INCREASING ENERGY EFFICIENCY IN THE ELECTRICITY SUPPLY OF A DWELLING BUILDINGS

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ABSTRACT: The purpose of this paper is to present an alternative supply of electricity to residential buildings and presented and analyzed methods to increase energy efficiency. The solution chosen and presented in this paper is the conversion of wind energy using a wind system consists of wind generator, inverter, batteries batteries, diesel generator.Efficient energy use is widespread concern regarding the efficient use of material resources of any kind. Efficient energy has become an economic necessity, condition expressed concentrated by reducing the share of energy costs in total production costs.

KEY WORDS: energy efficiency, wind power, renewable energy, conversion, wind

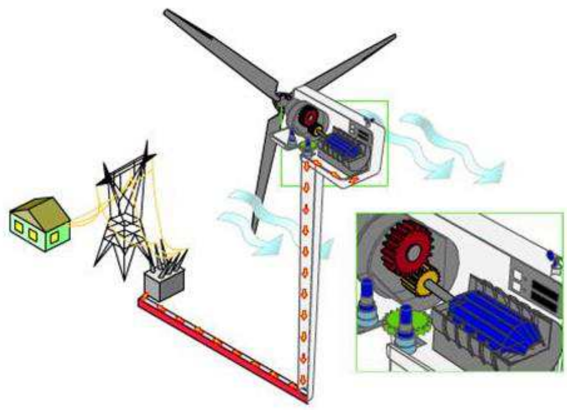
1. THE WORKING PRINCIPLE OF WIND TURBINES

Home wind energy is from renewables. Aero-generator using kinetic energy of wind to drive its rotor shaft: it is converted into mechanical energy, which in turn is converted into electricity by mechanically coupled to the wind turbine generator. This mechanical coupling can be done either directly, if the turbine and generator speeds are the same size, can be achieved through a speed multiplier.

There are several ways to use electricity either stored in batteries or is distributed through a grid or isolated tasks are fed. Convesie wind mainframe systems have losses. Thus, there may be mentioned a yield of the order of 59% for wind rotor, the multiplcatorului 96%.

Consideration should be given also losses and possible generator conversion systems.

			→ **Storage** battery
Energy kinetic →	**Energy mechanical**	→**electrical** **Energy**	→ **Distribution network**
wind	rotor	generator	→ Isolated tasks (Eg. Remote villages)



2.DESIGN WIND FARM

2.1. Mechanical

Wind power plant is located in a hilly area where the wind is about 4000 hours per year and average speed is 5-6 m / s. Thus this wind speed, a wind turbine will have a speed of between 25-35 revolutions per second.

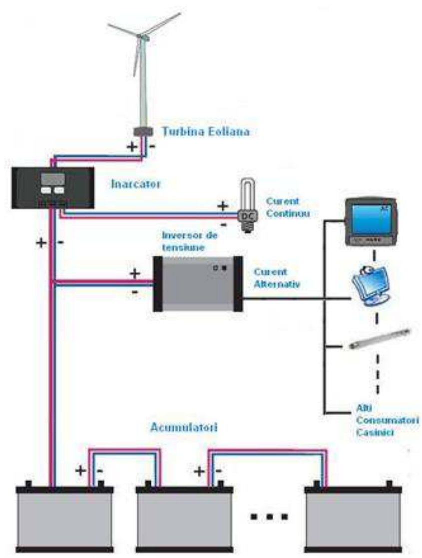
To determine what needs to produce electric power turbine is recommended replacing all traditional consumers, with others identical but much more efficient in terms of energy consumption. The first step must be done by determining consumption and consumers. The first step in designing such a system is the design of the house.

The ideal place for a wind house is on a hilltop somewhere where they can take full advantage of stronger wind speed. I chose a holiday home with two bedrooms, a living room, kitchen, two bathrooms, a lounge, a lobby and terrace. It is equipped with all appliances and equipment is inhabited by three people.

Table domestic consumption

Components	Power [W]	quantity [piece]	operation [h / day]	consumption [kWh / month]
Lighting				
fluorescent	13	15	3	15
Appliances				
mixer	300	2	0,5	9
Dryer	1000	4	0,5	60
Fan	50	3	1	18
Clothes dryer (electric)	1000	1	2	210
Coffee	1000	1	1	30
Washing machine (drying)	700	1	0,5	10,5
Iron	1000	1	1	30
Microwave oven	1500	2	1	90
Large electric cooker	2100	1	3	189
Refrigerator (new economy)	200	2	5	60
Aspirator (manual)	100	1	2	6
Washing machine (horizontal axis)	250	1	2	15
jacuzzi	750	1	2	15
air conditioning				
Air conditioning (central)	3500	1	3	323
communications	150	5	3	67,5
Color TV 25 "	500	2	1	30
AC stereo / home cinema	300	2	1	72
desktop Computer	35	1	1	1,05
Print. Inkjet	30	1	4	3,6

consumer category	**kWh/ month**	**Percent**
Lighting	15	1%
Appliances	680	52%
air conditioning	323	25%
communications	156	12%
Energy Reserve	125	10%
Other	10	1%
Total	1309	100%



2.1. 1. The calculation of the required electrical power at the output of the turbine

$$P_e = \eta_{total} \cdot P_i$$

$$\eta_{total} = \eta_{mecanic} \cdot \eta_{electric} = 0{,}75 \cdot 0{,}95 = 0{,}7125$$

$$\eta_{mecanic} = 0{,}75$$

$$\eta_{electric} = 0{,}95$$

$$E_{consum} = 1309,2[\text{kWh/luna}] = \frac{1309,2 \cdot 10^3 \text{kWh}}{30[\text{zile}] \cdot 24[\text{ore}] \cdot 3600[\text{sec}]} = 0,505[\text{Wh/sec}]$$

$$P_e = \frac{E_{consum}}{t} = \frac{0,505[\text{Ws}]}{1[\text{sec}]} = 0,5[\text{W}] \Rightarrow P_i = \frac{P_e}{\eta_{total}} = \frac{0,505}{0,7125} = 0,708[\text{W}]$$

$$t = 1[\text{sec}]$$

2. 1.2. The calculation of the torque

$$M_t = \frac{30 \cdot P_i}{\pi \cdot n_t} = \frac{30 \cdot 0,708}{\pi \cdot 30 \cdot \frac{1}{60}} = 13,522[\text{N} \cdot \text{m}]$$

n_t - turbine speed n_t = 30 [rot / min]

2.2. Electrical

Electric conversion chain will include:

• generator

• static voltage and frequency converter, composed of:

-convertor c.a.-c.c. (Rectifier) (1) (using uncontrolled rectifiers, diodes, in the case of synchronous generators. They are one-way converters. In the case of asynchronous generators is used controlled rectifier in duration.

They can also provide reactive power required magnetization.)

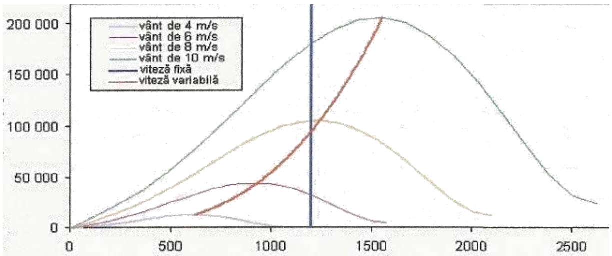
-convertor c.c.-c.a.

(Inverter) (2) (by order thereof, may adjust the frequency and effective value of energy so as to be able to connect to the network. It is preferred to use the PWM inverter, as the quality of the energy supplied is better)

The wind turbine is a variable speed to optimize power charged in the network, depending on the wind speed, it is desirable to be able to adjust the rotational speed of the wind. The basic idea is to provide a generator of fixed frequency but with variable speed.

Variable speed generator would allow operation for a much wider range of wind speed, thus recovering a greater proportion of wind energy, while reducing noise during intervals with little wind. if variable speed wind turbines, the system is adjusted so that each wind speed, wind to operate at full power. It is what is called Maximum Power Point Tracking (MPPT).

For a given wind speed of rotation, maximum power is obtained in accordance with the characteristic wind P(Q).



rotation speed [r / min]

Power depending on the speed of rotation of the shaft

The speed of rotation can be changed over a wide range (in a range of up to 3) by changing the frequency of the nutrition of the machine.

Variable speed wind systems operating networked, use static voltage and frequency converters (CSTF).

By changing the speed, frequency and amplitude of the output of the generator are variables. For networking, and brought electricity to be converted to constant parameters of the network. for this purpose using static voltage and frequency converters, interposed between the generator (synchronous or asynchronous) and network.

It converts AC power into DC power generates alternating current that is filtered to ensure connection to the grid without disrupting its produce. Generators so equipped can withstand wind gusts of reducing mechanical stress.

Order these converters is performed by specialized digital control boards, implanted PC.

Controlling transfer of power between the rectifier and inverter PWM control is achieved by DC intermediate circuit capacitor It contains an important value which both ensures filtration of blood and character of the intermediate circuit voltage source.

If asynchronous generators due to slipping, their operation is possible with slight variations of speed we use an asynchronous machine (MAS) cage associated with a static voltage and frequency (CSTF) indirectly.

In principle, the speed can be adjusted by means of the line frequency of the stator windings.

Bidirecţionalitatea CSTF function as both the hiposincronă (under natural mechanical characteristic), and in the hypersynchrony (above natural mechanical characteristic) and circulated to control reactive power distribution network.

3. A WIND ENERGY STORAGE

The current situation on the energy market provides opportunities for energy storage systems (ESS) which can store a certain amount of energy in order to be reimbursed later.

Energy storage plays a crucial role in the supply of electricity to ensure a more efficient management of the available resources. in combination with systems producing electricity by converting renewables, SSE can increase the amount of electricity generated by wind power, providing energy at peak times and accumulating energy in times when energy demand is low.

Strategically placed, SSE can increase system utilization and efficiency of existing transmission and distribution of electricity. ESS can be used to reduce the load peaks of a power supply station, which will cause the plants' peak and a better use of power steady state. Also, SSE serve to ensure power quality in the case, fluctuations in frequency of surges, the voltage drops and even total disruption of power supply from the power plant or power station.
In recent years, the need to find solutions more efficient energy storage has revived interest in energy storage flywheel.

Therefore, there have been inertial energy storage (SISE) comprising a flywheel coupled to an electric machine. Inertia flywheels for energy storage elements are in the form of kinetic energy. If the machine operates under electric motor, flywheel is accelerated and accumulated kinetic energy.

When the electric machine operating as a generator, turning them this hampers flywheel kinetic energy into electricity. Today, it is possible to build flywheels capable of storing energy at densities of 4-5 times higher than the electrochemical batteries. Also, the power density is over 30 times higher in flywheels. Sise are other advantages of the high rate of energy transfer, the ability to operate in dynamic regimes quick high number of charge / discharge cycles, long life, high reliability, no pollution, etc. In conclusion, it is possible to build "electromechanical batteries" based on the Vola inertia energy storage, more efficient than conventional batteries electrochiinice.

Capacitor banks. To improve the power factor of the system, connects capacitor, which consist of three phase capacitor connected in triangle. Batteries and capacitors ensure consumed reactive power compensation (as an average, taking into account irregularities wind). Reactive energy is required for asynchronous machines magnetization. Thus, capacitor banks (reactive energy sources) ensures local magnetization energy required, thus improving overall power factor of wind. if the autonomous functioning wind turbines, batteries, capacitors are essential to ensure the necessary reactive power magnetization machine.

4. CONCLUSION

Benefits

In the current context, characterized by the alarming increase in pollution caused by energy production from fossil fuels it is becoming increasingly important to reduce dependence on these fuels.

Wind energy was already proven to be a very good solution to global energy problems. Using renewable resources is addressed not only to produce energy, but the particular way of generating restates and development model by decentralizing sources. Wind energy, in particular renewable forms of energy is one that is suitable for small-scale applications.

Types of small wind systems capabilities: autonomous wind systems
• The main advantage of wind energy is zero emission of pollutants and greenhouse gases, because they do not burn fuel.

• No waste is produced. Wind power production does not involve any kind of a waste.
• Reduced costs per unit of energy produced. The cost of electricity in modern wind power plants has declined substantially in recent years, reaching US to be even lower than for electricity generated from fuel, even if not taken into account the negative externalities inherent in the use of classic fuels. In 2004, the price of wind energy has already reached one fifth of the 80s, and likely to continue to decline because their functions are put into more and more wind power units installed more megawatts.
• Reduced shutdown. Unlike nuclear power plants, for example, where the costs of shutdown can be several times higher than the cost of the plant, where wind generators, the cost of decommissioning at the end of normal operating period are minimal and they can be fully recycled.

Disadvantages

Initially, a major drawback of wind energy production was quite high price of energy production and relatively low reliability of the turbines. In recent years, however, the production cost per unit of electricity fell sharply, reaching figures of the order of 3-4 cents per kilowatt hour, by improving the technical parameters of the turbines.

Another disadvantage is the "visual pollution" - ie, have an unpleasant appearance - and also produce "noise pollution" (too noisy). Others argue that turbines affect the environment and the surrounding ecosystems, killing birds and requiring large vacant land for their installation.

Arguments against them are that modern turbines wind their appearance attractive stylized that cars kill more birds per year than gas turbines and other sources of energy such as electricity generation using coal, are much more harmful to the environment because it creates pollution and going to the greenhouse effect.

A practical disadvantage is the change in wind speed. Many places on Earth can not produce enough electricity using wind power, wind power, and therefore not viable in any location.

REFERENCES

[1] Foanene Adriana - OXY-FUEL COMBUSTION, Analele Universitatii „Constantin Brancusi" din Tg Jiu, Seria Inginerie, Nr.1/2016, Tg Jiu, Romania, ISSN 1842-4856;

[2]. C. Ionici, Comparison of mechanical properties of steels of the usual metal powders based on Cu and Ni tested at low temperatures, 14TH GEOCONFERENCE SGEM CONFERENCE ON NANO, B IO TECHNOLOGIES, ISBN 978-619-7105-20-9 / ISSN 1314-2704 DOI:10.5593, No. 1, 173/176;

[3]. C. Ionici, Considerations on surface fatigue behavior of pm steel, 14TH GEOCONFERENCE SGEM CONFERENCE ON NANO, B IO TECHNOLOGIES, ISBN 978-619-7105-20-9 / ISSN 1314-2704 DOI:10.5593, No. 1, 134/137

[4].Nicolescu, O. (coordonator) - Management industrial, Lito ASE, 1991

[5] Pătraşcu R., ş.a., Utilizarea energiei, Universitatea Politehnica Bucureşti, 2004.

[6] G.Popescu - Reducing polluting emission by converting plant waste into charcoal, Analele Universitatii „Constantin Brancusi" din Tg Jiu, Seria Inginerie, Nr.3/2014, Tg Jiu, Romania, ISSN 1842-4856