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## WIND POWER IN POLAND AND UKRAINE – CONDITION TODAY AND PROSPECTS FOR TOMORROW

### Summary

*The purpose of this study is to compare the condition and development prospects of the wind power sector in Poland and Ukraine. Our research is based on reports and studies prepared by industry organizations associating wind generating companies and wind farm equipment manufacturers. For Poland, the Energy Regulatory Office (Urząd Regulacji Energetyki - URE) and Central Statistical Office (Główny Urząd Statystyczny – GUS) were the principal sources of data. Wind farming industry has developed considerably both in Poland and Ukraine, however the installed capacity growth was significantly higher in Poland. The combined installed capacity of wind farms in Poland in 2017 exceeded more than ten times the combined installed capacity of similar facilities in Ukraine. In 2017 the capacity growth in Poland visibly decelerated. In Ukraine 2017 was another year of growth in wind farming. According to public sources, new wind farms with the capacity in excess of 300 MW are to be commissioned in Ukraine in the nearest future. In Poland, large wind farms are about to be commissioned on the Baltic Sea.*

**Key words:** wind power, RES, Poland, Ukraine

## STAN I PERSPEKTYWY ROZWOJU ENERGETYKI WIATROWEJ W POLSCE I NA UKRAINIE

### Streszczenie

*Celem badań była analiza stanu i perspektyw rozwoju energetyki wiatrowej w Polsce i na Ukrainie. Materiał badawczy stanowiły raporty i opracowania organizacji branżowych zrzeszających wytwórców energii elektrycznej z farm wiatrowych i producentów urządzeń do pozyskiwania energii z wiatru. Zarówno w Polsce, jak i na Ukrainie miał miejsce znaczny rozwój sektora energetyki wiatrowej. Jednakże znacznie wyższy przyrost mocy zainstalowanej w elektrowniach wiatrowych odnotowano w Polsce. Ilość mocy zainstalowanej w instalacjach wiatrowych znajdujących się na terytorium Polski w 2017 roku ponad 10-krotnie przewyższała łączną moc wiatrowych siłowni na Ukrainie. W 2017 r. w sektorze energetyki wiatrowej w Polsce odnotowano znaczne zahamowanie przyrostu nowych mocy. Natomiast na Ukrainie tendencja rozwoju energetyki wiatrowej w 2017 r. miała charakter wzrostowy. Z przeprowadzonych analiz i informacji w najbliższej przyszłości na Ukrainie planowane jest uruchomienie dużych farm wiatrowych o mocy przewyższającej 300 MW. W Polsce natomiast planowane jest uruchomienie dużych instalacji wiatrowych na Bałtyku.*

**Słowa kluczowe:** energetyka wiatrowa, OZE, Polska, Ukraina

### 1. Introduction

Wind power is one of the most rapidly developing renewable energy sectors both in Europe and worldwide. The sector developed dynamically in Poland too. More and more wind farms are put online also in Ukraine as the country has adopted a RES development strategy which assumes achieving an 11% share of energy from renewable sources in the total national power balance by 2020 [1].

Using wind power is one of the most attractive methods of increasing the share of Renewable Energy Sources (RES) in the power balance both in Poland and Ukraine [2, 3]. Although Poland is not endowed with any particular opportunities to use wind power, the country saw a dynamic growth of installed capacity in wind power from 2009 which did not slow down until 2016 [4, 5]. On the other

hand, Ukraine has a remarkable potential for using wind power. According to 2015 estimates of the State Agency for Energy Efficiency, the wind power potential in Ukraine is 15 Mtoe annually, that is approximately 30% of the total RES potential for the country (68 Mtoe) [6]. Despite the political and economic crisis, the total installed capacity of renewable energy facilities in Ukraine has been growing significantly which should be attributed to a large extent to wind farming [7].

According to relevant studies, available sources materials and expert opinions available in public sources, the wind power sectors both in Poland and Ukraine are troubled by unstable RES policies [8, 9].

This condition has inspired further studies of the development prospects for wind power in both countries.

Our goal is to conduct a comparative assessment of the condition and development prospects of wind power in Poland and Ukraine.

## 2. Sources and methods

Our study is based on the available reports, annual statistics and statistical papers on both Poland and Ukraine, as well as other publications concerning the development of renewable energy industry in both countries. For Ukraine, the principal source of data for wind power derived from reports of the Ukrainian Wind Energy Association (UWEA), a professional organization for designers and manufacturers of wind farm equipment and wind power specialists. Another source of information came from the reports and communications of the State Agency on Energy Efficiency and Energy Saving of Ukraine (SAEE). As to the Polish wind power sector, the main sources data were available in the Energy Regulatory Office (URE), the Polish Wind Power Association (*Polskie Stowarzyszenie Energetyki Wiatrowej PSEW*) and publications of Central Statistical Office (*Główny Urząd Statystyczny - GUS*).

Our review of the wind power sectors development in Poland and Ukraine covers the period 2009-2018. Due to the absence of relevant statistical data, with respect to the generation of electricity in wind farms the period under review is 2013-2017.

We use comparative and descriptive methods and the results of research are presented in the form of diagrams.

## 3. Results of the research

RES installed capacity has grown significantly both in Poland and Ukraine. In the period 2005-2017 the combined installed capacity of renewable energy facilities in Poland grew from 1,157 to 8,538 MW [10]. The installed capacity of RES in Ukraine towards the end of 2017 was 1,375 MW [11]. In Poland, a similar level was reached in 2006. Until 2016 Poland saw significant year-to-year growth of RES installed capacity, In the years 2012, 2013 and 2016 these annual increments exceeded 1 GW [10]. This growth was driven both by the increasing number of wind farms and their installed capacities. As the development of the wind power industry got inhibited, the growth in RES installed capacity in 2017 in Poland dropped to 122.8 MW, whereas in Ukraine it reached 257 MW [10, 11]. In the first quarter of 2018 Poland and Ukraine recorded a similar growth of RES installed capacity, In the first three months of 2018 the RES facilities launched in Poland had the combined installed capacity of 169.4 MW and in Ukraine 159.4 MW. The combined RES installed capacity as at the end of the first quarter of 2018 in Poland was 8.70 GW and in Ukraine 1.53 GW [10, 11].

So far, the wind power has been the most dynamically developing segment of renewable energy. The share of this segment in the total RES installed capacity in Poland in 2017 was 68.4% [10]. In 2017 the total wind farms installed capacity growth in Poland was a modest 41 MW. This dip is a corollary of a crisis in the Polish wind power sector. According to data of the Polish Economic Chamber of Renewable and Distributed Energy, almost 70% of wind farms in Poland showed financial losses in 2017 and the beginning of 2018 saw the first bankruptcy of a wind farm in Poland in many years [12].

Solar power is the RES segment that develops most rapidly in Ukraine. In the years 2012-2017 this segment showed an increase in installed capacity from 411 to 742 MW. By the end of June 2018 the total installed capacity of solar power facilities in Ukraine reached 948 MW [11].

In terms of growth dynamics, wind power in Ukraine ranks second [11]. A significant growth of wind power in this country commenced after 2009 when the Ukrainian authorities implemented green certificates for renewable energy. The highest increase in installed capacity in the Ukrainian wind power sector (276 MW) occurred in 2012. Between 2012 and 2014 the combined installed capacity of wind farms in Ukraine increased more than two-fold. In the years 2014-2016 the development of wind farming in Ukraine slowed down as a result of an economic crisis triggered by political transformations in the country. With Crimea seized, the Ukrainian wind power sector lost 87.8 MW of capacity already installed in the peninsula [13].

In 2016 the total installed capacity of wind power facilities in Ukraine was 437 MW, more than the combined installed capacity of Ukrainian nuclear power plants [13]. In 2017 the wind power sector in Ukraine grew by another 68 MW of new capacity [12]. Four new wind farms commissioned in Ukraine in the first quarter of 2018 added 47 MW of new capacity to the sector, and the combined capacity reached 512 MW [12]. The accretion in Poland during the same time was only 18 MW of installed capacity [11].

Towards the end of the first quarter of 2018 the total installed capacity of wind farms in Poland was 5.85 GW, more than ten times exceeding the combined installed capacity of wind farms in Ukraine [11, 12].

Fig. 1 below illustrates the changes of installed capacity in Poland and Ukraine in the years 2009-2017.



Fig. 1. Wind power facilities' installed capacity in Poland and Ukraine in the years 2009-2017 [11, 12, 14]

*Rys. 1. Moc zainstalowana w energetyce wiatrowej w Polsce i na Ukrainie w latach 2009-2017 [11, 12, 14]*

The wind farming sector expansion in Poland translated to a significant increase of its electricity output. Since the first wind farms were installed, the Polish wind power sector has been supplying continuously growing volumes of electricity which today exceed more than 10 times the electricity output from wind farms in Ukraine. In 2017 wind turbines in Poland supplied 14.8 TWh of electricity or 8% of the total domestic supply [14]. This is an all-time record for wind farming in Poland. The record levels of electricity output from wind turbines have been propelled both by favorable weather conditions and by the completion of investment projects at the end of 2015 and beginning of 2016 [15].

Ukraine also recorded a significant growth of electricity production from wind turbines. In 2014 with the growth of installed wind power facilities' capacity the electricity output from wind farms increased by 84% year-to-year, up to 1,172 GWh. In the years 2014 and 2015 the electricity output took a dive as the wind farms with a total capacity of 226 MW installed in the Crimean peninsula and in the Donieck and Lugansk oblasts were lost [12]. In 2017 the electricity output of wind farms returned to the 2015 level (974 GWh). In the first quarter of 2018 the wind turbines in Ukraine generated 333 GWh of electricity or 34% of the total 2017 output [12].

Fig. 2 below shows the electricity output from wind farms in Poland and Ukraine based on certificates of origin issued in the years 2013-2017.

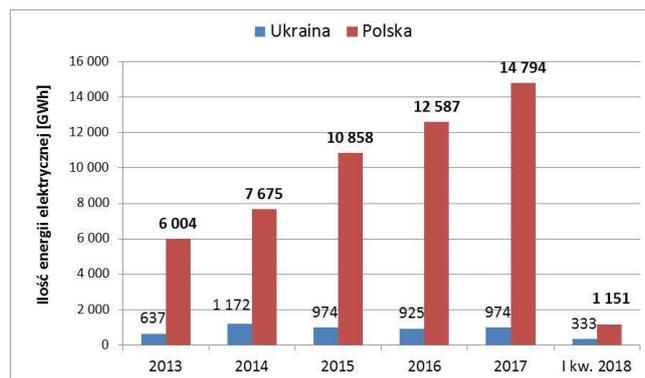


Fig. 2. Electricity output from wind farms in Poland and Ukraine in the years 2013-2018 [11, 12, 14]

*Rys. 2. Produkcja energii elektrycznej wytworzonej z instalacji wykorzystujących energię wiatru w Polsce i na Ukrainie w latach 2013-2018 [11, 12, 14]*

Since 2015 the new RES installed capacity in Ukraine has been growing rapidly. With attractive feed-in tariffs for solar power and wind power generators, the Ukrainian RES market thrives. For solar power, the guaranteed feed-in tariff is 0.1550 EUR/kWh – highest in Europe. For wind farms the feed-in tariff in Ukraine is 0.1096 EUR/kWh. Additional incentives are offered to those investment projects which use Ukraine-made equipment to generate energy [16]. Additionally, the development of the RES sector in Ukraine is significantly boosted by investments from large corporations, including those owned by the Ukrainian oligarchy (e.g. DTEK owned by Rinat Akhmetov). Additionally, in 2018 Ukraine joined the International Renewable Energy Agency (IRENA) which may facilitate its access to leverage financing necessary to maintain the pace of the domestic RES sector development. New rules governing the support for investments in renewable energy sources will come into force in Ukraine in 2019. These rules provide for an auction system designed to attract major investors, including foreign corporations [16]. The development of the wind power sector in Ukraine is also propelled by the feed-in tariffs system which ensures that the electricity generated by wind farms is purchased by the State at very attractive prices. This solution has already attracted attention from foreign investors to the Ukrainian wind power market [16]. According to publications available on the Internet, new wind farms are to be developed in Ukraine in the nearest future with the capacity exceeding 300 MW [17, 18].

In Poland, meanwhile, after a new RES statute was passed in 2016, new investments in wind farms withered and the previous upward trend got inhibited. A research by an environmental consulting firm Ambiens shows that the so-called “perimeter act” froze 99.2 percent of investments in Poland with a total value exceeding PLN 500 million [19]. The sector also ran into the problems shared by all RES segments in Poland. One of these problems relates to a crisis of the green certificates system launched in 2005, being the principal support mechanism for the development of the renewable energy sector in Poland [20]. According to an expert review conducted by a Dutch firm Ecosyf Germany GmbH (on assignment from the Polish Wind Power Association) the RES crisis, and in particular the crisis in the wind power sector, may prevent Poland from reaching the assumed 15% share of renewable energy in the total gross energy consumption by 2020 [21].

One promising path for generating energy using wind power in Poland is to use offshore wind farms. According to a research conducted by McKinsey & Company among the investors interested in RES, offshore wind farms in Poland may reach up to 6 GW of capacity by 2030. The first Polish offshore wind farms on the Baltic Sea are planned to be commissioned in 2025 [22].

#### 4. Conclusions

The wind power sector grew significantly in the last decade both in Poland and Ukraine. In the years 2009-2017 the annual increase in installed wind turbines capacity in Poland was higher than in Ukraine. In consequence, in 2017 the combined installed capacity of wind farms in Poland was more than ten times higher than in Ukraine. In 2017 the development of the wind power sector in Poland came to a halt, both as a result of amendments to the RES legislation and to the value impairment of green certificates. Opportunities for the Polish wind power sector can be found in the auction system of support for RES facilities and in the development of off-shore wind farms. After the loss of 226 MW of capacity installed in the Crimean Peninsula and in the Donbas region, the Ukrainian sector achieved a significant increase in the wind farm installed capacity in 2017 and in the first six months of 2018. This growth was fueled by a green certificates system that was favorable for the RES sector and the interest from foreign investors in the wind farming segment in Ukraine. According to publications in the industry press and the Internet, the forthcoming wind farming investment projects in Ukraine should add another 300 MW to the country's combined installed capacity.

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