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Problems with designing and building wind power plants in the Subcarpathian region

Abstract: *In Poland, the production of wind power increases every year, and Polish wind-power industry is developed dynamically. Even though the Subcarpathian voivodeship possesses optimal wind conditions and great energetic needs to be fulfilled, growth of this branch of power industry meets significant problems with preparation and implementation of wind investments.*

Keywords: wind-power industry, the Subcarpathian voivodeship, problems

Wind-power industry in Poland

Within the last years, Polish wind-power industry is developed dynamically: the European Wind Energy Association (EWEA) states that by the end of year 2011, Poland had 1616 MW power from wind farms installed. While it is true that it makes merely thirteenth result in Europe, Poland is only slightly behind Greece and Ireland (respectively 1629 MW and 1631 MW), so it was possible to outstrip those countries in the near future. According to the information given by the Energy Regulatory Office (URE) and cited by the Polish Wind Energy Association (PSEW), wind farms throughout the country had over 1968 MW of power installed, by March 31, 2012. In year 2012, that numbers increased by 880 MW.

The newest information published by the Polish Wind Energy Association shows that by March 31, 2013, there had been **2644, 989** MW of power installed in Polish wind-power industry.

Even though, density of wind-power plants in Poland is amongst the lowest in Europe. Installed wind-power per equals **0,012 kW** per inhabitant and **1,44** kW for one square kilometer of land.

According to the newest data brought by the Energy Regulatory Office (June 2013), there are **743** running installations with total power of **2645** MW throughout the country.

However, in the Subcarpathian voivodeship (in year **2012**), power installed in wind plants amounted to **61,99 MW** within **24** installations.

Table 1

Electricity producted by wind-power plants in Poland,
years 2006-2013:
On the basis of Certificates of Origin delivered
by the president of URE, by April 23, 2013.

RES source type	Years			
	2006	2007	2008	2009
Wind-power plants	257 037.412	472 116.429	806 318.563	1 045 166.230
RES source type	Years			
	2010	2011	2012	2013
Wind-power plants	1 823 297.061	3 126 526.394	4 524 473.670	446 872.905

Table 2

Power [MW] of wind-power plants intalled in Poland,
by March 31, 2013.

RES source type	Quantity [MW]							
	2006	2007	2008	2009	2010	2011	2012	2013
Wind-power plants	152,560	287,909	451,090	724,657	1180,272	1616,361	2496,748	2644,898

Wind-power industry as a part of national strategy of RES development and low-emitting economy.

According to the Ministry of Economy, developing wind-power industry is an essential element of long-term energy strategy of Poland. In accordance with assumptions established in August 2011 by National Low-Emitting Economy Development Programme (NPRGN), which is meant to "facilitate adaptation of all sectors to requirements of low-emitting economy", "special attention" is to be dedicated for balanced development of renewable energy sources (inter alia, wind-power energy). The goal then, is "complete exploitation of potential [of Poland]" in domain of renewable energy sources. More detailed - and most current - information on long-term energy strategy of Poland and expected role of wind-power industry in its development can be found in so-called Green Book and White Book of National Programme of Greenhouse Gases Emission Reduction, the documents elaborated and published by the Public Council of National Emission Reduction Programme, respectively in September 2010 and December 2011.

As found in the White Book, in accordance with European doctrines, in 2020, Poland is to achieve 15 percent rate of renewable energy sources (RES) in final energy consumption. according to prognosis and calculations prepared by the authors, share of the r.e.s. in final energy consumption in 2011had exceeded the minimum goal stated in the suitable European Union guidelines, with total 9,6% in

consideration of demanded 8,76%. This overplus is to be noted in following years. In 2020, contribution of RES in the final energy consuption is to amount to 15,48%, that is nearly 0,5% over appointed goal.

That increase will be followed by expenses, though. According to analyses included in the Green Book, fulfilment of obligations to European Union "is followed by putting up about 10-12 GW of new power in renewable electric power engineering and about 30 GW in renewable heat power engineering in coming 10 years". In newer document, the White Book, cost of required RES investments up to the year 2020 is estimated for 12 mld Euro (nearly 28% of total electric power engineering investment costs), and during next decade (till 2030) - 16 mld Euro (slightly over 28% of total investment costs).

2. Wind-power Industry in the Subcarpathian region.

According to studies of the Meteorology Center IMiGW, the Subcarpathian region is marked for advantageous (Pic. 1) wind determinant and is located in favorable Zone III. Those measurements, though, were taken on low (up to 10 metres) altitude (1971-2000). Measurements taken by EW Galicja LLC in years 2002 to 2008 and appraisements taken in Warsaw by EC BREC The Institute for Renewable Energy (IEO) LLC made a basis for creating "EW GALICJA Programme for years 2009 - 2016 for constructing wind-power plants in the Subcarpathian region". Those confirm average wind speed of 6.5 - 7.5 m/s in a year scale. Pilotage Wind Park Hnatkowice-Orzechowce , nowadays known as Farma GALICJA, of installed power 12 MW relied on six Gamesa G87-2 MW power plants of Spanish production, was handed over for exploitation on April 9, 2009. Project assumptions and wind parameters were completely fulfiled. The park designed by EW GALICJA was executed by Elektrownie Wiatrowe Podkarpacia LLC with contribution of Spanish capital.

Programme of constructing wind-power plants in the Subcarpathian region, prepared by EW GALICJA LLC for years 2009-2016, assumed design and construction of 12 wind farms of total power of 314 MW. This programme was handed over to the Subcarpathian Voivode and the Subcarpathian Voivodeship Marshal.

2.1. Assumed effect of the EW GALICJA Programme for years 2009-2016.

Construction of 12 wind farms, according to EW GALICJA LLC Programme, should lead to following energy and ecological effects:

Planned disbursal and assumed effects:

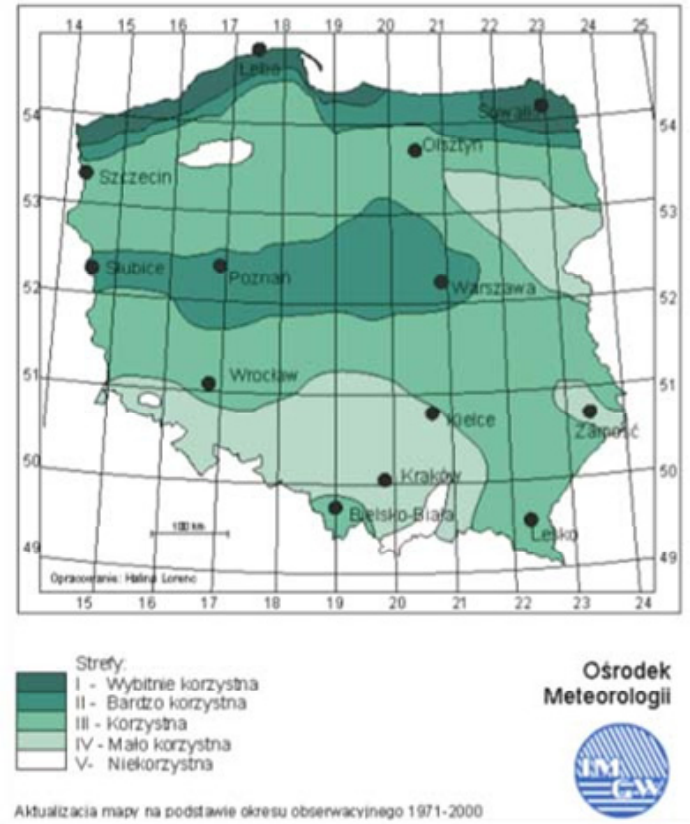
Investment value - 2 308 mln PLN

Total power installed - 314 MW

Annual electric power production - 758 025 MWh

Annual ecological effect - mitigation of emission to the Atmosphere

CO -152 Mg; CO2 -710 269 Mg ; NOx - 2426 Mg; SO2 –5913 Mg; pyły - 834 Mg ; Razem : 719 594 Mg/year



Pic. 1: Wind energy zones in Poland by IMGW

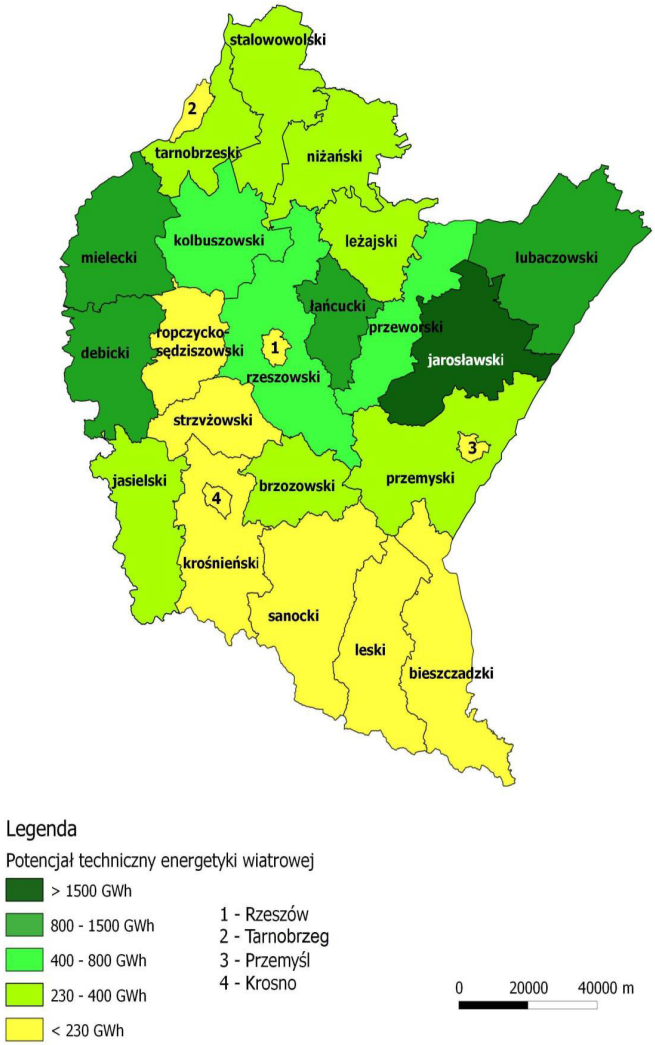
2.2. Technical capability of wind in the Subcarpathian region.

Measurements of technical capability of energy production recently published in the Regional Programme for the Development of Renewable Energy Sources for Subcarpathian voivodeship confirm the presence of advantageous wind determinants in the Subcarpathian region.

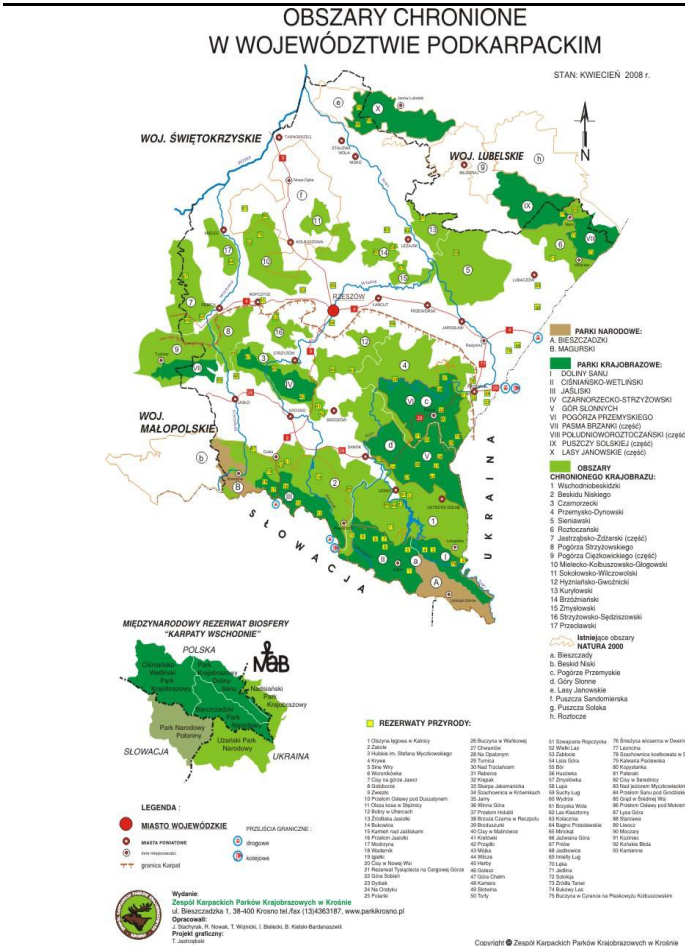
In 2012, power installed in wind farms in the Subcarpathian region equalled 61.99 MW of installed power in 24 locations.

The greatest technical capability of wind-power engineering development is situated within Yaroslav county (over 1500 GWh). Another great capabilities are situated in central and northern part of the Subcarpathian voivodeship.

2.3. Environmental determinants:



Pic. 2 . Technical capability of wind in the Subcarpathian region



Pic. 3. Protected areas in Podkarpackie Voivodeship

- 2 national parks
- 10 landscape parks
- 96 nature sanctuaries
- 17 areas of protected landscapes
- 17 areas of special protection (SOO) Natura 2000
- 8 areas of special protection (OSO) Natura 2000

Protected areas (without areas of Natura 2000) contain 794 193,60 ha (44,5% of voivodeship's territory)

Map source: Zespół Karpackich Parków Krajobrazowych

3.0 SWOT analysis for wind energy production in the Subcarpathian region

Strengths - Relatively advantageous wind conditions - Relatively developed power grid - Communes interested in placing wind farms on their terrains - Diagnosis of ongoing condition, allowing to plan new investments more accurately - Companies specialized in wind farm development as supply base - Academic basis for studying wind energy production	Weaknesses - Huge protected areas make it difficult to place wind-power plants - Scattered buildings make it difficult to perpetuate norms - Complex terrain topography - Lack of MPZP in many communes - Obsolete or poorly developed power grid in some areas - Lack of knowledge about wind energy production in society and social aversion; - Insufficient aid means on regional level
Opportunities - Necessity of executing climatic-energy obligations - Availability of aid means on country level - Retaining of profitable green certificate system - Development of new technologies and drops in prices - New possibilities of balancing power decreases in wind energy production - National Plan of Operations for RES and interrelated aid means - Smart grids development	Threats - New regulations imposing high charges for power reservation - Instable legal regulations - Lack of assessment in cases of unstable power from wind energy production - Lack of power grid development possibilities followed by impossibility to wire up the farms - Climatic changes that may result in different wind characteristics

4.0 Problems in development and construction of wind-power plants in the Subcarpathian region

Administrative barriers :

1. Long-term procedures of establishing/changing records of determinants and directions of space management studies and local plans of space management.

2. Impossibility of shortening investment process due to RES designating the

investment not as "public aim investment".

3. Prolonging procedures of obtaining construction permit for measuring masts (6-12 months)

4. Lack of "standards" in spatial planning: internal regulations involving distance between wind-power plants and power lines, no

guidelines involving distance between turbines and roads, no guidelines involving distance between two parks.

5. Frequent law alterations causing instability of investment conditions.

6. Difficult and long-lasting expropriation procedure or easement establishing procedure, also in case of ground power grid.

7. Immense proprietary fragmentation - within the radius of 200m from power plant, even to 80 allotments' owners.

4.2. Technical barriers:

1. Obsolete or, in some areas, poorly developed power grid - "weak grid"

2. Obstructed additive procedures - problems with handing over technical incorporation conditions.

3. Lack of clear and approved plans for developing power grid, that could be used for OZE connections - limitations for short distance future.

4. Lack of assessment in cases of unstable power from wind energy production.

4.3. Environmental barriers :

1.As per Regional Programme for the Development of Renewable Energy

Sources for Subcarpathian voivodeship, it is evaluated that only 14% of the voivodeship's area is suitable for placing wind-power plants, due to roughness of terrain, ecological and environmental limitation

2. No guidelines on performing environmental impact assessment, including making environmental reports, in particular:

- Accumulated inpact assessment
- Propositions of minimalizing and compensatory operations
- Rules of localizing project in vicinity of NATURA 2000 areas.

3. No good practices in the range of monitoring before investments and after implementation.

4. No guidelines in the range of assessing wind-power plants' impact on landscape.

5. No experts on making reports and monitoring in the field.

6. Problems with social acceptation - "adhension for projects realized in m field".

7. Lack of social knowledge associated with many myths about wind energy production.

4.4. Political barriers - no political will of wind energy production development.

1.Searching for problems, not solutions

2.Pointing out "negative impact of wind energy production on environment"

3.Business of carbon, gas and atom lobby

4.Hollow declarations - prosaic goal, theoretical support for countermesuring climatic changes politics and goal "3x20" for year 2020.

5.Exploiting social unawareness for political fight, against "3x20" programme.

6.Fear of establishing ambitious goals in the range of RES - frightening recipients with higher costs of RES's energy.

5.0 Conclusions.

Wind energy production and other RES types, like every new branch, requires responsible and advised development that gives possibly maximal benefits for society.

This is why constant social education about RES is essential for reducing barriers connected with development of wind energy production in the Subcarpathian region and avoiding problems with designing and constructing wind-power plants.

To ensure balanced development of wind energy production, constructing new RES power plants of more than local significance is crucial, as is consideration of paramount tenets of Subcarpathian Voivodeship Development Strategy, expansion and development of electrical grid, including creation of smart grid enabling progress of distributed generation, also including microgeneration (small wind-power plants).

This requires cooperation between research-developmental sector and companies, in favor of implementing new, innovative technologies.

To make investing in the Subcarpathian voivodeship possible, it is essential to create financial aid means on the regional level. Informed, successive adjusting local laws via enacting those zoning plans which consider RES installations, including wind-power plants, is essential. It is crucial to prepare and enact Regional Programme for the Development of Renewable Energy Sources for Subcarpathian voivodeship as soon as possible. It will allow to make use of energy potential of our voivodeship, as well as funds given by the Government.

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Кружель Єжи, Кружель Йоанна

Проблеми проектування і будівництва вітрових електростанцій в Підкарпатському регіоні

У Польщі виробництво вітрової енергії з кожним роком зростає, і польська вітроенергетична промисловість розвивається динамічно. Хоча Підкарпатське воєводство володіє оптимальними умовами використання вітру і має великі енергетичні потреби, які потрібно задовольняти, зростання цієї галузі електроенергетики має значні проблеми у зв'язку з необхідністю здійснення інвестицій.

Ключові слова: *вітроенергетика, Підкарпатське воєводство, проблеми.*

Кружель Ежи , Кружель Иоанна

Проблемы проектирования и строительства ветровых электростанций в Подкарпатском регионе

В Польше производство ветровой энергии с каждым годом растет, и польский ветроэнергетическая промышленность развивается динамично. Хотя Подкарпатское воеводство обладает оптимальными условиями использования ветра и имеет большие энергетические потребности, которые нужно удовлетворять, рост этой отрасли электроэнергетики значительные проблемы в связи с необходимостью осуществления инвестиций.

Ключевые слова: *ветроэнергетика, Подкарпатское воеводство, проблемы.*