

## **Economic Strategy to Maximize the Potential of Renewable Sources of Energy**

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**Abstract:** The implementation of an energy strategy to maximize the potential of renewable energy sources shall be entered in the coordinates the development of Romanian energy in the long term and provides an appropriate framework for the adoption of decisions relating to energy alternatives. By understanding and establishment of plans for the development of Romanian energy can help to ensure that the increase in the energy supply and reducing the importation of energy resources, in terms of the accelerated economic development. This requirement can be achieved by implementing a policy supported by the conservation of energy, in which the increase in energy efficiency, lead to disengage the pace of development of the evolution of the consumption of energy, either at the same time with increase of the exploitation of renewable energy sources.

**Keywords:** green energy; power generating

### **1. Introduction**

The renewable energies are coming from sources with self-regeneration properties in a short time, or of the inexhaustible sources.

The term of renewable energy refers to forms of energy produced by the transfer of the energy efficiency of energy resulting from renewable natural processes. Thus, the energy of sunlight, wind, water flowing, biological processes and geothermal heat can be captured by people using different processes.

In the sources of non-renewable energy sources are included nuclear energy and power generated by the burning of fossil fuels, such as crude oil, coal and natural gas. These resources are in the chip obviously, limited to the existence of the respective deposits and are generally considered non-renewable.

Renewable energy sources are: wind energy; solar energy; Hydraulic energy; geothermal energy; energy of biomass.

There is a strong current of opinion, according to which the generation of electricity from renewable sources will not be able to replace or even enter in competition with thermal power

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stations.

On the other hand, the increase in the public awareness on environmental issues, the pressure of the Communities and the various initiatives at international, regional and local level have begun to establish in powerful catalysts of a current of opinion.

## **2. Research Aimed at Renewable Sources of Energy**

### **2.1. Wind Energy**

Wind energy is a form of renewable energy sources and is one of the oldest environmentally-friendly energy sources, a source of energy generated from the power of the wind. Wind energy is a renewable energy and clean but is intermittent, having regard variations during the day and the season, and even from one year to the next year.

The wind turbines that are operating about 60% of the year, transforming wind energy into electrical energy, producing between 60 KW at a rotor with a diameter of 1 m and 2-3MW power to the rotors with diameters of approximately. 60 m, most power generating between 500-1500 KW (WWEA Report. 2010).

The most widespread wind turbines systems are medium-sized businesses. They use rotors which have diameters of 15-60 m and have a capacity between 50-1500 KW.

In cases where the wind turbines are connected to the electricity networks, the nature of the flashing of the wind energy does not affect consumers because during the days without wind compensation is made by other energy sources such as hydroelectric plants or plants which used as fuel coal where they are connected to the network.

The statistics presented in the Wind Europe report for 2017 highlight that new wind capacities with a record volume of 15.7 GW Wind Europe for continental and offshore parks have been installed in the European Union during the assessed period. The best results for newly installed wind power capacities are recorded in seven EU Member States: Germany (6.6 GW), the United Kingdom (4.3 GW), France (1.7 GW), Finland (577 MW), Belgium (476 MW), Ireland (426 MW) and Croatia (147 MW). Wind energy thus reached 55% of the newly installed capacity. Production units from wind power in Europe now have a total installed capacity of 169 GW: 153 GW on the mainland and 16 GW on maritime platforms. (<https://windeurope.org/wp-content/uploads/files/about-wind/statistics/WindEurope-Annual-Statistics-2017.pdf>).

In Romania, the newly installed capacity totaled 5 MW in 2017. Thus, the total capacity reached approximately 3,029 MW at the end of 2017 compared to 3,024 in the previous reporting period. The share of wind energy in Romania's total consumption reached 12.2%, above the EU average of 11.6%. (<http://rwea.ro/2018/02/15/windeurope-industria-eoliana-inregistreaza-noi-recorduri-in-europa/>).

In Romania, at the beginning of the year 2017, there are over 1,000 wind turbines which produce 3% of the total energy consumption. The wind investments have created until now about 1000 jobs. The wind turbines produced in Romania, on average 150 - 200 MW/h. The cost of wind power is 170 Euros per MW/h, almost three times more than the energy produced by hydroelectric plants.

On the basis of evaluation and interpretation of the data recorded in Romania can be installed wind installations with a capacity of up to 14,000 MW, which means a constant supply of electrical power almost 23 000 GWh/year. According to a study of Main Group, the wind potential of the country -estimated at 14,000 MW- is the largest in the south-east of Europe and second in Europe.

## **2.2. Solar Energy**

Solar energy is energy emitted by the Sun, being a source of renewable energy. Solar energy can be used to:

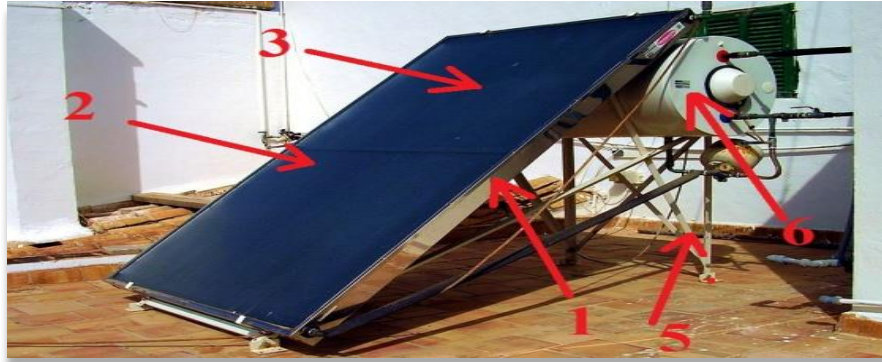
- generate electricity by solar cells (photovoltaic cells);
- generate heat by Solar thermal panel and directly lead inside buildings;
- warm buildings, through the heat pumps;
- warm buildings and to produce hot water consumption by solar panels heat shields.

Solar installations are of two types:

- a) thermal installations;
- b) facilities photovoltaic cells.

### **2.2.1. Solar Thermal Equipment**

Solar thermal systems, capture solar energy contained in the solar rays and convert it into thermal energy. Because almost the entire spectrum of solar radiation is used for the production of thermal energy, these high performance dirt is being around 60 % - 75 % related to the energy of sun incidents (200 - 1000 W/m<sup>2</sup> in Europe, according to the latitude, season and weather). Most solar water heating systems for buildings have two main parts: a solar collector and a storage tank. Solar collectors are the key component of solar-heating systems. They gather the sun's energy, transform its radiation into heat, and then transfer that heat to a fluid (usually water or air). Solar water heating systems can be either active or passive, but the most common are active systems. Active systems rely on pumps to move the liquid between the collector and the storage tank, while passive systems rely on gravity and the tendency for water to naturally circulate as it is heated. Figure 1 shows the schematic of a typical active solar system employing a flat plate solar collector and a storage tank (Saleh, 2012).



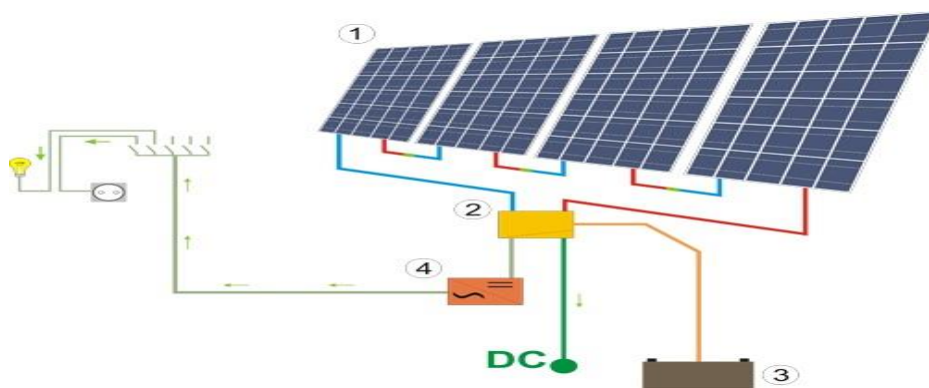
**Figure 1. Flat solar collector: 1. metal housing; 2. glass window; 3. absorbance board; 4. pipes for water; 5. water storage tank; 6. metal skeletons for support.**  
(<http://casaverde2012.ro/panouri-solare/panouri-solare-fotovoltaice-hymon/>)

From the operational point of view, the main component of the solar collector is the component that converts the energy absorber of sun thermal energy and an agent assigns a heat shield (water, antifreeze). Using this agent, thermal energy is taken from the manifold and is stored, be used directly, an example is the consumption of hot water.

### 2.2.2. Photovoltaic Installations

A photovoltaic solar panel as shown in Figure 2, unlike a thermal solar panel converts the light energy from solar rays directly into electrical energy. The main components of the solar panel represent the solar cells or photovoltaic cells.

Solar panels are used separately or in the batteries for consumers or independent power for the generation of electricity to be supplied in the public network. (<http://casaverde2012.ro/panouri-solare/panouri-solare-fotovoltaice-hymon/>).



**Figure 2. Solar photovoltaic plant: 1. Photovoltaic panels; 2. Voltage regulator; 3. Accumulator; 4. Inverter**

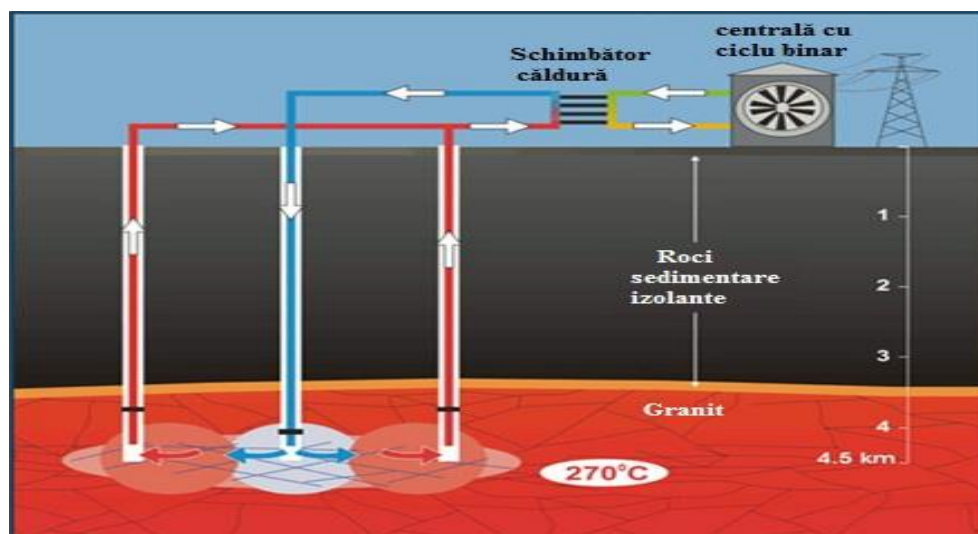
Solar photovoltaic plant is composed of:

1. The photovoltaic panels;
2. The voltage regulator - used for adequate control of the battery charge status;
3. Accumulator - builds up the surplus electricity generated by the Photovoltaic panels, which may be used for example, on the night when the panels do not produce electricity;
4. Inverter - converts the current continuously in alternating current.

### **2.3. Geothermal Energy**

Geothermal energy is a form of renewable energy obtained from the intercooler located inside the Earth. Hot water and steam, trapped in areas with volcanic activity and anomalies are used for heating of dwellings and for the production of electricity.

Geothermal tanks, which can be found at a few kilometers into the depths of the bark of land, they may be used for the direct heating, applications which bears the name of direct use geothermal energy. People have used the springs are still warm, now a few thousand years, for the provision of water in their own habitat. Water springs is captured and used in the spas.



**Figure 3. Geothermal equipment**

(<http://energielive.ro/delegatie-si-simpozion-solutii-germane-pentru-exploatarea-energiei-geotermale-in-romania/>)

The first three meters of bark terrestrial have a constant temperature of 10°-16°C. The thermal pumps are used to make heat (in the winter) and cool (in the summer) inside of buildings. Thermal heat pumps are composed of three parts:

- heat exchange with the ground;
- thermal pump itself;
- air supply system.

The replacement unit is an assembly of pipes arranged in a spiral, buried in the upper part of the bark of land near the buildings. A fluid usually water or a solution of water and antifreeze, flows through the pipes and absorbs or it transfers its heat to the ground.

In winter, the pump sends the heat accumulated refrigerant in the air supply system.

In the summer, the process is inversed and the heat removed from inside the building can be used to heat up water, constituting a source free of warm water.

Such equipment used much less energy compared with conventional heating systems and is more efficient for cooling the dwellings. In addition to the fact that saves energy and money, they reduce pollution.

#### **2.4. Hydraulic Power**

Hydraulic power is the capacity of a physical system, in this case, the water, to carry out a mechanical work when changing from one position to another position by date flow. Due to the nature of the coolant circuit, serviced automatically by the sun's energy, hydraulic power is a form of renewable energy.

The exploitation of this energy is currently in hydroelectric plants, which converts the potential impact of the water in the kinetic energy. This is then trapped by means of hydraulic turbines that operate the electric generators which in the end turn into electrical energy.

By Micro hydropower shall mean a hydropower with installed power of 5 - 100 kW, and a small hydraulic power has an installed power of 1 - 5 kW. That may feed a group of several (<http://energy.gov/eere/office-energy-efficiency-renewable-energy>),

#### **2.5. Biomass Energy**

The biomass is the most abundant renewable resource on the planet. This includes absolutely all organic materials produced by metabolic processes of living organisms. The biomass is the first form of energy used by humans, with the discovery of the fire.

By energy recovery of biomass, Bio fuels may be obtained which may be used in order to generations of thermal energy, biogas, the generation of esters by chemical transformation of the biomass type vegetable oil by treatment with an alcohol or obtaining of ethanol or biodiesel by enzymatic degradation of bio mass. Biogas is a bio fuel, resulting from the fermentation processes, which are carried out by anaerobic biodegradability of organic materials, of different origins. The energy value of biogas is directly proportional to the content of methane. Biogas is a melt of gases, and the main gases that make up the state are: methane, hydrogen sulphide and ammonia.

### **3. The Economy of Renewable Energy Market**

In the energy sector in most European states there have been major changes brought about by the need to increase the security of energy supply to the consumer, and in the framework of this requirement renewable energy sources provides a viable solution, including the protection of the environment. The attribute “green” is used in connection with the wider generated effects on the environment, from which the component “renewable energy” is just one of the aspects. For example, hydroelectric energy production is renewable energy and they may not generate a net effect on climate change. “Right” energy related specifically to renewable energies is at an early stage and must be well understood in the context of special features, policies and the regulations governing the energy industry and the forecasts in the industry.

One of the examples of significant importance granted to the renewable energies is the Kyoto Protocol, and ratified by Romania (Law No 3/2001).

Another example is the Directive on the promotion of renewable produced from renewable energy sources in the internal energy market of the European Union.

The promotion of renewable energy sources is recognized as a priority measure, since the exploitation of these sources contribute to the protection of the environment, sustainable development, ensuring security of energy supply and the possibility of meeting the targets to reduce greenhouse gas emissions, the commitments under the Kyoto Protocol.

Directive 77/2001/EC requires the Member States to establish the indicative targets for the consumption of electricity generated from renewable sources, with a view to ensuring medium-term adequate penetration of more emphasized in the internal market for electricity produced from renewable energy sources.

A particular aspect of the “right” renewable energy is linked to the concept of “against people’s rights”, i.e. the rights allocated to the generation of energy from renewable sources, apart from rights to the physical production of electricity.

As a result, the purchase of renewable energy or “green” does not represent a transaction so simple that in the case of purchase of a separate product and identifiable. In this respect, the internationally have been designed various types of “green” rights. An example is the “green” rights established to be sold separately from the electricity itself, so that the purchase of “green energy” to include both the purchase itself of electricity, as well as an additional, linked to the feature to “green”.

The Renewable energy industry is characterized by a rapid development. Many of the technologies for the generation of electricity from renewable energy sources are not new but the generation of electricity on the basis of fossil fuels has been considered in the traditional manner as being the most effective in terms of cost and with a great effect on a large scale.

Although the costs of applicable technologies of renewable sources of energy have begun to decrease over time even with the orders of magnitude in relative terms, in absolute terms, such technologies are much more expensive than the traditional, based on fossil fuels.

The cost of the generation of electrical energy from renewable sources represents one of the major barriers in the development of such industries.

#### **4. The Policy of the European Union in the Sector of Recoverable Energy**

The main objectives are:

- the liberalization of the sector;
- to reduce greenhouse gas emissions.

As regards renewable energies, the two objectives are considered to be of conflict, to a certain extent, at least in the medium term, because the process of liberalization of the electricity sector is in progress gradually in all Members for the internal energy market.

As regards renewable energies in the context of the liberalization of the internal energy market, the production of energy from renewable sources is less competitive with that obtained from conventional sources, mainly because the liberalized their markets expected effect is the reduction in the price of energy.

The market penetration of renewable energy sources is difficult and is due to a number of factors such as:

- the granting of subsidies are important for the generation of electricity from conventional sources (fossil fuels and nuclear), i.e. the low subsidies for the generation of electricity from renewable sources;
- the production costs of the energy produced from conventional sources does not include the full cost of pollution;
- technologies used for the production of energy from renewable sources are costly;
- most renewable energy sources are not constant (wind, solar, waves, water flow) generating difficulties related to the forecasting in energy production, which is reflected in the additional costs;
- due to the special characteristics of renewable sources of energy (are local and difficult to forecast), installations used for energy generation from these sources are unrelated located and have small capacity.

#### **5. Conclusions**

The policies in the field of renewable energies have in the viewfinder several aspects, such as the definition of renewable sources of energy policy instruments applied and the results expected.

The common element of these policies consists in increasing the share of renewable energy in the liberalized market.

Within the framework of policies in the field of renewable energies are highlighted four categories of instruments:



- Economic instruments - used to encourage the production of renewable energy (financial incentives, grants subsidies granted for investment, fiscal measures, grants awarded for research and development etc.);

- Regulatory instruments - used to determine the regulatory framework, the obligations and rights, the renewable energies enjoys a more favorable position as compared with the energy produced from conventional sources (quality standards, priority in the network, share of energy etc.);

- Tools - used for informing the citizens, and in order to increase awareness of the advantages of renewable energies (information campaigns, certification etc.);

- Voluntary Tools - applied more and more in the energy sector and, in particular, the use of renewable energy sources (voluntary agreements, prices “green”).

The “green” certificates serve both as an additional source of income and as proof of completion of the share of electric current. In this way, the energy producers get certified as “green” for the quantity of renewable energy which they generate and are entitled to sell on the market green certificates. The system can be the most suggestive illustrated by an example.

A wind turbine produces renewable energy. At the counter, renewable energy is separated into two “products” physical and electrical energy certificate for the environment.

Physical electricity produced from renewable sources is inserted into the distribution network, where it can no longer be differentiate the energy produced from conventional sources. Physical energy is sold by the owner of the wind turbine as in the case of the energy produced by all other traditional installations for the generation of electrical energy, at a price fixed by bilateral contracts or on spot markets.

Green certificate, which expresses the quantification of the environmental benefits of electricity generated from renewable sources, can be trade completely independent of physical market for energy.

The production of energy, using renewable alternative energy sources are the solution for the future, because they do not pose a risk to the environment, are easy to use and help Romania’s commitments to reduce emissions of greenhouse gases. Additional, the production of energy using renewable energy sources, determine a viability economic development on the long-term of localities and reduce the energy dependence of the Romania of primary energy resources.

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