

DISTRIBUTED POWER SYSTEMS – THE SITUATION OF WIND POWER PLANTS IN THE CZECH REPUBLIC

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ABSTRACT

This article presents the current situation of renewable energy resources in the Czech Republic from the point of view of wind power energy and describes some of their technical operation problems.

The utilization of renewable energy resources is the priority of the energy industry in the EU

1. INTRODUCTION - HISTORY

In the area of the Czech Republic, like in other European countries, wind power was used in wind mills in the past. Historically it is documented that the first wind mill in the area of Bohemia, Moravia and Silesia was founded in the garden of Strahov monastery in 1277.

The biggest prosperity of wind mills in Bohemia was in the 40's of the 19th century whereas in Moravia and Silesia it was up to the end of the 70's of the 19th century. It flows from the Pokorný work (1973) that there were 198 wind mills in the area of the Czech Republic. The work of Burian (1965) documents the existence of 681 wind mills in the area of Moravia and Silesia. There were together 879 historically documented wind mills in the Czech Republic.

Next period of wind power use was the stage of wind turbines driving water pumps. This time period is connected with the first twenty years of the 20th century. The biggest producer of wind motors was the firm Antonín Kunz in Hranice na Moravě, later Sigma, national enterprise (Jaroš).

The production of big wind power plants began in the Czech Republic in the 80's and 90's in last century. From the director's initiative of Mostárny company in Frýdek-Místek which was a part of Vítkovice iron and steel works, a team of designers prepared technologically the production of wind power plants with the power of 75 kW. A few pieces were produced one of which as functionless still lives on in Boží Dar in Krušné hory. Step by step it was come to the wind power plant production with the power of 315 kW, from which is in operation the only one, namely in Mladoňová at Šumperk.

In 1993 there arose Energovars company that produced two pieces EWT 315 kW and one wind power plant EWT with the power of 630 kW. These wind power plants has always been in operation. In the same year there arose EKOV company which produced five wind power plants E-400 kW from which four are still in operation in Nový Hrádek.

The last Czech wind power plant was produced in 1996. Czech companies that dealt with the production of wind power plants did not have developmental background due to the lack of financial resources, they could not provide the period of testing operation, and their products therefore embodied a significant failure rate. Due to the low redemption price of electricity gained from wind power plants which ranged from 0.9 to 1.13 CZK per kW in that time, the Czech market with wind power plants was not created. The export was not possible as well because the devices were not certified.

Because of these reasons the mentioned companies were abolished and the lead of the Czech Republic in that time, in comparison e.g. to Austria, in installed power in wind power plants after 1995 was quickly lost. By the decay of the companies that produced wind power plants there arose difficulties with the maintenance and reparations of the installed turbines.

2. HUGE WIND POWER PLANTS INSTALLED IN THE AREA OF THE CZECH REPUBLIC TILL THE PRESENT

In the Czech Republic there appeared a unique phenomenon in the dynamics of wind energetics development after 1989. While in other European countries there is in progress the growth of annually installed powers of wind power plants by geometric progression, it was possible to watch similar trend in our country during 1900-1995. After this year (1995) the development curve has a decreasing tendency. 24 wind power plants (with the minimal power of 50 kW) with total immediate power of 8220 kW were built to the end of 1995. With the evaluation to the end of 2001, 5 wind power plants (Bílý Kříž, Frýdek-Místek, Hory-Jenišov, Strabenice, Boršice) with total power of 925 kW were dismantled and 11 wind power plants with the total power of 4920 kW were out of order.

2.1 The basic facts in the branch of wind energy-dismantled wind power plants

Wind power plant TACKE 60 kW on Bílý Kříž in Moravskoslezské Beskydy. It had an operation licence in the protected landscape area only for two years. The operation began in 1992.

Wind power plant Vítkovice 75 kW in Hory-Jenošov locality. It was built in 1992, it was not approved and it may not have had a sufficient wind potential. Average annual speed at the height of 10 meters is here 3.6 metres per second.

Wind power plant Vítkovice 315 II with the power of 315 kW in Strabenice by Kroměříž. It was produced in 1993, and dismantled after the damage by windstorm. Even here there was not sufficient wind potential.

Wind power plant EKOV 400 kW in Boršice by Buchlovice was built in 1994.

Formally it is impossible to categorize the turbine Vítkovice 75 kW in Boží Dar which was put into operation in autumn 1992 to the category of dismantled wind power plants. It is concerned to be a device that has been out of order for a long time. The device was put out of order after many technical problems in 1994. The wind power plant is a characteristic coullise of the town, it may have caused that it has not been dismantled yet.

Nearby a renovated wind mill in Kuželov by Hrubá Vrba town (former district of Hodonín) DWP-D150 kW - a wind power plant of Danish production was built in 1990. In 2003 the power plant was sold by Velká nad Veličkou village to a firm that wanted to build a wind farm with as many as nineteen wind power plants. An airscrew and a nacelle were dismantled. A pillar was heighten by 15 meters to the height of 45 metres and it served to a roughly year-lasting wind measurement. The plan of the wind park did not pass through the expertising of the influence on the environment. In these days there is only the pillar which is going to be ismantled. The highest annual production was documented in 1993, namely 220 kW.

2. 2 Wind power plants in operation in the area of the Czech Republic

1. The locality of Mravenečník in Hrubý Jeseník on the ridge of Medvědí hora (Bear hill) belongs with its 1150 metres above sea level to the highest situated wind power plants in Europe. In 1993 WindWorld W 2500 wind power plant with the power of 250 kW was built here. After ČEZ, Inc. began to build a centre of renewable sources (pump storage power plant, solar panels) in this area, EWT-315 was built in 1995 and in 1996 there was built EWT-630 kW. Both power plants come from a Czech producer - Energovars. The operator had to deal with huge problems and that was reflected in production. In the years 1997 - 2002 the wind power plants produced on the average per year: WindWorld 43,9 kWh, EWT-315 123,7 kWh and EWT-630 139,4 kW.

2. A private investor built a small wind power plant Vítkovice VE 315/1 with the power of 315 kW on the top of a hill (585 meters above sea level) nearby Mladoňov village in 1992. This power plant was showing repeated failures. It was put out of operation in 1994 and in autumn 1995 it was placed with a new type - VE 315/1 with the power of 315 kW with a set of foreign agregates. The new type was put into operation in January 1996. Since that time the operation has been continuous with breaks for small repairs. Energy production in the period from January to October 1998 was 250 MWh.

3. In Nová Ves v Horách (Krušné hory) there was built a wind power plant of the Italian producer WEST with the mark MEDIT 320 kW at the beginning of 1994. Its production was surprisingly high, as many as 40 MWh per month. After a one-year operation it was out of order due to unexplained property-legal relations and financial insolvency roughly to 2000. It was robbed several times. After complete overhaul the turbine has been in operation since the beginning of 2002. A wind power plant with the power of 1,5 MW from Re power producer, type MD-70 was installed in the neighbourhood at the end of June 2003.

4. On the top of Hostýn pilgrim hill (735 metres above sea level) Matice svatohostýnská built a wind power plant Vestas V27-225 kW in April 1994. Roman catholic clerical authority Svatý Hostýn has operated this turbine so far. The real annual production ranges from 300 to 400 MWh. In November 1999 the production reached as many as 65 MWh. It is necessary to mention to this turbine that the building was realized despite strong protests of officers of landscape protection at the district as well as at the ministry authorities.

5. Velká Kraš u Vidnavy (former Jeseník district) is an area where the community built a wind power plant Vestas V29-225 kW in September 1994. This type of a power plant is equipped with two generators whereas the generator with a lower power (50 kW) is

determined for lower wind speed (starting speed 2.5 metres per second). In 1995 this power plant produced 281.2 MWh. The average annual production had been 248.7 MWh to 1998.

6. By now the biggest farm in our country was built in Ostružná (former Šumperk district). It concerns about six Vestas V39-500 kW wind power plants. The building was realized 720 meters above sea level in 1994. During the operation to the end of 1997 there developed unfavourable influences as icing and a thunderstroke that damaged switch room and an electrical device of particular wind power plants. But the mentioned meteorological influences were not the main reason why the farm produced less than a half of the expected annual production. The cause can be searched in mutual position of both turbines but mainly in a wrong determination of average wind speed and from it the calculated supply of wind energy. Low redemption value of energy and, against the hypothesis, the low production were the reason that the owner came into payment troubles and there was put up a post for the farm. Since 2002 as a new owner did necessary repairs after unavailability time, the farm of wind power plants has been in operation. Within years 1995 - 1998 the farm with six wind power plants produced on the average about 2000 MWh per year.

7. Roughly 200 meters from Nový Hrádek town (former Náchod district) on 578 meters high hill there were built four wind plants 6KOV-400 kW on the foundations that were former built for Vítkovice 315 wind power plant. It concerned about devices which were not tested in operation as many problems were removed during mounting and taking into operation. Among others there happened a significant "oversteer" of the wind power plant. The testing operation of the farm was permitted by surveyor's office in Náchod to the 30 th September 1997, but it was not realized due to failures and high level of noise. The owner of the farm became subsequently VČE, Inc., Hradec Králové which made several construction settings and an overhaul. In autumn 2002 only the day operation of the farm was permitted because at night the limit of noise was overranged.

8. Neklid nearby Boží Dar town in Krušné Hory is a locality where EWT-315 kW wind power plant was transferred from Dlouhá Louka (Long meadow) in 2001. This wind power plant keeping by ČEZ, Inc. was in operation from November 1993 to December 2000 and it was licensed only for temporary operation.

Research workers of Institute of atmospheric physics, Academy of Sciences of the Czech Republic took special measurements as well as measurement on meteorological pillar with the height of 48 metres. There was significant also the evaluation of the influence of icing on the wind power plant. Research polygon Dlouhá louka was as a subject delegated to Institute of atmospheric physics, Academy of Sciences of the Czech Republic and pillar's measurements continue. Since it concerned about the first wind power plant, type EWT-315 kW, a number of technical troubles was showed. Within 1994 - 1999, the highest annual production was reached in 1995, namely 303 MWh. After replacing the wind power plant EWT-315 kW has been in testing operation since March 2003.

9. In December 2002 there was built a wind power plant Furladner FL 100 by Protivanov Community in Dražanská vrchovina (680 metres above sea level). The power plant has a generator with two windings, namely 20 and 100 kW. It starts at the wind speed of 2.5 metres per second, reaches nominal power at the wind speed of 12 metres per second. The three-blade rotor has 21 metres diameter and stall regulation. The tube height is 33 meters. The workers of

Institute of atmospheric physics, Academy of Sciences of the Czech Republic took an annual measurement on near radiocommunication pillar. At 40 meters above the ground there was set an annual average 5.8 metres per second and calculated supposed annual production of 192 MWh.

10. By Jindřichovice pod Smrkem (410 meters above sea level) in Frýdlant promontory two wind power plants from Enercon E-40 with the nominal power 600 kW each supplied the first kilowatt-hours to the electric network in the middle of May 2002. The tubes height is 65 metres, rotor diameter is 44 meters. Starting wind speed is 2.5 metres per second, the nominal power is reached at the wind speed of 213 metres per second. It concerns about wind power plants without a gearbox with multipolar toroid synchronous generators. During the operation the rotor reaches 18 to 34 speed per minute.

3. CONCLUSION

The Czech Republic is one of the countries in which interest in wind power is gradually growing. The energy policy of the EU concerning the utilization of renewable energy resources allowed for an increase from 4 TWh to 80 TWh, which corresponds with a share increase from 0.2 % to 2.8 % of expected total electrical energy generated in 2010 (output increase from 2.5 to 40 GW).

These and many other problems with connection, expansion, financing, economic benefits and environmental aspects in using the potential of energy renewable resources have been and still are the topics of the discussions in the national and international conferences focusing on the issues of power engineering. Finally, they are the topics for follow-up discussions and expert meetings of individual energy companies not only in the EU countries but also over the world.

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5. ACKNOWLEDGEMENT

This paper was written under solving science project GAČR 102/06/0132

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