

Aeolian energy – the energy of the future?

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Abstract: The beginning of the IIIrd millennium faces a more and more concrete threatening: exhaustion of Earth resources and the entrance in a state of collapse as long as the states of the world will not find, as soon as possible, some alternative resources that they can use in the most important fields of activities.

Aeolian energy represents a solution in what concerns the exhaustion of resources of fossil fuels, but not only. Aeolian energy also represents an alternative in what concerns the protection of the surrounding environment, its noxious effects being incomparable smaller than the ones produces by conventional energy.

As a response to this threatening of the IIIrd millennium, the states of the world will have to unite their forces in the activity of research and implementation of some sustainable alternatives, the most important scope being the protection of the environment and of the finite resources of the Earth.

Key words: Aeolian energy, protection of the environment, pollution, resources

INTRODUCTION

The pollution of the surrounding environment has represented and continues to represent a major problem of the states of the world. Starting from the identification of pollution sources, specialists in the field have tried to establish as exactly as possible, the causes, the effects and the strategies to fight

against these noxious effects of pollution. Another important aspect of researches in the field of environment is the identification of potential alternative energy sources, in order to reduce a part of the noxious effects of the burning of fossil fuels, and on the other hand to protect some finite resources that represent the basis of conventional energy which is used in the present.

The present study tries to treat this problem of alternative energies, especially the Aeolian energy, the importance of the study being in the essay to analyze from the point of view of effects and of the impact that this use of energy has over the environment. One tries practically an exposure of positive effects but also of negative effects in order to decide which alternative will be the less noxious for the environment.

For the drafting of this work, the literature of specialty and applicable law in this field have been the basis, being supplemented by studies and researches in the field, and in the end we try to extract a pertinent conclusion.

As an introduction in what concerns the presentation of Aeolian energy as an alternative energy source, we must mention the fact that wind has represented a field of interest from the oldest times, due to the fact that it is an inexhaustible resource and non-polluting one. The renewal of wind has led to the issue of a source of energy alternative to traditional ones, this being the Aeolian energy or wind energy, the exploitation of this one being thought for the scope of economizing energy by an optimal and rational use of existent natural resources.

As a consequence, it is necessary an incursion in the history of wind energy in order to synthesize some basic elements of the progress registered by Aeolian energy, from Middle Ages until the present.

Before Christ, around the IVth century, the Egyptians were the first who used Aeolian energy with the help of some sails to navigate on the Nile. Over the centuries, the ships with sails will dominate seas and oceans of the world, being mainly used for commercial transportation but also for

military and scientific scopes. Aeolian energy was exploited on dry land since the first wind mill has been constructed in the old Persia during the VIIth century. The use of wind for the acquiring of a mechanical power, has appeared later in the antiquity when the Babylonian emperor Hammurabi planned to use the power of wind in its ambitious project for irrigation during the XVIIth century before Christ. The first mentioning of a wind mill in Europe referred to the ones of Burz St. Edmunds, from Suffolk, England. These ones were built in the form of mill-pillar, the sails rotating in vertical plan and the body of the mill was mounted on the central pillar. The industrial revolution offered a new beginning to wind mills due to the issue of more materials, like metal, which led to the modification of the form of the tower and the multiplication of these ones in number. Since then, wind mills were used to grind wheat, the pump water or for some other forms of mechanical energy. But, the exploitation to a large scale has appeared during the XXth century, together with the issuance of modern "wind mills" like wind turbine that can generate energy of 250 to 300 Kilowatts. The first modern Aeolian turbine was built at the beginning of the year 1980. The evolution of the last 30 years shows that the production of ecological energy has formed an important energetic industry.

To sum up, this type of alternative energy will continue to play an important role in the future of humanity, contributing in an appreciable way to the development of needs in energy and to the development of countries. A growth of the availability of some energy to a fair price is one of the key problems of our days. Once the obstacles of spreading renewable energies will be eliminated, this one

will become a substantial part of the stock of a country.

Legal frame

The main responsibility of environmental policy belongs to the Government with its central authority from the Ministry of Environment. The protection of the environment found in the Strategy of Lisbon and the Sustainable Development Strategy of the European Union is appropriated by the Government of Romania and is expressed by the promotion of some sustainable policies in what concerns the natural capital. The formulation and the implementation of a policy in environmental field have determined the institution of an administration especially organized and with specific attributions. This authority is the National Agency for the Protection of the Environment, an institution with juridical personality that exercises the attribution of authorizing activities of impact over the environment.

The Romanian Association for Aeolian Energy (A.N.R.E.E.) registered in 2008 has as scope the promotion of Aeolian energy. It intermediates the relation between the private sector and governmental authorities standardize and represent the Romanian producers' interests at a European level. So, this being a difficult and complex task for the protection of the environment, it cannot be achieved only by state organisms, but also the involvement of non-state organisms being important. Such a NGO (non-governmental organism) is the Association of the Producers of Aeolian Energy, which is meant to sustain, represent and promote economical and legislative interests of producers of Aeolian energy in front of state institutions.

The involvement of the local public administration in the development of some application for the producing of Aeolian energy stipulates: the valorification of Aeolian energy by the achievement of some investments in the "modernization" (G.D. no.1892/2004 modified in 2008, art.2, paragraph 2, letter h) of the capacity of installations that already exist and the reduction of the negative impact over the environment. For the construction and the building of some energetic installations that suppose activities of production, stoking and transportation of energy, as well as a change of the natural frame, represents a necessity for the acquiring of an environmental authorization. The request for the authorization is made by the general designer of the investment on the basis of a technical documentation, and for the issuance of this authorization the necessary documents will be submitted at the authority on the territory area where the investment will take place. After the issuance, the territorial authority makes the decision of authorization public at its own registered office. Besides the environmental authorization there is also necessary an authorization of town planning, in order to enframe without problems these Aeolian parks.

Energy law can contain some standards that englobe significant aspects concerning the protection of the environment and of some environmental factors. By law 220/2008 concerning the production of energy from renewable sources, in art.2 of the General Provisions there is the stipulations of "green certificates as titles that certify the production of some renewable sources, as well as Aeolian energy, of a quantity of 1 MWh of electric energy. The green certificate can transaction, distinctly from the quantity of

electric energy that this one represents, on an organized market, in the conditions of the law. This is a system by which all providers of electric energy must purchase a quota (voluntary or obligatory) and an offer guaranteed by the alimentation with electric energy from renewable sources (certificates – certification mechanism), that they provide to consumers. The provider which does not achieves an annual obligatory quota, declared by A.N.R.E.E., will be obliged to pay the counter value of green certificates not purchased at the value of 70 EUR, calculated in lei at the exchange course established by the National Bank of Romania and adjusted annually with the index of consumption prices in Romania. This amount results from the non-conformation of energy providers is paid at the Operator of Transportation and System which will deposit the amount in the account of the Fund for Energy or the amount comes to the producers of renewable sources for investments necessary to the promotion of use of Aeolian energy.

Structural funds for public authorities in the field of growth of efficiency of the economy that refer to the financing of some projects concerning environmental infrastructure, also finance those projects that aim the valorification of the potential of Aeolian energy by the purchase and arrangement of the territory on which the equipment of the project will be installed, by the purchase of equipment and achievement of construction works, introduction of the best techniques of fighting against polluted gas emissions and the rehabilitation of turbines, etc. According to the provisions of National Strategy for the valorification of renewable energy sources, during the period 2003-2015, the necessary of investments is estimated at 2.7 billions

EUR, from which over 2 billions represent direct investments. The Administration of the Environmental Fund will be an instrument for financing supporting 60% in the case of local authorities.

The law of green energy no. 220/2008 stipulates for investors in units of production of energy from renewable sources, that they will have at least 50% from loans on average and long term and will be exempted or will have their taxes reduced for three years since the implementation. A.N.R.E.E. is obliged to apply this law that will be approved by the Parliament. As ensured facilities, there is the infrastructure of transportation, the necessary utilities for the starting and development of the investment, the insurance of the infrastructure for transportation and access ways. Investors can benefit also from financial contributions to the budget for new work places that are created, due to the development of the production of green energy.

The Ministry of Environment stipulates the approval of the Guide for the Financing of the Programme for the replacement and supplementation of classical systems of heating with systems that use Aeolian energy that lead an improvement of air, water and soil. Persons who use renewable sources for the production of 20% from the own consumption of electric energy has the right to deduct from the global annual revenue an amount up to 50% from the value of equipment and installations purchased in the scope of production an regenerable energy.

Aeolian energy in present day

The valorification of Aeolian energy started in the 70's, together with the worldwide crisis of fuel. But, modern industry of

wind power started in 1979 by the production of a series of Aeolian turbines by Danish factories. According to today's standards, these turbines were small ones having capacities between 20 and 30 kW (kilowatts) for each. Since then, some have grown their dimensions, the production of Aeolian turbines being extended in many countries from the whole world. In the present day there are many Aeolian turbines that function in the whole world with a total capacity of 120790 thousands MW (megawatts) of the energy produces in Europe, this representing 70% from the total of Aeolian energy, this Aeolian energy becoming the most used source of energy.

The worldwide capacity for energy has grown four times during the years 2000 and 2006. From all Aeolian turbines, 81% are in the United States and in Europe.

90% from the producers of Aeolian turbines with small capacities and big power can be found in Europe. The distribution in Europe of electric energy produces with the help of Aeolian turbines presents a certain difference between states, so Germany is the leader on the European market despite some slowing down during 2003 in what concerns installations. Spain occupies the second position continuing to intensively install Aeolian parks, while Denmark occupies the third place having developed off-shore Aeolian turbines and passing to the modernization of Aeolian turbines older than 10 years. At a European level, Romania undertook to produce energy from renewable sources at a quota of 33% in 2010, 35% in 2015 and 38% in 2020.

In Romania, this field has become of a great importance at the moment of the adoption of G.D. no.958 of 18th of August 2005

concerning the promotion of the production of electric energy from renewable sources, which has implemented in the Romanian legislation the Directive 2006/108/EC of the 20th of November 2006 and which established the programme of increase of the contribution of renewable energy sources to the production of electric energy. From this point of view, Romania has an advantage to already produce the 30% from the total of energy for the year 2010.

The inexistence of a professional map of speed and direction of winds at a national level as well the some financing sources from the state are insufficient, make that, despite this impediments, Romania can be an important market for Aeolian energy, all these being certified by the production quota of the existent production and of the interest of some transnational companies to implement some project with a high potential.

An important direction of energetic strategy of Romania is that of the reduction of technological consumptions and the judicious use of all types of energy in the conditions of accelerated economical developments. This fact can be achieved by the implementation of some policies sustained by the conservation of energy concomitantly with the increase of the degree of valorification of renewable energy sources. "The Green Book" mentions that renewable energy sources effectively contribute to the increase of internal resources, fact that gives to these ones a priority in the energetic politics. Even if all the Aeolian Resources of Romanian are good ones, S.E.N. (National Energetic System) raises many problems from a technical point of view in the development of this field. For the development of these problems there is the necessity of the achievement of

some investments in the renewal and development of S.E.N.

To sum up, the opportunity to apply an energetic strategy for the valorification of the potential of renewable sources of energy is inscribed in the coordinates of the energetic development of Romania on long term and offers a suitable frame for the adoption of some decisions referring to energetic alternatives.

Impact over the surrounding environment

The importance granted to the use of Aeolian energy is due to the justified pre-occupation of humans for climate and surrounding environment. Changes in the environment due to negative effects of excessive consumption of fossil fuel, and made that the question remains the same: *"Will we be able to fight against these noxious effects?"* The response resides in the use of the most available and economical technologies and in the concentration of the attention over the efficiency of energy.

For European communities, the environment represents the assembly of elements in their rational complexity and constitutes the frame and conditions of human life. A document of the Council of Europe established that "the environment water, air and soil in their interaction as well as the connection between these ones and any other living organism (Council Directive, 27th of June 1967, art. 2)".

In the analysis of the national legislation, the notions of protection of the environment are defined in a juridical and legal manner. Romanian applicable legislation establishes, with some imperfections, a series

of distinct categories of documents, like "environment agreement" defined by EGO no. 195/2005 modified by EGO no. 164/2008 like "a techno-juridical document by which are established the conditions form the achievement of the project, from the point of view of the impact over the environment". The environment agreement represents the decision of the competent authority for the protection of the environment that gives to right to the project owner to achieve it from the point of view of the protection of the environment. Environmental law standardizes those social relations that appear in the process of protection, conservation and improvement of natural qualities of the environment.

Aeolian energy has the advantage of being one of those technologies that can fight negative effects. The benefits of this one are felt at a regional and global level helping at the improvement of the quality of air, decreasing the effects of acid rains and of greenhouse effect gases. It results that an important advantage that the Aeolian energy has is the emission of zero green house effect gases and of polluting substances due to the fact that there are no fuels which are burnt. Another advantage is the reduced cost for the units of energy, which is less than the one generated by fuel. Costs for the putting out of order of Aeolian generators at the end of the normal functioning periods are minimal, these ones being integrally recycled compared to nuclear power stations. As well, the exploitation of Aeolian energy does not involve to production of wastes, being a real advantage, and during these days when we confront ourselves with such effects. When the installation of some Aeolian turbines has in view some terrains where these farms are found, and the owners of these ones benefit

from some material rights from the part of the owners of Aeolian farms. The owners on whose terrains turbines occupy a quarter of hectare, receive considerable financial earnings that rise up to values of over one hundred millions lei annually.

Effects over wild fauna and its habitat which are produced by turbines and Aeolian power plants represent the only important advantage of this type of alternative energy. There is also a manifestation of concern among ecologists when this equipment were planted on the coast area. A special problem, to which one works and are made many studies and researches, is represented by the product for birds that enter in the action area of the airscrew, especially migratory birds. This fact appears because of the influence over the environment manifested by the presence of Aeolian activities in the region, area which before was at the discretion of birds. Here is where is emphasized the average distance between two turbines and this distance must be between 6 and 10 rotary diameters, which for bigger turbines will mean from another hundreds of meters until a kilometer. As a prevention measures, turbines of bigger dimensions will be emplaced as rarely as the pillars of the lines of high tension. Polluted areas with a big number of Aeolian turbines change their aspects producing perturbations over the area of fauna and nutrition that could be found in that area.

The directions, in which the impact over the population is manifested, are the noises produced the visual impact due to the movement of the airscrew, the destruction and modification of natural forms of the relief of the area and of telecommunication systems. Negative effects of noise are noxious for human health. Fighting phonic pollution

is achieved by to main ways: by an action to the source, by the establishment of emission standards, manufacturing standards, etc. and by adequate management, limitation of some activities, institution of a protection, insulation perimeter, etc. Government Emergency Ordinance no. 195/2005 modified in 2008 stipulates concerning the art. 64, letter f, paragraph 2, for owners of energetic installations that "physical and juridical persons must ensure measures and special equipment for phonic insulation and protection of sources generating noise and vibrations, and to verify their efficiency and to exploit only the ones which overpass the limit value admitted. Against the reduction of the noise, one must build an airscrew with a diameter smaller than 20 meters in the areas which area inhabited or in of some walls that are phonically insulated of houses situates next Aeolian turbines.

The form, size and permanent movement creates the sensation of discomfort and unpleasant aspect over the human being. The visual impact that is created by the movement of airscrews is especially complex. If before we could see the clear and silent sky, now we have a view of continuous movement that generates stress. The multitude of pieces that are in movement, the different rotation speed, produce optical illusions that make distances not to be correctly appreciated. The design, execution and exploitation of constructions are performed in conformity with all technical provisions in such a manner as in order to ensure resistance, functionality, safety in exploitation and architectural aspect. Aeolian turbines as well as other aerial metallic structures can perturbate radio transmissions, TV transmissions and telecommunication transmission. Perturbating

waves of signals of telecommunications propagate near the terrestrial surface and be perturbed by any metallic construction situated on the soil in front of their propagation way. A careful emplacement of Aeolian turbines can reduce these influences. A set of secondary disadvantages of Aeolian energy is characterized by a source of energy which is relatively limited, inconsistent due to the variation of wind speed and of the reduced number of possible emplacements. The great risk of destruction in case of storms, if the wind speed overpasses the limits admitted at designing, brings in the first plan another disadvantage of this type of energy.

Conclusions

Analyzing specialty literature, the results obtained in a concrete manner from the states that have already implemented this

type of alternative energy, by also the specific applicable legislation in this field, at a national and international level, the conclusions that results is that, even if the use of this type of alternative energy can produce prejudices for the environment by its implementation methods, use methods and even by its results, these prejudices are infinitely less compared to the effects of use of energies based on the burning of fossil fuels. Another favorable argument is that the wind will be an infinite resource, compared to fossil fuels which are a finite resource.

Even if the applications of alternative energies are based on a simple technology and locally available, in many cases these ones necessity advanced and sophisticated technologies. The best solution in this case is the mixture between traditional technology and the advanced technology for a better protection of the surrounding environment.

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