WIND POTENTIAL ENVIRONMENTAL IMPLICATIONS OF USING

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Abstract: *In accordance with the responsibilities assumed by Romania for transmission to future generations a clean and healthy environment, with respect to the three dimensions of sustainable development-economic, environmental and social, this paper addresses implications of using renewable energy (wind) on environmental quality. A "clean Nation" is the result of a complex of activities and actions related judiciously to improve environmental conditions and population health and involves the development of appropriate community mentality, realistically assess environmental issues, establish priorities and develop appropriate strategies to solve them and not least, changing attitudes and behavior towards the environment and civic responsibility. Without environmental protection, can not ensure sustainability. Sustainable development integrates environmental protection and environmental sustainability condition. Using renewable energy is a compulsory need time to achieve sustainable development of the country. The work was done using GIS map of areas that will place wind farm, using meteorological observations made over three years, with maps containing specific areas within the country with biodiversity, with findings of doctoral theses completed in the Oradea and in Debrecen University and using technical literature. In this mode achieve a wind farm located in a mountainous area on the environmental factors. They also studied the positive effects of investment and stfel have highlighted the beneficial effects on biodiversity by increasing humidity results due to the decrease of wind speed due to its passage through the plant palettes. Although wind power worldwide is at an advanced stage of technological maturity, we can state that in Romania the share of energy from renewable wind energy balance, short term, are below the real possibilities of economic recovery, due to high prices and difficulties administrative. These reasons have prevented so far come true regenerable energey competitive with fossil rule. Using of renewable energy will certainly lead to the need for similar studies to that presented.*

Key words**:** *wind, energy, sustenaible*

INTRODUCTION

The concept of sustainable development refers to the kind of economic development to ensure needs of the present generation without compromising the ability of future generations to meet their own requirements.

Sustainable development put in the foreground, in terms of the energy industry, to: diversion of energy production technologies and the risk control their resource base and increasing conservation, reducing CO emissions, developing renewable resources, the unification process decision making on energy, economy in general and environmental protection in particular.

Rational use of energy in the so-called "alternative" or "integrative" exploitation of wind energy is certainly of great importance. Reasons for renewed interest emerged on these energy sources in recent years are many: broadcasting to the territory, increasing technology in those sectors, growing desire to become more independent of centralized production and distribution services, energy, unpredictable development of traditional fossil fuel prices and rapid depletion of their perspective.

MATERIAL AND METHODS

To estimate the environmental impact of a wind farm to imagine a wind farm would be built in a hilly to mountainous.

To implement the investment we made:

- Studies on the area's wind potential;
- Geotechnical;
- Studies of connection to the NPS.

The conclusions of these studies indicate that essential conditions are met, consisting of:

- Local enough wind potential;
- The availability of land to sitting turbines;
- Connectivity to the National Energy System.

Conditions of use of land are pasture and arable only.

As noted, the economic feasibility study based on study of wind potential in that area. Relevant to this study are measurements and analyzing data on average speed and prevailing wind direction.

Specific wind potential is defined as the kinetic energy of air masses passing through a vertical surface in a given period (unit) time. We can calculate at any time by the formula:

$$P_f = \frac{\rho}{2} v^3$$

where - V is wind speed wind specific

- P is the density of air (air) and its measurement unit is Wm-2.

Measurements were made in accordance with the rules of financing, using speed and direction sensors, placed at 30, 40 and 50 m. The records were made every 10 minutes, and interpretation, processing, and analysis was performed with using specialized software.

Major interventions will take place during the execution of excavations for the foundations of the turbines, the pillars and the high voltage transformer station. Since the sites are in proximity to municipal road, partly paved, the project does not require building new roads, only existing arrangement so as to be passable by heavy equipment.

Maximum power will be installed on this investment of 38 MVA capacity accepted by the system can be achieved because of the wind potential area.

The investment is made to the following standards:

IEC 61400-1:1999 "Wind turbine generator system - Part 1: Safety requirements"

ENV 1992-1:1991 EC2: Design of concrete structures - Part 1 General rules"

ENV 1997-1:1996 EC7: "Design / Geotechnical - Part 1 General rules.

EN 206-1:2000 "Concrete: Specification, performance, production and compliance

EN 10080:2005 'Steel for reinforced concrete.

The solutions proposed by the designer specialized in regard to the distribution system are:

- Distribution network 20 kV indoor park will and will consist of underground pipelines, located at 0.80 m depth, on the existing communication channels, operating on the roads that for each turbine, full length internal network will be around 28 km;
- The substation will be located above ground;
- Connection to the network operator will be by overhead line to 110 kV systems;
- Length of connection between the station and the existing line will be around 9000 m.

Aero generator parts are shown in Figure. 1

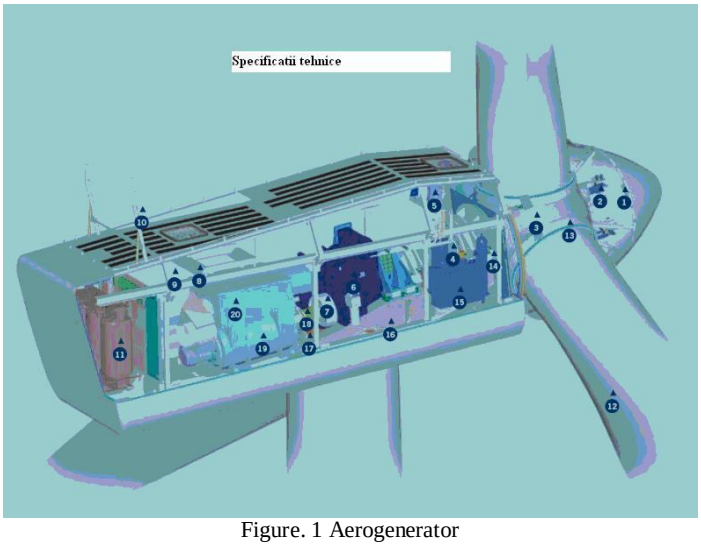

Figure. 1 Aerogenerator

Structural and functional characteristics of the main components are shown in the figure number 2:

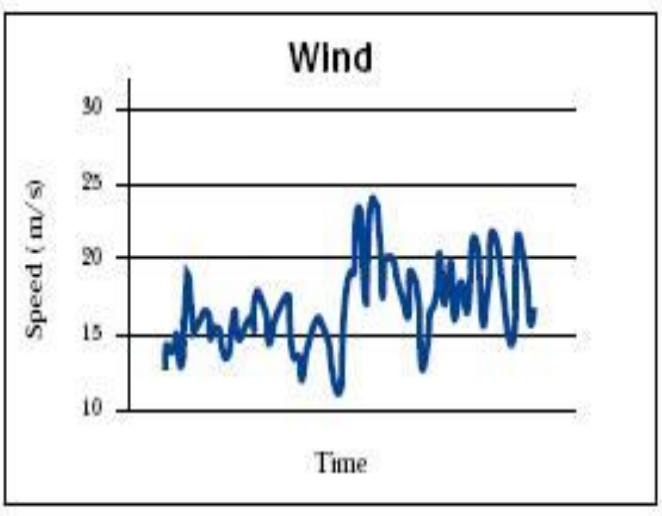

Figure.2 The variations of wind in time

Rotor
Diameter: 90m
Covered area: 6362 m2
Rated rotation: 14.9 rpm
Operating range: 9.0-14.9 rpm
Number of blades: 3
Power allowed: Palette / Optispeed

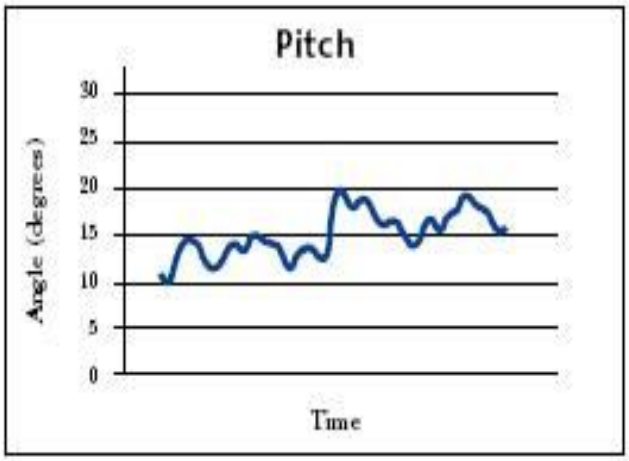

Figure 3. The variations of pitch in time

RESULTS AND DISCUSSIONS

Classification in landscape

We note first that a wind farm, especially if the flat is situated in the interests of maximum exploitation of wind energy, the average distance between two wind turbine rotor diameters is 6-10, which means large turbines few hundred meters to more than one kilometer. Those large turbines will be placed as rare as pillars of high voltage lines, which occur almost anywhere in the landscape around us, but we normal and no longer consider a negative impact on the landscape.

Large turbine rotor speed is very slow - about 10 rpm, so it does not induce or cause any negative feeling.

Employment land is minimal in the area arranged (about 0.1% of total) - as for power lines - and could still use the land for farming or grazing [125].

Windmills as a source of noise and vibration.

Like any other industrial equipment and operating wind turbines produce noise due to mechanical systems in operation, the air splitting or rotating blades in the blade passing through the right pillar of support when there is a compressor.

To not have a negative impact especially in densely populated areas, noise sources are very closely controlled by manufacturers of turbines and special technological measures are taken for each source. That is a result of such measurements; manufacturers give firm guarantees on the upper limit that noise from the turbine [43].

But we can say that modern wind turbines are not noisy, most manufacturers ensuring that the turbine rotor noise (sound pressure) does not exceed 100 dB (A), equivalent to a noise of any manufacturing industry.

If the wind blows towards a receiver, the sound pressure level at a distance of 40 m from a turbine is typically 50-60 dB (A), which corresponds to the ordinary human conversation. 150 m noise decreases to 45.5 dB (A), equivalent to the normal noise from a building and at a distance of over 300 m of turbine noise operation is identical with that wind noise. If the wind blows from the direction contrary, received noise level decreases by about 10 dB (A).

According to the specific location of each part, because noise is not accepted, should

be considered keeping a sufficient distance from human settlements, various household annexes, public institutions, historical and architectural monuments, parks, squares, hospitals and other places of public interest.

As regards vibration, they are insignificant for medium.

Impact on birds fly

The main impact questioned the environmental impact is related to birds flying in wind turbine rotors in motion, and disturbance of habitat (ground) if the area is important colony of birds.

This issue has risen - still more than a decade now - the intense disputes in Western European countries promoters of technology. For this reason, many countries have initiated many studies the impact of the operation of wind turbines on birds.

Today in Western European countries environmentalists and wind power developers have reached a consensus: the impact of wind turbines and birds is less than stated in the beginning and in any case lower than the impact of other human activities such as hunting, road and air or even existence of static structures like power lines or poles and tall buildings, of which birds collide because they hardly see [42].

This finding allowed the development of wind energy boom in all EU countries. As I looked there were over 40,000 MW at the end of 2005.

A Dutch study (prepared by the Territorial Office for wind energy in cooperation with the Dutch Foundation for the Protection of Birds) estimated that 1500 birds are killed annually by hunting, power lines 1000, 2000 birds/1000 road and only 20 MW of wind turbines. It follows that the number of birds killed by cars is 300 times greater than the number of birds killed by wind turbines, while the hunting of 70 times.

These estimates are confirmed by a study of Danish Ministry of Environment, which concluded that the poles and power lines are a greater danger to birds than wind turbines, which in turn are visual and audible warning is significant for birds, they avoid area. Radar studies of Tjaeborg - West Denmark where 2 MW mills operating a show that birds tended to change their flight route with 100-200 m of turbines and passing near or over them at a safe distance. This behavior was observed both day and night [43].

Port-la-Nouvelle in southern France, five turbines is placed in an important reserve for birds passing through thousands of birds, including predators, especially during migrations. The study, prepared by the French League for the Protection of Birds has found that older birds deliberately flew around the turbines. In five years of operation of the wind farm has not reported any bird in the league injured or killed.

These highly positive findings does not eliminate the need for specific analysis in each site, taking into account that there are any reported bird species are protected and stable habitats where these species may suffer extinction through the wind farm, or passage just wandering birds pass over location proposed.

In these cases require some additional precautions such as increasing distance between the turbines and their location in technically possible, under ridge summits (in the case of sites on the heights of hills or similar), and in extreme cases interruptions project implementation to make a concrete study of the agencies of the Ministry of Environment to determine the effects of possible impact. But we believe that these findings can only be positive, as was done in all other developed countries in wind energy production.

Electromagnetic Interference

Radio waves and microwaves are used in a wide range for communication. Any large structure may cause electromagnetic interference mobile. Wind turbines can cause interference by electromagnetic signals reflected turbine blades so that nearby receptors directly acquire the signal and the reflected. Interference occurs because the reflected signal is delayed due to both

their wavelength frequency of the turbine and the Doppler effect caused by rotating blades. Interference is more pronounced for metallic materials (highly reflective) and weaker wood or epoxy (absorbent). Modern blades constructed of a metal span strength, dressed in polyester reinforced with glass fiber are partially transparent to electromagnetic waves.

Communication frequencies are not significantly affected if the transmitter wavelength is four times the total height of the turbine. Commercial turbine usual limit is 1.5-2 Hz frequency (150-200 m). Theoretically there is no upper limit.

Types of signals for civilian and military communication may be affected by electromagnetic interference include issuing radio and television signals, microwaves, cellular radio communication systems and various control air traffic and shipping.

Consulted the specialist is required. To achieve the correct solution obviously comes first the method of wind turbines to the emitters and receivers in the area, as their existence in the park near the turbines.

Interference with a small number of receptors that television is an occasional problem can be solved by relatively inexpensive range of technical measures such as using multiple transmitters and / or target receptors, or broadcast by cable network [9].

Risk of failure with the onset of impact

The worst damage that may occur at a wind turbine is damaged brake rotor during operation (ie wind speeds of 3-25 m / s) such as the loss of network connection. This leads to the turbine packaging, which ultimately can lead to broken pieces of the blade, the impact of gravity on the ground. Although modern equipment such failure is becoming less common, the user should take warning and prohibition of access under the turbines turning radius indicating the possible risks.

In countries that have developed wind energy are of general warnings and fitted only to wind park that fits in any case unrestricted land use (agriculture). These alerts to individual turbines usually are missing.

Other types of impact

There is no impact on surface water and groundwater and aquatic ecosystems are not affected and no water use.

There is no emission of pollutants that may affect the terrestrial vegetation and wildlife. With no emissions of air pollutants due to the completion of such projects, not produce any changes in dispersion and air quality.

Changes in quality and soil structure and subsoil due to achieving more access roads, installation of platforms, the pouring foundations (concrete), production control room and lines electrical connection to the network are minor. Measures envisaged by the projects (rehabilitation of the soil, of green etc.) by sufficient assembly construction works.

An effect that can be perceived and at greater distances, so many local neighbors of the wind farm, the flicker phenomenon of blades when the sun struck directly, which could be annoying. This happens only on clear days from sunrise until noon and is charged only when the wind blows in the direction toward the viewer, which means at most a few tens of hours per year, almost any configuration and topography of the wind farm site. The fact that the blades are painted white phenomenon is much dimmed.

Positive effects on air quality, vegetation and terrestrial fauna.

When passing through the wind turbine rotors, they yield about 30% of the kinetic energy of wind turning it into electricity, and immediately downstream of the turbine speed decreases by about 15%. Because this decreases the wind speed is expected local relative humidity to rise by several percent. By increasing the humidity, vegetation grows better with beneficial effects on the tropic chain in this area.

CONCLUSIONS

From reviewing the Western experience with assessment we can say that large wind farms with a significant number of turbines, they are placed sensibly in most locations will not cause significant impact on air, surface water and groundwater, vegetation and fauna land, soil and subsoil, or on human settlements and other targets in the area.

Technology itself offers some advantages among which were mentioned:

- The wind passing through the turbine rotors, lowering speed is expected local relative air humidity to grow, which may lead to better development of vegetation with beneficial effects of complex trophies chain.

- Landscape, wind farms not only disturbing but can be a significant tourist attraction, while visiting the park can become an important focus of local tourism program.

Although not strictly refer to people from an area with wind farm, can not neglect the very important and the overall reduction of CO2, SO2 and NOx by producing electricity by using wind power. These reductions are measured at: 670 kg CO2/MWH, 2.4 kg SO 2 / MWh and 2000Kg NOx / MWh.

Without major impact on the environment be seen in locations of areas environmentally sensitive (eg Danube Delta Natural Reserve and other protected areas), and lack of specific experience as national consider it necessary even when the project start to be made - by the Ministry of Environment - specific investigations to assess the actual environmental impact. The conclusions of such studies will create a correct opinion both among specialists and the Romanian population and development will benefit all the wind energy sector in Romania.

Although wind power worldwide is at an advanced stage of technological maturity, it can be appreciated that in Romania the share of wind energy in the energy balance in the short term, are below the real possibilities of economic recovery, due to high prices and difficulties administrative. These reasons have so far prevented to enter truly renewable energy compete with fossil fuels. We can only hope that this will change soon.

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