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WIND POWER TECHNOLOGY

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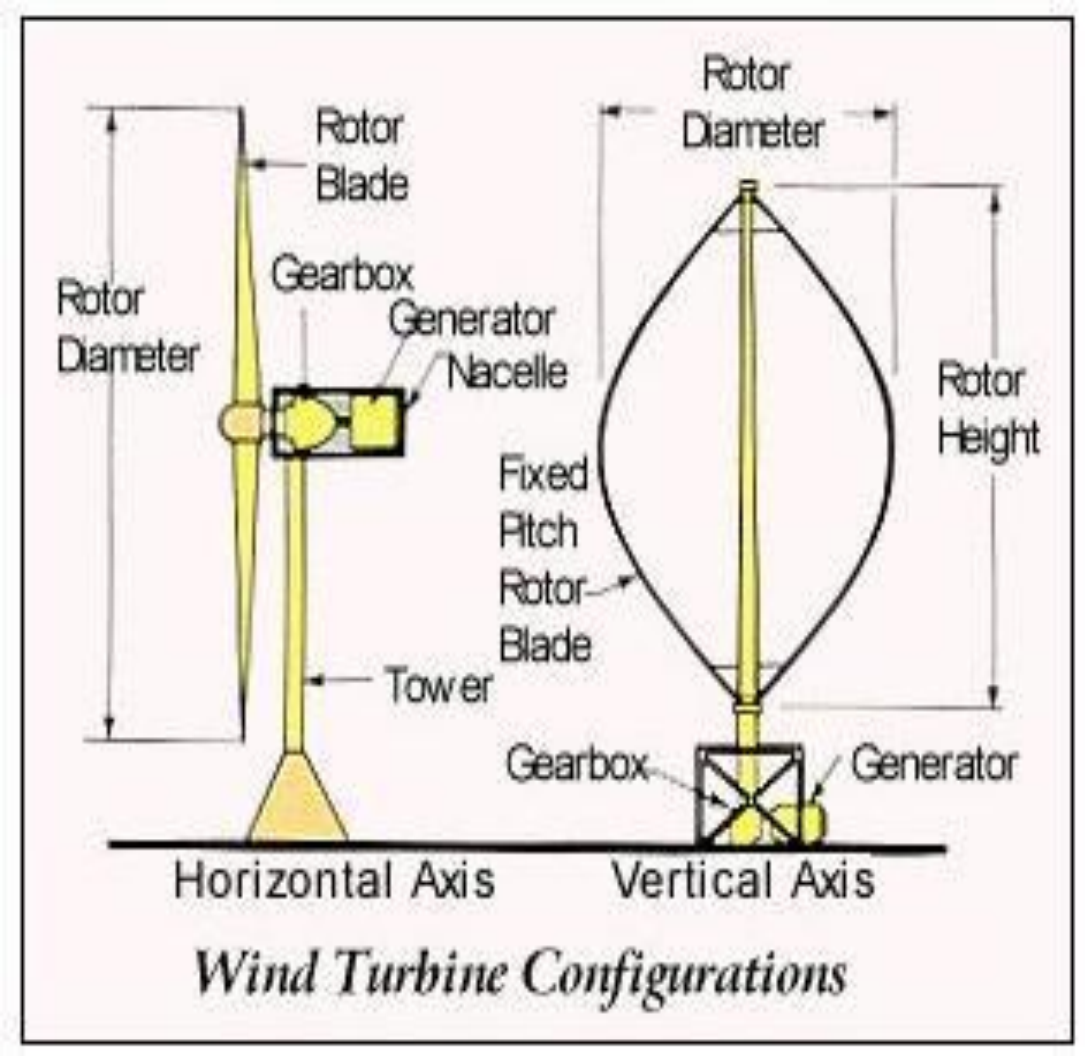
TURBINE TECHNOLOGY

- The wind brings into play the rotor blades which spins around a central shaft, which is connected to a shaft motor, which powers an electric generator.

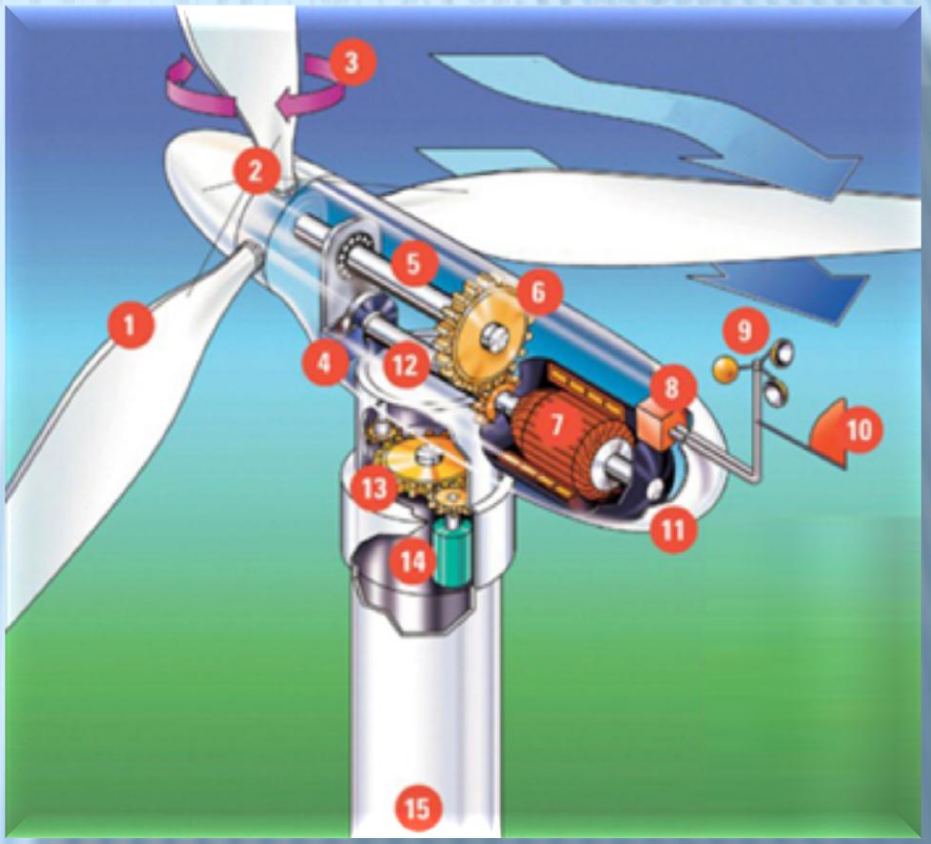
COMPONENT ELEMENTS

- Components
  - Rotor
  - Gear box
  - Tower
  - Foundation
  - Command/ Automation
  - Generator
- Types
  - Horizontal shafts (the most used)
    - Controling or project for the rotation of the rotor shaft down-wind
  - Vertical shafts (less used)



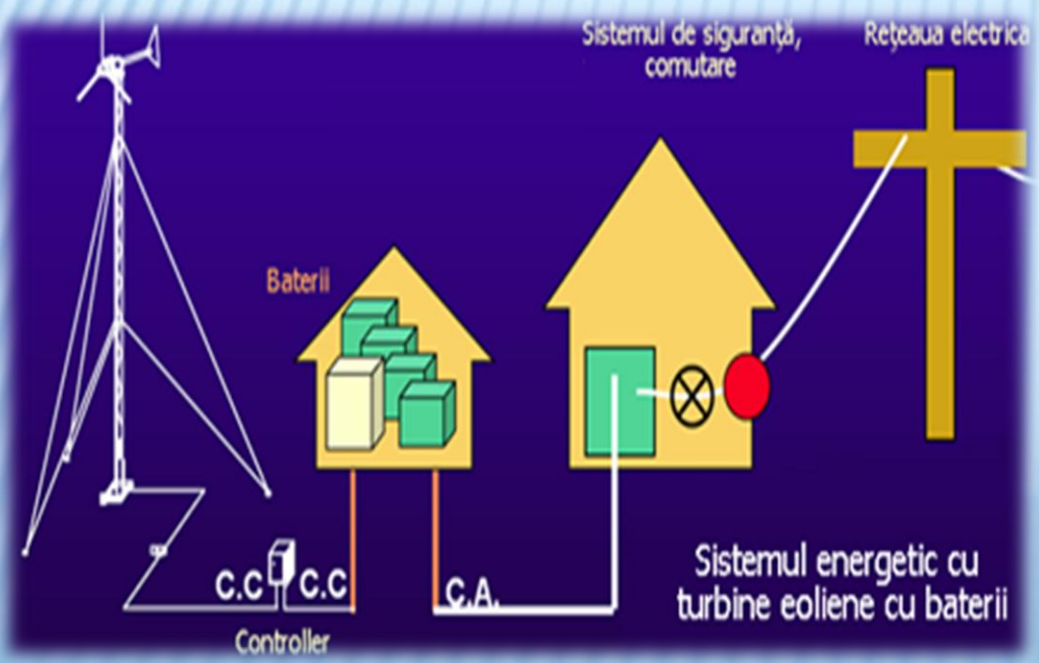
THE DIAGRAM IN WHICH ARE DESCRIBED THE COMPONENT PARTS OF A TURBINE

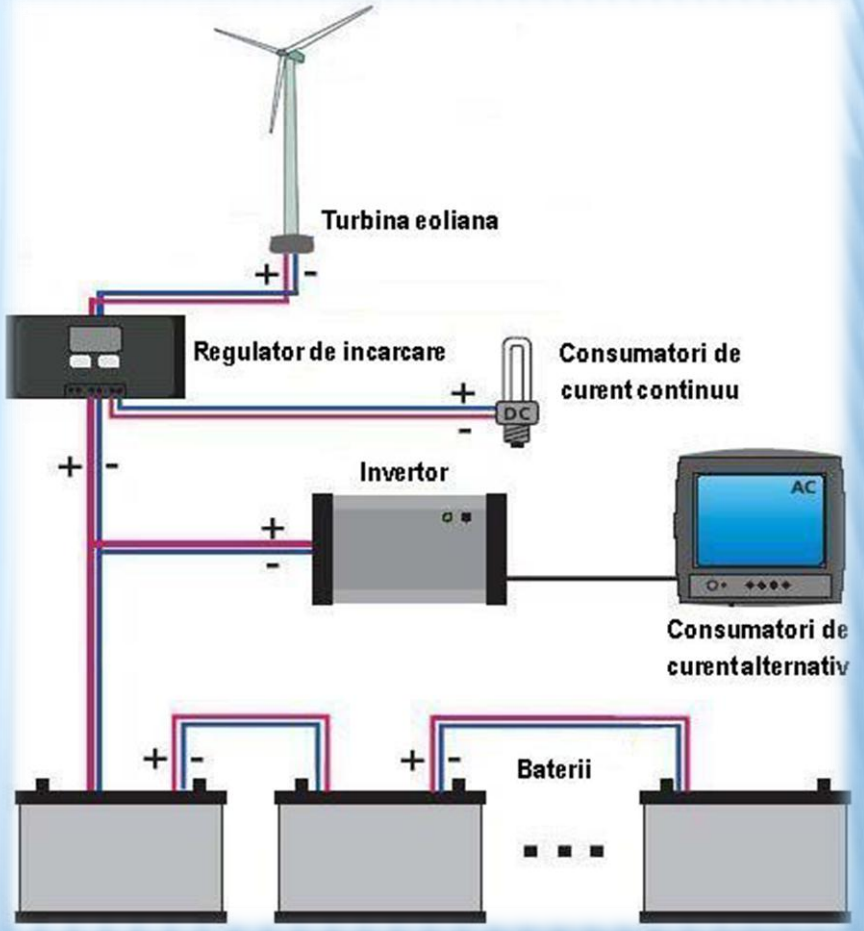
1.Propeller blades
2. Rotor
3. Blades
4. Dempfer
5. Blade shaft
6. Rotation fixer
7. Electric generator
8. Wind speed controller
9. Anemometer
10. Anemometer blade
11. Basket
12. Engine shaft
13. Pylon rotation system
14. Pylon rotation engine
15. Pylon (fixed tower or anchor pole)



AEOLIAN ELECRTIC SYSTEM FOR HOUSEHOLD USAGE

In these figure is presented a household system which produces electrical energy (AC/DC), through an aeolian turbine.



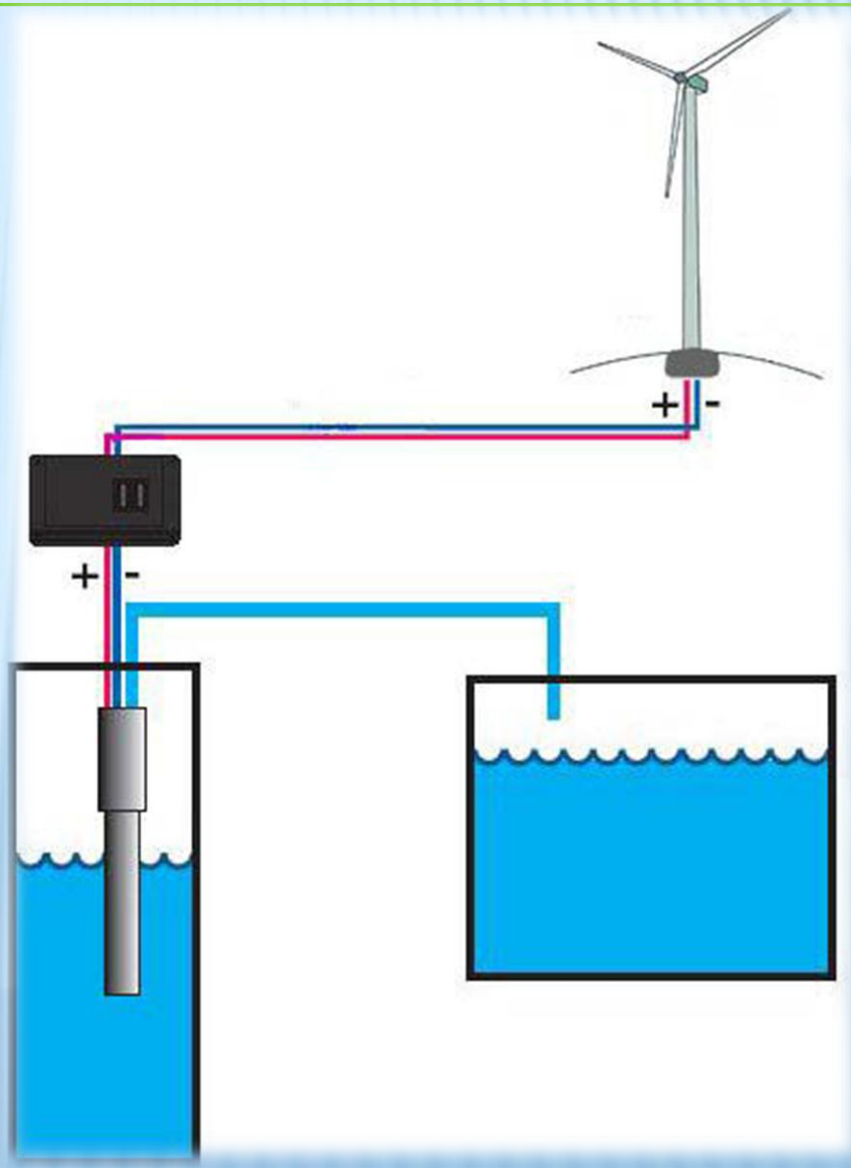


This system supplies AC and DC power consumers.

WATER PUPMING SYSTEM BASED ON AEOLIAN ENERGY

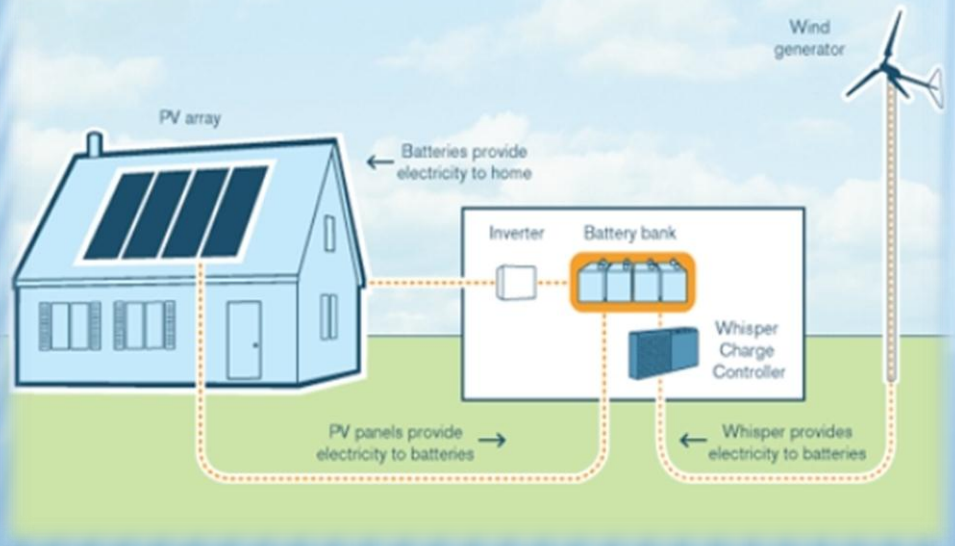
Where water exists in limited quantities, but deep in Earth can be found groundwater and the wind blows with regular speed (typical situation for dry lands), an aeolian turbine can be used successfully, for pumping up the water.

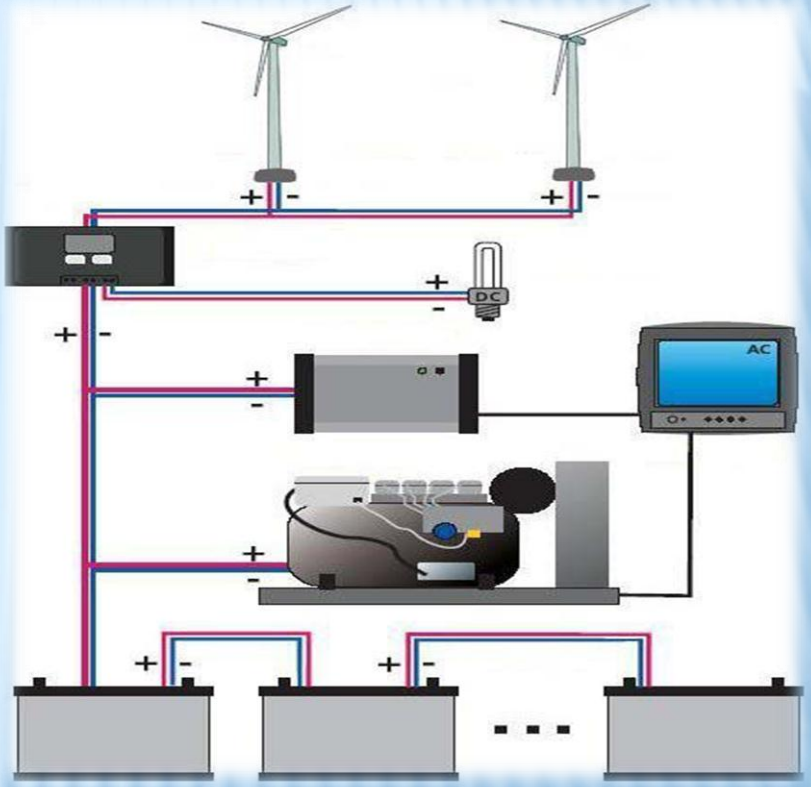
This system is used in agriculture, for irrigation of dry lands, for pumping water inland from rivers, etc.



HYBRID AEOLIAN SYSTEMS USED FOR POWER PRODUCTION

In some cases, specially in low scale systems, power can be produced with the help of alternative systems like thermal engines or solar panels.





In this image is presented a power production system that includes a generator powered by a thermal engine.

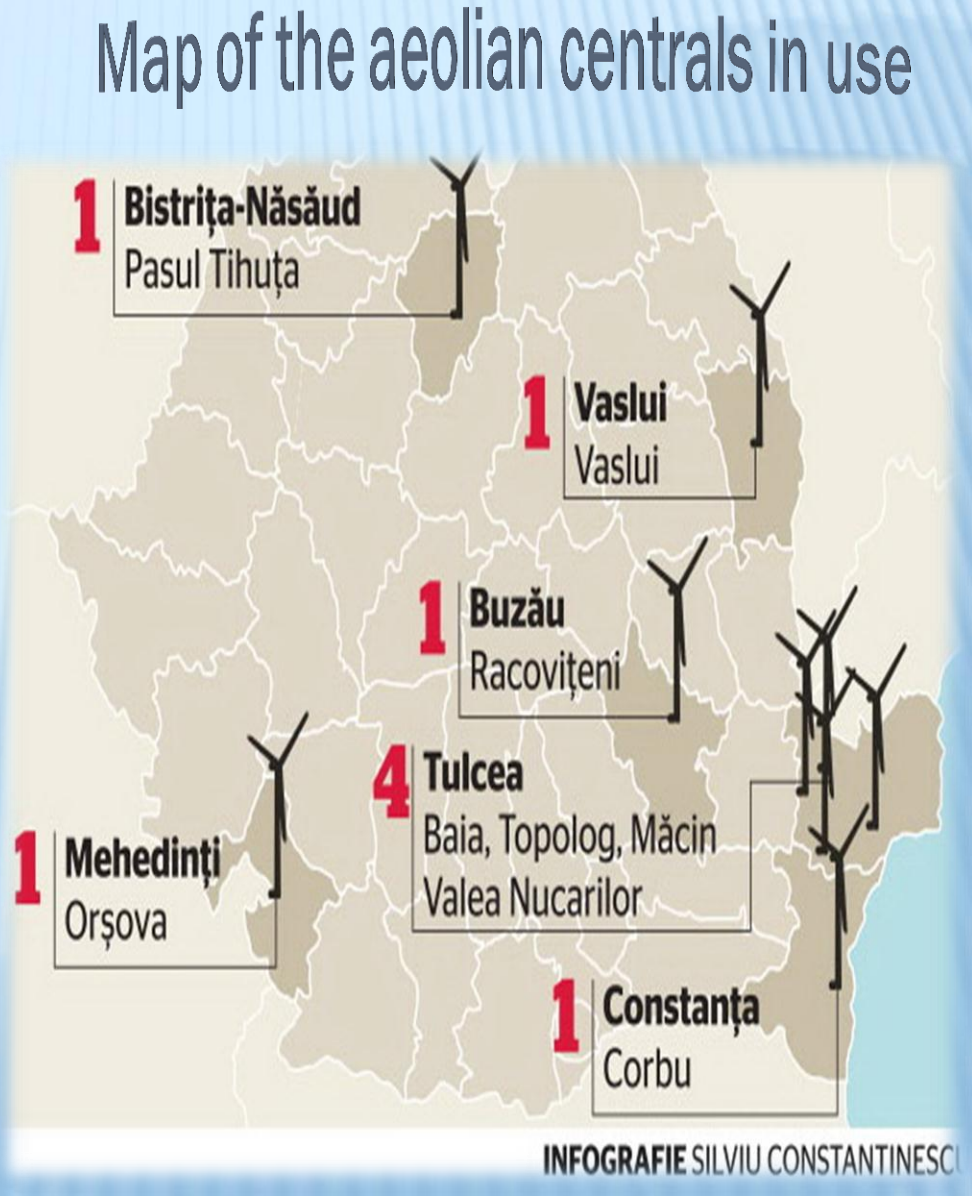
NEW TECHNOLOGY IN USING THE AEOLIAN ENERGY

- Turbines are energetic systems, very sophisticated, which catch the wind energy by the medium of some new designed blades or new profile hydrofoils.

- The aeolian energy represented the source of energy which had the most fast development, worldwide, after 1990, with an annual average growth of 25%. This trend is due to some significant improvements in the technological area.

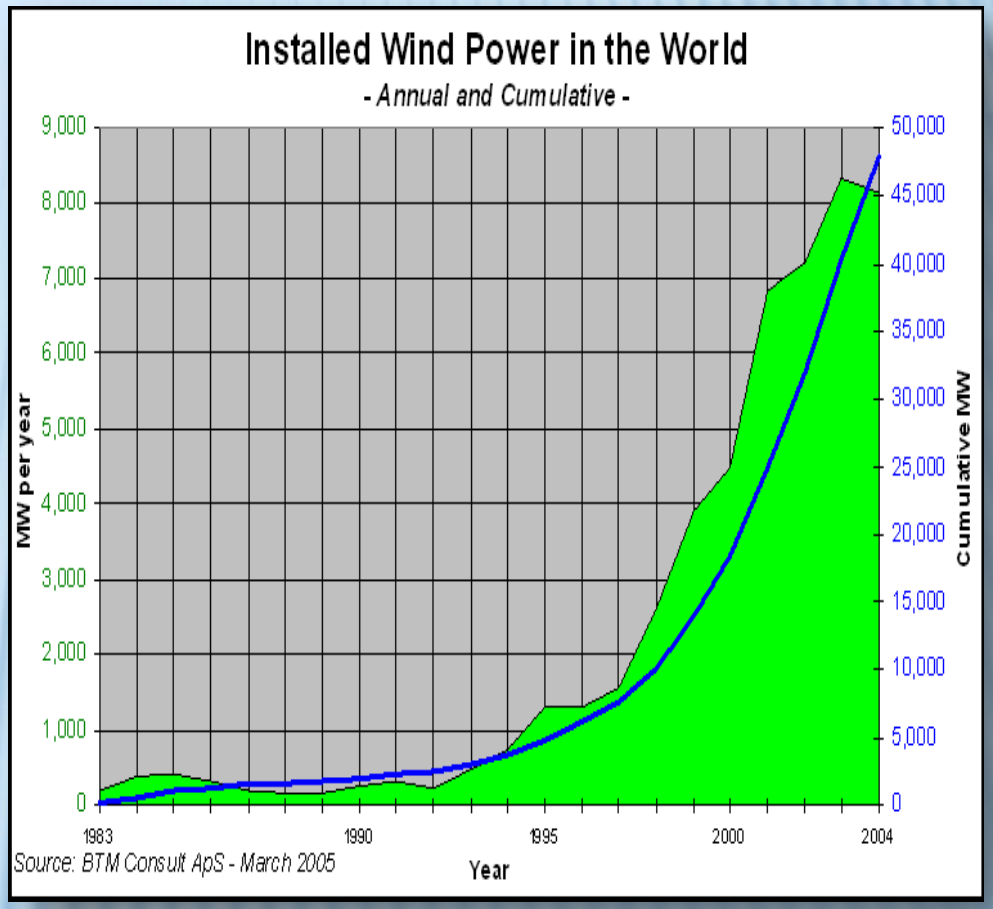
CHARACTERISTICS

- Hundreds of years ago, people used windmills and sailboats for taking advantages of the aeolian energy.
- Nowadays, the wind turbines, which work differently from the windmills, represent a much more efficient technology, safe and profitable.
- CEZ fit up 115 turbines at Fântânele, 90 of them being already connected at the national network of electric energy.
- At the beginning of 2012, in Dobrogea there were over 500 aeolian turbines.
- The Romanian aeolians produce, in average 150-200 megawatts/hour. The cost of the aeolian energy is 170 euros/per megawatt/hour, almost three times more than the energy produced by hydrocentrals.



WHAT AEOLIAN SYSTEMS ASSURE

- Electricity for
  - Central networks
  - Isolated networks
  - Providing energy at long distance
  - Pumping water
  - Support for weak networks
  - Reduce exposure to energy price variations
  - Reducing transmission and distribution losses



RESOURCES

- The existence of medium and high-speed winds is essential:
  - The minimal annual average: 4 m/s
  - Many people overestimate the speed
  - The wind speed increases with height
- Appropriate resources:
  - Coast areas
  - Steep peaks
  - Ghats
  - Open lands
  - Valleys that channel the wind
- Usually, there are more windy:
  - The winter from the summer
  - The day from the night

ADVANTAGES

- The main advantage of wind energy is zero emissions of polluting substances and greenhouse gases, because it is not burning.
- No waste is produced. Wind power generation not involving any kind of waste production.
- Lower cost per unit of energy produced. The cost of electricity from modern wind turbines has decreased in recent years, reaching in U.S. to be even lower than for electricity generated from fuel.

DISADVANTAGES

- Has an irregular time in the area of activity;
- Has a low concentration per unit area acting normal to the direction of the wind;
- By its irregular nature, aeolian energy can not satisfy irrigation work so it must take place after a rigurous program
- relatively limited energy source
- inconsistency due to variation of the wind speed and the low number of possible locations.

SAFETY OF EOLIAN ENERGY

- People who live in distant places and use aeolian energy, frequently use batteries or backup generators to provide power during periods without enough wind.
- Most commercial wind turbines are offline (for maint enance or repairs) less than 3% of the time, is therefore as safe as conventional power factori es.
- Wind turbines have a reputation as enduring. Many turbines have been producing energy in the early 80.

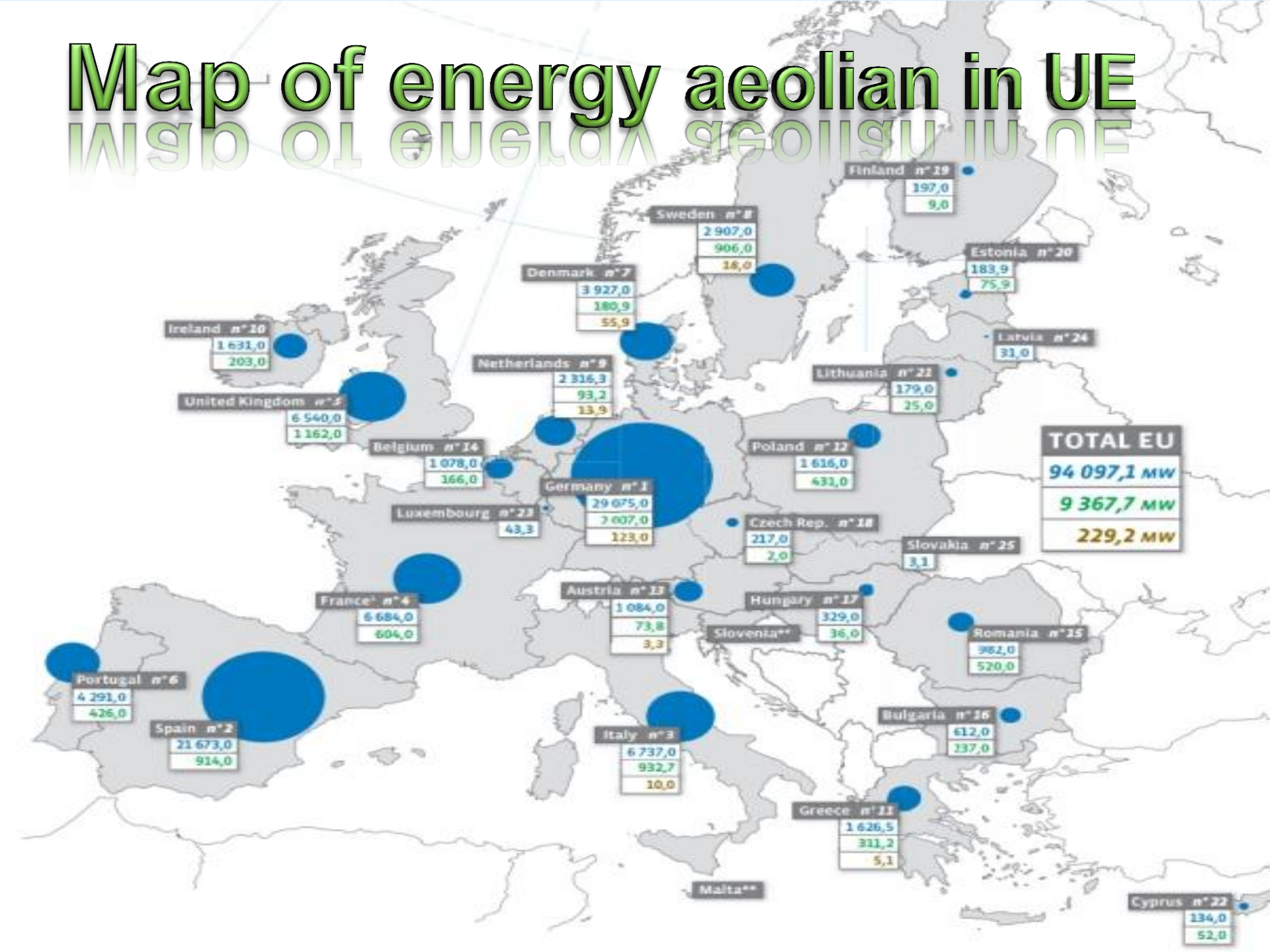
ENVIRONMENTAL EFFECTS

- Production of electricity using wind turbines produce no air pollution because they do not consume fuel. The only fuel is in the process of production, transportation and installation of turbine equipment.

- The main objection against the installation of wind turbines is the danger that it represents against birds and bats. However, studies show that the number of birds killed by wind turbines is negligible compared to the number of birds killed by cars, power lines or because of other human activities. It posesses a greater danger to migratory bats during migration periods.

- The noise made by wind turbines is often considered a problem though, larger turbine noise is lower than that of small turbines.

Map of energy aeolian in UE



THE AEOLIAN POTENTIAL OF ROMANIA

In the strategy of using renewable energy sources, the aeolian potential is 14.000 MW (installed power), which can supply a quantity of energy that can reach 23.000GWh/yr. The aeolian potential for economical usage can be appreciated only on a moderate period of time, based on the technological and economical data known today.

The usage of aeolian energy potential is evaluated on a macroeconomic scale in our country, starting from the next premises:

- conditions of aeolian potential (wind speed), in Romania is close to the conditions of the rest of Europe's territory;
- energetic policies of our country will be integrated in European Union policies, in accordance with produced energy.

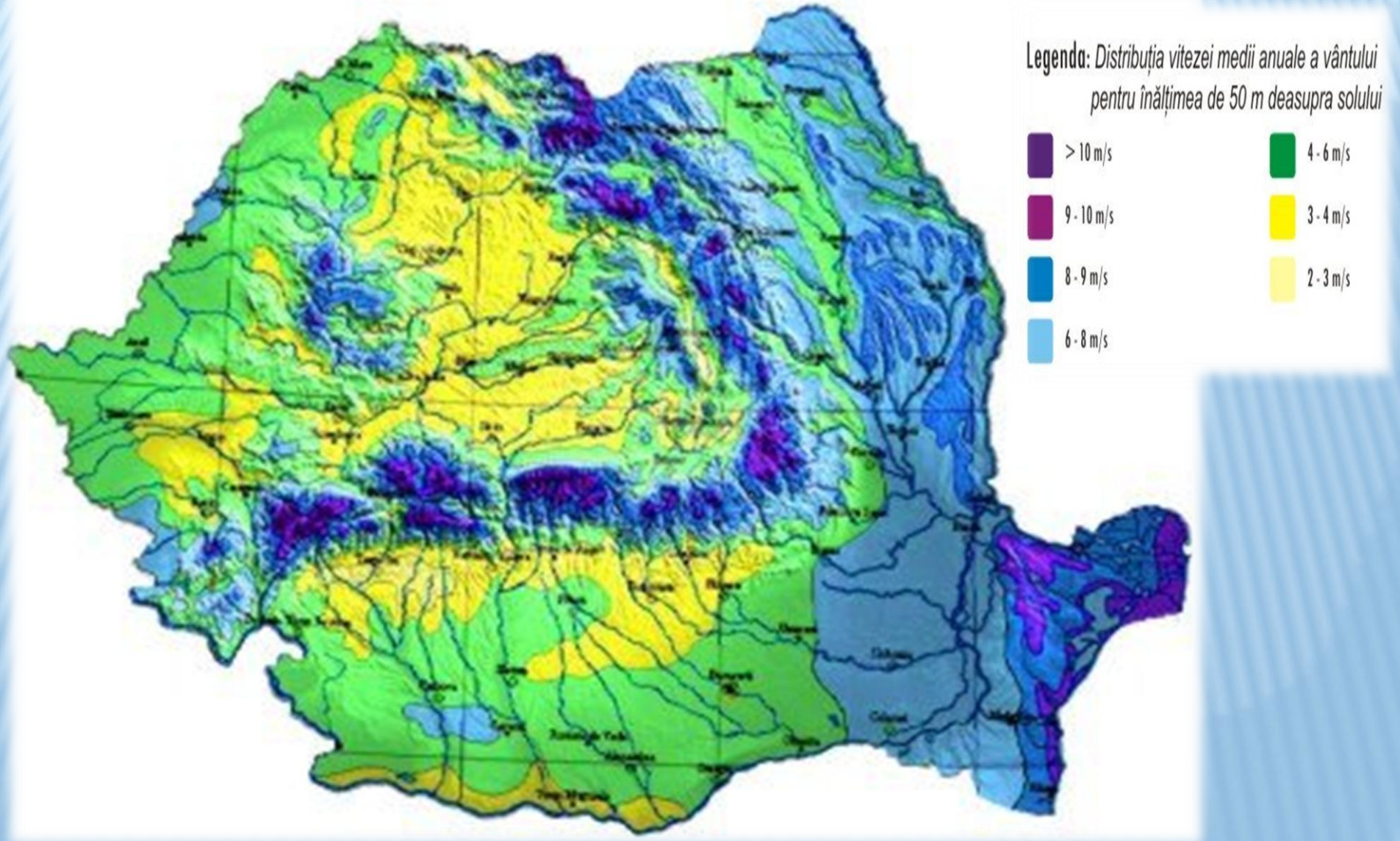
Also, in the national strategy, there is a plan to install 280 MW until 2015.

Based on this evolution, the power from aeolian sources assured about 1,6 % of the power consumption in 2010. Reported to the power source quantity from renewable sources without hydro power, the aeolian energy can assure 12,3 % from this .

TECHICAL AND ECONOMICAL POTENTIAL DATES OF AEOLIAN ENERGY IN ROMANIA

Parameter	UM	Techical	Economical (2030-2050)
Nominal power	MW	3600	2400
Power	TWh/yr	8,0	5,3

ROMANIAN ENERGY POTENTIAL MAP



CONCLUSIONS

Use of wind energy has taken a very large scale in the European Union. In Romania, as a member of this community, this problem should be taken seriously.

If before 1989, non-conventional energy use (as they were called then) was a national problem, in the past 15 years and it has been neglected. Researchers who have dealt with this theme issue have given more opportunities for direct use or storage of electricity for its use in periods of calm.

Studies to date in 1989 revealed several types of rotors that can be used depending on the wind, especially the horizontal axis, multiple (more than 3 pallets) or vertical axis.

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