Electrically independent house

Stanislav Števo, MSc.

Section of Information and Communication Systems
INSTITUTE OF CONTROL AND INDUSTRIAL INFORMATICS
Faculty of Electrical Engineering and Information Technology
SLOVAK UNIVERSITY OF TECHNOLOGY
stanislav.stevo@stuba.sk http://www.fei.stuba.sk

Key-Words: *passive house, low-energy house, 3 litre house, alternative energies, wind energy, solar energy*

Abstract
The sources, the energetic self-sufficiency and the independence are the inducement of global interests. A lot of worldwide problems follow from them. Perhaps everybody and mainly our wallets see, that each of human activity has huge reserve in source exploitation. Except the well-known sentence " the easiest earned money is saved money " there is one more reason of rationalizing source exploitation. It is the independence end consumers from monopolistic energy producer. Electrically independent house is brand new term and it is very useful to discuss the possibilities of house designing, which need not be connected to electric network. We want to show a new direction of house design.

2 House requirements

If we design the house and its equipment we can distinguish three basic approaches.
The first approach is that we have a real house and we know the average day, month or year consumption. So we know the consumption and our task is to design the sources of energy. In the second approach we don't have any real house and therefore we can design the house and the sources of energy too. We can decide if we build the common house, low-energy house, 3 – liters house or passive house. The third approach is the combination of the two aforementioned approaches.

3 Sources of energy

Assume that we have a house with living space about 100m2 (LS), which is located somewhere in central Europe. The parameters of our passive house are:

Total primary energy consumption (TPEC) (primary energy for heating, hot water and electricity) 190 kWh/(m²a) (60,228 Btu/ft²/yr)

The building heating energy 85 kWh/m²a (23,755 Btu/ft²/yr) (HE)

Basic energy requirements (R) :

$R = LS * TPEC + LS * HE = 100*190 + 100 * 85 = 27500$ kWh/m²a

$R^* = R * c = 27500 * 1.09 \cong 30000$ kWh/m²a

c – is coefficient of loss, (storing energy – accumulators charging)

So we have to design combination of alternative energy sources which will produce minimal 30000 kWh/m²a.

The forms of energy we will look at include:

- Electricity
- Biomass Energy - energy from plants
- Geothermal Energy
- Fossil Fuels - Coal, Oil and Natural Gas
- Hydro Power and Ocean Energy
- Solar Energy
- Wind Energy
- Transportation Energy

For our house (assume that house is located in interior) from these forms of energy we can consider Biomass Energy, Geothermal Energy, Fossil Fuels, Solar Energy and Wind Energy. We also want to propose the combination of these energy forms that will be produce needed energy and will be ecologically. We decided to use only solar energy and wind energy, because the process of energy gaining produces no CO_2 or other wastes.

As we mentioned our house has living space about 100m2, so if we assume straight tilted roof, we have 150 m2 (RS) to locate solar cells or solar collectors.

Summary
In this paper is presented the thought about designing an electrically independent house, which need not be connect to electric network. We studied the applicability of alternative energy in common house. One of the basic issues concerning the electrically independent living is to design combination of alternative energy sources. We discussed about various types of houses and about basic approaches how to choose sources of alternative energy. On a simple case is showed how can equip house with solar cells and wind generators. Wind and sun energy is ample, renewable, widely distributed, clean, and reduces toxic atmospheric and greenhouse gas emissions if used to replace fossil-fuel-derived electricity, therefore is very important and nowadays indispensable to solve question about electrically independent house.