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THE IMPACT OF GREEN CERTIFICATES ON PROFITABILITY OF POLISH WIND FARMS

In order to enable constant development of wind farms, as well as an increasing share of renewable energy sources in total energy production, certain auxiliary steps have to be taken. Investing in wind farms absorbs great outlays. Therefore, the President of Energy Regulatory Office issues so called "green certificates." These certificates can be disposed on the Polish Power Exchange, which may become the additional income for energy companies. Nonetheless, the arising and developing field of energy from renewable sources paradoxically leads to a decrease in price of green certificates. The article analyses the way how a decrease in price of green certificates influences the company's performance, as well as tackles the issue of implementing the new project concerning renewable sources of energy and the matter of support in the shape of certificates. It is perceptible that, when the income from green certificates is decreasing, the cost of depreciation of this object as well as the interests and loans to be paid are too high to acquit of the liabilities. However, it is significant to draw attention to the fact that wind farms are still profitable. The indicated decline in the volume of support for wind farms causes that many foreign investors started to withdraw from engaging in Polish wind farms. However, in the occurred circumstances the project of a new bill concerning the system of support in shape of green certificates is becoming crucial.

Keywords: management of green certificates system; compensatory payment; renewable sources of energy; management of energy sector in Poland

1. INTRODUCTION

In the context of the increasing demand for energy and heat, it is indispensable to draw attention to the issue of energy safety and the new sources of energy production. Recently, more and more countries are being inclined to invest in the renewable energy sources as a solution to meet requirements of the environment protection, support technological development, innovatory operations and provide development and safety. In Poland a phenomenon could be perceptible that over the last few years there have appeared new wind farms that have been created with the participation of Western European capital. However, it is undisputable that building wind farms implicates engaging high investment outlays. Therefore, in order to enable constant development of wind farms, as well as an increasing share of renewable energy sources in total energy production, certain auxiliary steps have to be taken. One of such activities is to emit certificates of origin by the President of Energy Regulation Office which corroborates that energy has been produced from renewable sources. These certificates can be disposed on the Polish Power Exchange, which may

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become the additional income for energy companies. When the financial matters are analyzed, so called green certificates have frequently pivotal impact on the companies' performance. The purpose for this paper is to examine and analyze the influence of green certificates on the companies' results and their profitability in the light of Polish energy market and the new project that is under discussion.

2. DEVELOPMENT OF WIND FARMS IN POLAND

Wind energy is considered to have a good potential for energy production in regards to quite fine wind conditions in large part of the country and on the coast.[2] Nevertheless, in 2010 it has been used only in 1%, but the usage of wind energy is still increasing. It is anticipated that by 2020 there should be a meaningful growth of energy production amounting to 15% of the total energy production as European Wind Energy Association states.[3] There appear several impediments to use wind energy at the higher level. First of all, it entails administrative barriers. The permission for building wind farm requires much more time than the same practice in other European countries. This obstacle stems from the fact that there are no transparent requirements of its impact on the environment. The second impediment concerns difficulty in connecting to power networks. Still, the structure of networks in Poland is not sufficiently developed. There are also uncertainties connected with the prospective level of tariffs, since Polish energy and heat sector is under regulation. Finally, such obstacle as the high level of investment outlays cannot be omitted. Despite of the above-mentioned difficulties, the share of wind farms in energy production is rapidly increasing (Fig. 1).

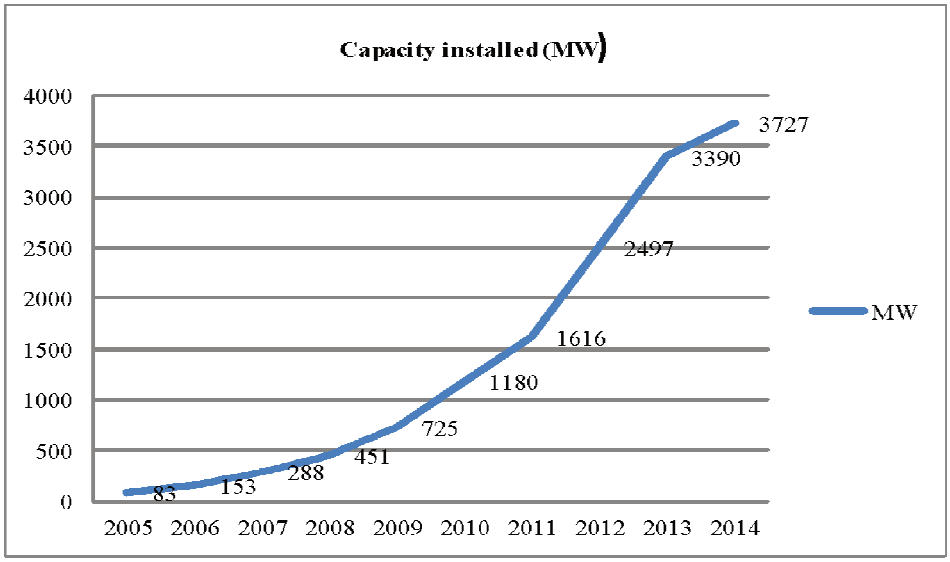

Fig. 1. Development of wind farms performance in Poland 2005-2014, http://www.ure.gov.pl [retrieved: 10th November 2014].

[2] K. Kolvits, *Wind Energy in Poland – Potential, Prospects and Pitfalls*, Modern Energy, No. 1, 2008.
[3] OECD, OECD Economic Surveys: Poland 2012, OECD 2012.

In order to support the development of energy from renewable sources, there has appeared the system of support in the shape of green certificates.

3. LEGAL REGULATIONS CONCERNING GREEN CERTIFICATES

The dominant regulation determining the usage of green certificates in the Polish market is the Polish Energy Law which constitutes an act from 10th April 1997. The Act poses a basis for companies performing in the field of energy production and distribution. The last amendment to the act dates back to 1st August 2014. Another regulation from 14th August 2008 of Polish Minister of Economy pertains to the scope of obligations to obtain and redeem the certificates of origin, make the compensatory payment, purchase energy from renewable sources and duty to confirm data relating to the volume of energy produced from renewable sources. Currently, the draft of a new bill concerning inter alia the system of support of renewable sources of energy is gaining significance.

4. THE USAGE OF GREEN CERTIFICATES

Green certificates of origin entail several sources of energy from renewable fuels, such as wind energy, solar energy, geothermal energy, wave, sea current and tidal energy, hydro energy, energy gained from biomass, landfill gas, and biogas produced in the process of wastewater discharge or treatment, or decomposition of plant and animal remains.[4] Therefore, it could be inferred that green energy is produced by such facilities as wind farms which are under deliberation in this paper, hydro-plants, biomass, biogas plants or thermal collectors.

These certificates of origin have been present in the Polish market since October 2005. The certificates constitute property rights and are issued by the President of Energy Regulation Office. Green certificates are issued for the physically produced and measured volume of electric energy. Certain requirements have to be met in order to receive the certificates. Firstly, the companies ought to have valid concession or registry for energy production from renewable sources excluding agricultural biogas. The source of energy has to be connected to domestic power network.[5]

Certificates of origin define the unit which produces the energy, the volume of energy, period in which it has been produced and the kind of technology used. They also indicate the subject which will organize the exchange of property rights arising from certificates of origin. They are not emitted in the material form, but rather through electronic record. Having indefinite form, they are allowed to be redeemed. The certificates can be exchanged on the Trade Exchange of Energy (Towarowa Giełda Energii) which serves the purpose of registering and trading with certificates. Only the members of stock exchange who have the consent for operation with property rights are permitted to buy and sell the certificates. Among them, there are energy companies, entities producing energy and trading companies (TGE). The Exchange does not impose any price variations. The certificates function in the single price system. The transactions on Polish Trade Exchange of Energy are made in contracts like PMOZE (Polish acronym for Property Rights of Re-

[4] http://www.ure.gov.pl/pl/rynki-energii/energia-elektryczna/odnawialne-zrodla- ener/4762,Odnawialne-Zrodla-Energii.html [retrieved: 5th October 2014].

[5] M. Ćwil, *Systemy wsparcia certyfikatami odnawialnych źródeł energii w Polsce*, Elektroenergetyka 2011, No. 4.

newable Sources of Energy) which reflect the real prices of green certificates and PMOZE_A which are additionally charged with the excise.

5. PRICES

According to regulation, the companies that deal with producing energy and selling it to the final consumers, are obliged to either obtain and redeem the adequate volume of green certificates or to make the adequate compensatory payment. If the company does not use renewable energy sources for energy production the second option, which means making compensatory payment, is taken into consideration. The volume of obligatory green certificates is proportional to the given share of energy provided by the company to final consumers in a given year (Table 1).

Year	2010	2011	2012	2013	2014	2015	2016	2017
Share	10,40%	10,40%	10,40%	10,90%	11,40%	11,90%	12,40%	12,90%

Table 1. The share of energy from renewable sources provided by the company to final consumers and its prediction until 2017, http://www.ure.gov.pl [retrieved: 5th November 2014].

In order to fulfil the duty of bringing green certificates, the compensatory payment has been created. The compensatory payment is calculated according to the following formula.

$$P = Pu \times (Ed - Er) \quad (1)$$

where,

P- the compensatory payment in a given year;
Pu- the unitary compensatory payment
Ed- the volume of energy (MWh) that stems from the duty of obtaining and redemption of green certificates in a given year.
Er- the volume of energy (MWh) which stems from the certificates of origin that the company intends to redeem in a given year

The calculated results are given in PLN/MWh unit. Since 2007 the payment should have included the index of inflation. The certificates in the form of compensatory payment have to be redeemed by 31st March as the execution of duty for the previous year. The moment they are redeemed they terminate. When one studies the price of green certificates, the tendency is visible that these certificates are decreasing in price. The annual growth of energy volume from renewable sources along with smaller rate of growth of energy consumption is indubitable. In addition, there appears a problem of co-incineration.[6] Frequently, the plants which used to incinerate only coal are inclined to make a co-incineration of bio-

[6] J. Rączka, *Nowe Regulacje OZE - mapa rzeczywistych interesów*, Centrum Strategii Energetycznych 2013.

mass or waste which allows for getting the status of the company supporting ecology and renewable sources. Such a venture also enables to receive the permission for redemption of green certificates. The situation, as it is easy to predict, has caused an excessive supply of the certificates. As director of European Renewable Energy Council (Polska Izba Gospodarcza Energii Odnawialnej) notices, the current position is an effect of undervaluation of volume of renewable sources of energy (Polish OZE). The installations of co-incineration make a significant contribution to price decline of green certificates. This deterioration in prices of green certificates along with the downward trend in prices of so called "black energy" lead to the situation when the financial growth and return of incurred expenses are unfeasible.

The downswing in price of green certificates was particularly apparent at the beginning of 2013 when the price oscillated even around 100PLN/MWh on the Polish Trade Exchange of Energy. In 2014 the price increased, although the current level is still low in comparison to the price of green certificates in 2009. Therefore, the income for investors from green certificates has been radically limited. In order to comprehend the significance of green certificates for a standard wind farm, one can make a simulation (Table 2).

Year	2009	2010	2011	2012	2013	October 2014
Market price of the certificates	264,5	265,86	281,39	249,36	164,02	169,35
Compensatory payment	258,89	267,95	274,92	286,74	297,35	300,03

Table 2. The comparison of prices of green certificates on the Trade Exchange of Energy and the level of compensatory payment 2009-2014, http://www.tge.pl, http://www.ure.gov.pl [retrieved: 5th November 2014].

For the purpose of depicting the prevalent conditions of green certificates, let us analyze such case. One turbine in the wind farm may have the average installed capacity at the level of 2 MW. The estimated volume of energy produced by this turbine is quite difficult to estimate, since there is no standard formula to calculate the climatic conditions and wind speed. However, some estimated predictions and simulation can be made.[7] When one assumes that the turbine is 2 MW, the vol-

[7] For the purpose of making predictions concerning the volume of energy produced by wind turbines, a review among the operators of existing wind farms has been made. According to their opinions and experience the most adequate formula to calculate realistic volume of energy is subsequent:
0,25*MW* 365*24
where:
0,25 is the accepted index of probability;
MW is the installed capacity of the turbine;
365 is the number of days per year;
24 is the number of hours per day;

ume of energy generated per year will be 5 782 MWh annually. Going further, when the wind farm has 4 turbines, the annual energy volume is 23 127 MWh.

$$V = 0{,}33 \times 2 \times 365 \times 24 = 5782 \tag{2}$$

where:
V-the volume of energy generated from 2MW turbine

Now, if the price of green certificates were at the level from 2009 which means 264,5 PLN/MWh, as it is not difficult to calculate, the income from green certificates would be 1 529 339 PLN per year for one turbine.

$$I = 5\,782 \times 264{,}5 = 1\,529\,339 \tag{3}$$

where:
I-the income from green certificates

When we take the average price of green certificates for the first two quarters, it is 195,86 PLN/MWh. Further, the price for 30th October 2014 is 169,35 PLN/MWh, thus it is still decreasing. Making the same calculations, but assuming the price at the average level of 170 PLN in the recent period, the income from green certificates is 982 940 PLN.

$$I = 5\,782 \times 170 = 982\,940 \tag{4}$$

It becomes apparent that the given wind farm loses 546 294 PLN per year. The case comprises the loss for one turbine, but when the wind farm consists of several turbines, the loss is proportionally higher in the annual period of time. It seems that wind farm does not have to bear the costs of labour at all or at least minor in the case of workers caring for the maintenance of the farm. What is more, the costs of materials are also restricted as the fuel for generating energy is wind which is free of charge. However, when the income from green certificates is decreasing, the cost of depreciation of this object as well as the interests and loans to be paid are too high to acquit of the liabilities.

6. CONCLUSION

The situation of oversupply of green certificates needs to be considered in the light of the policy undertaken by the government. However, for the time being all the suggestions to improve the current status are under preparation and examination. According to the current governments announcements, the sooner date the

It have to be admitted that some sources give higher index of probability which is at the level of 0,33 (zielonaenergia.eco.pl). For the purpose of calculating volume of energy in the particular case, the 0,33 index is taken into consideration.

regulation can be anticipated is 2016. As yet, the problem of oversupply of green certificates is omnipresent and it will exacerbate along with appearance of new wind farms. The article intends to analyze the way that the decrease in price of green certificates has a significant influence on wind farms performance. It makes the company's result exacerbate. Albeit the lower results of the wind farms stemming from decrease in price of green certificates, it cannot be denied that wind farms are still profitable. However, the situation implies that the investors resign from investing in Polish wind farms. In the occurred circumstances, it seems that the new draft of a bill implementing the auction system becomes pivotal.

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[12] Rączka J.: Nowe Regulacje OZE - mapa rzeczywistych interesów, Centrum Strategii Energetycznych 2013.
[13] Rozporządzenie Ministra Gospodarki z dnia 14 sierpnia 2008 r. w sprawie szczegółowego zakresu obowiązków uzyskania i przedstawienia do umorzenia świadectw pochodzenia, uiszczenia opłaty zastępczej, zakupu energii elektrycznej i ciepła wytworzonych w odnawialnych źródłach energii oraz obowiązku potwierdzania danych dotyczących ilości energii elektrycznej wytworzonej w odnawialnym źródle energii (Dz. U. z dnia 28 sierpnia 2008 r.).
[14] Wnuk R.: Energia Odnawialna - perspektywy rozwoju gmin, Polsko-Japońskie Centrum Efektywności Energetycznej, 2011.

WPŁYW ZIELONYCH CERTYFIKATÓW NA EFEKTYWNOŚĆ POLSKICH FARM WIATROWYCH

W celu umożliwienia nieustannego rozwoju farm wiatrowych, a także wzrostu udziału odnawialnych źródeł energii w całkowitej produkcji energii elektrycznej konieczne jest podjęcie działań pomocniczych. Inwestowanie w budowę farm wiatrowych pochłania znaczne nakłady. Dlatego też, Prezes Urzędu Regulacji Energetyki przyznaje tzw. „zielone certyfikaty". Certyfikaty te mogą stać się przedmiotem obrotu na Towarowej Giełdzie Energii, co z kolei staje się dodatkowym przychodem dla farmy wiatrowej. Paradoksalnie,

można zauważyć, iż nieustannie rozwijająca się działalność odnawialnych źródeł energii prowadzi do spadku cen zielonych certyfikatów. Artykuł stanowi analizę, w jaki sposób spadek cen zielonych certyfikatów wpływa na funkcjonowanie przedsiębiorstwa, a także podejmuje kwestię implementacji nowego projektu ustawy dotyczącej OZE i systemu wsparcia w postaci zielonych certyfikatów. Poprzez ograniczenie przychodu farm wiatrowych w postaci redukcji cen zielonych certyfikatów obiekty te osiągają znaczny spadek generowanych zysków. Pomimo faktu, iż farmy wiatrowe ponoszą znacznie niższe koszty związane z personelem czy nabywanymi materiałami, gdyż materiałem wykorzystywanym jest energia wiatrowa, spadek przychodów może znacząco utrudniać wywiązywanie się ze swoich zobowiązań. W związku z tym faktem, zamortyzowanie farmy wiatrowej oraz pokrycie kosztów odsetkowych może stać się problemem. Istotne jest jednak podkreślenie, iż pomimo znaczącego wpływu na wynik przedsiębiorstwa, farmy wiatrowe są wciąż opłacalne. Jednakże spadek wolumenu wsparcia produkcji energii z odnawialnych źródeł powoduje wycofanie się inwestorów z angażowania się w polskie farmy wiatrowe. W zaistniałej sytuacji potrzeba weryfikacji systemu wsparcia w postaci zielonych certyfikatów w nowym projekcie ustawy staje się kluczowa.

Słowa kluczowe: zarządzanie systemem zielonych certyfikatów, opłata zastępcza, odnawialne źródła energii, zarządzanie sektorem energii w Polski.

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