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THE MAIN STAGES OF TOPOGRAPHIC AND GEODETIC SUPPORT FOR THE CONSTRUCTION OF WIND POWER PLANTS

Today, during the full-scale war in Ukraine, one of the most important tasks of the state is to protect the country's critical energy infrastructure. The constant shelling of thermal power plants (TPPs) leads to a shortage of electricity for the population and industrial facilities. This necessitates a quick solution to this problem and the construction of new power plants.

One of the fastest, most cost-effective and, most importantly, environmentally friendly options is the construction of wind and solar power plants (WPPs, SPPs), which are considered to be "green energy" facilities. These power plants use natural renewable resources to generate electricity, which is another key factor in the design of power plants, given the fact that the eastern regions of the country are occupied, where a significant percentage of renewable resource extraction enterprises (coal mines) are located.

The most important issue in the construction of wind and solar power plants is the choice of a land plot for the location of such a facility. Thus, the purpose of the study is to conduct topographic and geodetic support for the selection of land plots to determine the most promising sites for the location of wind power plants.

The object of the study is the land plots located in Korosten district of Zhytomyr region, which are considered for further wind farm design.

The authors of the article [1] previously described in detail the principle and requirements for the optimal selection of a land plot for wind farm design. A key condition for the efficient operation of a WPP is the availability of sufficient wind energy potential of the selected area. At the same time, it is equally important to ensure environmentally balanced spatial planning, in particular, to take into account geospatial constraints such as terrain slope, proximity to environmental protection facilities, water resources, forests and settlements, etc.

The paper [2] analyses modern geoinformation methods and tools for assessing the energy resources of territories, in particular wind energy. The authors constructed maps of wind energy potential, which, as already mentioned, plays a key role in the selection of a land plot.

To date, there are many different studies on topographic and geodetic works when selecting a land plot for the construction of various facilities, methods of performing geodetic works when changing the designated purpose of a land plot, but the issue of topographic and geodetic works when re-registering a land plot for the construction of a WPP remains insufficiently studied.

First and foremost, in order to provide topographic and geodetic support for the selection of land plots for the location of wind and solar power plants, land surveyors, in accordance with the task, find in the StateGeoCadastre database land plots that are in communal or uncertain ownership and have the designated purpose "Reserve land plots (land plots not granted for ownership or use by citizens or legal entities)".

The next step is to verify compliance with the conditions and restrictions when selecting a land plot - environmentally sound spatial planning, technical feasibility of installing wind turbines, studying the relative suitability of the area, etc [1, 3].

After selecting a land plot, a topographic and geodetic survey is carried out using existing topographic maps and Google maps to make a preliminary decision on conducting a detailed

survey. Next, a letter of appeal to the territorial community is drawn up, which grants permission to conduct engineering and geodetic surveys and draw up a detailed plan of the area.

According to the terms of reference, a set of engineering and geodetic surveys must be carried out in accordance with the Guidelines for Surveys of Overhead Power Lines 35-1150 kV [4].

The list of engineering and geodetic surveys includes the following tasks: 1) perform a geodetic survey of the right-of-way along the overhead line (OHL) routes to execute the plan at a scale of 1:1000; 2) indicate the height and characteristics of buildings and structures falling within the 50-metre zone to either side of the overhead line axes; 3) when constructing longitudinal profiles, survey the situation 50 metres to either side of the overhead line axis; 4) when crossing the OHL with railways, roads, ground structures and communications, perform topographic works that will allow determining the dimensions of the crossing structures and their location in relation to the OHL being designed; 5) when the OHL passes along the existing line, , perform a binding with their indication on the route plan and on the outline of the OHL route profile; 6) collect information on communication lines in the OHL impact zone; 7) clarify data on the characteristics of forests and garden plantations (show clearings that fall into the zone); 8) to develop a construction management project, conduct a survey of existing roads in the area of the OHL project; 9) on sloping terrain, to break down cross sections if the ground marks under the extreme wires differ from the OHL axis marks, counting along the cross section, by 0.3 m or more (each cross section should reflect the relief in the direction perpendicular to the route).

In the course of this task, the author of the article carried out engineering and geodetic surveys using a SOKKIA GRX3 L1 GPS/GLONASS SINGLE INTL GNSS receiver and a SOKKIA FX-205 total station.

After processing the results obtained in AutoCAD software, a detailed topographic plan of the area is drawn up.

The final step is the approval of the detailed territory plan by the relevant engineering and communication services and its submission to the State Cartographic Fund of Ukraine. After all the approvals, a geological team is sent to the site to take soil samples and analyse them. Technical documentation for the re-registration of land and detailed designs for the wind farm are prepared.

Thus, designing wind farms is a complex multi-stage process that requires consideration of technical, environmental and socio-economic factors.

References

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