

ENERGY EFFICIENCY SOURCE FOR REDUCE THE CLIMATE

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Abstract: Improving the available level of the energy through an efficiently using, the economy of energy due to this measure can be considered as an energy source which leads to limit the energy production from classics sources and reduce the greenhouse emissions. Energy efficiency is the most cost-effective path to reduce emissions, improve safety and competitiveness and decrease energy services cost.

Keywords: sustainable development, climate, efficiency

1. INTRODUCTION

One of the common priorities of U.E countries strategies is to improve the energy efficiency. Increasing efficiency is a major contribution to achieving security of supply, sustainability and competitiveness, saving primary energy resources and reduction of greenhouse emissions [2]

Nowadays, about 65% of global CO₂ emissions, 80% SO₂ emissions and 70% of NO_x emissions are resulted by electrical energy sector as well as transport sector. The energy sector concerns for reducing the greenhouse involving a special interest for sustainable development of society. The growth of energy efficiency is the most used method for decreasing the emissions level.[10]

Increasing the energy efficiency involves a lot of instruments through warranting the necessity of adopting several measurements for reducing the used energy without affecting the quantity and quality production [6].

The energy efficiency increasing in different operations of energy and decreasing the harmful emissions level help the human society to have a cleaner atmosphere, a better health and more related comfort.

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The definition of energy efficient (relation 1) is the ratio of energy used to final product (p_u) and total energy (W_t).

$$e = \frac{p_u}{W_t} \quad (1)$$

So, it can notice that energy efficiency has not an unique measurement unit because is in correlation with analyzed process.

The avoided CO₂ quantity represents a measurement of efficiency to reduce the necessary the equivalent CO₂ concept.[4]

Carbon footprint diminution in energy sector can be evaluated as the most important sign to compare the adopted measurements to improve the efficiency. Restrictions of greenhouse emissions for a sustainable development and maintenance of primary resources for future generations are representing essential objectives for energy efficiency due to the world has entered in a new era for clean energy from renewable sources and net-zero carbon emissions. The reduction was made possible by reduction of industrial activities with major economic and social effects [1], [5].

To provide energy needs related to development requirements under sustainable conditions, it is necessary to prioritize policies and energy efficiency measures, as alternative to increase of energy sources. The values of pollutant emissions factor f_c (kg/kWh) for different resources are shown in the below table.

Table 1. The values of pollutant emissions factor f_c

Resources	f_c (kg/kWh)			
	CO ₂	SO ₂	NO _x	CO
coal	1,18	0,0139	0,0052	0,0002
petroleum	0,85	0,0164	0,0025	0,0002
natural gas	0,53	0,0005	0,0009	0,0005
hydro	-	-	-	-
Wind, photovoltaic	-	-	-	-

In Romania, for the electrical power plants, the average $f_c = 0,9$ (kg/kWh). It is important to divide the process of increasing of energy demand with limitation of emission level.

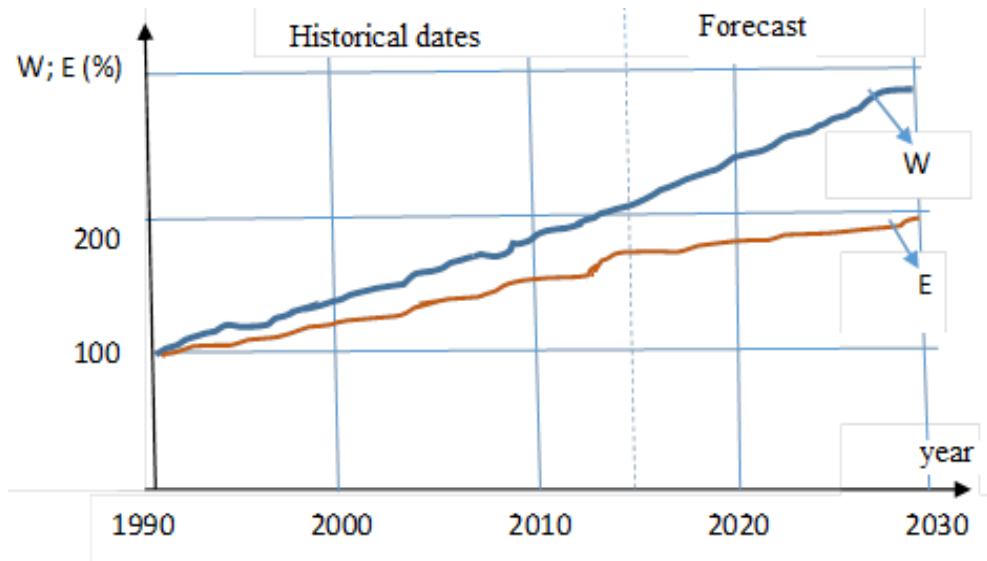


Fig.1 The relative growth of electrical energy necessary (W) and the emissions level (E)

2. THE COST OF GROWTH ENERGETICALLY EFFICIENCY

For evaluating of energy saving up possibilities have to follow some stages [3]:

- establishing the technical possibilities knowing the best available technology (BAT) without taking into account economic aspects;
- choosing the economic potential based on the economic viability of technological lifetime (when Internal Recovery Rate is bigger than 8%);
- establishing the potentially achievable in the same time with the recovery of the investment, the achievable sources can reach about 30% from economical potential;
- evaluation of realistic potential based on implementation the requirements (as political, financial, opportunities).

The evaluation of technical resource is made with knowing the BAT as following [4]:

- the energy efficiency is about 34-46% for electric power plants using fossil resources and can reach about 61% for gasses power plants;
- transmission and distribution of electrical energy are accompanied of losses between 12-15% in Romanian grids, but some technologies can assure the limitation of losses to 5%;
- implementing a performant energetic management system develop an increasing of efficiency about 5% in manufacturing processes;

- in order to improve the efficiency of heat generation, the modernizing the heat supply systems through the district heating system or improve the insulation that lead an economy about 50% of necessary energy;

For these purposes, Romania will increase efforts in order to consolidate its role of important player on the energy market, through infrastructure development and diversification of supply sources, improvement of financial and operational efficiency of the energy companies while increasing their competitiveness in the European market.

3. LEVELIZED COST OF ENERGY – ENERGY EFFICIENCY MEASURE METHOD

The unused energy due to energy efficiency growth is evaluated in Negajouli or kg CO₂ equivalent avoided. LCOE has an important role in evaluating the efforts for reduction the environment pollution through decreasing the quantity of fossil fuel burned in electrical power plants [7].

Levelized cost of energy LCOE (relation 2), or the cost per unit of energy is based on amortized capital cost, present value of operating costs, and saving up energy. For example, in a renewable energy system with no change in annual output this evolution of costs reflects estimative cost of capital, load factors for solar and wind, and prices for coal.

However (LCOE) has to take into account the rapid technological changes in renewable sources and the impact of fossil fuels on the environment, LCOE is the amortized capital cost plus operating cost divided by annual energy output:

$$LCOE = \frac{f_r \cdot CI}{E} \quad (\text{Euro/kWh}) \quad (2)$$

$$f_r = \frac{a \cdot (1+a)^t}{(1+a)^t - 1} \quad (3)$$

Where:

- f_r is the factor of recovery capital (relation 3),
- CI is the cost of annual operating,
- a is a rate of annual interest, t is the life of the project in years.

Making a compare, the fossil fuels and renewable energy sources often require large capital investments but the fossil-fuel LCOE also takes into account fuel purchases. Solar, wind, hydro, and geothermal energy sources have no fuel costs but require significant expenditure of capital [3], [4].

If solar electricity were available for 100euro/MWh and wind electricity for 52 euro/MWh, wind power seemed to be cheaper choice but the investments in a wind-power installation are more expensive (marginal cost rises). To bring at the minimum total energy cost, wind power could be chosen as long as it cheaper than solar (depending on temporal availability). Solar photo voltaic is the most

abundant renewable resource in many parts of Romania, and effectively the cost of solar PV sets the price for all renewable energy. Compared to fossil fuels, renewable energy sources require large capital investments but a large portion of fossil-fuel LCOE is fuel purchases (figure 2).

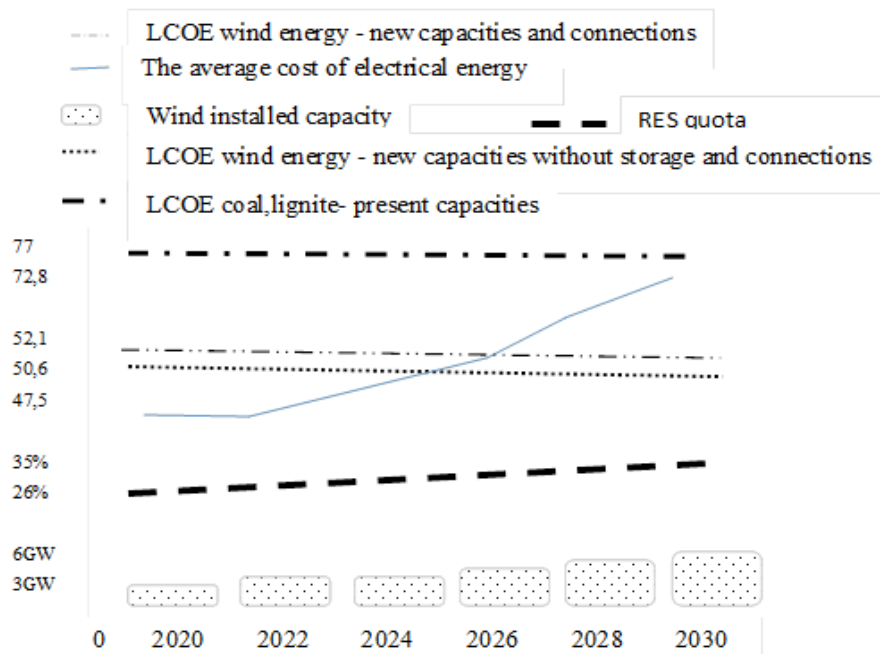


Fig.2 Compare the LCOE function of coal, wind and price of energy

The technologies costs would gradually decrease as renewable sources energy will become competitiveness in compare with energy from conventional resources. It has to estimate an average cost for investments in wind capacities of 1086 euro/kW in the next years in Romania, almost the same with the other countries from Europa. The connection cost is estimated to 120000 euro, and the storage cost is about 453000 euro. The coal power plant has to involve significant investments for making face to the pollution requirements and standards [8], [9].

Only by creating some development programs for energy sector, Romania may have a significant contribution to reducing greenhouse emissions associated with energy security and competitiveness, without affecting the economic growth and general welfare.

The representative synthetic indicator of energy use efficiency at national level is energy intensity, respectively, the energy consumption so as to generate a unit of gross domestic product. The structural adjustment of the economy, and the increasing of resources efficiency determine the reduction in primary energy intensity, also the value of this indicator is twice higher than the EU average [10].

The energy saving up involves in the first way the energetically behavior of customers for rational use of energy. The financial mechanism for reducing the carbon emissions like Emission Trading Scheme remains the only mechanism that supports modernization of energy infrastructure.

4. CONCLUSIONS

Among all, two valid solutions for reducing CO₂ emissions have been identified as being most relevant: energy efficiency improvements (EE) and generation by renewable energy sources. The sustainable development is based on efficient energy using. The energy efficiency increasing in different operations of energy and decreasing the harmful emissions level help the human society to have a cleaner atmosphere, a better health and more related comfort.

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