definition, the green certificate is a document certifying the production of a quantity of electricity from renewable energy sources (LAW no. 220 of 27 October 2008 on the establishment of a system to promote the production of energy from renewable energy sources). In practice, green certificates are intangible assets granted by the state authorities to beneficiaries. The green certificate is one of the means of supporting and promoting the production of electricity from the following renewable energy sources: hydropower used in power plants with an installed capacity of up to 10 MW, wind power, solar power, geothermal energy, biomass, bioliquids, biogas, waste fermentation gas and sewage sludge fermentation gas.

This system, like any promotion system, is a tool, scheme or mechanism that promotes the use of renewable energy by reducing the cost of energy, by increasing the price at which it can be sold, by renewable energy obligations or the amount of renewable energy purchased. Thus, the Romanian state, through this system, not only provides evidence that electricity has been produced, but also offers these certificates the quality of marketable goods and a predefined value.

Romania entered the integration process when it became a member of the European Union on 1 January 2007. This process involves the gradual achievement of quality standards in all areas of economic and social life, as defined by EU legislation. In the energy sector, the objectives are very bold. At the same time, they are a necessity, the aim being to reduce Europe's dependence on energy resources from outside its borders.

The aim of these schemes is to gradually enable the development of new production technologies using renewable energy sources without public support. There are various market-based instruments used by EU Member State governments to support renewable energy power generation, and some countries have implemented a number of financial support schemes for heating and cooling as well. As a member of the EU, Romania has committed itself in its accession treaty to a series of targets for the share of green energy in

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electricity consumption by the end of 2020, and is therefore debating how the support scheme that promotes the use of renewable energy by reducing the costs of this energy adopted by Romania from all the models made available by the European Union.

The green certificates market is a separate market from the electricity market and operates on the basis of competitive mechanisms, respectively in terms of supply and demand for green certificates. The trading of green certificates takes place on the market of bilateral contracts and / or on the centralized market of green certificates in the period 2015-2017, and in the period 2017-2020 the trading takes place on the centralized anonymous spot market and the anonymous centralized market of green certificates between energy producers renewable energy and suppliers to final consumers of electricity.

### **1. Review of scientific literature**

On renewable energy sources in Europe, a common framework is aspired. Tradable green certificates are a cost-effective market-based means to stimulate electricity production from such sources. As tradable green certificates are the most widespread support scheme in Europe, together with feed-in tariffs, there is a chance that a common European framework could be based on them. (Verhaegen, Meeus, and Belmans, 2009) The authors, Li, Wang, state that, green certificate is the green attribute of renewable energy generation. They first analyze the context and key points of green certificate policy. They also study the implementation status and existing problems of green certificate transaction. The result of the assessment shows the volume of green certificate trading in the business area. (Li, Wang, Ye, Wang, and Hao, 2019)

Regarding the evolution of the support scheme for the quota obligation system of green certificates negotiable in Romania, the authors, Atănăsoae and Pentiu, analyze the profitability of the support scheme due to the reduction of the number of green certificates and the trading price of certified green certificates. The cost-benefit analysis takes place by comparing three situations: the situation at the beginning of the support scheme and the maximum selling price of green certificates; the situation at the beginning of the support scheme and the minimum selling price of green certificates; and the current situation after reducing the number of green certificates and the minimum selling price. (Atănăsoae and Pentiu, 2017) An analysis of the evolution of the support scheme for the promotion of renewable energy sources in Romania was performed by some authors who found that it can be composed as follows: mandatory annual quotas for the acquisition of the green certificate and those realized; the price of green certificates; the evolution of the installed capacity of renewable energy resources and implicitly of investments in renewable energy sources; the structure of the installed capacity in renewable energy resources and the contribution of renewable energy sources to the production of electricity in Romania. Investments in renewable sources are much higher than in fossil fuel technologies (Atănăsoae, Pentiu, Bobric and Hopulele, 2016).

Given the purpose of green certificates, it is said that it should introduce more renewable electricity into the energy market at the expense of traditional energy. And it states that a key feature of the scheme is that energy producers based on new renewable energy sources receive certificates from the authorities, commensurate with their production, so that green certificates can help reduce traditional energy production. (Raluca Sava, 2017) To investigate the impact of renewable energy schemes and tradable green certificates on competition in the wholesale electricity market, the authors propose a joint equilibrium model that considers the oligopolistic tradable green certificate market based on oligopolistic competition equilibrium theory. These strategic behaviors will increase the electricity market price and have negative effects on market efficiency (An, Zhao, 2015).

According to author Jianqing's findings, suggestions are proposed, expected to help the domestic smart health care industry practice green marketing and lead the public focus on environmental protection. The domestic government positively advises and encourages enterprises to become green enterprises.(Jianqing, 2021) One option to combat anthropogenic climate change is to increase the share of renewable electricity supply. The present authors defined and discussed a spot market for time-specific tradable renewable energy certificates. Implementation of this market promises a more credible supply of renewable energy, along with a mechanism that rewards flexibility in renewable generation and storage, as well as tangible investment signals.( Will, Jochem, & Fichtner, 2017 )

On an optimal strategy for green energy trading there are three important pillars: resident users (RUs), service providers (SPs) and the network. Resident users make decisions about the amount of green energy generated for self-use and trading. Service providers collect green energy from user residents and sell it on the market and receive subsidies from the network. In addition, an optimal network subsidy policy, optimal pricing strategies for service providers, and an optimal user utilization strategy are also provided at each stage. Both analytical and simulation results show that optimal decisions, such as the amount of green energy generated by resident users and the grid subsidy, are all decreasing functions of their average cost.(Wu, Zhuang, 2021)

Liberalization of markets under regulatory control requires new tools for environmental policy-making, as subsidies and regulatory intervention are not in line with liberalized transnational markets. The introduction of tradable green certificates has been delayed mainly due to the uncertainties involved for renewable energy suppliers. Several studies have been undertaken using comparative statistical economic analyzes and partial equilibrium models. A set of trading strategies is examined for participants under different marked models, these trading strategies being deduced from laboratory experiments. (Vogstad, Kristensen and Wolfgang, 2003) The authors Verhaegen, Meeus and Belmans clearly illustrate that a single European support scheme for renewable energy, however desirable, is still far in the future.

## **2. Research methodology**

Descriptive analysis was used to carry out the research in order to define a series of concepts, such as the meaning, importance, role of green certificates trading and their evolution through the historical method. The historical method was used through the evolution of the number of green certificates traded and their price on the market. The limitations of the research are mainly associated with the application of the methodology from an economic point of view and the availability of the data used. In this respect, information was collected from scientific articles, books, and data was collected from reports from power plants in operation, from companies that have invested in renewable energy, such as ANRE and OPCOM. The analysis was carried out at the level of Romania but also at the general level of the European Union area for the period 2015-2020, in order to highlight the role of green certificates traded on the market in order to obtain energy from renewable sources that can contribute to the development of the European energy sector in a safe, competitive and competitive way.

## **3. Results and discussion**

### **3.1.Scope and approach of green certificates**

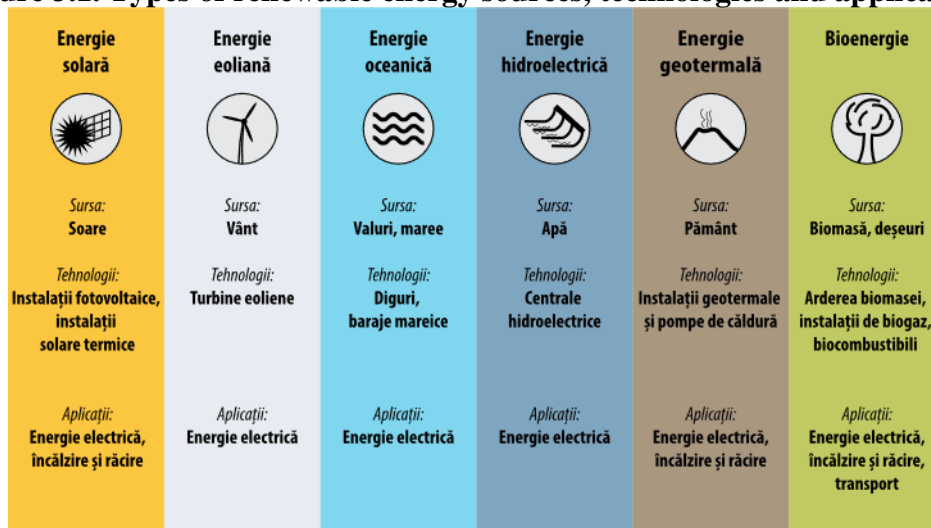
A green certificate is a marketable asset that proves that the electricity was generated from a renewable energy source.

Across Europe, renewable energy is now a mainstream technology. In recent years, clean power plants have increased in number and capacity, leading to record levels of production.

Romania was among the first candidate countries to the European Union to transpose the provisions of Directive 2001/77/EC into its own legislation. In order to encourage the production of electricity from renewable energy sources in Romania, by HG no.1892/2004, with subsequent amendments, the system for the promotion of electricity production from renewable energy sources was established. The system for the promotion of electricity production from renewable energy sources adopted is that of compulsory quotas combined with the green certificates trading system. The transposition of Directive 2009/28/EC into national legislation was done through the adoption of Law No 220/2008 for the establishment of the system for the promotion of energy production from renewable sources, which aimed to make the system of promotion through green certificates more attractive for investors by introducing new facilities, including the granting of a greater number of green certificates, differentiated according to the type of renewable energy production technology.

Renewable energy is produced from non-fossil renewable sources that, when considered on a human time scale, are naturally replenished. Renewable energy sources include solar and wind energy, ocean energy and hydropower, geothermal energy and bioenergy. The main types of renewable energy are shown in Figure 3.1.

**Figure 3.1. Types of renewable energy sources, technologies and applications**



Source: European Court of Auditors

Electricity suppliers are obliged to purchase annually a number of green certificates equivalent to the product of the amount of the mandatory green certificate purchase quota set for that year and the amount of electricity supplied annually to final consumers.

The annual mandatory green certificate purchase quota set by ANRE is the number of green certificates that an electricity supplier is obliged to purchase for each MWh of electricity that is sold to consumers. For the period 2015-2020, the annual mandatory quotas for electricity produced from renewable energy sources benefiting from the green certificate promotion scheme are as follows:

**Table 3.1. Mandatory quotas**

Year	2015	2016	2017	2018	2019	2020
Quota	16%	17%	18%	19%	19,5%	20%

Source: Own processing ANRE (<https://www.anre.ro/ro/energie-electrica/legislatie/surse-regenerabile/legislatie-ue-esre>)

The supplier that does not reach the mandatory annual quota is obliged to pay the equivalent value of unacquired green certificates in the amount of 110 euros for each certificate, calculated in lei at the average exchange rate set by the BNR for December of the previous year.

According to the data in the table for the period 2015-2020, there has been a slight increase in the mandatory annual quota for the purchase of green certificates, which may demonstrate the profitability of a good negotiation of these certificates on the market.

### 3.2 Evolution of the green certificates market in Romania

Currently, there are a number of operational support schemes in the EU that have focused on electricity from renewable sources, one of which is the mandatory quota and green certificate system that is adopted in Romania. The mandatory quota system is a mechanism to promote the production of electricity from renewable energy sources through the purchase by suppliers of mandatory quotas of electricity produced from these sources for sale to consumers. The purchase price is set on a competitive basis. This system of mandatory quotas and green certificates is also used in countries such as the UK, Sweden, Belgium, Italy and Poland.

The number of green certificates that electricity suppliers/producers are obliged to purchase annually for every 1 MWh of electricity sold to final consumers is determined as the product of the value of the mandatory annual green certificate purchase quota set for that year and the amount of electricity invoiced annually to final consumers by each electricity supplier/producer with a green certificate purchase obligation. In the event of non-purchase of green certificates, the electricity suppliers/producers with the obligation to purchase green certificates shall be subject to penalties.

Registered participants in the Green Certificates Marketplace (GCM) are : The Centralised Green Certificates Market (GCMP) and the Green Certificates Bilateral Contract Market (GCBCM).

The following values were recorded on the Centralised Green Allowance Market during 2015-2017:

**Table 3.2. Values recorded on the green certificates market during the period 2015-2017**

Period	Number of CVs traded GCMP in the year	Weighted average price (lei/certificate)	Value (lei)
2015	36.618	130,95	4.795.268
2016	8.468	132,25	1.119.899
2017	15.600	132,54	2.067.636

Source: OPCOM

The following values were recorded on the Green Certificates Bilateral Contracts Market during 2015 - 31.08.2017:

**Table 3.3. Values recorded on the Green Certificates Market during 2015-2017**

Period	Number of CVs traded GCBCM in the year	Weighted average price (lei/certificate)	Value (lei)
2015	10.070.686	131,04	1.319.707.797
2016	7.019.976	132,30	928.748.531
2017	1.448.061	132,41	192.012.101

Source: OPCOM

As of 01.09.2017 the registered participants of the Green Certificates Market (GCM) are : Centralised Anonymous Spot Green Certificates Market (CASGCM) and Centralised Anonymous Forward Green Certificates Market (CAFGCM). On the Centralised Anonymous Spot Green Certificates Market, the following values were recorded during 2017- 2020:

**Tabelul 3.4. Values recorded on the Green Certificates Market during 2017-2020**

Period	Number of CVs traded CASGCM in the year	Weighted average price (lei/certificate)	Value (lei)
2017	523.785	132,03	69.155.072
2018	2.599.148	134,31	349.071.035
2019	4.562.134	136,82	624.158.783
2020	6.578.991	139,51	917.827.798

Source: OPCOM

Pe Piața Centralizată Anonimă la Termen de Certificate Verzi s-au înregistrat următoarele valori pe parcursul anilor 2017 - 2020:

**Tabelul 3.5. Values recorded on the Green Certificates Market during 2017-2020**

Period	Number of CVs traded CAFGCM in the year	Weighted average price (lei/certificate)	Value (lei)
2017	35.202	132,03	4.647.702
2018	214.522	134,31	28.810.755
2019	903.668	136,82	123.633.440
2020	259.701	139,51	36.230.601

Source: OPCOM

In Romania, the green certificate market during 2015-2020 has grown due to the increasing number of consumers, thus obliging suppliers to purchase and trade a large number of green certificates. In terms of the number of green certificates traded we can say that it varies from year to year, the highest number being recorded in 2015 on the bilateral contract market of 10.070.686 green certificates and the lowest being 8,468 green certificates traded on the centralized green certificate market. At the price level we can say that there are slight but significant increases for suppliers and also for consumers, so in relation to the higher number of green certificate transactions and the total value is higher and reverse.

The price of green certificates depends on the market shortage. The price is higher when the green certificate system is driven by strict government policy targets. This is one of the reasons why green certificate markets have lost popularity in recent years and only a few European countries still rely on this mechanism, including Belgium, Sweden, Norway and Poland.

### **3.3. Green certificates market developments in Europe**

Romania has technological potential and an adequate geographical location for the use of renewable energy for electricity production, but this high potential is not fully realized, referring to the EU environment, energy, strategies and legislation on renewable energy.

In June 2016, the European Parliament adopted a resolution referring to the Progress Report on Renewable Energy, which outlined a better climate and energy package for 2030, reaching an EU target of 30% for the share of renewable energy sources in total consumption.

From a European perspective, there are still areas with high potential for renewable energy sources and untapped in Romania. The gap can be closed after 2030, when renewable energy technologies are expected to become competitive without support schemes.

In technology-based schemes, payment may be higher or lower, either to stimulate specific technologies or to support new capacity more than existing capacity. At the same time, suppliers must ensure that a certain percentage of their supply is covered by green certificates otherwise they pay penalties.

An example of such a mechanism is in Poland, where the green certificate scheme was introduced in 2005 and supported in particular the increase of wind capacity to around 6 GW by the end of 2019. Suppliers are required to obtain and submit green energy certificates in on a regular basis.

Another example is Italy, where the scheme was introduced earlier in 2002, but was replaced by other schemes in 2016. The same thing happened with the schemes in the UK and Romania. In the EU so far, only Sweden (with Norway), Poland and Belgium have a fully functional compliance mechanism for green electricity.

The Netherlands is an example of supply and demand dynamics. It has a high demand, much of which is for internally generated (wind) energy. Consumers, both households and businesses, are keen to pay a premium for locally produced green electricity.

### **3.4 Accounting and tax treatment of green certificates**

Those that produce electricity from renewable energy sources receive a number of green certificates for each unit of electricity delivered to the grid. The electricity market operator is OPCOM. The monthly recording of the right to receive green certificates is accounted for via the accounts for subsidies, 445 and operating subsidy income based on turnover, 7411. (ORDER No. 1802 / 29 December)

The green certificate entitlement is valued according to the number of green certificates to be received and the trading price at the date of establishment of this entitlement offered by the electricity market operator. The price of green certificates varies within a range of values, so that the minimum price is imposed to protect producers and the maximum price to protect consumers.

When the green certificates are received, their value is reflected in account 507 "Green certificates received". Those green certificates received will be valued at the trading price on the date of receipt. If there is a difference in the value of the green certificates recorded in the allowance account between the value established at the time of the decision to receive certificates and their value at the date of receipt, determined on the basis of the trading price at the date of receipt, this is a financial income and is recorded via account 768 or a financial expense and is recorded via account 668. (ORDER No 1802 / 29 December 2014)

At the end of each financial year, the green certificates that have been booked to account 507 will be valued at the trading price published by the electricity market operator for the last transaction, with the resulting differences reflected in the result for the period, with reflection in account 768 or 668. At the time of the sale of the green certificates the resulting gain will be recognised as short-term investment using account 7642, respectively short-term investment loss recorded through account 6642 resulting from their sale. Electricity suppliers and generators are obliged by law to purchase a number of green certificates each year and record the value of these certificates in account 652 "Environmental protection expenses". If the green certificates are purchased before the legal deadlines, the value of the green certificates is recorded as an advance expenditure via account 471, and the expenditure is recorded in account 652 when the legal deadlines are met. Green certificates which are cancelled because they have not been used within the period of validity shall be recorded as financial expenses of the period via account 668.

When the value of green certificates is delayed, the entry is made via account 266 and the revenue recorded in advance in account 472. At the end of the financial year, any loss in value relating to green certificates is recognised as deferred income. The income which is

taxable for the purposes of calculating corporation tax is that recorded in accounts 7411 and 768, while the income recorded in account 7863 'Financial income from adjustments for impairment of financial fixed assets' is not taxable for the purposes of calculating corporation tax. When calculating corporation tax we have deductible expenses which are recorded in accounts 668 and 6642, while non-deductible expenses are recorded in expense account 6863.

The reverse charge procedure applies only to the transfer of green certificates between taxable persons registered for TVA purposes under Article 153 of the Tax Code, but this rule does not apply in the case where energy suppliers who are obliged to purchase certificates and who have to recover the cost of these certificates from final energy consumers are taxable persons registered for TVA purposes.

### **Conclusions**

The state provides renewable electricity producers with green certificates free of charge. These producers must demonstrate the production of a quantity of electricity from renewable sources and thus receive the appropriate amount of green certificates. The seemingly closed and difficult-to-access green certificate system can and will work optimally if state authorities treat electricity suppliers and producers professionally and with the utmost seriousness. Green certificates are purchased on a voluntary basis to obtain green electricity. For businesses, this has commercial benefits as it improves their reputation and gives them a competitive advantage in a society where awareness and the importance of environmental impact is growing.

The support scheme encourages beneficiaries to become more competitive as they have to sell their electricity on the market and the same goes for the green certificates. Beneficiaries must therefore set up their bidding strategies in two separate markets in order to generate revenue. This will increase competition in the electricity market and have a positive impact on customers. Moreover, the measure rewards production and therefore provides an incentive for generators to increase their production efficiency.

The promotion of renewable energy on the Romanian market required legislative and financial support. After analyzing the options for promoting electricity from renewable energy sources, it was decided to create a system of green certificates and mandatory quotas. The system of mandatory quotas combined with the trading of green certificates is compatible with competitive market principles and promotes the use of renewable energy sources. As a result of the implementation of the support scheme through green certificates and annual mandatory quotas.

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