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Lada Voloshchenko-Holda, PhD (Economics),
Banking Institute, Collegium of Socio-Economics,
Warsaw School of Economics,
Warsaw, Republic of Poland
e-mail: lvolos@sgh.waw.pl

Pawel Niedziolka, PhD (Economics),
Banking Institute, Collegium of Socio-Economics,
Warsaw School of Economics,
Warsaw, Republic of Poland
e-mail: pniedz@sgh.waw.pl

ONSHORE WIND ENERGY AND PV PROJECTS FINANCING IN POLAND: RISKS AND OPPORTUNITIES

Abstract. The article examines the evolution of the renewable energy support system in Poland, with an emphasis on benefits and risks from the perspective of investors and banks engaged in renewable energy sources (RES) financing. It also introduces business conditions for bank financing, which investors can expect under the current auction system. The characterization of the market structure of RES projects financing implemented in 2019 was made based on the results of an analysis of market offers and interviews conducted with representatives of leading banks declaring their willingness to finance RES projects in Poland. Onshore wind energy and photovoltaics (PV) are not the only RES for which support is provided through the auction system in Poland. Those two will likely play a key role among other RES in the next few years, since the share of their installed capacity after auctions planned for 2019 is expected to amount to about 80%.

Keywords: renewable energy sources; wind energy; photovoltaics; project finance; green certificates; auction system.

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INTRODUCTION

Formulation of the problem. Renewable energy development in Poland results to a large extent from the goals set by the European Union. As early as in 2007 EU leaders agreed on and in 2009 implemented the "Climate and Energy Package for 2020" also named the "20–20–20 Package". The Package stated that in addition to reducing greenhouse gas emissions by 20% and increasing energy efficiency by 20% (compared to 1990), the share of energy from renewable sources should amount to at least 20% of gross energy consumption by 2020. The next EU initiative sets even more ambitious goals: reducing greenhouse gas emissions by 40% (compared to 1990), increasing energy efficiency by 27% with a 27% share of RES in gross energy consumption.

The article has two main objectives. First, to show the evolution of the renewable energy support system in Poland, with an emphasis on benefits and risks of investors and banks engaged in renewable energy sources (RES) financing. Second, to introduce business conditions for bank financing, which investors can expect under the current auction system. The characterization of the market structure of RES projects financing implemented in 2019 was made based on the results of an analysis of market offers and interviews conducted with representatives of leading banks declaring their willingness to finance RES projects in Poland. Onshore wind energy and photovoltaics (PV) are not the only RES for which support is provided through the auction system in Poland. Those two will likely play a key role among other RES in the next few years, since the share of their installed capacity after auctions planned for 2019 is expected to amount to about 80%.

RESEARCH RESULTS

Support system for renewable energy in Poland in 2005–2016.

The RES development in Poland took place under state support. As a consequence of the amendment of the Energy Law Act of 10 April 1997, a quantitative mechanism of 15-year support for electricity production from renewable sources has been in operation since 1 October 2005. Green certificates (also referred to as Renewable Energy Certificates (REC), provided to the market by the amendment's provisions, are tradable assets. They are property rights which result from the conversion of the certificates of origin from RES (wind, solar radiation, geothermal energy, waves, tides and currents, and biomass), issued by the President of the Energy Regulatory Office (ERO) as evidence of energy generation from a renewable source. In addition to green certificates, there are also blue certificates, which confirm the origin of energy from agricultural biogas, and several other "color certificates" (brown, yellow and purple), for cogeneration sources.

The certificate of origin from RES is subject to conversion into a green certificate upon its submission to the Certificate of Origin Register. One property right (certificate) is vested per 1 MWh of renewable power. Green certificates have no expiry date and are subject to redemption by the President of ERO upon the request of its holder. Green certificates are traded on the Polish Power Exchange (Towarowa Giełda Energii (TGE) in the so-called Property Rights Market, where the price is determined in a single price system and continuous trading, without price variation limits. They can also be traded in an OTC formula. In the later case, such transactions are only registered by TGE. Holders of green certificates may sell them not only on TGE, but also in bilateral transactions.

Transmission and distribution system operators are obliged to purchase energy originated from renewable sources. The green certificate mechanism (in accordance with the Renewable Portfolio Standard) requires all energy companies producing and selling energy to final customers to hold a specified number of green certificates on a yearly basis for its later redemption by the President of ERO. The number of certificates is defined by a minimum share of energy originated from renewable sources in total energy sales each year. There is also an alternative way to meet the requirements: instead of holding the specified number of green certificates, obliged companies can pay a so-called substitution fee. Chart 1 shows a comparison of the substitution fee and the average annual price of green certificates in 2006–2014. In 2019 the substitution fee amounts to 125 % of the annual weighted average price of property rights resulting from certificates of origin from RES (with the exception of electricity produced from agricultural biogas), but not exceeding PLN 300,03 [1]. This formula for the substitution fee was introduced in 2017. Previously, the substitution fee was set at a fixed level.

It is important to underline, that until 2011 the prices of green certificates were similar to the substitution fee. In some months, however, the substitution fee was lower than the price of green certificates. Under these circumstances and also taking to consideration the existing overestimation of the redemption obligation in relation to the production capacity of RES installations, the obliged companies were choosing to pay the substitution fee instead of buying green certificates. As a result, already in 2010 there was a surplus of green certificates on the market, which partially covered the redemption obligation for the next year. After 2011, the certificates' prices decreased significantly in relation to the substitution fee (see Chart 1), as a result of the increase of energy production from co-firing.

Chart 1. Substitution fee in the years 2006–2014 (in PLN)

Source: Own elaboration

Currently the next round of the discussions concerning the change of the substitution fee mechanism is taking place. The Ministry of Energy proposed to link the substitution fee to the electricity price in order to limit the support for RES installations when energy prices are high. In this regard the Ministry's Draft of the Energy Law Act Amendment enclosed a provision, that was supposed to limit the sum of the electricity price and the substitution fee at 312 PLN/MWh. Finally, the RES lobby convinced the Ministry to withdraw the proposal, arguing, that it would lead to unprofitability of most wind farms [2].

Chart 2 shows significant fluctuations of the annual average prices of green certificates quoted on TGE in the period 2005–2019. Annual average prices do not reflect mid-year volatility and even if prices remain low for several months, the liquidity of a green energy producer may be undermined. The exchange prices also differ from the prices in bilateral transactions (OTC market). In 2016 bilateral transactions were concluded with prices close to 20 PLN/MWh – much lower than the average exchange price [3].

Chart 2. Volatility of green certificate prices (PLN/ MWh)

Source: Own elaboration based on data available on: <https://tge.pl/pl/536/ceny-okresowe-oz> (06.05.2019)

After 2011, could be observed a sharp drop in green certificates prices, due to the following factors [3] – [5]:

- on oversupply of green certificates granted for: 1) electricity produced in so-called “large” hydroelectric power plants (over 10 MW), built mostly in the 1980s, and 2) co-firing of coal and biomass in large coal-fired power plants (it is estimated, that about 70% of green certificates were delivered to old fully depreciated coal-fired power plants, adapted to biomass combustion without significant investments). The oversupply can be measured by comparing the number of green certificates issued with the share of renewable energy in total sales required for a given year. As a rule, obliged companies do not buy certificates beyond the level required by the regulator. The exceeding supply at the end of 2017 amounted to approx. 23 TWh and was at least 20% higher than the redemption of certificates planned for 2018 (moreover, this existing surplus would accumulate with certificates, supposed to be issued each subsequent year). This was the result of a misguided support system, which assumed equally high support for all kinds of RES technologies. The effectiveness of support would be higher in the case of differentiation: at first offering relatively low support for implementing the less advanced, relatively cheap technologies, and then higher support for advanced and expensive technologies. Co-firing should not be the subject of support at all;

- it is difficult to reduce production in large plants adapted for co-firing even when demand for electricity drops. This is, inter alia, due to the fact, that these producers received investment support provided they guarantee stable lasting for at least 5 years production;

- accumulation of certificate surpluses from previous years on a low-demand market – the existing mechanism let electricity sellers pay a substitution fee instead of making them buy certificates;

- limited capacity of the Energy Regulatory Office (ERO) to handle the growing number of applications for certificates of origin in time, destabilizing the functioning of the green certificate mechanism;

- lack of regulator’s response to the increase in co-firing energy production (especially in the years 2011–2012), which caused the growing imbalances of the system.

In the case of energy from agricultural biogas, in 2016 it became possible to limit the process of reducing support by separating this segment and assigning it to so-called blue certificates. In the same year, the support for energy from co-firing was reduced by 50%, which, given the rising prices of biomass, resulted in a reduction of energy production from this RES type (production simply became unprofitable: in 2016 the green certificate price oscillated around 74 PLN/MWh, while this type of generation becomes profitable at a green certificate price of 130 PLN/MWh). Until 2010 the increase in co-firing energy production was justified by political goals (meeting the target of at least a 7.5% share of RES), later on however it contributed to imbalances in the green certificates market [5]. The drop in green certificate prices put RES producers operating under the project finance formula into a very difficult situation. These companies largely lost the ability to pay off their debts to banks. This happened paradoxically in a situation when the amount of produced electricity turned out to be higher than forecast.

Some RES producers signed long-term contracts for the sale of green certificates and electricity at a fixed and subsequently indexed price to state-owned energy concerns. In view of the falling market price of green certificates, these concerns took steps to withdraw from unfavourable contracts. In 2015, Polska Energia – Pierwsza Kompania Handlowa Sp. z o. o. (Tauron Group)¹, which, lacking the possibility to renegotiate electricity sales agreements and

¹ As a result of energy sector consolidation in Poland after 2004, four vertically integrated energy groups were created: Polska Grupa Energetyczna S.A., Tauron Polska Energia S.A., ENEA S.A. and Energa S.A.

certificates of origin, unilaterally terminated 15-year contracts. Earlier, in 2014, it filed for bankruptcy in liquidation, which was rejected by the court. Liabilities of wind farm operators towards this entity were estimated at PLN 4 billion. In September 2017, another company Energa – Obrót SA decided that its 150 contracts for the purchase of green certificates concluded in the years 2007–2013 were invalid due to being in contradiction with the public procurement law. The price was set as a percentage of the substitution fee. Energa – Obrót SA declared that in 22 cases it ceased to perform contracts and commenced court proceedings to recover the amounts paid so far against RES producers selling property rights to Energa and banks being assignees [6]. One year earlier, Enea SA submitted statements on termination of or withdrawal from long-term contracts for the purchase of property rights resulting from certificates of origin from RES. These were contracts signed in 2006–2014 with 8 entities in total, out of which 3 were indirect subsidiaries of the State Treasury. The reason for termination or withdrawal from contracts was, *inter alia*, “exhaustion of the possibility of restoring contractual equilibrium and equivalence of benefits of the parties caused by changes in law”. As at the end of 2016, the undiscounted value of Enea's liabilities under the aforementioned contracts amounted to approximately PLN 1,2bn [7].

The green certificates system was abandoned in July 2016 due to inefficiency as a result of the above mentioned shortcomings. Installations connected to the system after the 1st of July 2016 did not acquire rights to certificates of origin, but only may participate in auctions for individual technological baskets [8]. In the meantime a number of changes to regulations with negative effects was introduced:

- rule 10H (minimum distance from houses and protected areas amounting to at least 10 times the wind power turbines’ height);
- 4-fold increase in the property tax;
- a ban on repowering wind turbines²;
- a law reducing and freezing the amount of the substitution fee (so-called *lex-Energa*, 2017).

The above mentioned measures taken by state-controlled energy companies in order to terminate unfavorable contracts (often in violation of the *pacta sunt servanda* principle) together with regulation changes, resulted in a significant decrease in the confidence in state institutions of private investors and banks engaged in RES projects financing.

The auction system in Poland.

The auction system was introduced in Poland pursuant to the provisions of the RES Act (20 February 2015). Pay-as-bid auctions are organized by the President of ERO. A bidder submits an offer which includes the volume of electricity (MWh) and the price (PLN per 1 MWh), at which they agree to sell electricity, but not higher than the reference price (maximum auction prices, specified by the Minister of the Economy for a given RES). Auctions are organized for particular technological baskets.

Entities that have won an auction will receive support in the amounts resulting from the submitted offers. This means, that support will not be uniform. It is important to mention, that if an energy producer benefited from public aid (i.e. got subsidies for the construction of RES installations) this aid should be considered in the price offer. Public aid at the investment stage may cover: support for investments in environmental protection, a subsidy for small and medium sized enterprises or financial support for companies carrying out new investments [10]. It is important to ensure that total public aid does not exceed the statutory limits. In order to

² Ultimately, under the amendment of the RES Act of 2018, the repowering, i. e. the replacement of turbines with more efficient ones, was allowed and the tax base for wind farms was also reduced [9].

determine the maximum amount of public aid, the average selling price of electricity in a competitive market set by the President of ERO should be deducted from the reference price and then multiplied by the amount of electricity produced by the installation within 15 years from the sales' commencement date. Subsequently, the aid received so far shall be deducted from the maximum public aid and divided by the amount of energy planned to be auctioned for 15 consecutive years. This results in a maximum price that can be offered in the auction [11].

Four auctions were held (all for PV and onshore wind farms basket) until May 2019 (Table 1).

Table 1

RES auctions (PV and onshore wind farms) organized by the President of ERO in the years 2016 – 2018

Date	Installation	Average PLN/MWh	Min. PLN/MWh	maks. PLN/MWh
30.12.2016	New installations up to 1,00 MW (mainly PV, total of 70 MW)	353,78	253,50	408,80
29.06.2017	New installations up to 1,00 MW (mainly PV, total of 350 MW)	372,83	195,00	398,87
05.11.2018	New installations more than 1,00 MW (onshore wind farms, total of 900 MW)	196,17	157,80	216,99
15.11.2018	New installations up to 1,00 MW (mainly PV, total of 550 MW)	352,34	288,99	364,99

Source: ERO data

Further auctions are planned for the year 2019, which is supposed to result in a capacity and electricity production increase (see Chart 3).

Chart 3. Planned onshore wind farms and PV capacity (on the left, MW) and energy production increase (on the right, GWh) after auctions in 2019

Source: Own elaboration based on the presentation: Najważniejsze prace Ministerstwa w zakresie rozwoju OZE, Ministerstwo Energii, 12 April 2019.

In accordance with the auction system functioning rules the lowest sale price offer (indexed annually to the inflation rate) wins an auction. The entity (installation) that has won an auction receives for maximum 15 years the difference between the average electricity sale price and the auction price in case of a so-called “negative balance”. The compensation of the difference will depend on energy produced and will be limited by an amount of energy contracted. If the balance is positive, it will later be settled with a “negative balance” which may appear in the next years. If the balance remains positive within the whole 15-year horizon, after the end of the support period the winning bidder will be obliged to pay-in the surplus in 6 equal installments (without an upper limit on the amount).

In practice, investors do not receive a net auction price. The actual electricity price is the auction price adjusted for the cost or additional income from the basic business activity. The reference level for the compensation is determined on the basis of the auction price, which is an average daily energy price, whereas photovoltaic installations produce energy mainly during the so-called peak period (sale price is higher than the average daily price) and wind farms – during the night (sale price is lower than the average daily price). Balancing costs should also be taken into account (in 2019 they amounted approx. 3–4% of electricity price). Settlements with RES electricity producers are carried out by the state-owned company Zarządca Rozliczeń SA (“Settlement Manager”).

For Zarządca Rozliczeń S. A., the information, that given producer sold at the end of a calendar year in the auction system less energy than declared means, that he is no longer fulfilling obligations accepted in the support system. However, there is still the possibility to fulfil such obligations during a 3-year cycle. It is allowed to default up to 15% of the agreed amount of energy production. If the non-performance is higher, a contractual penalty is charged. Obtaining certificate of admission to an auction and meeting a number of criteria is a condition for participation in the auction. The maximum duration of the construction period of the project (i. e. until the first sale of electricity) is 36 months, with 30 months for onshore wind farms and 18 months for PV projects. The settlement is made on a monthly basis. After the end of the month a producer delivers to Zarządca Rozliczeń S.A. the information concerning the volumes and prices of electricity supplied to the grid in the previous month (no separate agreements are signed with Zarządca Rozliczeń SA).

The issue of risk related to the possible withdrawal of the state from its obligations towards the electricity producers who have won the auctions is addressed by Article 6 of the RED II Directive³, in which “Member States shall ensure that the level of support and the conditions for granting support for renewable energy projects are not changed in a way that would adversely affect the rights granted on its basis and the financial viability of projects which already benefit from support” [14].

Commercial banks’ opportunities in renewable energy financing in Poland

Currently commercial banks are again getting interested in renewable energy project financing in Poland after quite a long break. This is happening for several reasons:

- the new support scheme depends on neither market factors nor on changes in the support rules during the financing period (as opposed to the green certificate scheme);
- the risk of a possible withdrawal of State institutions from their obligations towards electricity producers is limited by the RED II Directive provisions and the special status of the entity responsible for carrying out the settlements (Zarządca Rozliczeń SA);
- RES installations are steadily becoming more efficient (e. g. in the case of PV the costs per MW of installed capacity are reduced annually by about 13%);
- as a consequence of more experience being gained by construction companies, the construction risk is also systematically reduced;
- relatively short period of the project’s implementation in the case of PV (about 18 months).

In the meantime, there are a number of risk factors related to the financing of onshore wind farms and PV projects. These include:

- relatively high investment outlays, mean that RES electricity producers will rather balance on the verge of profitability without state support;

³ Directive 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources

- uncertainty caused by the fact that, although the first auctions have been completed, none of the winning projects have entered into the operational phase yet;

- a long period of potential financing with uncertainty about the level of installation failure and the stability of power generation (e.g. in the case of PV, the so-called degradation ratio is about 0.6% p. a.);

- limited reliability of the forecasts as regards wind power and the level of sunny days due to the short time series of data and unpredictable but very dynamic climate changes (on the basis of earlier observations Poland is rather recognized as a country with relatively little sunshine).

The first half of 2019 was a breakthrough period in which the attitude of many commercial banks towards renewable energy projects financing changed. Under new financing strategies built on the principles of state support, banks declare, on the one hand, to be open to incoming renewable energy projects and, on the other hand, to phase out their financing of coal power generation. The EBRD, after nearly 3 years, decided to return to RES financing in Poland [12].

Banks structure transactions (most often carried out under the SPV formula) aimed at financing new RES installations in a way which lets them mitigate the above mentioned risks. A typical baseline variant of projection is scenario P90, where the probability of achieving (over the entire projection period) the amount of energy planned by the intrabank financial model is assumed to be 90% [13].

Table 2 shows business conditions, defined on the basis of banks' credit policies analyses and as well as interviews with representatives of banks specializing in renewable energy financing.

Table 2

Business conditions for onshore wind farms and PV projects financing

Projects' characteristics:		PV	Onshore wind farm
Project:		<ul style="list-style-type: none">● Portfolio of PV projects with a single rated capacity from MW to MW. Portfolio approach – not less than 5 installations;● Sunlight conditions verified by an advisor accepted by the bank.	<ul style="list-style-type: none">● Onshore wind farm with a rated capacity of not less than [...] MW;● Windiness conditions verified by an advisor accepted by the bank.
Sponsor (owner of SPV):		An investor with the experience in an implementation of similar projects with satisfactory economic and financial results	
Borrower:		SPV (a newly created special purpose vehicle which no employees)	
Max. amount of the investment loan:		PLN 2,5 Mln/MW for installed rated capacity	EUR 1,0 Mln/MW for installed rated capacity
Financial conditions:		DSCR ≥1,4 (Debt Service Coverage Ratio = Net operating income/Debt service) LTC ≤ 65% (LTC Ratio = Investment loan amount /Total project costs)	
Model assumptions (to be accepted by the bank):		<ul style="list-style-type: none">● Electricity price path for the financing period;● Productivity/efficiency of the installation.	
		Credit conditions:	
Loans:	Investment loan	Purpose: net CAPEX Repayment: in equal quarterly installments Period: 15 years	
	VAT loan	Purpose: VAT Repayment: Bullet Period: 2 years	
Other costs (to be incurred by the borrower):		Costs of: <ul style="list-style-type: none">● legal advisor to the bank;● technical advisor to the bank;● related to the granting of credit and the establishment, modification, maintenance, withdrawal or waiver of collateral	

Collateral (investment loan):	<ul style="list-style-type: none"> • Assignment of receivables under current and future contracts for the sale of electricity; • confirmed assignment of rights and receivables from all insurance policies, • pledge on shares in SPV; • pledge on the assets; • power of attorney to the bank account and power of attorney to the account to settle the negative balance with Zarządca Rozliczeń SA; • borrower's declaration on voluntary submission to enforcement up to the amount corresponding to 150% of the Loan pursuant to Article 777 of the Civil Procedure Code; • assignment of rights under lease of real estate for the purposes of operating the installation; • mortgage, provided that the project is executed on own land.
Debt Service Reserve Account (DSRA)	6 months debt service
Other blocked accounts:	<ul style="list-style-type: none"> • Positive balance account In the event of a continuing positive balance, periodically depositing funds on a restricted account in order to use them to repay liabilities towards Zarządca Rozliczeń SA after the end of the support period; • Maintenance and CAPEX account Depending on the scope of the maintenance contract, it may exist or be terminated by a bank decision. Funds collected from surpluses for future renovations (to be agreed with the bank's technical advisor depending on the type of installation and maintenance contract).
Conditions precedent:	<ul style="list-style-type: none"> • auction win; • positive opinion of the bank's technical and legal advisor; • payment of the full amount of own contribution;
Interest rate hedging:	Obligatory
Financial covenant:	DSCR $\geq$ 1,2

Source: Own elaboration

CONCLUSIONS AND PERSPECTIVES OF FURTHER RESEARCH

The new system of support for renewable energy in Poland is largely independent of market factors shaping the price of electricity. An analysis of its assumptions leads to the conclusion that in the next 15 years it will rather guarantee stable financing for these installations that will win auctions. This is also the RED II Directive entering into force, which obliges EU member states to maintain support for RES, even if in the long run the results of auctions turn out to be unfavourable for the State Treasury. The banking sector in Poland, noticing the above changes, gradually reopens to the financing of RES projects. So far, banks' offers are rather conservative mainly due to: recent experience (the State companies withdrawal from the contracts in 2015–2017), the financing form of new projects (project finance without recourse to the sponsor) and rather ambiguous conclusions on the energy prices' dynamics in the next 15 years.

REFERENCES (TRANSLATED AND TRANSLITERATED)

1. Informacja Prezesa Urzędu Regulacji Energetyki nr 12/2019 w sprawie sposobu realizacji obowiązku, o którym mowa w art. 52 ust. 1 ustawy o odnawialnych źródłach energii, w roku 2019 (<https://www.ure.gov.pl/pl/oze/umarzanie-swiadectw/8073,Informacja-Prezesa-Urzedu-Regulacji-Energetyki-nr-122019-w-sprawie-sposobu-reali.html>)
2. Sawicki B., ME ustępuje przy zmianie opłaty zastępczej do noweli OZE, 2019 (<https://biznesalert.pl/oze-zielone-certyfikaty-oplata-zastepcza/>)
3. Derski B., Co dalej z zielonymi certyfikatami?, 2016 (<https://wysokienapiecie.pl/1861-zielone-certyfikaty-cena-nadpodaz-obowiazek-2016-2020/>)
4. Janik B., Determinanty zmian cen zielonych certyfikatów, Zeszyty Naukowe Uniwersytetu Szczecińskiego nr 804, Finanse, Rynki finansowe, ubezpieczenia nr 67, 2014. – 785 – 791pp.
5. Obiektywne i subiektywne powody destrukcji systemu zielonych certyfikatów w latach 2005-2016, Polska Izba Gospodarcza Energetyki Odnawialnej i Rozproszonej (PIGEOR), Warszawa, 2018.
6. Szydłowski K., Certyfikatura kość niezgody, 2018 (<https://www.teraz-srodowisko.pl/aktualnosci/certyfikatura-kosc-niezgody-4900.html>)

7. Enea wypowiedziała umowy na zakup zielonych certyfikatów, 06.04.2016, (<https://gramwzielone.pl/energia-wiatrowa/26161/enea-wypowiedziala-umowy-na-zakup-zielonych-certyfikatow>)
8. Zielone certyfikaty dalej tanieją!, GLOBEnergia, 2017 (<https://globenergia.pl/zielone-certyfikaty-tanieja/>)
9. Rząd podtrzymuje wsparcie dla energetyki wiatrowej, Pracownia finansowa, 2018, (<https://www.ekologicznaelektrownia.pl/rzad-podtrzymuje-wsparcie-dla-rozwoju-ladowej-energetyki-wiatrowej/>)
10. Paszko P., Sposoby finansowania energetyki odnawialnej, „Czysta Energia”, no 1/2005, (<https://www.cire.pl/pliki/2/sposoby.pdf>)
11. Trela M., Dubel A., Porównanie systemów wsparcia odnawialnych źródeł energii w Polsce: zielone certyfikaty vs system aukcyjny, na przykładzie instalacji PV, Polityka Energetyczna, Tom 20, Zeszyt 2, 2017. – s. 105-116.
12. Reiserer A., EBRD returns to financing wind power in Poland (<https://www.ebrd.com/news/2019/ebrd-returns-to-financing-wind-power-in-poland.html>)
13. Saratsis Y., Renewable Energy Projects Financing, 2018 (<http://eletaen.gr/wp-content/uploads/2018/07/2018-05-10-saratsis-eurobank-presentation-eletaen.pdf>)
14. Directive 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources, L 328/82 as of 21.12.2018
15. Ignarska M., Odnawialne źródła energii w Polsce, „Poliarchia”, Kraków, No 1/2013. – s. 57–72 (<https://www.uj.edu.pl/documents/123362602/dae03865-4596-454e-ae70-364a74419434>)
16. 2020 climate & energy package, Komisja Europejska, 2019 (https://ec.europa.eu/clima/policies/strategies/2020_en#tab-0-0)
17. Najważniejsze prace Ministerstwa w zakresie rozwoju OZE, Ministerstwo Energii, 12.04.2019
18. Ustawa z dnia 20 lutego 2015 roku o odnawialnych źródłach energii, Dz. U. 2015, poz. 478

Лада Волощенко-Холда,
кандидат економічних наук,
Варшавська Школа Економіки,
Варшава, Республіка Польща
e-mail: lvolos@sgh.waw.pl

Павел Недзьолка,
доктор економічних наук, професор,
Варшавська Школа Економіки,
Варшава, Республіка Польща
e-mail: pniedz@sgh.waw.pl

ФІНАНСУВАННЯ ПРОЕКТІВ В ГАЛУЗІ НАЗЕМНОЇ ВІТРОЕНЕРГЕТИКИ ТА РОЗБУДОВИ СОНЯЧНИХ ЕЛЕКТРОСТАНЦІЙ У ПОЛЬЩІ: РИЗИКИ ТА МОЖЛИВОСТІ

Анотація. У статті розглядається еволюція системи підтримки відновлюваної енергетики у Польщі, з акцентом на можливості та ризики з точки зору інвесторів та банків, які займаються фінансуванням проектів у галузі відновлюваних джерел енергії (ВДЕ). У статті, також запропоновано характеристику умов банківського фінансування, на які можуть розраховувати потенціальні інвестори за чинної системи аукціонів. Ця характеристика була здійснена на основі результатів аналізу актуальних ринкових пропозицій щодо фінансування проектів ВДЕ у 2019 році, а також опитування представників провідних банків, що заявили про готовність фінансування проектів ВДЕ у Польщі. Наземні вітряна та сонячна енергетика - не єдині ВДЕ, яким надається підтримка в Польщі через систему аукціонів. У той же час ці два напрямки, ймовірно, відіграватимуть ключову роль серед інших ВДЕ у найближчі кілька років, оскільки очікується, що частка їх потужності після проведення аукціонів, запланованих на 2019 рік, буде на рівні близько 80% від загалу.

Ключові слова: відновлювані джерела енергії; вітроенергетика; сонячні електростанції; фінансування проектів; зелені сертифікати; система аукціонів.

Лада Волощенко-Холда,
кандидат экономических наук,
Варшавская Школа Экономики,
Варшава, Республика Польша
e-mail: lvolos@sgh.waw.pl

Павел Недзюлка,
доктор экономических наук, профессор,
Варшавская Школа Экономики,
Варшава, Республика Польша
e-mail: pniedz@sgh.waw.pl

ФИНАНСИРОВАНИЕ ПРОЕКТОВ В ОБЛАСТИ НАЗЕМНОЙ ВЕТРОЭНЕРГЕТИКИ И СТРОИТЕЛЬСТВА СОЛНЕЧНЫХ ЭЛЕКТРОСТАНЦИЙ В ПОЛЬШЕ: РИСКИ И ВОЗМОЖНОСТИ

Аннотация. В статье рассматривается эволюция системы поддержки возобновляемой энергетики в Польше, с акцентом на возможности и риски для инвесторов и банков, вовлеченных в финансирование проектов в области возобновляемых источников энергии (ВИЭ). В статье также предложено характеристику условий банковского финансирования, на которые могут рассчитывать потенциальные инвесторы при существующей системе аукционов. Эта характеристика была осуществлена на основе результатов анализа актуальных рыночных предложений по финансированию проектов ВИЭ в 2019 году, а также опроса представителей ведущих банков, которые заявили о готовности финансирования проектов ВИЭ в Польше. Наземные ветряная и солнечная энергетика - не единственные ВИЭ, которым предоставляется поддержка в Польше через систему аукционов. В то же время эти два направления, вероятно, будут играть ключевую роль среди других ВИЭ в ближайшие несколько лет, поскольку ожидается, что доля их мощности после проведения аукционов, запланированных на 2019 г., будет на уровне около 80%.

Ключевые слова: возобновляемые источники энергии; ветроэнергетика; солнечные электростанции; финансирования проектов; зеленые сертификаты; система аукционов.

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