

Using wind and solar renewable energy by enterprises and consumers in terms of the energy management

~ Ph. D. Associate Professor **Cornelia Nistor** (University of Bucharest, Faculty of Administration and Business, Bucharest, Romania)

E-mail: cornelia_faa_ub@yahoo.com

Abstract: More and more leaders realize that the wider use of renewable energy brings many benefits on long-term, both for the enterprises and for the whole society in the process of developing the smart grids. One of the continuing concerns of any leader at any level must be the energy efficiency growth for all the users, individuals or legal entities. A good corporate leader supports a wider use of the renewable energy because thereby he promotes the care for the environment through the clean energy, the green economy idea in general, which will create him a positive image in the community and he will be considered a good representative of "corporate social responsibility", by reducing the social ethical implications of strategies adopted. The more there will be more leaders who will promote the idea of production and use of alternative and renewable energy will be required also a greater involvement of the state in the use of the economic policy instruments in order to increase the investments in the infrastructure, to encourage the innovations in this field and to establish the regulations guiding of the specific markets mechanisms and the responsibilities and roles of each economic subject.

Keywords: renewable energy, energy efficiency, wind energy, solar energy, hydropower, energy potential, energy consumption

JEL Classification: D21, D24, L26, L94, M11, M14, Q42, Q47

1. Introduction

The sustainable economic development requires increasing the energy efficiency that provides the prerequisites for reducing the negative impacts of energy production and consumption on the environment and requires increasing the investment in scientific research in this field, promoting measures to stimulate innovation process. Achieving energy efficiency implies for each country to produce a bigger amount of clean energy and to increase the number of transactions with such energy, thus reducing carbon dioxide emissions.

According to a recent study on different types of consumers, energy losses of all the energy consumption in Romania are between 30-35% in industry and between 40-50% for buildings. The European Union established, as an important objective to be achieved for all countries by 31 December 2020, 1.5% savings each year for the energy sales to the final consumers. After this stage, the next stage in the European Union will be to stimulate the competition in the energy sector, to encourage the development of the national support programs in order to reduce the energy consumption, the wider use of the green energy, to encourage in particular solar and wind energy production where natural conditions are necessary and where they are effective.

In order to increase the energy efficiency, an important role has the consumption decreasing, which refers both to industrial producers, domestic consumers and Government. Among the measures that can lead to reducing the total energy consumption, the most effective are: purchasing an advanced fixed capital for the automations, improving the production methods in industry, using some light bulbs including for the

street lighting and insulations. The advantages of such measures have also side good effects. Inside the housing, it provides an increased level of the comfort because the inside of the houses is warmer in winter and cooler in summer. Similarly, the leaders which demonstrate social responsibility may introduce some measures for energy saving in their offices. The isolation of the office buildings, the economic lighting and the use of some less energy consumer devices, thus releasing less heat, can significantly reduce indoor heat and the necessity of the air conditioners, which are great energy consumers, with beneficial effects on the human health of the employees.

To introduce some effective measures widely to the entire national economy, the state must establish proper government policies to decide a maximum level of the energy consumption, which cannot be exceeded and thus stimulates the energy efficiency. Also, the state leaders must promote the green industry, must encourage the economic policies for producing innovations in reducing energy consumption, must improve the already used technology in order to reduce the energy waste which are containing numerous heavy metal residues and chemicals toxic, must reduce to the lowest possible level the grants in the areas that have a negative impact on the environment.

In the total quality management, an increasingly important area is the energy management, which involves the realization by every manager of an annual energy audit, the financial analysis of the investments in this field, the determination of sources funding in order to increase the energy efficiency.

A manager leader should encourage the conduct of all employees in efficient energy

management, to develop interest in this matter, to ensure security of supply, to introduce monitoring systems of the energy consumption, thereby reducing the energy consumption and the corresponding costs. Besides increasing the market competitiveness, they are obtained, as side effects, social benefits and the care for the environment.

2. Literature Review

The "National Geographic" Review underlines the benefits of wind energy that does not pollute any water or air and has been a spectacular development, 4 times increasing of the production in the period 2000 - 2006. In addition, „since the wind is free, operational costs are nearly zero once a turbine is erected. Mass production and technology advances are making turbines cheaper, and many governments offer tax incentives to spur wind-energy development." The same magazine emphasizes that although many people believe that visual pollution produced by wind turbines is very high, yet „The slowly rotating blades can also kill birds and bats, but not nearly as many as cars, power lines, and high-rise buildings do."

The "Global Wind Energy Outlook" presents three estimates of the wind energy industry: out to 2020, 2030 and up to 2050. „The scenarios compare the International Energy Agency's central scenario from its World Energy Outlook with a 'Moderate' and 'Advanced' scenario, detailing how the global wind industry might deliver in terms of global electricity supply, CO2 emission savings, employment, cost reductions, and investment. "Wind power has become the least cost option when adding new capacity to the grid in an increasing number of

markets, and prices continue to fall", said the Steve Sawyer, CEO of GWEC. "Given the urgency to cut down CO2 emissions and continued reliance on imported fossil fuels, wind power's pivotal role in the world's future energy supply is assured." The power sector is responsible for more than 40% of all carbon dioxide emissions from burning fossil fuels, and about 25% of our total greenhouse gas emissions. Wind power's scalability and its speed of deployment makes it an ideal technology to bring about the early emissions reductions which are required if we are to keep the window open for keeping global mean temperature rise to 2°C or less above pre-industrial levels.

In his book, "Wind Power .Revised edition: Renewable Energy from Home, farm and Business", Paul Gipe explains how to include the commercial-scale wind turbines of all sizes in distributed applications and underlines, by studying Germany and Denmark cases, the role of the small communities of consumers in the increasing of the social responsibility regarding the use of the clean energy. "In community wind, farmers, small businesses, and groups of community-minded citizens band together to develop-for profit--"their" wind resources. The paper analyzes also the advantages and the disadvantages of using each possible technology used to produce the wind energy, from viewpoint of reducing the consumption, but also from a financial perspective.

The authors of "Sun, Wind and Light. Architectural Design Strategies", GZ Brown and Mark Dekay, underline some particularly interesting aspect to the relationship between "form and energy" through the design of an architecture for building that meets the objectives of the "sustainable design", that

“applies the latest passive energy and lighting design research organizes information by architectural elements”. The book focuses on the impact sun and wind can have on the architectural design. “It provides real insight into the issues involved in passively cooling and heating homes. Developed for rapid use during schematic design, this book clarifies relationships between form and energy and gives designers tools for designing sustainably.

“Wind Energy Fundamentals, Resource Analysis and Economics” by Sathiajith Mathew is a technical approach concerning wind energy conversion, an economic analyze of the aspects of using this type of resource.

In the solar energy field, must be mentioned the book “Solar Water Heating: A Comprehensive Guide to Solar Water and Space Heating Systems (Mother Earth News Wiser Living Series)” by Bob Ramlow and Benjamin Nusz, which begins with a history of using the solar energy at the dawn of the humanity, initially for heating and continues with the modern forms of solar energy systems, energy conservation and energy savings. The authors present the financial - economic aspects of the solar water and space heating systems, including the possibility to reduce the long-term costs.

“Solar Revolution: The Economic Transformation of the Global Energy Industry” by Travis Bradford demonstrates, on the basis of mathematical models, that it results a significant increase in the production and the consumption of the solar energy in the next twenty years and it will become the cheapest and the best form of energy. The author shows that the use of photovoltaic panels is a widely adopted solution in countries like Japan, Germany and Southwest America, the role of state subsidies being

very important.

The Information Centre of the European Commission, EUROPE DIRECT, IASI course, “Wind Energy Outlook, Challenges, European Policies.” presents concrete issues related to investment and costs for the wind turbines. “Besides the cost of the turbine, which is 74-82% of the total investment, other significant costs include those on foundation (20-25% of the rest), associated electrical installations (10 -15% of the rest), adaptation and connection to the national grid (35 -45% of the rest).”

3. The most important issues in the renewable energy production and consumption

Especially after 2006, in Romania, began the development of both production and consumption of energy from renewable sources. An important element was the modernization of the legislation and the fact that more and more leaders are aware and acknowledge that the wider use of renewable energy bring many long-term benefits, both for the enterprises and the whole society, in the formation and the development of smart grids for the society. An important role has the continuous concern for the energy efficiency, for all users, individuals or legal entities.

Another reason why a good firm leader supports the use of renewable energy is that thereby he actually promotes his concern for the environment through the clean energy, the general principles of the green economy, which certainly will improve his image in the community and he will be considered a good representative of the “Social Corporate Responsibility”. He demonstrates that he is reducing the ethical social implications of the

strategies adopted by the company that he is managing.

The more there will be more leaders who will promote the idea of production and use of alternative and renewable energy will be required also a greater involvement of the state through the economic policy instruments in order to grow the investments in the infrastructure, to encourage the innovations in this field and to establish guiding regulations for the specific markets mechanisms and to establish the responsibilities and the roles of each economic subjects involved

Of course, all these regulations and developments must be consistent with all the regional development policies, provisions and E.U. economic legislation. In our country, the most important Romanian laws in this field are the 220/2008 Law on green certificates and the 123/2012 Law on energy and natural gas. According to the 220/2008 Law, the renewable energy producers receive subsidies from the state as green certificates, which are paid by all traders, producers and consumers. Because of the importance of both production and consumption, should be considered the consumer protection provided by the Consumer Code. "According to art. 1 of Law no. 296/2004, the Consumer Code regulates the legal relations created between economic operators and consumers on the purchase of products and services, including financial services, providing the necessary access to products and services, completes and accurate information about their essential characteristics thereof, defenses and ensures the rights and interests of consumers against abusive practices, their participation in decision-making foundation and its interest as consumers." (A. N. Gheorghe, C. Spasici, D.S. Arjoca, "Consumption Law", Hamangiu Publishing House, Bucharest 2012).

The E.U. has set a goal to be achieved by 2020 by our country: 20% of the total final energy consumption of the country must be provided by the renewable energy sources. According to A.N.R.E. (the National Regulatory Authority for Energy), this objective has been achieved in early 2014. The mandatory share purchase by the green energy remained, however, at 11.1%. In August 2014, the total production of renewable energy was 4470 MW, from which 2800 MW came from wind parks, 1234 MW came from solar parks, 570 MW from small hydro centrals and 100 MW from biomass energy. Moreover, it was also envisaged that by 2020 our country must increase the energy efficiency by 20%, which means also to have as final objective the limitation of the energy consumption at 30.32 million tep (tones of oil equivalent) by 2020.

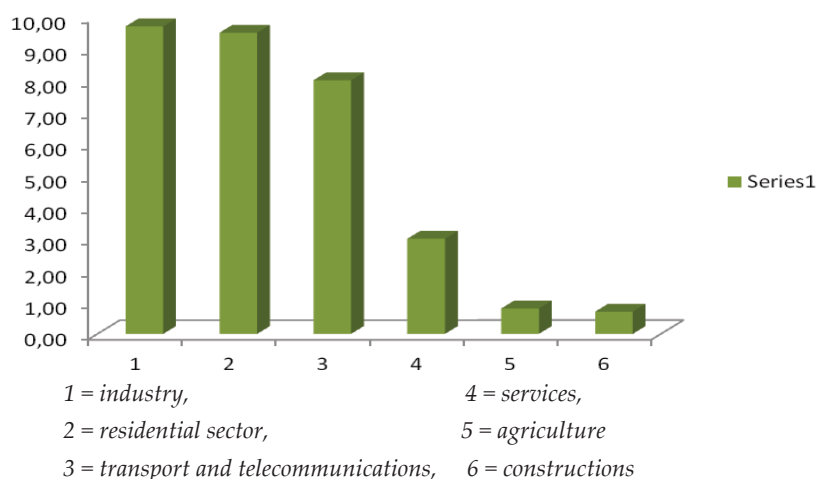
Energy efficiency implies that the countries have to produce a bigger amount of clean energy and to increase the number of transactions with it, which leads to reduce the carbon dioxide emissions. In order to increase the energy efficiency, an important role has the decrease of the consumption. In recent years, the average energy consumption in the E.U. consisted of: 40% building consumption and 20% energy consumption for lighting - which requires the rehabilitation of buildings and the use of the energy saving light bulbs.

Romania currently consumes 2,5 times more energy per unit of GDP than the average of the E.U. countries. It has been estimated that only through energy efficiency measures, our country would save between 5 and 7 billion euro. According to the forecasts made recently in Romania, in 2020, the final national primary energy consumption

will reach 31,9 million tep (tons of oil equivalent), representing an 50% increase compared to 2010. The largest energy consumption in 2020 will be recorded in the industry with 9,7 million tep, followed by the residential sector

with 9,5 million tep, transport and telecommunications with 8,0 million tep, services with 3,0 million tep, agriculture with 0,8 million tep and constructions with 0,7 million tep.

Chart 1. Forecast of the final national primary energy consumption in Romania in 2020



Source: Processed by author

One of the issues that are affecting this area, given the high consumption of the residential sector, is that over 12% of energy consumers in Romania are in the category of social charges payers. The total consumption points in our country are 8868 million, of which only 351,968 are non-household consumers. From these data, it appears that a major concern is to streamline the energy consumption also at the level of the end-users and not only in the industrial companies that are using it as working capital.

The "Energy Strategy of Romania for 2007-2020 updated for 2011-2020" establishes as overall objective the "providing the energy needs, both now and in the medium and long term, at a price as low as suitable, adapted to a modern market economy and to a decent standard of living, in terms of quality, food safety and respecting the principles of

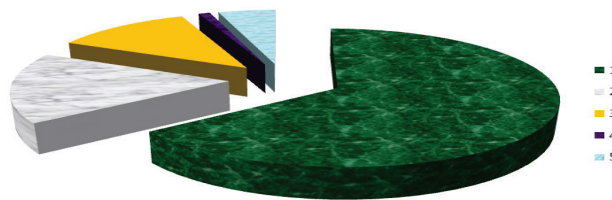
sustainable development." Safety concerns mainly providing a modern transport infrastructure with an adequate level of protection, limiting the imports and diversifying the energy sources. The Energy Strategy specifies the steps that should be taken in order to increase the competitiveness in this sector, as the basis of its rapid progress including: "development of competitive markets for electricity, natural gas, oil, uranium, granting green certificates, certificates for the gas greenhouse effect emissions and energy services; liberalization of energy transit and ensuring permanent non-discriminatory access of the market participants to transmissions, distributions and international interconnections; further restructuring and privatization, especially on the stock market, for the sectors of electricity, heat and gas."

The limited and reduced quantities of available fossil fuel and the decreasing trend of the domestic output increases the country's dependence on imports of primary energy and shows that in Romania the renewable energy sources are essential.

The most important types of renewable clean energy are: wind, solar, biomass and

geothermal energy. According to the renewable energy map, the potential of Romania is: 65% bio-energy based on biomass, 17% wind energy, 12% solar energy, 4% small hydro-power energy, 1% voltaic energy, 1% geothermal energy.

Chart 2. The potential of Romania, according to the renewable energy map



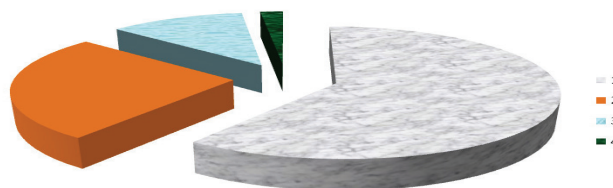
1 = biomass, 2 = wind, 3 = solar, 4 = geothermal, 5 = other forms

Source: Processed by author

The present production, however, is not in accordance with the map of the potential, since, for example, in August 2014, most of the renewable energy produced in Romania

was: wind energy 62%, photovoltaic parks 27%, small hydroelectric energy 12% and biomass energy 2%.

Chart 3. The production of the renewable energy in Romania (August 2014)



1 = wind energy, 2 = solar photovoltaic energy, 3 = small hydroelectric energy, 4 = biomass energy

Source: Processed by author

4. Wind energy

In the last 10 years, wind energy currently has the highest annual growth rate worldwide: 30%.

It can be considered that wind energy has been used at a small scale, since

Antiquity, for the transformation of wind energy into mechanical energy. The first windmills operated in Persia, more than 2000 years ago. They were introduced in Europe in the XII Century in England and France. These mills were mainly used to grind grain

and other agricultural products, but also for making paper and paints for painting.

Currently, the kinetic energy of the wind is converted to electricity by wind turbines that produce between 50-60 KW (the micro power stations) and between 2-3 MW for the highest power stations. In general, the maximum diameter of the turbines is up to 20 m. The ordinary wind turbines produces between 500 - 1500 KW.

The available studies provided that the potential of worldwide wind energy can provide 5 times the current energy consumption. This, however, would require sacrifice more than 12% of the surface area of Earth in order to cover it with turbines, returning an average about 6 turbines per km².

The countries that currently have the largest installed capacity are those that are having an adequate speed of the wind for longer periods during each year, such as China, USA, Germany, Spain, India, Italy, France, UK, Canada, Denmark. Even in those countries with the highest potential to produce wind energy, it is estimated that the turbines produces at maximum 8 months in a year. In E.U. countries, the average share of wind energy in total domestic energy consumption was 5,3% in 2012, the countries with the highest consumption being Denmark (23%), Spain (8%), Germany (6%). In our country the consumption was 3,0% in the same year.

In Romania, through an effective management, were attracted numerous foreign investors in wind energy, the main companies being: CEZ from Czech Republic, Energias de Portugal from Portugal, ENEL from Italy and Iberdrola Renovables from Spain. It should be noted in particular the investment made by Monsson Group, a leading European producer of wind energy. In

Romania, this Monsson Group has installed wind turbines totaling 100 MW and has sold 850 MW projects to other foreign companies in the field. The Group also provides consultancy for the companies that are producing wind energy and includes Emon Company which is specialized in electricity infrastructure. For countries like Germany and Romania, due to their specific natural conditions, the Group has implemented the Monsson GE Wind Power Up program, which is a software that is installed on the turbines (at Monsson Mireasa II, Galbiori, Silistea II) that allows them to measure, via the Internet industry, tens of thousands of data every second, thus adapting the operation of wind turbines to the concrete conditions specific to that place.

This program has determined the increase of the turbines yields to one fifth of the initial value, increasing the annual production of wind energy by up to 5%. At the end of 2012 in our country already existed over 1.000 wind turbines, which contributed to increase the employment by creating over 1.000 new jobs. The most favorable areas for the development of the wind energy production in Romania are Dobrogea and Podisul Central Moldovenesc.

When a leader faces the choice of the optimal production, based on the possible variants of combining the production factors, in terms of wind energy he must know and compare the advantages and the disadvantages of its use.

Among the most important advantages are that it is a form of clean energy and because it does not burn fuels there are no emissions of pollutants and greenhouse gases, no waste is produced, production costs per unit of energy produced are small, which is an

important element of cost reduction and also the costs for a possible shutdown are small.

The most important disadvantages are that the resource on which wind energy is produced is limited to some certain potentially appropriate areas and certain times of the year, the production is not constant, which creates difficulties in the consumption, the production causes a very high noise pollution, for some people creates a considerable visual pollution and not least, it affects the ecosystems.

5. Solar energy

Solar energy is 10.000 times powerful than all the forms of energy used today. It can be used in different ways to produce electricity. Most common way is to use photovoltaic cells and its conversion into thermal energy for direct heating of buildings or to trigger heat pumps. The potential of solar energy on Earth is extremely high, so if it could be concentrated collected, it would be the most important energy source of mankind.

Energy efficiency of the solar panels is not very high, ranging between 12% - 20%, depending on their quality, but it is great if it is considered in relation to the amount of energy from other types of sources that can be saved by using solar energy. For example, a house which is equipped with solar panels saves over 50% of the energy normally used. There are also solar thermal panels, which are built to heat fluids. They are very heavy, so they cannot be placed on the roof, but only on the ground, near the houses.

Also, there are plants that can convert the stored heat from the sun into electricity. These plants are not widely used because their efficiency is very low and the

production is relatively low compared to the costs of maintenance and given the disadvantage that the production is not continuous.

Among the more special uses, it is interesting to note the contribution of solar energy in rail and marine. Examples of this are the launch in Europe, between Paris and Amsterdam, of the first high speed train powered by solar energy produced by solar panels mounted on its surface and the launch of the solar boats that are quieter than the others. The first solar boat was produced in Britain in 1975 and now due to the advantages that they present, are produced on a large scale. Solar energy can also be used via LEDs in traffic signs or for the lighting of the rural areas based on the accumulation of energy in batteries. Although in the latter case the profits are very low, there is a favorable ratio between costs and social benefits. One of the areas of the world where solar energy is widely used in heating homes is the rural areas of Sub-Saharan Africa.

Among the world countries with the highest energy production based on photovoltaic panels are: U.S.A., India, China, Germany, France, Ukraine, Canada, Italy. The largest thermal solar plants in the world are in the U.S.A. and Spain. In Europe, the country with the largest production of solar energy is Germany, being favored by legislative regulations that allow those who produce an excess of solar energy to resell at the same price per KWh to other energy consumers. In 2011, in terms of consumption, solar energy provides 3% of all the electricity produced in Germany and 3,2% in Italy.

In Romania, households are also favored by legislation, which requires that they may sell the surplus product to other electricity consumers. This provision may be

exploited by the leaders of small businesses who may have in this a diversified source of gain or by the public institutions for public objectives such is the example of Comuna Cornu.

Another positive element which can be used to by an open-minded leader is that the banking system in our country allows the access to credit facilities for those who develop alternative energy industries.

Solar energy potential of our country is located in particular in the Black Sea, where the average of the sunshine is 2.300 hours per year. In these circumstances it can produce a maximum of 1.600 KWh/m²/year, the national average being 1.250 kWh /m²/year.

The national solar energy consumption in the country increased especially in the luxury residential areas. In some localities, the state wanted to encourage consumption by providing facilities through the "Green House" Program. All the constructions must comply certain conditions concerning the height and the orientation of some parts of the roof to the south in order to capture better the energy of sunlight.

Romania is considered, according to a survey conducted during 2013 as having great potential in renewable energy, ranking ahead of countries like Poland, Turkey, Spain and Austria. Of the 40 countries surveyed, Romania's rank is 10 and on solar energy Romania in on the 24th place.

One of the main foreign investors in the field is TerniEnergia, an Italian company that wants to install six solar parks in the areas Lugoj and Buziaș, with a total capacity of 5.5 MWp.

As the main advantage of solar energy production and consumption, in addition to the possibility of installing plants near the

places of consumption and relatively low cost, is that the depreciation of such installation is less than for other forms of energy, being less than 5 years. In Romania, this branch is favored by the fact that the authorization process is greatly simplified compared to other forms of energy and to other states and the investments are more advantageous supported.

As main disadvantage it can be mentioned that the solar energy is not concentrated, and convert it into other forms of energy is difficult. Production is discontinuous, since that cannot be achieved overnight and what the output achieved during the day cannot be accumulated in large quantities. In addition, an indirect disadvantage stems from the fact that the production of solar panels themselves, it consumes a lot of energy from non-renewable sources, mainly coal, which makes the production of solar energy remain at a lower level compared to the energy consumption.

6. Conclusions

From the Romania's energy strategy for 2007-2020 updated for 2011-2020, results that in 2008 the total final consumption of electricity in our country was 41.775 GWh, of which 43.363 GWh in the industry, 842 GWh constructions, 1.401 GWh in transport, 10 .040 GWh in the household, 555 GWh in agriculture and 6.432 in services.

The same strategy presents the advantages and disadvantages of the renewable energy, especially wind energy and solar energy. Romania must rely more than until now on renewable energy, which will increase food safety, will be more environmentally friendly by being clean forms of energy and

will reduce the country's dependence on the energy imports. In order to increase the energy efficiency the state must take some important measures such as: "to use the financial instruments for energy savings, including energy performance contracts that provide for delivery of measurable energy savings; to purchase new equipments and technologies taking into account the priority of energy efficiency specifications; to accelerate the execution of rigorous energy audits at the level of the industrial consumers, public and residential buildings, audits certified by competent bodies, followed by measures able to reduce the energy consumption.

The national potential for energy savings, reducing energy losses, is estimated at 27-35% of primary energy resources - industry 20-25%, buildings 40-50%, transport 35-0%). "These measures should be applied differentiated by types of business - industrial producers, farmers, carriers, households

and the public sector. An important role has the modernization of the networks for the energy transport, which are currently characterized by a high degree of wear and turning them into intelligent grids, the increase of the competition in the sector, ensuring the environmental protection and sustainable economic development overall.

A further analysis of this topic, it might consider some concrete case studies conducted at operators of different territories with different conditions in terms of the possibility of using some form of renewable energy, the analysis of the state intervention, the role of the law system and of the possible negotiations between the directly involved actors, the forecasts of energy consumption, energy demand and energy supply, based on the data available up to now, even the influence of the culture on how to implement the energy-saving strategies.

REFERENCES:

1. **Bradford T.** (2006) *"Solar Revolution: The Economic Transformation of the Global Energy Industry"*, 1st Edition, SPI Publisher Services, S.U.A.
2. **Brown G.Z., DeKay M.** (2014) *"Sun, Wind and Light. Architectural Design Strategies"*, 3rd Edition, Wiley
3. **Cornescu V., Cretoiu Gh, Bucur I.** (2011), *"Economie"*, Editura CH Beck, Bucuresti
4. **St. Gadole, V. Grasin, G. Pădureanu. F. M. Pop, F. R. Pop, D. Beu** (2005), *"Principii moderne de management energetic"*, EnergoBit, Universitatea Tehnică din Cluj Napoca, Cluj Napoca
5. **Gheorghe A. N., Spasici C., Arjoca D.S.** (2012), *"Consumption Law"*, Hamangiu Publishing House, Bucharest
6. **Gipe P.** (2004), *"Wind Power. Revised edition: Renewable Energy for Home, Farm and Business"*, Chelsea Green Publishing Company
7. **Sathijith M.** (2006) *"Wind Energy Fundamentals, Ressource Analysis and Economics"*, Springer
8. **Ramlow B., Nusz B.** (2006), *"Solar Water Heating: A Comprehensive Guide to Solar Water and Space Heating Systems (Mother Earth News Wiser Living Series)"*, "New Society Publishers", Gabriola Island, Canada
9. Centrul de Informare al Comisiei Europene, EUROPE DIRECT, IASI, suport de curs, *"Energia Eoliana Perspective, Provocari, Politici Europene."*

10. "Strategia energetică a României pentru perioada 2007-2020 actualizată pentru perioada 2011-2020"
 11. „Global Wind Energy Outlook”
 12. „National Geographic” Review
 13. <http://energielive.ro> (25 October 2014)
 14. http://ro.wikipedia.org/wiki/Energie_eolian%C4%83 (25 October 2014)
 15. http://www.energobit.com/USR_uploads/ContentCMS/media/Brosuri/Energoeco/Management%20energetic.pdf (26 October 2014)
 16. <http://environment.nationalgeographic.com/environment/global-warming/wind-power-profile/> (30 October 2014) <http://www.gwec.net/publications/global-wind-energy-outlook/global-wind-energy-outlook-2014/> (30 October 2014)
- 