
SOUTH MORAVIAN COUNTRYSIDE AND THE WIND ENERGY

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ABSTRACT

According to the Action Plan for Regional Energy Policy of the South Moravian Region it is important to increase the share of renewable energy sources. Wind energy is a renewable source of energy that comes into consideration as an additional resource. Wind speed is the most important factor here. The average wind speed for the year should exceed 6.0 m.s^{-1} . In South Moravia the wind speed is affected both ruggedness of the earth's surface and artificial obstacles (buildings). Therefore, wind power stations are situated outside the urban areas. And despite all the benefits in terms of lower environmental impact (compared to production from conventional sources), the construction of wind power plants represents a big impact on the landscape. The case study focuses on wind power stations in Břežany, Bantice and Tulešice. All sites are located in the district of Znojmo. In the village Břežany five wind power stations were installed in 2005. In the village Bantice one wind power station was installed in 2008. And in 2009 one wind power station was built in Tulešice.

Key words: renewable source of energy, wind power, wind speed, South Moravian Region

Acknowledgments: This study was supported by the project of MENDELU internal grant agency, Faculty of Agriculture, number SP2130011.

INTRODUCTION

The Czech Republic is bound by the European Directive 2001/77/EC on renewable energy sources that the share of energy from renewable source will reach 13 % in 2020. According to the Action Plan for Regional Energy Policy of the South Moravian Region one of the priority measures “Environment and Natural Resources” is to support energy efficiency and increase of the share of renewable energy sources. Wind energy is a renewable source of energy that comes into consideration only as a supplementary source. Such production requires considerable space and is located primarily in the regions of small communities. Using of the wind has a long tradition in our country and especially in the form of windmills. The first windmill was built in 1277 in the garden of the Strahov Monastery in Prague. And as well as the views on the windmills by the population in history, there are different opinions on modern wind turbines today. In the Czech Republic, there was an expansion of wind power plants (WPP) at the end of the 1980s (Šefer J. I. 1991).

The work is aimed at obtaining an overall view on the issue of WPP, the local context and conditions for the development of renewable energy of the South Moravian Region (SMR), especially in the South Moravian countryside. It also deals with the advantages and disadvantages of WPP in the region that are already built.

MATERIAL AND METHODS

The work is methodologically based on literature reviews, analysis of available statistical data (Czech Statistical Office, the Energy Regulatory Office, Czech Society for Wind Energy) and own field research. The methodology that was used corresponds with the methodology from the work Vaishar et al. (2011).

Finding of the natural conditions for the production of electricity from wind energy in the Czech Republic was the basic step. Then the existing state of WPP in the Czech Republic was analysed and selected. The specific cases of WPP in the South Moravian Region and their documentation were analysed too. Three sites in the district of Znojmo were selected for the research. They are the communities Břežany, Bantice and Tulešice.

RESULT

The Czech Republic does not have entirely appropriate areas for wind power due to its continental climate. This reflects the seasonal variation of wind speed. Wind speed at a given location is the most important parameter for the construction of WPP. The average annual wind speed at a height of 100 m above the ground should be at least $6.0 \text{ m}\cdot\text{s}^{-1}$. This parameter is met mainly in places at altitudes higher than 500 meters above sea level and in mountain areas. In these altitudes a problem with landscape protection occurs. Technological development has enabled to generate electricity from the wind efficiently even in the off – mountain areas. Most modern WPP generates electricity with wind speeds of $4.0 - 5.0 \text{ m}\cdot\text{s}^{-1}$. Wind speed increases logarithmically with the height above the ground. The wind is slowed down differently by the terrain, especially by the obstacles in landscape (buildings, hills, etc.) and by the type of surface (grass, forest, water level, snow). Therefore, it evokes constructions of more and higher power stations. The mast is usually 80 – 110 m high. Although the wind power plants are away from the main village buildings, due to the height of the mast and location (usually on a hill) WPP are visible at great distances (Cenek M. 2001).



Fig. 1 Map of the Czech Republic with the distribution of WPP, the source: <http://www.csve.cz/cz/aktualni-instalace>

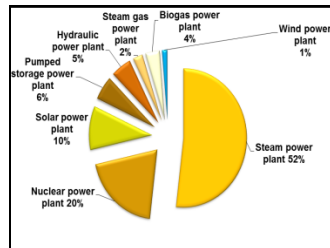


Fig. 2 Graf expressing interest in the installed capacity in Czech Republic, data: CSWE

At Fig. 1 we can see the distribution of WPP of the Czech Republic. Mostly these wind plants are located in the mountain parts of the Czech borderlands. The wind park with the largest installed capacity in the Czech Republic is located in the Ústecký Region. It is in Kryštofovy Hamry - Přisečnice where the 21 wind turbines were built with a total installed capacity of 42.0 MW. In Czechia there were 43.7 MW wind energy plants installed in year 2012 (The Energy Regulatory Office, ERO). In summary, it was installed 263 MW installed capacity of WPP in the Czech republic by the end of 2012. It is according to the Czech Society for Wind Energy (CSWE) about 1 % of the total share of installed capacity in the Czech Republic (Fig. 2). Total production in 2012 was 417 GWh (Tab.1); it covers the energy consumption of about 119,000 households.

Tab. 1 Statistical data - ERO, Czech Republic, year 2012

Czech Republic (ERO) 2012	
Total electricity production	87,574 GWh
WPP total electricity production	417 GWh
Total electricity production from renewable sources	7,913 GWh
Total installed capacity	20,520 MW
Installed capacity WPP	263 MW

According to the Act No. 100/2001 Coll. on the assessment of environmental impact category the point no. 3.2 Wind power plants with total installed capacity greater than 500 kW or stand height exceeding 35 m is included in category no. II. (projects requiring the screening procedure (Cetkovský S., Frantál B., Štekl J. 2010). In the South Moravian Region eleven projects were issued with a concurring opinion, fifteen projects with a dissenting opinion between 2004 and 2010. However, under CSWE none of these plans has been implemented since 2009 (braking or stopping of other processes and permitting procedures). Most projects are located in the district of Znojmo.

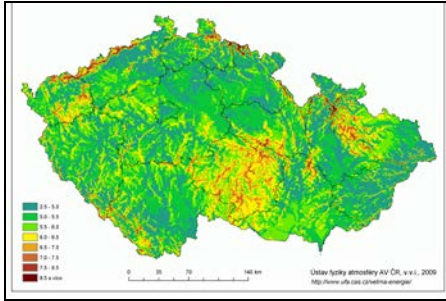


Fig. 3 Map of the Czech Republic - the average wind speed 100 m above the ground, Institute of Atmospheric Physics, Academy of Sciences of the Czech Republic

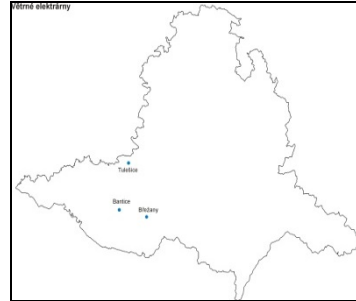


Fig. 4 Sitemap wind farms in the South Moravian Region

The map of the Czech Republic can be found at Fig. 3, where the colours shows the average wind speed at a height of 100 m above the surface. Here it is confirmed that the South Moravian Region does not have suitable climatic conditions for the construction of WPP. The county has the third lowest installed capacity of WPP (8.3 MW). According to ERO, 14 GWh of electricity were produced by wind turbines in 2012. If we compare the total electricity production in SMR, which is 1,544 GWh, and the amount of electricity produced only by the wind power stations, it is clear that WPP are only an additional source of energy. SMR is significantly below average in terms of wind speed needed for energy production. The suitable areas are faced either with the protection of nature and landscape, or interfere with the migratory routes of large birds (storks).

The areas suitable for the installation of wind power plants are mainly located in the district of Znojmo, where all the case studies are situated (Fig. 4). They are WPP Břežany with total capacity of 4.25 MW, WPP Bantice with a total capacity of 2 MW and WPP Tulešice with a total capacity of 2 MW. Five wind turbines were installed in the village Břežany in 2005. One wind power station was installed in the village Bantice in 2008. And one wind turbine was built in Tulešice in 2009.

The Wind Park Břežany consists of five wind turbines type Vestas V52 (Fig. 5). The total height of a tower is 74 m. Total installed capacity of the wind farm is 4.25 MW and energy supplies 2,477 households. The cost of construction of the park was 128 million CZK. The Park is operated by the company W.E.B Wind Energy s.r.o., Brno. One wind turbine in wind park Břežany (850 kW) will save more than 50,000 tons of brown coal. Thereby it will save up to 120,000 tons of carbon dioxide during twenty years of WPP life. The project Wind Park Břežany has been designed with respect for the landscape and at the same time to meet the technical requirements. The park is located along the railroad tracks partially covered by self-seeding trees and about 1.5 km from the main buildings of the village. This is particularly useful to reduce the noise emissions of the Wind Park.

The next site is Bantice. Wind power station in Bantice is represented by the device type Vestas V90 with an installed capacity of 2 MW, tower height of 105 m. This WPP can provide power for 1,400 households. The WPP is operated by the company W.E.B Wind Energy s.r.o., Brno too. During its twenty-year life the wind turbine will save 110,000 tons of brown coal. Thanks to a special system, that was installed, there is an increase in energy production and it minimizes noise emissions. The main benefit for the community contribution is 200,000 CZK per year from the WPP operator.

Tulešice is the last site. This wind turbine is also type Vestas V90, as well as the WPP in Bantice. The height of the mast is 105 m. The installed capacity is 2 MW. Total construction costs were 85 million CZK. This WPP is able to supply electricity for more than 930 people. The WPP is operated by the company V-Stav Invest, s.r.o., Hrotovice. The site for construction was chosen by Regional Energy Policy of South Moravian Region for the construction of wind turbines. Power station stands on a hill about 700 m from the main buildings of the village.



Fig. 5 The wind park Brežany, photo: author



Fig. 6 WPP Tulešice, view from the village, photo: author

DISCUSSION

What are the benefits of wind energy? The wind energy can be converted into electricity relatively easily. Furthermore, the fact that WPP used the clean product of natural resource means that it does not require further treatment and does not produce waste neither greenhouse gases. A single wind turbine does not use any significant amount of agricultural land and the building site area requirements are minimal. The surrounding land can be used for example for agriculture or grazing after the installation. The main benefit for the small villages is that operators usually offer municipalities a voluntary contribution in the order of 10,000 to 100,000 CZK per year for the operation of one WPP. Contribution to the community may be also indirect. In particular, the indirect contribution can be the increase of the tourism or arrange of the excursions.

The most important disadvantages can be seen in fact that the wind in the Czech Republic is an unreliable and erratic power supply (need backup energy sources). In time of the installation of the wind power station it can be hard to transport large parts of the WPP into place. In addition, there is a problem with noise. Even modern WPP gives some aerodynamic noise. The power engine room can be the source of noise for older types of power plants. There is no interference of animals; normally the sheep is grazing around the WPP. A collision of birds with the rotor occurs primarily at night or in fog. These collisions are not as common as the death of birds on electric power lines or on the road. Wind power must not stand in the place of migration directions. WPP equipment is very high and is visible at a great distance, which can disturb the landscape character. It is an essential and highly subjective issue. It is also important that the WPP does not bring any direct profit for the village in which the land is situated. And after 20 years of economic life of the WPP it will most likely disassembled and investor and authorities will have to decide again whether to build in its place a new, modern WPP. Or the location will not continue to be used for the wind energy production.

CONCLUSIONS

Production of energy from renewable sources is a trend of the contemporary period. The recoverability is the main argument. The use of wind in the Czech Republic has limited options. The average intensity of wind speed for power engineering is at a low level not only in the South Moravian Region. Any construction of power plants must be supported by appropriate selection of sites with long-term measurements of wind speed and non-conflict related to nature conservation.

The South Moravian countryside is a place, where much of the renewable energy arises and it can be used. Wind power plants are the dominants in some areas of SMR, whether citizens approved it or not. And despite all the benefits in terms of lower environmental impact (compared to production from conventional sources), the construction of wind power plants is a big impact on the landscape. The highest production of energy from renewable sources in SMR accounts in Znojmo district.

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