

WIND PARKS DESIGN



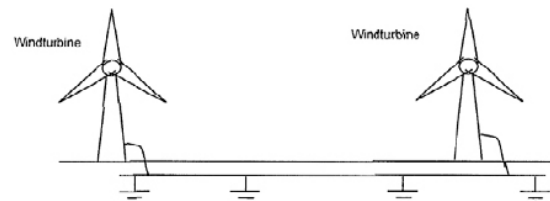
Wind Energy

Wind energy is one of the most popular renewable energy source (RES) used for electricity production.



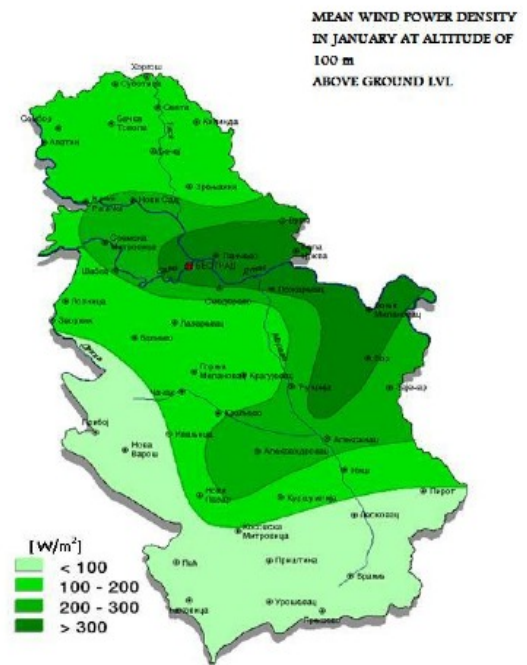
Wind Park

Wind park represents sum of several wind turbine generators (WTGs), organized in power plant which produces electricity and is connected to the power line grid. Design of the wind parks represent rather complex process made of wind resource estimation and environment issues resolved which is base for designing a wind park.

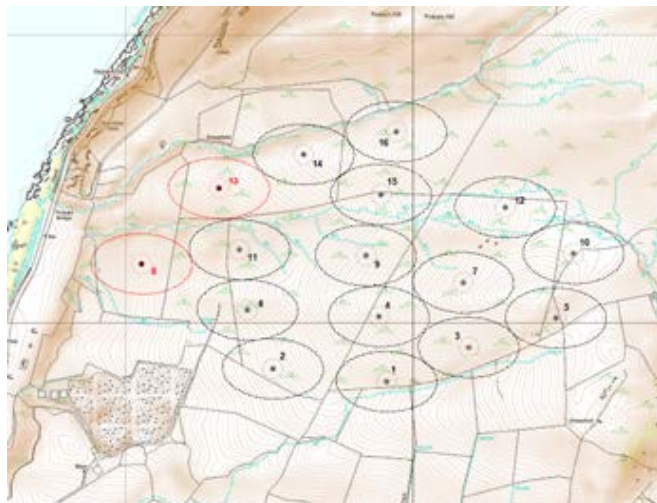
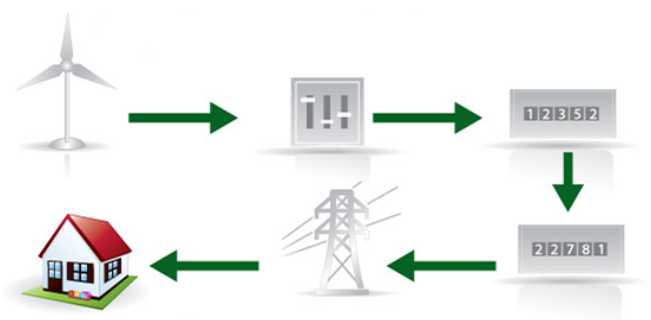


Wind potential in Serbia

Serbia is not the richest country with the wind potential compared to the countries next to the sea shore. However it does not mean that it is not feasible to exploit wind energy for electricity production. Depending on the region of the country average wind speed may vary but eastern and northeastern parts are the richest in wind. However, WTG producers increase technical specification of their products every year and today it is possible to make feasible and profitable wind parks even in the regions with the low wind speed and potential.



Wind park converts kinetic energy from the wind into electricity. Main equipment for this is wind turbine generator (WTG) which transforms energy into electricity and sends it further to the electricity grid. Since WTGs are quite big and complex, additional equipment is also required such as transformer station. Distributed electricity through the grid can be used by end users, houses, industry or other consumers.



Location

Choosing the location for future wind park is rather sensitive process and should include estimation regarding wind potential, grid conditions, environment issues, good relations with the Municipality where wind park will be placed, soil and topographic characteristics, spatial planning and many other issues. Designated area should cover enough space for planned capacities so WTGs can be placed in optimal positions.

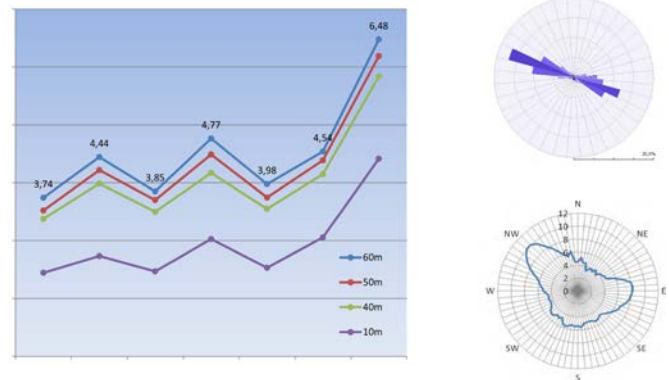
Wind measurement

First step for wind park design and reliable source for financing the investment is wind measurement. It is done with by met masts measuring wind for at least one year (2+ years of measurement is preferable). After first year of measurement it is possible to make initial estimation about wind park productivity and to avoid critical parts of location where wind resource is not suitable or may cause operational problems. Wind speed and direction parameters are combined with temperature and humidity in order to secure reliability of future calculations. Netinvest offers wide range of met masts and measuring equipment.

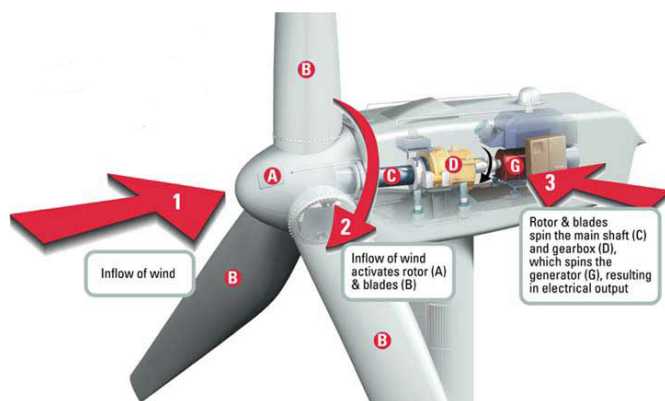
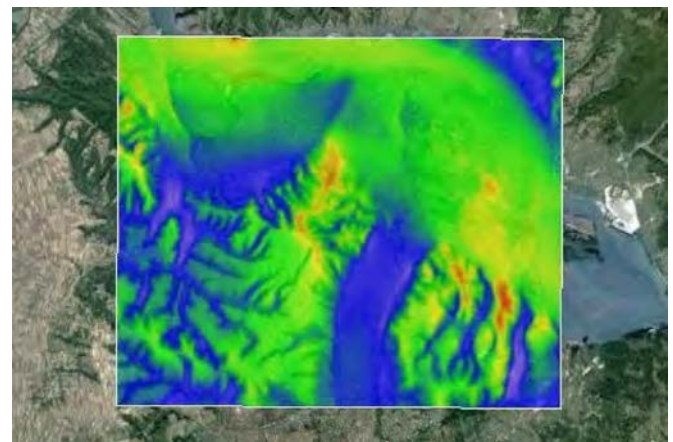


Wind potential estimation

Important step in wind potential estimation is reading raw wind data (RWD) obtained from the met mast in previous periods. Wind rose generated from the measured data and in the correlation with existing data available will give the main wind direction. Average wind speed for different heights is generated as well therefore important input for next steps in wind park design and annual energy production (AEP) estimation.



Extracted and calculated data are represented in graphical form so they can be easily used for preliminary detection of good and less good WTG positions. Wind potential map is positioned over existing maps as separate layer in order to check it with other issues. Places marked with the colors representing highest wind potential will probably be the future WTG positions. In phase of wind park optimization this will be rechecked according to the most optimal solution and compromise between feasibility and productivity.



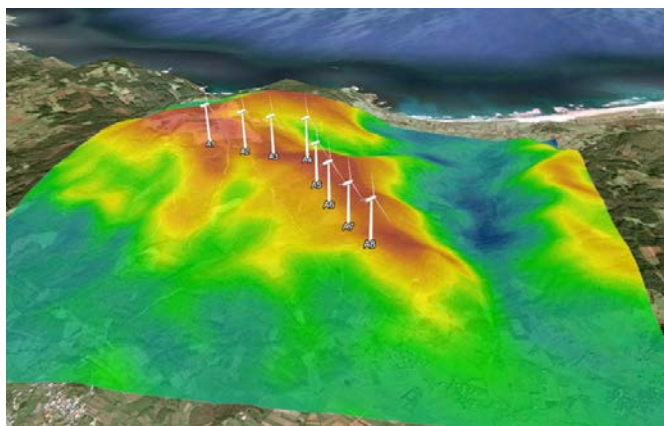
WTG equipment

Wind turbine producers offer different kinds of products – from smaller power performances up to 4.5MW per turbine. This equipment is the core of the wind park and should be carefully chosen because it affects financial, construction and operational aspects of wind park exploitation. Netinvest has established close contacts with several of them and is able to offer full support during negotiation with WTG producer and further cooperation with them.



Environmental issues

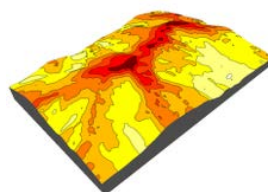
In most cases wind park investments will include environmental aspects, particularly birds and bats monitoring. Appropriate body will determine if such species should be monitored so the future wind park will not make negative effects. Relevant laws in Serbia and region countries usually require this type of monitoring, sometimes with strategic environmental impact assessment (SEIA), or environmental impact assessment (EIA). Monitoring usually takes one year in order to cover all migration and reproduction periods. Since time required for monitoring lasts as much as wind measurement period, it is advisable to start them in the same period and save time. Netinvest has good contacts with environmental bodies and companies performing monitoring and is available to offer such services.



Wind park design and productivity

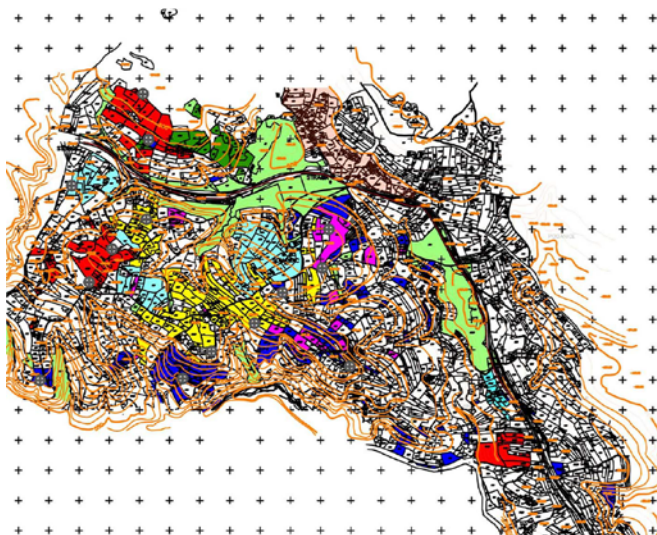
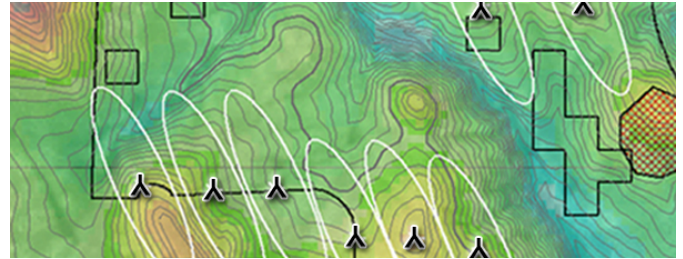
Tools used for AEP estimation are very important step during the design of wind park layout. Depending on their type it is possible to make more or less certain energy production, therefore financial and functional feasibility. Netinvest uses either linear types of software such as WASP or even high end CFD software tools such as WindSim. WindSim pioneered the use of CFD (Computational Fluid Dynamics) technology to optimize wind turbine placement. WindSim's advanced simulations deliver value for every type of terrain — from the simplest to the roughest — maximizing energy production while minimizing the loads on installed equipment. Depending on the site characteristics Netinvest can offer both options but highly recommends complex CFD simulations. If you prefer to perform your own AEP estimation, Netinvest is pleased to offer you WindSim software as authorized reseller for Balkan region.

windsim



Wind park optimization

The most important step in wind park design is optimizing all parameters which can affect it – starting from reliable AEP estimation, continuing with placing WTGs according to the land ownership issues, grid and road connectivity options and conditions, particular conditions defined by spatial plan in law force, bird and bat monitoring issues and negotiations with relevant Nature conservation institute, processing Plan of Detailed Regulation (PDR) if required by Municipality, negotiation with relevant bodies and Ministries, all in order to achieve the best possible design – in financial and time means. Results of such processes may decrease time required for obtaining licenses and permits and may be significant advantage for successful investment. This is supported with the fact that any of the stated activities can seriously jeopardize investment if not performed properly. Netinvest is proud to offer all of those activities including consulting so you can secure your investment.

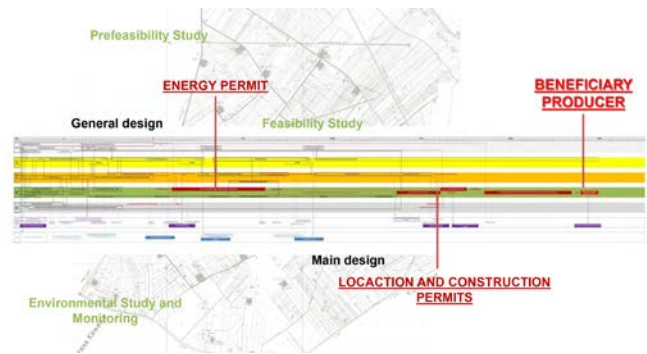


General design and Prefeasibility study

This phase sums all previous steps in form required by relevant construction and energy law on force in Serbia. This means that General design and Prefeasibility study is documentation containing the best solution for your wind park, but is stamped and signed with certified engineers for the for required by Serbian Ministries to issue required permits. In Netinvest we know all details about procedures and necessary steps to be taken and we can offer quality processing of design documentation in the manner that Energy, Location and Construction permit will be issued to the Client.

Construction and maintenance

Netinvest is able to find the most confident construction companies in Serbia and region which will guarantee quality works and according to Serbian standards, including the maintenance of the wind park equipment and including maintenance of WTGs.



Estimated annual eco-benefit per 1MW of installed WTG

Reduced emission	
CO ₂ (t)	860,85
NO ₂ (t)	2,42
SO ₂ (t)	1,82
Saved forest equivalent surface (ha)	16
Estimated number of consumer households	600



LET US KNOW IF YOU PLAN A WIND PARK – WE WILL OFFER YOU FULL SUPPORT!



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