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The use of wind energy in Serbia natural conditions and practical policy

THE USE OF WIND ENERGY IN SERBIA – NATURAL CONDITIONS AND PRACTICAL POLICY

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December 2009.

SUMMARY

In 2008 wind became a major source of energy for operation of newly built capacity to produce electricity in the European Union (EU). The installed power of new wind turbines that year exceeded the individual participation of new power plants using classic fuel and nuclear power. Countries in the region of Serbia - Croatia, Hungary, Romania and Bulgaria - use the power of wind. Why does Serbian have no windmills? One text cannot give answer to this question, because there are a number of issues. Who is the customer of wind energy and what does he say, because "the customer is always right"? What protected species disappeared from the face of the Earth due to windmills, as claimed by the official Serbian institutions responsible for nature conservation? Is the development of "higher-order spatial plan" an effective tool to fight against windmills, since Don Quixote tactics has failed? Why is the balancing of energy from wind turbines technically such a difficult issue, when our experts have been solving fundamental problems since the first steps of humanity related to the mass use of electric power? Who pays for the balance energy, and who charges for "green energy"?

This paper deals with the previous issue - whether in Serbia there are technical requirements and regulations under which it is possible to build a windmill? Serbia has a tradition of using wind energy. The results of studies and specialized wind measuring are shown. Technically it is possible to connect the windmill to the electric transmission network. We have explained the elements of positive and negative politics of planning and using electricity from wind turbines on the basis of the analysis of the success in the development of wind engineering in individual countries. A positive policy encourages and accelerates the development of wind engineering, while a negative policy creates barriers in this area. In Serbia no permits have been issued for the construction of more power windmills, however, recently adopted regulations allow the issuance of building permits for wind parks. The effects of negative practical policies are reflected in the implementation of spatial planning and environmental protection and the inefficiency of the administration.

BACKGROUND

Huge wind power is evident at times through its destructive power, while in the long term wind causes soil erosion and formats terrain in different areas. Through the centuries, man has learned that the wind may be his ally. Except vast sea voyage, it is likely that the wind was used to drive some kind of windmills in China and Japan about 3000 years ago. The first written records of 947 mention a windmill built in Persia, near the border with Afghanistan. This windmill worked on the principle of water flow windmills. As the wind blew constantly from the same direction it was possible to apply the principle of mills.

In Europe, the windmills appeared at the end of the 12th century and, thanks to finding gear, they were designed with a horizontal axis. In the period from 12th to the end of the 19th century, wind was used as a major source of energy. In mid-19th century in the Netherlands there were about 9.000 windmills, in Germany 18.000, England 80.000, Denmark 3.000, France 20.000, and Spain is even now known as the land of windmills, thanks to the novel about Don Quixote /1/.

There was the tradition of using the wind on the territory of Serbia, in Vojvodina. In the 19th century in Vojvodina there were about 280 windmills, and the first was built in the late 18th century in Elemir near Zrenjanin.

Before the invention of the steam engine and the industrial revolution, half of the energy was produced with the help of wind, and the other half by using hydropower. Since monasteries had the exclusive right to use waterways they were able to exploit all those who had a need to use the mill. At that time, the wind, whose use had no limitations, was considered a symbol of freedom (example: Remains of the windmill that was used for operation of the local water supply in the village Šušara).

In addition to grinding grain, windmills were also used to drive pumps for water supply. Figure 1 shows the old windmill in Šušara, the village in the municipality of Vršac, which was used for the operation of the local water supply and whose reconstruction is in progress. According to some data, village Šušara had a water supply 4 years before Paris.

The oil crisis of the early 70's of the last century and accidents in nuclear power plants initiated the need for using renewable energy sources. At the end of ‘80s and in the early '90s of the 20th century, the development and application of wind power for energy production gained in importance. The annual growth of the total installed power of windturbines in the world is shown in Figure 2

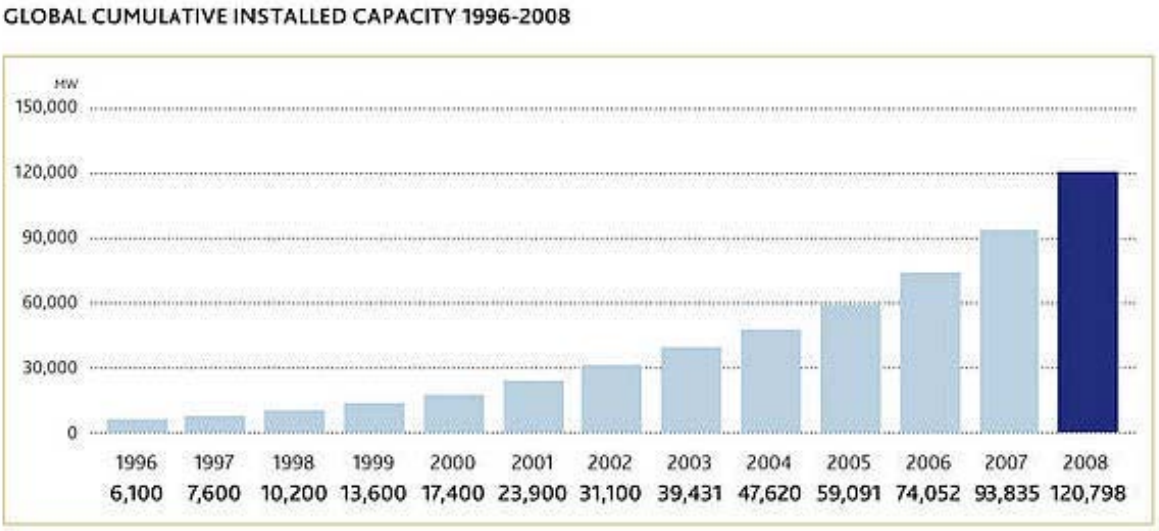


Figure 2. Annual growth of the installed power of wind turbines in the world /2/

In 2007 the total installed power of wind turbines exceeded 100GW, and at the end of 2008 it was 121GW!/2/. In the total electricity produced in the European Union (EU), the proportion of energy from wind turbines was in 2008 approximately 4.2% and this energy is enough to supply about 35.000.000 households /3/.

WIND ENERGY POTENTIAL OF SERBIA

Mass use of electric energy is related to the inventions of Nikola Tesla, and the first hydroelectric power plants in Serbia were built in the early stages of development of power industry. In regard to the use of wind energy, Serbia, compared to the EU countries, is about 20 years late. The reasons for this delay may be multiple. The basic condition for the development of wind engineering is the existence of technically useful energy potential of wind. Wind potential determines the economic justification for investing in the construction of wind turbines and is the basis for practical policy in this area.

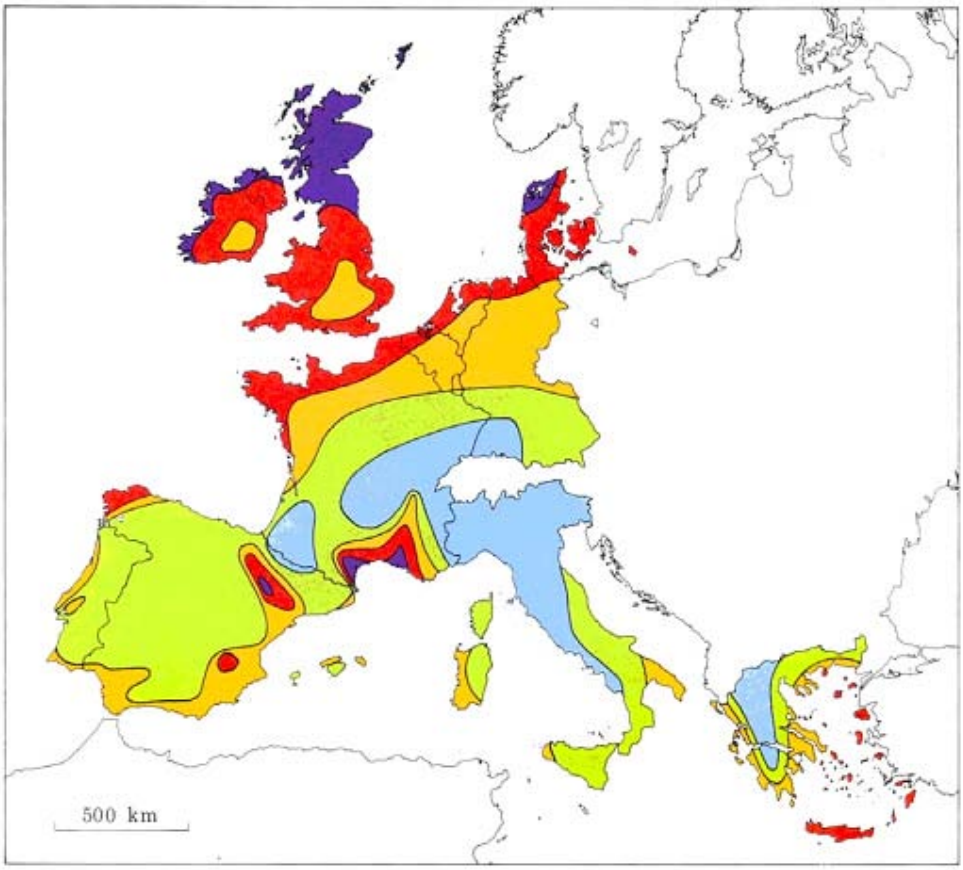
METHOD OF WIND ATLAS

Wind energy potential of a certain area is graphically displayed on maps on which the areas with characteristic intensities of wind speed and wind power density at a given height above the ground were drawn. A set of these maps is called Wind Atlas, and the data associated with geographic coordinates are said to be given in the geographic information system (GIS Geographic Information System). The first European Wind Atlas was published in 1989 and it represents the result of the project whose Coordinator was the Institute

RISO from Denmark. /4/. As shown in Figure 3, based on the Wind Atlas it is possible to identify areas potentially suitable for the conversion of mechanical wind energy into electric energy. The importance of research initiated in 1981 from which Wind Atlas of Europe resulted is in developing a methodology for determining the wind energy potential. This methodology can now be used to evaluate wind turbine electricity generation projected on a site with known wind energy potential and the known data about the technical characteristics of the selected wind turbine.

For the development of Wind Atlas of the given area the data base on wind characteristics of the existing meteorological stations is used, as well as data collected by using satellite measurements and meteorological balloons. Satellite measurements give relatively reliable data on wind in the coastal area, while their usability of the land is very limited. The new models that are continually being developed provide an increasingly accurate production of wind atlases in the mainland area on the basis of data from geostationary satellites over the poles.

When using the data of meteorological stations on land, it is necessary to obtain database of wind from as many stations located in the selected area as possible. For each of the stations modeling the impact of all factors affecting the local speed and wind direction is done. Taking into account the estimated impact of all factors, it is possible to reduce the database of wind obtained by measuring to the values which would be measured by instruments if they were placed in the area characterized by "standard" terms of terrain around measurement stations. Wind speed above the ground in the so-called border atmospheric layer changes depending on terrain shape (orography), features of ground surface (roughness), barriers to wind around measuring stations (different objects) and ways of placing the measuring system. Roughness of terrain is different for water surface, forests, grasslands, sand, snow, settlements and other landscape and is characterized by a certain class of roughness or another measure. The size of roughness can depend on the season. Usually, all types of roughness are classified into 4 classes with marks from 0 to 3. When the data on the wind at a height above the ground are reduced to a given class of roughness, it is possible, using an appropriate model of change of wind speed depending on the height above the ground, to calculate the characteristics of the wind at several heights, usually altitude of 10m, 25m, 50m, 100m and 200m. Thus the obtained data present the local climate of the wind for the area around measuring stations. Wind Atlas for the wider area is obtained with the interpolation of all the results of measuring stations in the monitored area.



Wind resources at a height of 50m above the ground for five different topographic conditions

	Hidden terrain		Open terrain		Sea coast		Open sea		Hills and ridges	
	ms^{-1}	Wm^{-2}	ms^{-1}	Wm^{-2}	ms^{-1}	Wm^{-2}	ms^{-1}	Wm^{-2}	ms^{-1}	Wm^{-2}
	> 6.0	> 250	> 7.5	> 500	> 8.5	> 700	> 9.0	> 800	> 11.5	> 1800
	5.0-6.0	150-250	6.5-7.5	300-500	7.0-8.5	400-700	8.0-9.0	600-800	10.0-11.5	1200-1800
	4.5-5.0	100-150	5.5-6.5	200-300	6.0-7.0	250-400	7.0-8.0	400-600	8.5-10.0	700-1200
	3.5-4.5	50-100	4.5-5.5	100-200	5.0-6.0	150-250	5.5-7.0	200-400	7.0-8.5	400-700
	< 3.5	< 50	< 4.5	< 100	< 5.0	< 150	< 5.5	< 200	< 7.0	< 400

Figure 3. European Wind Atlas /4/

WIND ATLAS OF SERBIA

The first study of the energy potential of wind in Serbia was created in 2002 for the needs of the Electric Power Industry of Serbia (EPS) /5/. A significant energy potential of wind was identified, especially in South Banat and eastern and southern Serbia. The energy potential of wind in Serbia was estimated at about 1.300MW, and the possible annual production of electric power from wind power to 2.3TWh.

As a result of the project "Study of the energy potential of Serbia for using solar radiation and wind energy" Study EE704-1052, the Wind Atlas of Serbia was made for different

heights above the ground and for different seasons /6/. Figure 4 shows the speed of wind at altitude 100 m above the ground in winter (4a) and summer (4b) period. Again, there was the conclusion of the technically usable potential of the wind in South Banat and eastern Serbia.

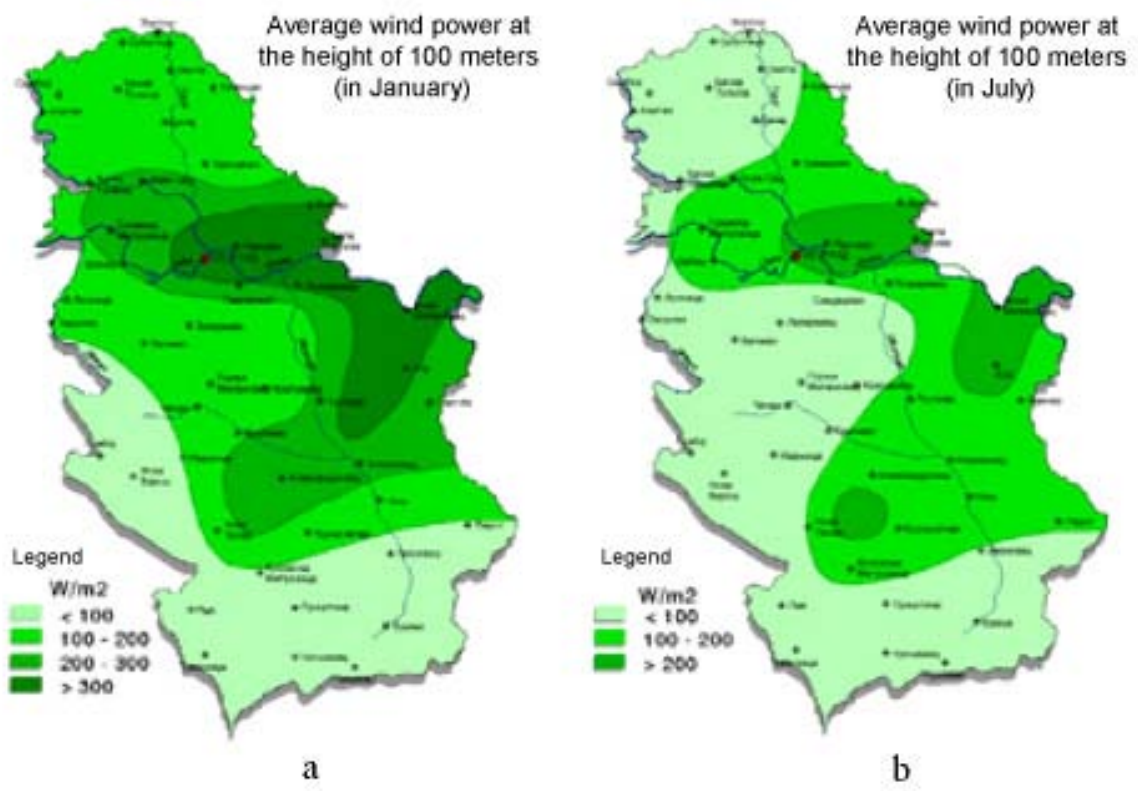


Figure 4. Wind Atlas of Serbia-Study EE704-1052 project in 2005. CMS /6/

The latest Wind Atlas of Serbia is the result of the project "Atlas of the energy potential of the Sun and wind in Serbia" TD-7042B /7/. The software developed within the project provides introduction of new data on the wind, so that it is possible to verify the Wind Atlas in some locations, making comparisons with the specialized measurements of wind characteristics at some heights above the ground.

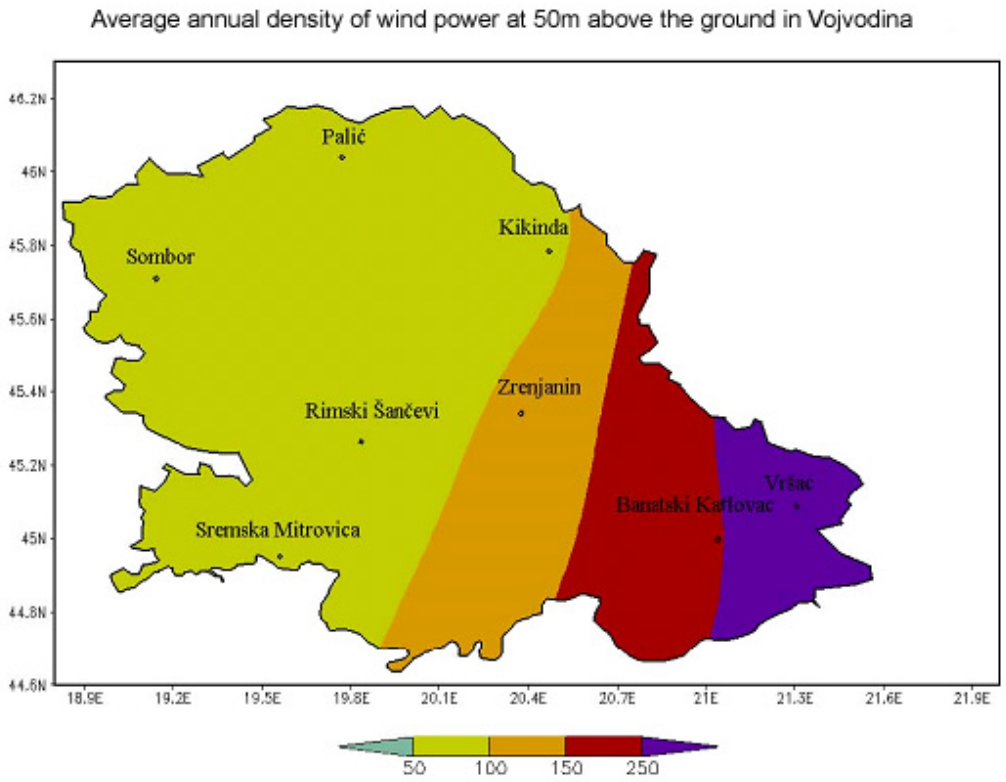


Figure 5. Wind Atlas of Vojvodina - project "Atlas of winds in the territory of Vojvodina", December 2008 /8/

For Vojvodina, as an area with a tradition of using wind energy, special wind atlases have been made. In addition to individual works, the study "Wind Atlas of AP Vojvodina" was published in late 2008 as a result of the "Wind Atlas of the territory of Vojvodina "/8/. Figure 5 shows a map of wind power density in Vojvodina at a height 50 m above the ground. Due to the periodic change of the seasons, the values of all wind maps refer to the average values in one year. The greatest density of wind power is in the southeastern area of Banat, which is a region with significant technically usable wind potential.

DETERMINATION OF THE POTENTIAL LOCATIONS FOR WIND TURBINE CONSTRUCTION

Wind Atlas serves to identify broad areas in which there is the possibility of using wind energy. To determine the specific locations for the construction of the park or a wind farm (wind park) there must be specialized measuring of wind features at a few heights above the ground, as well as other meteorological measurements: temperature, pressure and, possibly, humidity. There are certain rules for placing measuring stations for the wind and

the orientation sensor on the measuring pillar, as well as the manner of collection and recording data. Depending on the used sensors and systems for data processing, the measurement of speed and wind direction is done in one or a few seconds. On the basis of these measurements, mean values are determined for each period of 10 minutes. These values are stored in digital form, and by their subsequent statistical processing data are obtained relevant to assessing the energy potential of the wind in the vicinity of the measuring points for wind turbine design. Current values of wind speed obtained by measurements during a second serve to determine the intensity of turbulence. This data is used in the choice of wind turbines whose mechanical properties must conform to the local characteristics of the wind, as well as for the additional correction of the calculation of the wind energy potential.

Wind turbine design requires continuous measurement for at least one year, as to include the characteristics of all seasons. Annual measurements allow determination of the wind turbine production during exploitation with an accuracy of 14%, while the error in the assessment of the plant production based on measurements during 3 years is 3 to 4%. /9/. In order to perform calculations with a greater accuracy, the procedure of comparing the data of specialized measuring stations with the data closest to the so-called reference meteorological station is used. Since weather stations have measurements during many years, it is possible, using the method of correlation, to reduce the data of specialized measuring stations to long-term data for all heights above the ground on which measurements are performed.

Such a specialized wind measurement station in the area of southern Banat, which has continuously collected data on the characteristics of wind for a few years, allows wind energy potential assessment for the period of exploitation of possible wind turbine with an error 3-4%. The measurement results confirm the significant technically usable energy potential of wind in the area of southern Banat.

In Serbia specialized measurements of wind on over 20 locations are under way or have been completed. Measuring columns 40m to 80m high are used. The measurements confirm the significant energy potential of wind, and the project reports and feasibility studies done on the basis of these measurements and other data confirm that the projects of individual wind turbines are economically justified.

THE POSSIBILITY OF INTEGRATING WIND TURBINES INTO THE ELECTRICAL NETWORK

The basic requirement for planning the construction of wind turbines is the existence of technically useful wind energy potential. There are other necessary technical requirements for windmills. In order for wind turbines of greater power to supply more electricity to consumers, they must be connected to the transmission or distribution power grid.

Electrical energy cannot be found as energy source in nature, but is obtained through the conversion of other sources of energy and is characterized by the ability to transfer it over a distance to consumers. It is necessary that the electric power system over time is balanced, and that electricity production is equal to consumption. A lack of balance leads to changes in voltage frequency in the network, and in case of larger disorders to the collapse of the system.

Wind is an energy source whose power changes over time and whose changes cannot be reliably predicted for a long time. This feature does not allow the management of wind turbine production, but it is determined by the current characteristics of the wind. Wind turbine connection to the network means that the system must have power plants to enable the delivery of balanced energy. Possibility of balancing energy supply in a given electricity system depends on its characteristics, primarily the energy sources used by plants connected to the system. It is believed that the participation of wind turbine up to 10% of the total electricity production of a given system can be successfully balanced. Even with a small share of wind power plants in the total production, system management must be planned to ensure balancing energy. Figure 7 shows the share of wind power plants in the total production of electric power in individual EU countries /10/.

In some countries the level of participation of wind turbines is well above 10% and Denmark is planning that its participation with wind energy in future reaches a level of 50% of total production. It should be noted that the Danish electricity system is part of a wider Nordic system. It can be concluded that construction and operation of a single international transmission system provides a significant share of wind energy in total production of electricity.

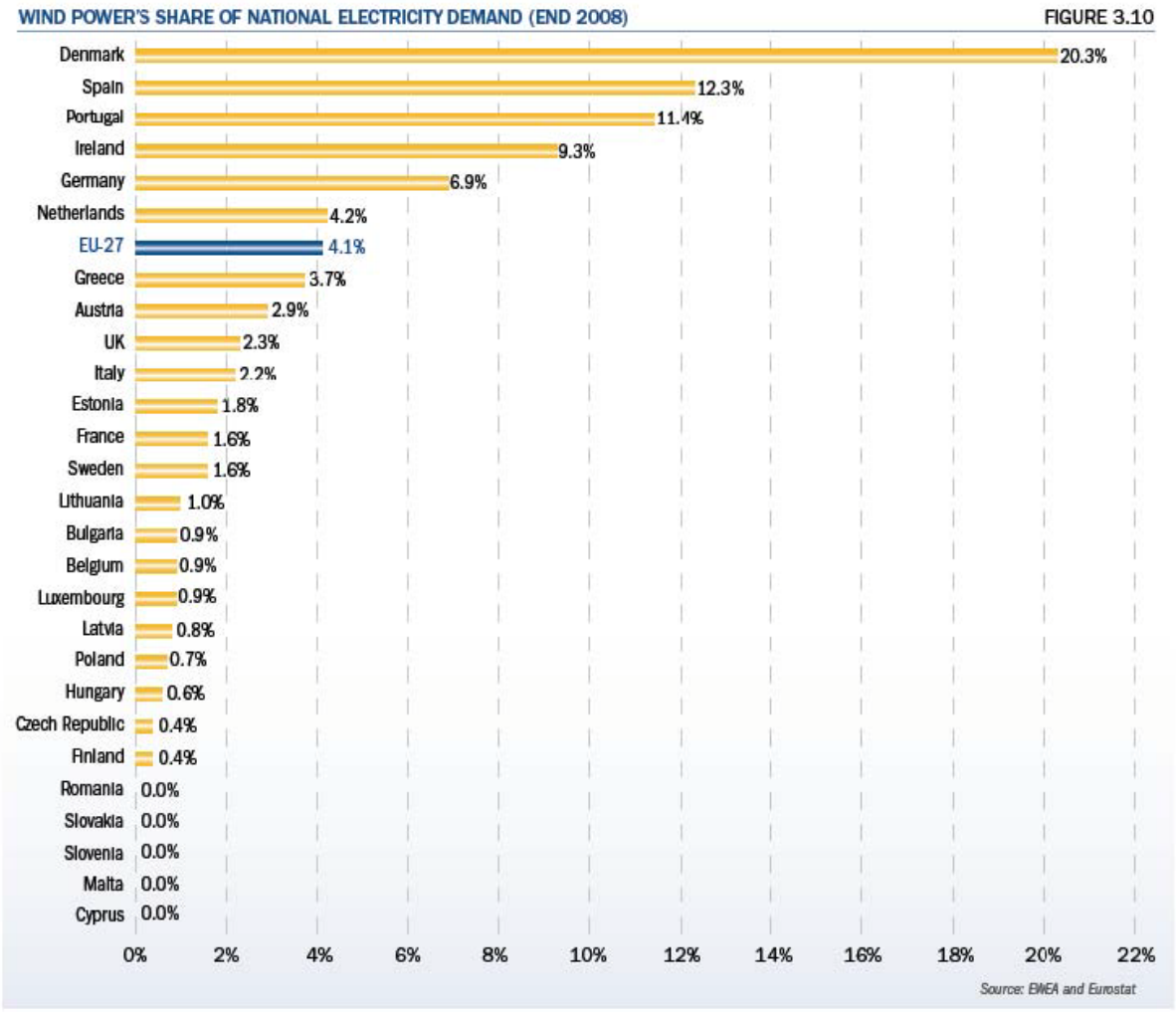


Figure 7. The participation of wind power plants in meeting the overall need for electricity /10/

Hydroelectric and gas power plants are suitable for balancing electricity production and consumption in the system. Reversible hydropower plants enable the excess of electricity to be used for pumping water in the accumulation at higher altitudes and to accumulate in this way excess energy for use in period of increased spending. In Serbia, a reversible hydro power plant was built in Bajina Bašta, and there is a project to build another reversible hydro power plant, as well as a plan for the construction of power plants using natural gas.

In addition to plants that can provide balancing energy in the system, development of wind engineering requires the construction of a transmission network. Development Plan of the electrical network of Serbia for the period until 2014 envisages the construction of new 400kV and 110kV transmission lines, as well as cross-border network connectivity

that could provide the conditions for the construction and connection to the network power of the wind power plant /11/.

Other technical conditions for the construction of wind turbines include appropriate transport infrastructure and availability of land. In the area that has technically usable wind potential these conditions are satisfied or can be satisfied with the investment of certain assets.

The main conclusion is that Serbia has the technical conditions for the initial phase of the construction of wind turbines and their integration into the electric power system.

"POSITIVE" AND "NEGATIVE" POLICY IN PLANNING THE USE OF WIND ENERGY

Political will, adequate legislation and efficient administration are necessary additional conditions that allow the realization of favorable technical conditions for the construction of wind power plants. Spatial distribution of energy sources, power plants and consumers is a precondition for the international association of the energy sector. The result of this relationship is the impact of global and regional energy policy on the national policy.

International treaties, protocols, conventions, recommendations and other documents may act as an incentive for the use of RES. Serbia is a signatory to the Kyoto Protocol, and has expressed willingness to perform all its obligations under the agreement in Copenhagen. Determination to slow the impact of climate change by reducing greenhouse gas emissions, especially CO_2, favors the use of renewable energy sources, especially wind and solar radiation energy.

The energy sector is a significant source of CO_2 emissions and other harmful gases and particles. If the total electricity production were represented symbolically as a single cube emitting greenhouse gases, the larger the share of wind energy in the cube, the less the harmful CO_2 emissions, with the same total produced electricity. If all the electricity were produced from wind, we would completely eliminate the emissions of harmful gases.

Globally, the use of wind energy for electricity generation has a major positive impact on the environment.

Serbia is a member of the South East Europe Energy Community, and its international obligations encourage the use of RES, especially the use of wind energy.

The delay in the construction of wind turbines has a positive side. In forming policy and the construction of wind turbines, Serbia can use more than two decade experiences of countries with developed wind engineering.

Denmark, Germany and Spain are leading in the use of wind energy among European countries. Practical policies pursued by these countries have encouraged this form of electricity generation and their policies in this sector can be characterized as positive. Measures implemented in some countries, which have resulted in slowdown or delay in the development of wind engineering and the creation of various barriers, may be characterized as negative policy.

The main difference of positive and negative policies is in the stimulatory mechanisms, spatial planning and the efficiency of the licensing procedure for wind turbine construction.

Of all the methods used so far as economic support, the system of subsidized price of electricity produced by using RES, the so-called feed-in tariff system, proved to be the most successful. This system was applied in Denmark, Germany and Spain. A system variety with prescribing quotas, or maximum total capacity of power plants based on the RES for which the state provides subsidies, proved to be unfavorable.

Spatial planning essentially affects the extent of use of RES and the speed of development in this field. Successful use of RES is contributed with four factors /1/

1. well-designed produced energy payment mechanism
2. transmission and distribution network access and network development
3. simple and well-defined administrative licensing procedure
4. support and acceptance by the public

Spatial planning method is very important for the successful use of wind energy. Conflict of interest is most pronounced in the area. The use of wind energy has a very positive global effect on the environment. Some negative effects become prominent on the local level, such as noise, light reflection, the impact on telecommunications, the impact on birds and bats, and the visual impact on the landscape.

As a negative policy in this area has proved to be planning starting from the national level, through the regional and local levels. This way of planning has much slowed the development or created barriers for the use of wind energy in countries where applied.

Table I. zone model /1/ .

Box 14.2 ZONING CRITERIA FOR REGIONAL PLANNING, 1997–1998

The following list defines the criteria for distances between wind turbines and settlements, infrastructure, etc. 'Minimum distance' means the total height of a wind turbine.

Farmhouses	300 metres
Villages, rural settlements	500 metres
Towns, urban areas	1000 metres
Campsites, holiday homes	1000 metres
Motorways, federal highways	overall height of wind turbine (at least 50m)
State and county roads	overall height of wind turbine (at least 50m)
Railways	overall height of wind turbine (at least 50m)
Radio relays	100 metres
Overhead electricity lines > 20 kilovolt	50 metres
Military facilities	outer protection zone
Airfields	protection zone
Nature preservation	minimum distance
Forests, tree-lined alleys	200 metres
Coastal waters, lakes > 100 hectares	1000 metres
Rivers of first category	800 metres
Small lakes (1–100 hectares)	400 metres
Important biotopes for wildlife animals	minimum distance
Areas of very high importance	1600 metres
Areas of high importance	800 metres
Areas of medium importance	200 metres

Approach based on planning at the local unit level on which the construction of wind turbines has the greatest influence has proved to be a positive policy.

The method of "round table" at the municipal level is one of the most effective methods of planning areas suitable for the construction of wind turbines. The initial condition is that there are favorable wind and commitment to build windmills, and it is necessary to decide where and when to begin construction. A working group of representatives from government, associations, professionals for various fields and representatives of other interested parties is formed. The working group is in charge until the proposal is approved.

There are different rules of construction used in the design of wind parks. Table I shows the planning criteria applied in the region of Rostock in Germany.

PRACTICAL POLICIES AND REGULATIONS IN SERBIA

The possibility of use of RES in Serbia is based on the implementation of the Law on Energy, the implementation of the Laws on Environmental Protection and the Law on planning and construction.

The Law on energy defines the energy production from renewable energy sources as privileged, provides the obligation of using the energy, introduces certain privileges and provides the ability to export the energy produced from RES.

The set of laws in the field of environmental protection envisages the development of the assessment of the impact of the plans and projects on the environment with the opinion of the Institute for Nature Protection. Devices for the use of wind power to produce energy (wind farm) of the total generating power of over 10MW are on the list II of the projects that may require assessment of the impact on the environment.

The Law on Planning and Construction introduces a number of novelties that relate to RES objects. Windmills can be built on agricultural land in private ownership with solved question of ownership or lease, these objects represent an exception to the general rules for formation of building plots, as a basis for issuing location permits only a spatial plan is sufficient, for the power facilities smaller than 10MW municipalities are responsible regardless of the height of the building etc.

Generally speaking, these regulations encourage the development of individual wind mills and wind parks.

The use of RES is also supported in the Energy Development Strategy of Serbia.

Serbia has signed the Kyoto protocol, supported the decision of the meeting in Copenhagen and joined the South East European Energy Community, which encourages the development of wind engineering.

INCENTIVES MEASURES

Manufacturers of energy from RES can gain privileged status on the basis of manufacturer Decree on measures of incentives for the production of electricity using renewable energy sources and a combination of electricity and thermal energy. The same act defines that the buyer of electricity from RES is Power Industry of Serbia (EPS).

The regulation on feed-in tariff system determines the fixed price of 9.5 c€/kWh electricity produced by using wind. The effectiveness of this incentive depends on the energy potential of wind at the selected location.

Public Enterprise Electro-nets of Serbia (EMS) has made a plan for the development of transmission system by 2014 which considers planning the ways and time for the connection to wind turbines /11/. The plan contains an overview of requests for the connection of wind turbines by the end of summer 2009, which shows the interest of potential producers of electricity.

SPATIAL PLANNING

The largest number of wind turbines is planned in the area of southern Banat. Some municipalities in this area have adopted a spatial plan with a graphical display of the area for wind park building. The Institute for Nature Protection, the operating unit Novi Sad, has launched an initiative for the preparation of higher-order spatial plan which would define the areas for wind park building.

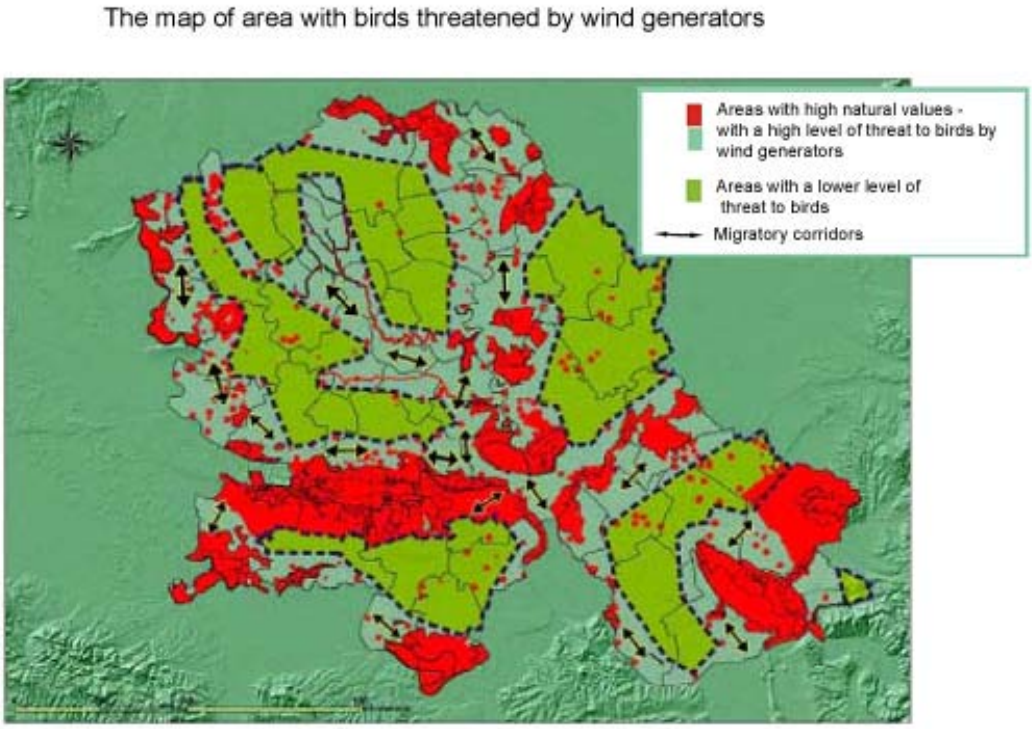


Figure 8. Areas of high vulnerability of birds by wind parks /12/

The document "Establishment of an ecological network in Vojvodina – Overview of the situation, analyses and opportunities "/12/ contains a section" Wind park and protection of biodiversity," which refers to wind park impact on birds. Figure 8 shows a map of the areas

where there is significant vulnerability of birds due to the possible construction of windmills.

Overlapping this map with the map in Figure 5 gives the cumulative map shown in Figure 9

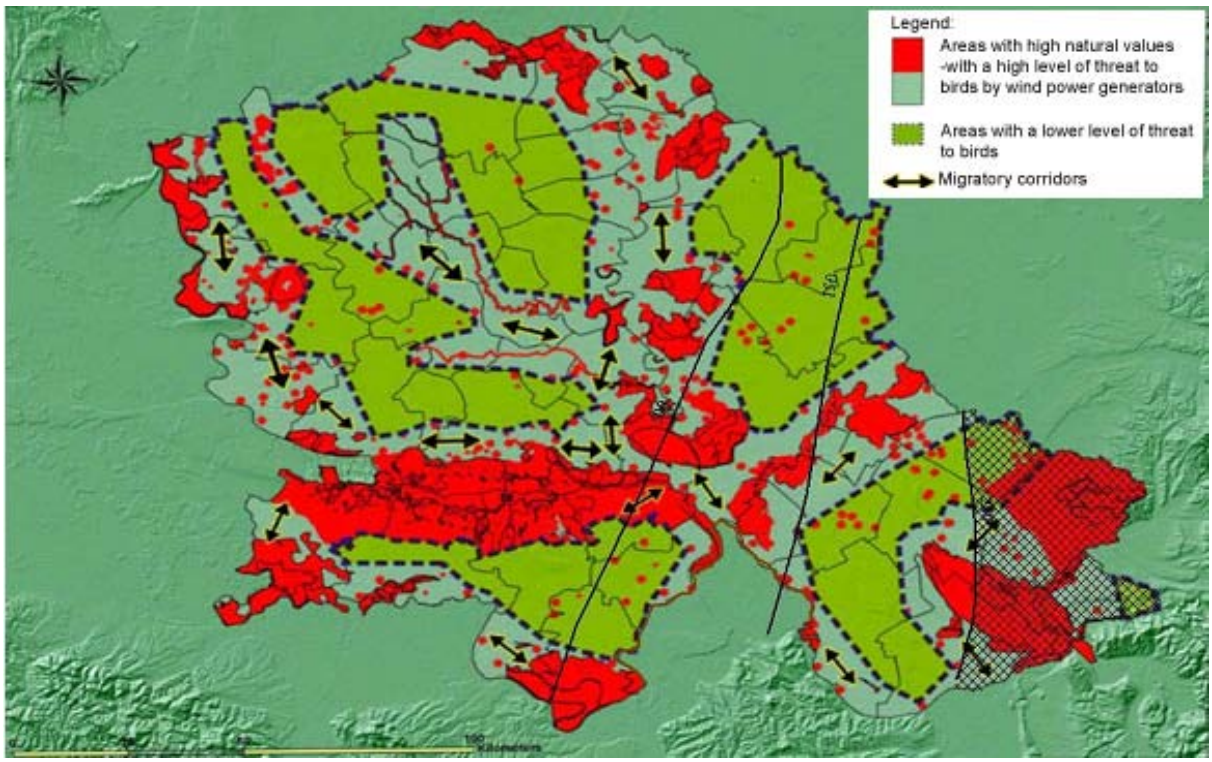


Figure 9. Comparison of the high bird vulnerability map and the map of wind energy potential

This map marks the area with the greatest wind energy potential. This area, almost entirely, is in the area of high vulnerability of birds. If in proceedings following the proposal for the development of a regional spatial plan of South Banat, an interpretation is adopted that the area of "high threat for birds from wind power plants" is a forbidden area for wind parks, the conclusion is as follows: In Vršac municipality that has the highest wind energy potential it is not allowed to use the wind!

This confirms that the *negative policy* of wind park planning or the development of plans from national to local level based on some general rules, creates a barrier to the use of wind energy.

Positive planning policy provides for planning at the local level with taking all necessary measures to protect birds and the environment in general.

ADMINISTRATIVE PROCEDURE FOR ACQUIRING WIND PARK LICENSE

In the process for obtaining building permits for wind park construction there are still some ambiguities in the interpretation and the implementation of the licensing procedure. Ministry of Environment and Spatial Planning has given interpretation and instructions that eliminate the main uncertainties.

The initial step in the process of obtaining the building permit is obtaining the energy permit. Table II shows the review of licenses issued by November 2009.

Provided that the wind park area is provided in the spatial plan of the municipality, the time-consuming procedure of drafting a plan for detailed setting up of wind mills is not required. However, the construction of infrastructure facilities such as linear structures - roads and power lines - requires development of planning documents.

Table II. issued energy permits

PD DOO VPBC Wind for investment and energy, Bela Crkva, Proleterska 2	Facility for the production of electric power Wind generator farm "Vracev gaj" power 187,5 MW	Bela Crkva, KO Bela Crkva, kp 2101/1, location Vračev gaj
PD Wellbury Wind Energy doo Beograd, Beograd, Dečanska 12/VII	Facility for the production of electric power Wind power plants "Bavaništansko polje", power 188 MW	Municipality Kovin, location between settlements Bavanište, Deliblato, Mramorak and Dolovo
PD Windteam doo Beograd, Beograd, Božidara Kneževića 20	Facility for the production of electric power Wind park "Šušara", power 60 MW	Municipality Vrsac, KO Izbište and KO Uljma and Municipality Bela Crkva, KO Grebenac
PD Energowind doo Vršac, Bulevar oslobodjenja 3	Facility for the production of electric power Wind park "Vršac-Alibunar-Plandište", power 400 MW	Municipality Vrsac, Municipality Alibunar, Municipality Plandiste
PD Wind power plants Balkana doo Beograd, Svetoyara Miletića 32	Facility for the production of electric power Wind power plant "Čibuk", power 300 MW	Municipality Kovin, KO Mramorak
MK FINTEL WIND, Mekenzijeva 53, Beograd	Wind power plant "La Piccolina" estimated power 5 MW	

The procedure of issuing building permits for wind mill construction is time-consuming and complex, but basically there are regulations needed to enable its obtaining. The largest uncertainties are related to the regulations on environmental protection and adoption of positive policy in this area.

On the territory of AP Vojvodina, there is a problem of conflict of interest between sustainable energy development through the construction of wind turbines in the area of greatest energy resources and insisting on the ban of construction in this area by developing a regional spatial plan of the South Banat. The ban is explained by the possible influence of windmills on birds.

In resolving the conflicts of the local influence of wind mills on the environment, and their construction with the purpose of sustainable development, local governments and people with a tradition of using the wind should have an important role in the decision-making.

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