

ALTERNATIVE ENERGY, A VIABLE SOLUTION FOR MANKING

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Abstract. *The use of energy from fossil fuels (petroleum, gas, coal-by combustion) had disastrous effects on the environment for the last century. As a result, the use of some alternative sources of energy becomes increasingly relevant for today's world. The following are types of alternative energy: solar, eolian, geothermal, hydro, waves, bio-mass (including scraps). The different sources of energy offer as main advantages: the reduction of the environment's pollution degree, the prevention of high costs that the society cannot afford, the removal of `externalized` costs. Having in view that classic energy resources are not inexhaustible and also to limit the environment pollution, the use of regenerable sources of energy imposes itself, where it is possible. For reaching this desideratum it is necessary to develop the intake technologies for alternative sources of energy, with competitive and sustainable costs.*

Keywords: the environment, pollution, eolian energy.

1. Introduction

On the occasion of various international conferences on energy issues or in the meetings on a high level people take a clear stand, saying that both world deposits of petroleum and those of natural gas will end and that mankind must seriously think of viable alternatives to find. The totality of inexhaustible energy sources that do not lead to environment pollution by exploitation make up *alternative energy*. Researchers have discovered during the last four decades various sources with energy potential. The most widespread of these sources are: solar, eolian, geothermal, hydro, waves` and bio-mass` (including scraps) energy.

2. General presentation

Environment protection appeared as a problem of mankind only nowadays, namely when man conquered all the space of the Earth suitable for life. Now, the abundance of energy resources has been affected to such an extent that rapid ending of some of them is expected; some essential conditions for human existence, such as water or air, show signs of poisoning, too. One can see from this the possibility that mankind`s future should be questionable- of course, unless strong measures to protect the planet should be taken. Man understood that he is also part of nature, that the Earth and its resources are limited, that this planet functions as a system and that disturbances manifested in one place can have consequences for a whole circuit, including man.

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Environment degradation determines ever more organizations and natural persons to direct to various alternative solutions of producing energy. Electricity from regenerable sources becomes more and more available. In choosing such energy sources, consumers can support the development of some clean energies, that will reduce the impact following the generating of conventional energy on the environment and will increase energy independence. On the one hand, energy produced so far relies on primary energy resources, extracted from the subsoil, namely petroleum, natural gas, coal or uranium. Moreover, resources come exhaustible deposits. On the other hand, `green` energies are based on primary energy resources above the ground, that is the sun, the wind, the water, the biomass, the waves energy. All these come from regenerable, inexhaustible sources. `Green` energy can be obtained only after several generations of research that should cover the entire spectrum of technologies, from production to transport and energy distribution.

The known petroleum reserves diminish, and so do the natural gas or the coal reserves. There are also resources practically inexhaustible of energy- the solar one, for example- that we consider a recipe to save mankind. The moment when production from regenerable energy resources is impossible, `someone` or `something` must compensate for these variations in an instant, so that we, end consumers, should not feel it. The wind, the sun and the warmth stored in the soil can produce electrical or thermic energy for free. Technological progress has substantially reduced the cost of these alternative solutions, so that amortization is achieved in a short time [1]. Romania owns numerous, although not significant, sources of alternative energy, but has the advantage that there should be a certain energy potential in most of its regions, depending on its relief. There is solar energy in the South and Southeast, wind energy on the sea coast, hydroenergy in its hills and plains close to the rivers, and energy resulting from bio-mass in most of the areas. In an increasingly globalized world, the energy strategy of a country is defined in the context of evolutions and changes occurring on the world level. From the viewpoint of the structure of primary energy consumption in the world, the reference evolution and prognosis effected by International Energy Agency (I.E.A.) singles out for the next decade a faster growth of regenerable sources, but also for natural gas(which will surpass coal). It estimated that approximately a quarter from the needs of primary energy resources, on global scale, will continue to be satisfied by coal. The growth of energy consumption will lead to coal consumption at the same time.

The growth in energy demand, combined with geopolitical factors, especially the situation in the Middle East, determined in the first decade of the twenty-first century the increase of crude oil price that also led to the increase of natural gas price. Another factor that determined the increase of petroleum products` price in

the world was the lack of refining capacities. This problem asks for the identification of some medium and long term solutions. The trend manifested by some states, to supplement the stocks in order to meet crisis situations, was added to all these. The elements above lay at the basis of energy politics reorientation for all the countries that import energy, in the direction of an increasing attention given to regenerable resources of energy and improvement in energy efficiency. Simultaneously, the opportunity to close some nuclear plants in countries that had in view to stop the production of electrical energy this way is reassessed.

In accordance with the New Energy Policy of the European Union (E.U.), devised in 2007, the energy is an essential development element on the level of the Union. But it is, to an equal extent, a challenge for the E.U. countries concerning the impact of the energy sector on climate change, the increasing dependence upon the import of energy resources, as well as the increase in energy price. To meet these challenges, the European Commission (E.C.) considers absolutely necessary that the E.U. should promote a common energy policy, based on energy security, durable development and competitiveness [2]. The E.C. proposes in the set of documents representing the New Energy Policy of the E.U. the following objectives:

- the reduction of emissions of greenhouse effect gases by 30 percent until 2020, as compared to 1990;
- the increase of regenerable energy amount from less than 7 percent in 2006 to 20 percent from the total of its energy sources until 2020;
- the increase in the amount of bio-fuels to at least 10 percent from the total of fuels used in 2020;
- the reduction of its global consumption of primary energy by 20 percent until 2020.

Wind turbines are one of the oldest forms of alternative energy used in the world. Evolving from the wind mills used to pump water and to irrigate, to electric generators today, the wind turbines helped mankind for centuries. The first signs indicate the use of this energy as early as 5.000 B.C.(Before Christ) [3] when it was used to navigate on the Nile in boats with sails. Persians used it around 900 A.C.(After Christ) to grind cereals and to pump water, and Cretans used it to irrigate. The Dutch developed to the maximum the concept and the benefits of wind mills. They owned around the fifteenth-sixteenth centuries the best system of milling which consisted of a wind mill having separate levels dedicated each to the different processes that took place: grinding, separation, depositing, and on the ground floor the lodging for the miller and his family. It is still them who became known at 1390 already by a system of draining the flooded land.

Specialists say that the system had been so well perfected up to that moment that it had all the essentials of a turbine blades system nowadays, but this process lasted about five hundred years. Mills were also used to process tobacco, spices, pigments, cocoa and paints.

The wind mill was later improved in the nineteenth century in the U.S.A. and some models from that period are still used today. The thick, inefficient wooden blades have been replaced then by some lighter steel blades around 1870. Over six million of such mills were built in the U.S.A. during the next century and they were used for irrigations in the development period of the West. Eolian energy represents a viable solution for the locations that do not benefit in the present from the connection to the mains national network. In the future, by an appropriate legislation these systems can also become profitable for the consumers connected to the national network by eliminating the need to use accumulators and by delivering the energy directly to the national network. People begin to realize today that the power of wind is one of the most promising sources of energy that can best replace the electricity generated by fossil fuel. Starting from 1999 the capacity for global eolian energy exceeded ten thousand megawatt, which represents approximately sixteen billion hours of electricity. Enough to provide for the consumers in five cities like Miami, says the American Association of Eolian Energy. Five cities like Miami may not seem significant, but if we continue the development and the application of such sources the eolian energy might become the main energy source.

The wind's energy can produce with the technology at our disposal today 20 percent of the electricity in America [4] (approximately the quantity that the nuclear energy produces) by the turbines installed in an area of less than 1 percent of the total area. And inside that area less than 5 percent from the land proper would be occupied by technical equipments. The rest of 95 percent could continue to be used for cultures or animal breeding. It is estimated that approximately 10 million households will benefit from eolian energy until 2010, thus avoiding emissions of 100 million tons of carbon dioxide per year. The diminution of dependence from fossil fuels is essential for the health of all living beings, and eolian energy does exactly that. Germany, U.S.A., Spain, Denmark and India are leading the top of nations that produce eolian energy on the world level.

In our country the use of regenerable sources of energy for electricity production depends, in the case of eolian systems, on the assurance of an adequate adjustment capacity. Transelectrica announced that the National Energy System (N.E.S.) can take on, without supplementary investments, the connecting of a peak power of 1.500 megawatt (MW). This is due to the limited power of the power units in the hydro-electric power plants that can be turned on rapidly in case that wind

turbines stop. The power is calculated depending on the water reserve that can be stored in the storage lakes. Eolian power plants, whose functioning is influenced by weather conditions, need that they should be rapidly replaced by some other units for electricity production when they stop, in order not to disturb the system's functioning. Transelectrica received applications to connect to the mains for units of wind turbines over the possibilities of the existing mains. We can say that the eolian potential of Romania technically suitable to fit up measures 3.000 MW in a pessimistic view and 9.000 MW in an optimistic view, according to the manager of the Regenerable Energies Center.

The capacities of production for eolian energy in Europe have an installed power of over 40 GigaWatt (GWatt), that is, five times bigger than the whole installed power of Romania [5]. At the same time the installed power in Europe represents 75 percent of the whole wind energy on the globe. The National Energy System cannot integrate such a big capacity of wind energy. Up to the present we issued approvals of connection for an installed power of about 900 MW, a power that comes very close to the maximum of 1.000-1.500 MW, points out a press release of Transelectrica. Advantages offered by the wind energy are the following:

- wind energy is an inexhaustible source of energy. It will exist as long as the Earth will receive energy from the Sun
- the production of electric energy from wind energy does not lead to environment pollution. The expenses that should be made for the ecological regeneration of some areas, such as the mining areas or the petroleum fields, are so high that the society cannot afford them
- as compared to petroleum or natural gas, the obtaining of energy from eolian resources does not threaten in any way people's lives. It is unconceivable that wars should take place to assure eolian resources, as it happens in the case of petroleum or natural gas, and the malfunction of eolian power units will not lead to ecological disasters that should put people's lives in danger
- eolian energy is available for two thirds of the cold periods of the year, which makes it complementary to hydro-electric energy, as water resources diminish very much during the cold periods
- production of electric energy from eolian resources does not imply `externalized` costs. The externalized costs are those costs that cannot be found in the pay-bills of electricity consumers, but that are managed by the company, such as costs for environment pollution, health and industrial accidents costs, costs linked to the transport and the protection of transport for energy resources, costs due to disasters, like the accident in Chernobyl or military costs. Externalized costs are clearly associated to the traditional technologies of obtaining energy from fossil or nuclear fuels, and they have been up to the present `hidden` costs. But their pressure upon the company became gradually stronger, so that in the short run they will have to be included in the energy price.

If this happens, the price of electric energy produced in thermo-electric power stations will double, according to a study effected in the E.U.

- the technology to produce eolian energy is safe, it reached its maturity, it improved continuously of late and its costs fell dramatically. An installed power of 100 MW supposes an investment of about 100 million Euros. Although it seems a big sum, it is notable that the investment would be amortized in approximately seven years, a time limit extremely reasonable for an energy investment.

- the costs of production for electric energy from eolian resources are at the moment comparable to those of energy from traditional fuels –not to mention what we pointed out before, namely `externalized` costs. If it were taken into account, eolian energy would be one of the cheapest forms of energy.

The use of *bio-mass* in energy processes began to be applied in West-European countries in the 80`s, when the development of an alternative to the combustion of coal in the steam-generating stations for heating appeared as necessary. By the raise of coal price and also by hardening the conditions concerning nox emission and the raise of due taxes, the use of coal in power stations to produce exclusively thermic energy became non-economic. As a consequence more power stations were adapted for the combustion of pellets (a fuel obtained by the agglomeration and the thermic drying of wooden scraps), so that in 1992 about 150.000 tons of pellets should be used in such power stations only in Denmark [6], one of the most advanced European countries in using this type of fuel. The use of wooden scraps in thermic power stations to assure the necessary of thermic energy of some communities began in the 80`s, continuing to grow ever since, and the use of straw to the same end began in 1983.

Another sort of energy is represented by the *waves` energy*. If the ocean waves` energy could be acquired 100 percent as a new resource of alternative energy, then most of mankind`s crises could be solved. It is estimated that if one could install these energy converters of billows in all the oceans of the globe, one could produce energy meaning double of the consumption on the whole planet. It is known that this type of solution for alternative energy will be difficult enough to implement practically, but it is a certainty that one could pick up the waves` energy on a small scale. These types of solutions can easily provide the necessary for a planet having a great energy consumption. Not everybody is lucky enough to have a river close to his house, but for those included in the category, small hydro-turbines are the cheapest source of alternative energy. Any small turbine can produce energy incessantly as long as there is water, irrespective of weather conditions.

The sun provides clean energy for us –economically and permanently. Using the heat power of solar radiations in certain areas by the introduction of a personal

system of solar panels, each household can assure its daily necessary energy very efficiently and entirely unharmed the environment. Thus we give up the processes of extraction and combustion of various fossil fuels that practically create the most difficult ecological problems. Solar technologies use *sun energy* to produce heat, light, hot water and even air conditioning for lodgings and industrial areas. Solar systems acquire energy from solar radiation and from diffuse radiation even at low external temperatures to insure hot water. Conversely, solar energy seems to be the saving solution for countries in the Third World. Their development is blocked due to the lack of means to assure the minimum necessary of electric energy. The African continent is at the same time the most suitable to locate these alternative systems. The benefits would be extraordinary: not only that it could supply the entire continent with electric energy almost for free, but also it would implicitly create work opportunities and it could even export this energy to countries needing more energy. World economic situation would suffer major changes, and with so much green energy exported, polluting emissions produced by conventional energy would be significantly reduced.

Romania lies in a geographical area with plenty of sunlight. The climate changes due to the greenhouse effect and Romania's geographical position assures approximately two hundred and ten sunny days a year. There is at present a strategy negotiated with the E.U. containing for Romania taken obligations regarding the satisfying of a part of at least 33 percent from the internal consumption of energy from regenerable sources, and of 11 percent from the consumption involving all forms of energy, by 2010 [7]. The amortization of these systems is effected in approximately five to eight years, and the life limit of a solar-thermic system is of over twenty years. The only source of energy that will not diminish in the near future is that coming from the Sun. According to the studies of the Environment and Durable Development Ministry eolian energy could cover 17 percent of the entire clean energy, the solar energy- 12 percent, and small hydro-power stations and geo-thermal installations would contribute with 4 percent and respectively 2 percent.

The European Commission alongside with Greenpeace and a number of twelve scientific institutes from around the world have effected a study concerning the switch to the generating of more alternative energy, as long as the heating of the atmosphere would be kept lower than two degrees Celsius. The conclusion reached is that we need over 50 percent alternative energy by 2050. The switch to alternative sources supposes bigger investments in a few years' time.

With a regard to the situation in our country, if we designed an economic strategy we would need to have in view the entire coverage of internal consumption of electric and thermic energy under the conditions of the rise in energy security

of the country, durable development and insuring an appropriate level of competitiveness. The energy security could be achieved by the assurance of the necessary of energy resources and the limitation of dependence from import energy resources, by the enrichment of import energy sources and of energy transport routes, and by the increase of adequacy level of national networks of transport of electric energy and natural gas.

The durability of the energy system will be assured by the following measures:

- the improvement of energy efficiency
- the promoting of energy production based on regenerable resources
- the support for activities of research-development and dissemination of the results of applicable research
- the reduction of the negative impact of the energy sector on the environment.

Conclusions

One of the priority elements of the energy strategy consists of improving the energy efficiency, which contributes greatly to the achievement of providing security, to durability and competitiveness. The reduction of energy demand by increasing the energy efficiency represents a profit policy that leads to the saving of primary energy resources as well as to the reduction of greenhouse effect emissions.

There are so many advantages in using regenerable energy sources that it is surprising that they are not used on a larger scale. The durable use of energy imposes the use of regenerable energy sources wherever it is possible in order to keep the fossil fuels resources and to limit environment pollution.

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