

## SLOVAKIA AND THE WIND ENERGY AT PRESENT

### ABSTRACT:

The exploitation of wind force has been known for a couple of thousand years and it is being linked to the beginning of the human civilization when man decided to make use of this kind of energy. An effective step in transforming wind energy into electricity is also building wind energy plants/parks where the main concept is to maximize the possibilities of the given location.

The following article is focused on wind energy as one of the mostly used renewable energy sources. The goal of this paper is to familiarize the reader with the current situation of electrify generation using wind energy in the Slovak Republic and it's share on the market. Bringing the basic patterns of usage of this energy and the positive impact on the environment. The contribution shows the current share of wind energy in Slovakia and the subsequent plans and visions of the Slovak Republic as EU Member States, which wants to increase the proportion of use of this energy in the coming years.

### KEYWORDS:

wind energy, wind energy plants, renewable energy sources, environment

### INTRODUCTION

The energy that we use today in the form of heat, electricity and fuels for motor vehicles, has its origins mostly in fossil fuels (coal, oil, natural gas). These fuels are below the surface, where it originated millions of years after the decomposition of prehistoric plants and animals. Although fossil fuels the action of natural forces (heat and pressure) ever created, its current consumption far outweighs their formation.

The fact that they are not replenished nearly as fast as they are being consumed means that in the near future they run out. For this reason, fossil fuels are considered non-renewable energy sources. The main negative consequences of burning fossil fuels is serious damage to the environment and therefore it is today, when rising demand for electricity we must seek alternative sources of energy. Between a so-called renewable, "green", energy sources we include biomass, geothermal, solar, water and wind energy.

### USAGE OF WIND ENERGY

The exploitation of wind force has been known for a couple of thousand years and it is being linked to the beginning of the human civilization when man decided to make use of this kind of energy.

Since wind energy is being counted into unexhaustible renewable energies without direct impact on the environment and represents a clean form of energy with no waste production, no air pollution and no

negative effect on the human health, a tremendous development of wind energy plants, which is the fastest growing branch in energy producing, is being observed.



Figure 1. Wind turbines [3]



Figure 2. Wind farm [3]

The currently mostly used forms of wind use are wind energy plants using turbines. They are converting kinetic energy of the air molecules to mechanical work of the turning rotors which, through a geared mechanism, drive electric generators that transform work energy into electricity.

An effective step in transforming wind energy into electricity is also building wind energy plants/parks where the main concept is to maximize the possibilities of the given location. Therefore, several turbines are built in the same location.

#### EFFECT ON THE ENVIRONMENT

Every form of energy production creates negative effects on the environment, however while using wind energy plants, the negative effects are minimal in comparison with other, traditional electric production. [1]

Replacing the production of electricity from fossil fuels with wind chargers brings positive facts: [2]

1. Saving the fuel that is not renewable
2. Reducing the amount of CO<sub>2</sub> that would be produced while burning this fuel
3. Reduction of gas emission (SO<sub>x</sub>, NO<sub>x</sub>)
4. Reduction of dust outlet
5. Reduction of liquid and solid waste
6. Reduction of the waste heat leaking into the atmosphere or water systems

#### CURRENT STATUS OF WIND ENERGY UTILIZATION

Although the wind energy is one of the youngest technologies of energy production and does not have such background as other commercial sources of electricity production, with time its usage as a renewable source of energy grows more and more.

Despite the massive development in Europe in the field of wind energy began in the early 90's, many of those managed to establish world leadership in a relatively short time. Wind energy and its usage reached the highest growth from the entire spectrum of renewable energy sources in the EU (tab. 1). Together with solar energy, it is considered to the "second generation" technologies.

Table 1. The development of renewable energy sources in the EU [3]

Order	Energy	Year			
		1990	2000	2010	2020
1	Solar Energy	0.1	0.2	0.9	3.2
2	Wind Energy	0	0.1	0.4	2
3	Geothermal Energy	0.1	0.3	0.5	0.8
4	Modern Biomass	1.4	2.2	3.5	5.1
5	Small water generators	0.2	0.3	0.4	0.6
	Total	1.8	3.1	5.7	11.7

The reduction of electricity prices is a commonly observed trend in the wind energy field. This is tightly bound to the power increase of the new wind turbines.

As a side effect, the competitiveness of the wind energy with commercial energy production is growing as well. At the same time it gets less dependent on the state grants reflected mainly in the buying prices of the renewable energies. It is to be expected that the prices of electricity will continue to drop, as well as the competitiveness of wind energy with current energy sources will continue to grow. The development of the equipment is also foreseeable.

#### THE POTENTIAL OF WIND ENERGY UTILIZATION IN SLOVAKIA

Slovakia as an inland country has its potential in utilizing wind energy rather limited as in comparison with the west European countries. It has been estimated to 600GWh/r which, in comparison with other renewable energy sources potential (biomass, water), is very low.

Despite relatively large occurrences of wind during the year, not every region is suitable for electing a wind charger. In our latitude and average altitude of 600m above sea level, the wind speed is averaging to 2-3m/s while the ideal wind speed would be 12m/s. In the mountain terrain that is characteristic for Slovakia, is the wind flow relatively inconsistent. As a result of terrain obstacles the wind intensity and direction is changing and inapt turbulences occur. Therefore multiple year long specific measurements with special analysis needs to take place to estimate the suitability of the locality for wind chargers.

Despite the good wind conditions with speeds over 5,5m/s are certain areas, like the National Parks (High Tatra National Park etc.), excluded from electing wind parks for environmental reasons.

#### BARRIERS IN THE UTILIZATION OF WIND ENERGY IN SLOVAKIA

Among the barriers that are complicating the utilization of wind energy in Slovakia are being counted:

1. lack of knowledge of the wind climate (wind intensity and its temporal and geographic variability)
2. a strong dependence on wind climate
3. lack of knowledge of the effects of a high proportion (approximately over 5%) in electricity production and fluctuations in transmission and distribution system
4. negative impact on power system stability
5. problems in perception, mainly related to changing visual environment
6. restrictions in protected areas
7. lack of awareness of health and environmental impacts of operational wind farms

Another important criterion is the economic return of wind power in the form of electricity generation. The cost of installing 1 kW wind power in Slovakia are from 1500 to 2000 Euros, the price paid for electricity generated from wind power is 94 Eur / MWh. From that follows that the period for the return of total investment is about 17 years.

### WIND POWER PLANT IN SLOVAKIA

Even though we are not a country with ideal conditions for the use of wind energy, there are currently 9 wind turbines in operation in Slovakia in three operating wind parks located in (Fig.3).

These power plants annually produce about 6 GWh of electricity (as of 2004). Slovakia uses only about 1% of its full potential. The reason is the wide range of economic, legislative and environmental barriers, of which the introduction of fixed prices for electricity generation from renewable sources eliminate at least some. Highly actual issue, which divides the professional community impact assessment, is mainly impact of the construction of wind farms on the environment.



Figure 3. Wind farms in Slovakia [6]

### VISION OF SR WIND ENERGY UTILIZATION LISTEN

Slovak Republic as a European Union member country is obliged under their obligations to contribute to increased share of renewable in the total resources, thereby reducing negative environmental impacts, the European Union's heavy dependence on imported fossil fuels and vulnerability to fluctuations in energy prices.

Setting targets for the years 2010 and 2015 gives a real opportunity for Slovakia to increase the current 4% share of renewable in total energy consumption to 12% share in 2020.

Basis for setting a binding target for Slovakia in 2020 will be elaborated in a forthcoming material, energy security strategy of the SR, which is an indication of the outlook to 2030.

According to ZVES (Association of wind energy in Slovakia), Slovakia has the potential to increase the current total installed capacity of 5 MW to approximately 600 MW over the next 5-7 years and the prospect to further enhance the technology up to 1000 MW. This objective can be considered as a realistic and feasible in the horizon of 2020.

### CONCLUSION

If we are to get even closer to achieving the objectives of increased use of wind energy as a renewable energy source and thus avoid possible sanctions from the EU, it is essential to use all available and economically and environmentally sound electricity generation from renewable energy sources, which include the use of wind energy.

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