[*INTERMITTENT CAPACITY RESOURCES IN THE POLISH CAPACITY MARKET: THE CASE OF WIND POWER*]

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Overview

The wind power is one of the renewable energy resources which is characterized by the rapid growth globally (IRENA, 2018). This trend has been also observed in Poland. Installed capacity of wind power amounted to 5,874.8 MW in 2018 what represents a 13.5% share of the total installed capacity and a 68.43% share of all renewable energy sources in Poland (Energy Regulatory Office, 2018; PSE SA, 2018). The increasing share of wind power in the Polish power system and the climate regulations of the European Union influences the domestic electricity market. The power generating companies do not receive sufficient revenues from sales of electricity and ancillary services. Therefore, they do not obtain adequate incentives to invest in new generating units. If the abovementioned trend continues, the missing capacity problem occurs. As a remedy to this issue, the Polish government implemented a technology-neutral capacity market. One of the technologies that is allowed to participate in capacity auctions is wind power. All the power generating units offer the capacity obligation which is equal the MW installed value of capacity resource in the capacity market multiplied by the availability correction coefficient. Accordingly the PJM standard this parameter is called the Unforced Capacity (UCAP) (PJM - System Planning Department, 2014).

In Poland, the availability correction coefficients for each technology are defined by the secondary regulation (Ministry of Energy, 2018). For the onshore wind turbines, the availability correction coefficient was set at the level of 10.94%. However, our previous studies suggest that the value of the availability correction coefficient for onshore wind is underestimated (Augustyn and Kamiński, 2018). Moreover, technology learning effects result in an increase in energy efficiency of wind turbines, hence improves capacity factors. In this context, the aim of this paper is to analyse wind power generation in 2015–2018 in order to estimate the value of availability correction coefficient. Since the capacity market is a mechanism that has been implemented in Poland recently, this comprehensive analysis will improve the technological neutrality of this policy instrument.

Methods

The study is carried out with the employment of statistical methods based on parameters of the probabilistic distribution. The following parameters of a probability distribution of wind power generation are calculated: maximum and minimum value, mean value, standard deviation, mode, median, the coefficient of variation, variance, skewness and kurtosis. Subsequently, the load carrying capability of wind generation is analysed for 2015–2018. In order to tackle this research problem we also analyse the contribution of wind power generation to energy security with the application of the statistical approach. It enables to set the parameters of a probability distribution of load carrying capability. Consequently, the analysis of various levels of the availability correction coefficient is conducted. It assumes the following levels: 0-10%, 10-20%, 20-30%, …, 90-100% independently for each year over the 2015–2018 horizon.

Results

The preliminary results of the study are presented in the following Figure.

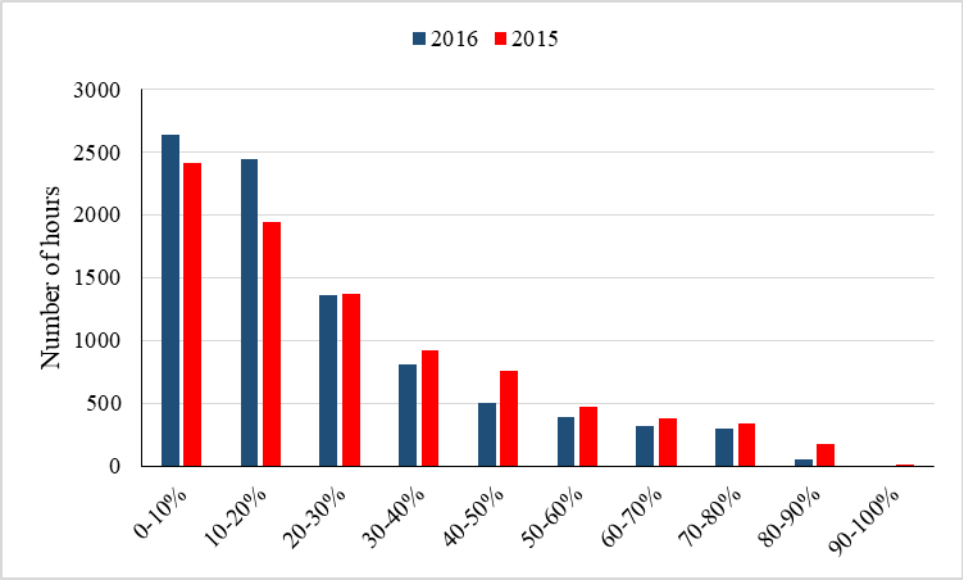

Fig. 1. The rate of the utilisation of the wind power generarion in Poland, in 2015–2016
Source: (Augustyn and Kamiński, 2018)

As observed the lowest utilisation rate of wind power capacity (at the level of 0–10%) occurred over the highest number of hours annually (2,633 hours in 2016 and 2,408 in 2015). The 10-20% level occurred by 2,439 in 2016 and 1,939 in 2015.

Complete results of the analysis will be provided in the full version of our paper.

Conclusions

The preliminary results of the study show that the availability correction coefficient for the onshore wind technologies provided in the secondary regulation of the Polish capacity market was underestimated. The value of availability correction coefficient shall be set at a higher level because the contribution of wind power generation to energy security is more significant than previously estimated.

References

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