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RENEWABLE ENERGY SOURCES IN REPUBLIC OF SRPSKA – THE USING OF WIND POWER

Abstract: This paper will summarize exploatation of the wind energy in the region. Europe and the world. Following up those circumstances, methods for subvention (which is the most important element for development of wind power plant), of wind energy consumption will be explained. It has also been completely analysed situation in the Republic of Srpska, actually the reasons which gives us as a result that we have no wind power plants connected to electric power system. Based on this analysis the guidance strategy of wind energy consumption is derived. It is concluded to: Urgently set up system for determining wind potential, Define and prepare legal frame and technical recommendations, Establish research centres for wind energy studying.

This research should be a base for further, more detailed, analysis and development of strategy of wind energy.

Key words: *Renewable energy sources, wind energy consumption, wind power plants*

Sažetak: U radu je dat pregled stanja eksploatacije energije vjetra u okruženju, Evropi i svijetu. Nakon toga, obrazloženi su mehanizmi za subvencionisanje korištenja energije vjetra, pošto je subvencionisanje najznačajniji faktor koji podstiče razvoj vjetroelektrana. Analizirana je situacija u Republici Srpskoj, tj. razlozi zbog kojih u Republici Srpskoj još uvijek ne postoji niti jedna vjetroelektrana priključena na elektroenergetski sistem. Na bazi sprovedene analize, izvedene su smjernice za strategiju korištenja energije vjetra: hitno uspostavljanje sistema za određivanje vjetropotencijala, definisanje i priprema potrebnog zakonskog okvira i tehničkih preporuka, te formiranje istraživačkih centara za izučavanje energije vjetra. Navedena istraživanja treba da predstavljaju osnovu za daljnju analizu i razvoj strategije energije vjetra.

Ključne riječi: *Obnovljivi izvori energije, iskoristivost energije vjetra, vjetroelektrane*

INTRODUCTION

The process of European integrations is accompanied with certain obligations, one of which is using the energy from renewable sources. Participation of ener-

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gy from renewable sources in the Union total electricity generation has to increase from today's 6% to 12% by 2010 [1].

A directive on promotion on the use of energy from renewable sources 2009/28/EC [2] was adopted in April 2009. Priority tasks are to have the energy from renewable sources participating with 20% in total Union energy consumption and to reduce the emission of greenhouse gasses (GHG) by 20% It is concluded from this legislature that in 2020, 12% of total European electric energy will be generated in wind power plants. The USA is a leader in installing wind power, geothermal, biomass and concentrated solar energy (CSP) plants. The strongest progress is noted with wind power and photovoltaic energy, with the growth rate of their installed capacities in 2008 of 51% and 44% respectively. Nevertheless, in spite of such a progress, renewable electric energy share in total electric energy generation of the USA is small – 3,8% by the installed power and 3,1% by production of energy, according to 2008 data [3].

Wind power energy in comparison with other energy forms has experienced the fastest development over the past few years. In 2008 the wind power plants of above 100 GW capacities were installed across the world, growth rate climbed to 28 GW per year with the tendency of continued fast development [4]. It is estimated that by the year 2010 wind power plants of capacities above 300 GW will be installed, and by 2020 plants of capacities between 500 and 700 GW.

Single wind turbine power is currently between 1 and 3 MW, investment costs vary from 1200–1500 €/kW and maximum power utilization factor is 20–35%.

Speaking of the distribution by the continents, most of the wind power plants in the world are located in the Europe, North America and Asia. Only 2% of all wind power plants are located in the rest of the world.

The wind atlas can be obtained by combining the satellite wind speed measurements with orography data and atmosphere models. The results obtained by satellite measuring done in 25 x 25 km resolution can be used for calculation for the altitude of 50 m and above and homogeneous terrain roughness.

SUPPORT MECHANISMS IN DEVELOPING WIND POWER

The main problem with the development of wind power exploitation is presented by the financial means that would stimulate purchase, in order to make the wind power economically attractive. These financial means can generally be obtained in three ways: with direct support either in money or through tax benefits, through penalties to be paid by the producers of unrenewable energy because of environment pollution or finally providing financial means by increasing the energy price, which in the end will be paid by the consumers themselves.

One of the legal-economical mechanisms is the policy of fixed prices which will promote integration of renewable energy sources into electric power system [5].

There is no wind power plant in the Republic of Srpska integrated into electric power system. In order to set the basis for development of strategy for wind power exploitation in the Republic of Srpska, it is first necessary to define the causes

of current situation i. e. of such drastic deviation in regard to both geographically and topographically close European countries. In the Republic of Srpska there is no clearly defined legal regulation or division of competencies amongst different authorities' levels concerning the measuring of wind power, designing, approving, building, technical conditions and integration into the renewable energy sources network. Because of that there is no good procedure which would easily lead the process of building of renewable sources [6].

STRATEGY PROPOSAL FOR DEVELOPMENT OF WIND POWER EXPLOITATION

In today's circumstances the only realistic strategy could take into consideration the following solutions:

a) Urgent setting up and commissioning the system for wind potential measuring in the whole of Republic of Srpska, made by the latest technology and in line with the European standards and directions for wind potential measuring

b) Setting up of an institute or an excellence centre for wind power as part of the University of Electrical Engineering in Banja Luka and East Sarajevo, as the future scientific and professional body for exploitation of wind power

c) Defining clear legal procedure, standards, technical recommendations and procedures for issuing certificates and licenses for wind power measuring, building of wind power plants and their integration into the network so as not to discourage those interested in exploiting the wind power, and to have the procedure of building wind capacities legally regulated from the very beginning.

Introduction of the wind power exploitation in Republic of Srpska is a big challenge taking in consideration current circumstances. It is only by hard work and making of comprehensive and good development strategy that it will be possible to catch up with lost time in wind energy exploitation.

Presently the Republic of Srpska has no financial interest in investing a great deal in wind energy exploitation, except to the extent defined in international recommendations to meet quotas according to the required dynamics. Introduction of wind power should only go to that level necessary to meet the European Union requirements, in order to avoid unnecessary money squandering and to invest it in more profitable conventional energy resources.

WIND ATLAS OF THE REPUBLIC OF SRPSKA

In the analysis of the wind atlas in the Republic of Srpska, the data of the U. S. Department of Commerce National Oceanic and Atmospheric Administration NOOA [9] was used. Time middling was done for a 40 year period. The map of wind atlas is relevant for one entire working life of a wind park which is from^{2}0 to 25 years. The average speed of 50 m land level height is low and insufficient in terms of technologically usable wind power exploitation. Orography effect plays a decisive role in determination of wind power on the local level, along with the terrain roughness.

The wind speed in January is much higher than the average speed over the year.

The wind atlas is usually shown in segments of given speed intensity span [10]. In order to get a wind atlas that includes terrain orography, we need to combine wind databases with sea level databases. Such wind maps are offered with different land level heights and some typical terrain roughness types. Heights of 10, 25, 100 and 200 m are usually used, and four roughness types, classified as 0, 1, 2 and 3.

Wind atlases which combine satellite data and orography data are formed on the basis of some of atmosphere models. On the basis of the most probable state of atmosphere and data obtained with the European satellites in the period 2001–2005, the Institute ARMINES has drawn a wind atlas of the Balkans countries with 50 m of altitude; it has forecasted that the wind power in the area of the Republic of Srpska will not be much technically exploitable.

For the period 2004–2009 ANEMOS took as a basis of analysis NCEP/NCAR [11] database as a border condition, and applying non-hydrostatic MM 5 [12] model of simulation made ten minutes BiH wind database on mezzo scale. This database has been made in horizontal 5 x 5 km resolution.

In order to obtain, starting from the wind atlas that does not account for the terrain topography, the wind map that encompasses orography effect, it is necessary to combine wind databases and orography database. Drawing of wind speed isolines on the map makes possible, for each wind speed span in an area, determining the speed on the basis of land location and dominant direction of the wind to which the land is shelter.

Isolines of wind speed in January are obtained based on the supposed land sea level for entire area 25 km x 25 km and supposed roughness of land. When the location is chosen it is necessary to alter average wind speed by taking into consideration land configuration effect and roughness of land.

ANEMOS takes into consideration orography, therefore its wind map very much reminds of relief [8], showing a map in resolution 25 km x 25 km. By the analysis of the map [8] it is possible to determine the location with most favorable wind, within the area of wind speed span. In the area chosen to observe the wind speed, one determines the speed span by using isolines, whereas the impact of land configuration is determined by relative speed interactions, which is marked with colors on the scale. The picture serves only as an illustration, because the ANEMOS map is made with land level of 100 heights, and isolines are shown for the land level of 50 m.

CONCLUSION

Taking into consideration a very low level of economic activities in the Republic of Srpska, in the next period it would be the best to focus on defining the frames for the development of wind power, in order to create stable environment for future development and investments. That frame should include preparation of strategy, defining legal solutions and precise measuring of wind power in line with the European standards. At the same time, we should certainly open as soon as possi-

ble the scientific and research centers as part of Electrical Engineering Faculties for studying wind energy in order to create domestic competent staff who will be the bearers of development of wind energy, capable of cooperating with foreign professionals and technologies.

The meteorological stations in the Republic of Srpska are located in relatively good locations, however in order to use them for wind power measuring, remodeling of each of them is required, because of land configuration impact, roughness of the landscape and obstacles in developing the speed of wind.

Data about wind was extracted by the measuring from satellite in resolution 25 km x 25 km, recalculated for the land level of 50 m height and homogenous land configuration.

The wind potential in the Republic of Srpska increases going from direction of northwest-southeast, and on the basis of satellite wind map and information about land it is possible to choose the right location for erecting the specialized wind station.

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