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The profile of Polish prosumer and its political background¹

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Abstract: Thermal coal power plants in Poland have not been and will not be able to meet the demand for energy in the country, in the face of increasing climate change. Effective solution to the existing problem is the diversification of energy sources and making investment in distributed, renewable energy sources. Another factor which can increase the energy security of the citizens is to generate electricity for their own needs at the point of consumption, i.e. the households. A prosumer becomes a real participant in the energy market of Poland. How vital a role can such prosumer play in the power system? What is the profile and the potential of a Polish prosumer? The author of this article will attempt to answer these questions by defining the concept of the prosumer, identifying the legal regulations concerning the EU and Poland in the sphere of energy production, and by analysing the prospects and development opportunities of prosumerism of the country.

Keywords: Polish households, prosumers, renewable energy sources, energy production

JEL codes: Q41, Q42, Q43, Q48, Q58

1. Introduction

Every year the climate changes are becoming more apparent. The security of energy supply was jeopardized in Poland in the summer of 2015. Due to drought and low water levels in rivers, there have been restrictions on cooling units of coal-fueled power plants. On August 11, the stock market price of energy has increased tenfold and amounted to 1400 PLN per MWh. This energy deficit situation saw the state-owned companies earn extra earned extra 10 million PLN within a few hours. The next day, energy consumers have suffered a loss of 100 million PLN

¹ The project was financed by the National Science Centre, decision number: DEC-2012/07/D/HS4/00733

within a few hours due to limitations in the supply of energy, which were already implemented at 20-th power rationing level (Instytut Energetyki Odnawialnej, 2015). There is a danger that if the situation recurred, a black-out might take longer on the market. Consumers may feel threatened by the loss of electricity supply. It is worth mentioning that Polish power industry is three times more energy-intensive as compared in the European industry, and that in the area of penetration of water resources per capita per year Poland holds the penultimate place in Europe. Additionally, Poland has one of the lowest shares of distributed power generation in the structure of energy production.

Thermal coal power plants have not been and will not be able to meet the demand for energy in the country, in the face of increasing climate change. Effective solution to the existing problem is the diversification of energy sources and making investment in distributed, renewable energy sources. Another factor which can increase the energy security of the citizens is to generate electricity for their own needs at the point of consumption, i.e. the households. A prosumer becomes a real participant in the energy market of Poland. How vital a role can such prosumer play in the power system? What is the profile and the potential of a Polish prosumer? The author of this article will attempt to answer these questions by defining the concept of the prosumer, identifying the legal regulations concerning the EU and Poland in the sphere of energy production, and by analyzing the prospects and development opportunities of prosumerism of the country.

2. Definition of the term „prosumer”

The term prosumer dates back to the early 80s of the last century, when in his book *The Third Wave* Alvin Toffler (1990) described the transformation of civilization, by trying to identify three types of waves (societies): agricultural (the first wave), the second wave (industrial society, beginning in 1750), and the third wave (information society, since 1950). The prosumer is coined from the combination of the words **producer** and **consumer**. Initially it concerned the creation of products for one's own use and their simultaneous consumption. In Poland, the term was in employ in the management and marketing (Szymusiak, 2013). Currently, the concept is related directly to the producers of renewable energy in micro-installations, who produce the energy for their own use and consume it on the spot, while selling the surplus to the network.

So prosumer is a producer and consumer at the same time. One who may connect his installation of renewable energy sources to the distribution network operator and sell back the surplus of the electricity produced to the grid.

Back in 2011, when the Act on Renewable Energy Sources was in its planning stage (version 1a.4), a prosumer was called "a micro-installation electricity producer with the purpose of own consumption or sale of the electricity produced in a micro-installation in the amount not greater than 30% of the electricity produced in a micro-installation in a given year (Projekt ustawy, 2011). In the present Act the term does not appear, it is replaced by the term: producer of renewable energy, as well as there are no imposed limitations to the sale of electricity to the grid, noting, however, that it is allowed after meeting the energy requirements of the prosumer. Only the surplus energy would be sold and it would be subject to the obligatory purchase by the dealer principal. Currently, based on the definition of micro-installation, as quoted in the Energy Act (Ustawa z dnia 10 kwietnia 1997), prosumer is defined as the natural person who generates electricity in microinstallations and does not conduct any business. This also applies to producers of electricity from agricultural biogas, with micro-installations, and producers of agricultural biogas who are natural persons and are registered in the register of producers (national register of producers, register of farms, and register of grant applicants) who generate electricity from biogas farm to the grid or in order to use it for their own needs.

3. The EU and Polish law regulations on the energy market

Competitive green economy, enhancing energy efficiency, security of energy supply, reduction of greenhouse gases emission are the main goals for the Climate and Energy Package called 3x20%, until 2020. In October 2014, the European Council, as part of the next Climate and Energy Package for the years 2021-2030, has endorsed a binding EU target of domestic reduction in greenhouse gas emissions at least 40% by 2030, as compared to 2005. In addition, there was proposed the goal that the share of renewable energy sources has to increase to at least 27% of energy consumed in the EU in 2030 (European Council, 2014: 6). Another future target is to reduce Europe's greenhouse gas emissions by 80-95% as compared to 1990 levels, by 2050. The EU has endorsed this objective as part of efforts by developed countries to, as a group, reduce their emissions by a similar degree, set for 2020.

Reduced energy consumption and an increased use of energy from renewable energy sources (RES) have an important part to play in promoting security of energy supply, technological developments and in creating opportunities for low energy market development. According to the Directive 2010/31/EU, the Member States should include within their national plans measures to support public authorities and private investors (households) to become early adopters of energy efficiency improvements, and to implement the recommendations as soon as feasible (Directive 2010/31/EU).

The one of the goals of Polish Energy Policy until 2030 is the support of RES development. It is said that the renewable energy potential is significant: the technological level is estimated as 46% of the primary energy and the economic potential at almost 22% of the final energy (Ministerstwo Gospodarki, 2009). Energy and climate policy of the EU oblige each country to implement instruments supporting RES development. Finally, in Poland, on 20 February 2015, after four years waiting, Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources, was implemented by the new Renewable Energy Sources Act. The Polish Renewable Energy Act is necessary for Poland to meet the EU objectives of energy policy. Polish Act on Renewable Energy Sources passed by the Polish Parliament on the 20th of February, 2015 is a retreat from the system of certificates of origin to the auction system, and implementing different regulations for micro renewables. Former President of Republic of Poland, Bronislaw Komorowski, signed it on 11th of March 2015. It is worth mentioning that it had taken 4 years to adopt it. According to act (Ustawa z dnia 20 lutego 2015), renewable energy producers in microinstalations up to 10 kW are guaranteed to use the feed-in tariff system for 15 years, starting from the day the installation starts operating. In other words, for the installations being in use from 2016, with capacity:

- up to 3 kW (onshore wind energy, solar energy oraz hydroenergy), a constant price has been set to 0.75 PLN per kilowatt-hour,
- from 3 kW to 10 kW, a constant price has been set to 0.70 PLN per kilowatt-hour for agricultural biogas, 0.55 PLN per kilowatt-hour for biogas from storage, 0.45 PLN per kilowatt-hour from sewage works; 0.65 PLN per kilowatt-hour for hydroelectric, onshore wind and solar energy.

The tariffs will expire when installed capacity reaches 300 MW in the segment of up to 3 kW, and 500 MW in the segment of 3 kW up to 10 kW (Ustawa z dnia 20 lutego 2015: art. 41, point

10-17). Feed-in tariff system means the price per unit (of electricity) that an eligible renewable electricity generator receives according to cost-based calculations for the specific resource used (European Commission, 2014: 29). It means that a new player was introduced onto the energy market – the “prosumer”.

Table 1. Polish law regulations on RES market

SOURCE TYPE	OLD SOURCES (WHICH STARTED GENERATING ELECTRICITY BEFORE THE ACT ENTERED INTO FORCE)	NEW SOURCES (WHICH STARTED GENERATING ELECTRICITY AFTER THE ACT FOURTH CHAPTER ENTERED INTO FORCE – EXPECTED DATE IN JANUARY 2016)
RES SOURCES WITH A CAPACITY ABOVE 500 KW	Remaining in the old system, i.e. revenue from sales of energy and certificates or converting into the new system (right column). For multi-fuel installations (dedicated) the volume of certificates no larger than the average output of 2011-2013.	Chosen in the auction. Producers sell energy on the market, they receive compensation to the auction price level from the RESO.
RES SOURCES WITH A CAPACITY BELOW 500 KW		Chosen in the auction. Energy is bought by the liable seller at the auction price. Liable sellers receive compensation from the RESO to the market price level.
MULTI-FUEL INSTALLATIONS (DEDICATED)		Chosen in the auction. Only new dedicated sources with a capacity of 50 MW of electric capacity and to 150 MW in cogeneration.
MULTI-FUEL INSTALLATIONS (NON-DEDICATED)	Remaining in the old system, i.e. revenue from sales of energy and certificates. They receive only 0.5% certificate for MWh to 2020.	Lack of support.
HYDRO SOURCES WITH A CAPACITY ABOVE 5 MW	Lack of support (they receive no certificates of origin; no obligation to buy energy by the liable seller).	
MICRO SOURCES WITH A CAPACITY OF 10-40 KW	Obligation to buy energy produced by the liable seller at the average selling price of energy on the market in the previous quarter (announced by ERO). Entrepreneurs having micro-sources may also receive certificates and may convert into the new auction system.	Obligation to buy energy produced by the liable seller at the average price of energy sale on the market in the previous quarter (announced by the ERO) or entrepreneurs having micro-sources may convert into the new auction system (i.e. RES sources with a capacity below 500 kW).
MICRO SOURCES WITH A CAPACITY TO 3 KW AND BETWEEN 3 AND 10 KW		Fixed tariff price depending on the technology and capacity.

Source: Mężyński, 2015: 56.

The Act introduces a number of significant changes (see Table 1). New system provides support for RES up to 15 years, but no longer than by 31 December 2035. Basic assumptions include:

- an auctions of electricity sales from RES, which are organized by the URE President at least once a year,
- Polish government determines the maximum amount and values of energy that can be purchased. The Minister of Economy announces maximum prices for each RES technology, the so-called reference prices,

- introducing net metering for micro-sources, which means that the settlement of the energy coming from the grid and returned is held semi-annually. Prosumers are billed only for the difference between consumption and production.

It is worth to outline that, over 20 years of experience of introducing feed-in-tariff system in the EU countries show that this system is a guarantee for most cost -effective support system, especially for PV panels (Jammera, Grob, Indvik, 2013).

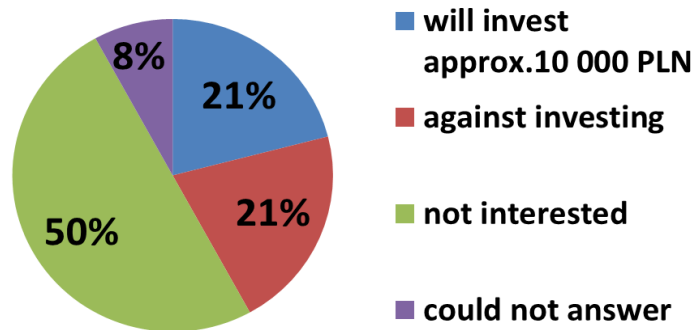
4. Profile of Polish prosumer

Taking into account the report of The Institute for Sustainable Development, more than 50% of investigated Poles support energy policy which develop RES in Poland. Moreover, in comparison to the previous study commissioned by this Institute in 2008 and 2009, support for RES has risen by 15% (Stanaszek, Tędziągolska, 2011:16-17).

In this part of the article the profile of a Polish prosumer will be defined. TNS Polska has conducted a study, commissioned by RWE Polska, where Poles were investigated about their preferences according to investment in RES (RWE, 2015). The omnibus study was conducted across the whole country in 2014 on a representative sample of 1,000 Poles over 15 years of age. Worth to mention is that, the terms of “potential prosumer” and “potential investor in PV panels” refer to respondents who answered “yes” to the question: “Would you buy a PV panel, as part of your household investments, that cost about PLN 10,000 and allowed you to acquire energy from solar radiation?”

Every second respondent is not interested in RES (Figure 1). The main reason indicated is that respondents have no impact on this type of decision, they probably rent a house or have a flat and have no possibility to install the panels. The study revealed also that 21% of them would be ready to invest in photovoltaic panels up to the amount 10,000 PLN, especially if the investment paid for itself within five years.

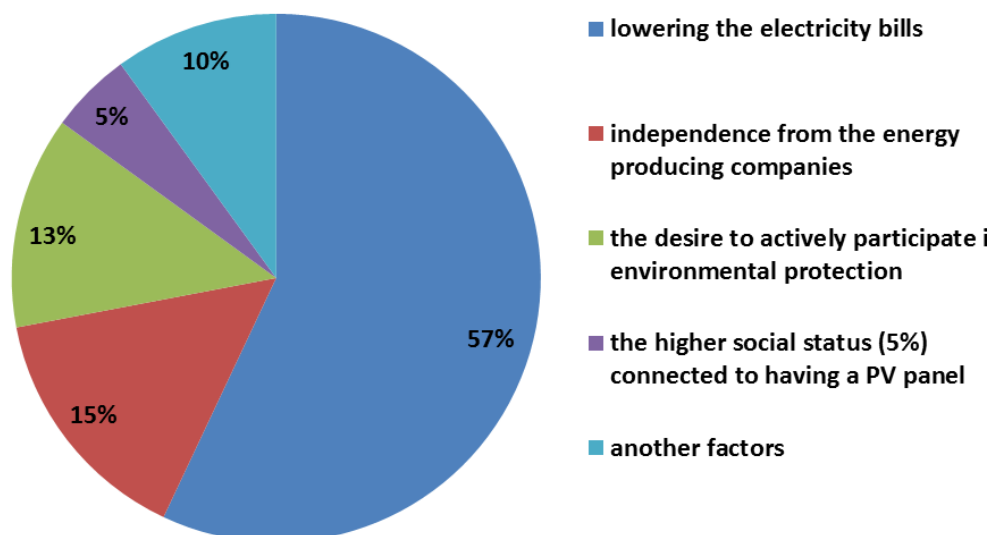
Figure 1. The interest of Polish respondents to invest in RES



Source: Own elaboration based on RWE, 2015.

Respondents were also asked to indicate the two main factors in favour of buying photovoltaic panels (Figure 2). The most frequent reason was the possibility of lowering the electricity bills. Almost 60% of the respondents provided this answer. The second most frequent answer was the independence from the energy producing companies (15%), the third was the desire to actively participate in environmental protection, which was indicated by 13% of respondents. The people who belong to the third group, and who care about the environment, have net incomes above PLN 4,000 per household. Only 5% of investigated pointed to higher social status in connection to having a PV panel.

Figure 2. The factors in favour of buying photovoltaic panels

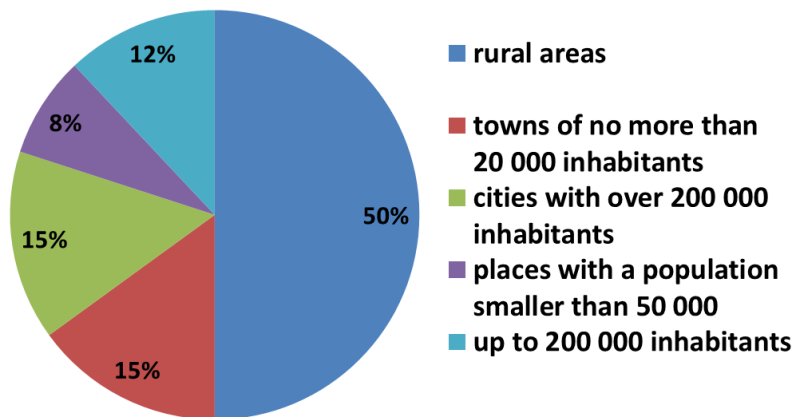


Source: Own elaboration based on RWE, 2015.

The survey showed that the living area of potential prosumers is rural area (51% live there). In towns with no more than 20,000 inhabitants and in cities with over 200,000 inhabitants, 15% people are interested in RES (Fig. 3). The rest of the respondents who are willing to invest in PV live in places with population smaller than 50,000 (8%) and up to 200 000 inhabitants (12%).

59% of the respondents live in detached houses, semi-detached houses, or in terraced houses, where there are vast possibilities for investments, especially in terms of location; roof, balcony, terrace, ground. The remaining 41% live in a multi-family house or a block of flats, where this kind of possibilities are rather restricted.

Figure 3. The living area of potential Polish prosumer



Source: Own elaboration based on RWE, 2015.

People under 29 years of age are most interested in RES investments. They constitute over 23% of investigated population. Every fifth Pole who is willing to buy PV panels is between 30-39 years of age or is over 60 years old. Other groups interested are between 40-49 years old (18%) and 50-59 years old (17%).

Taking into consideration the earnings of potential prosumers, it is worth to mention, that 46% of them declare their net salaries to range from PLN 2,501 to 4,000 per household. Approximately 21% have a net income within the range of PLN 1,501 to 2,500 per family. Further group accounts for 17% and the representatives earn below PLN 1,500 net, while another 17% earn more than PLN 4,000 net.

Drawing the conclusions, a profile of potential Polish prosumer points to a person with medium and higher income levels (earns from PLN 2,501 to 4,000 net), under the age of 29, living in rural areas, in a detached or semi-detached house, where the possibilities for implementing RES installations are higher. The main motivation for RES installation is lowering the electricity bills.

Respondents are also ready to invest through leasing if it cost PLN 1,000 per year and allowed them to save more than PLN 1,000 a year on the electricity bill (81% of respondents).

5. Prospects for the development of prosumer energy in Poland

Poland is, so far, not fully aware of the consequences of lacking decisive reforms aimed at transitioning from a carbon-based economy to a low-carbon model. It is worth to outline that, about 51% of the electricity generated in Poland comes from hard coal, and approximately 34% from lignite. It means that our electric energy demand is based on carbon sources (Mężyński 2014). International Renewable Energy Agency reports that in 2012-2014 more power capacity was installed in RES than in conventional and nuclear sources in the whole world energy market. Moreover, renewable energy is twice as cheap as nuclear (Rogalska, 2015:45).

Polish prosumers tend to be seen as a threat to the Polish energy system which can destabilised, especially by the solar panels and micro wind-turbines owners. Miners and large state-owned energy companies are still counting on maintaining the current scheme- energy supplied by a hard coal and lignite. In this system, based on large scale sources, 1 out of 10 operates only to cover up for network losses. Enabling prosumers to become active player on the energy market could help eliminating this problem, since energy would be produced in the same place where it would be used.

It is currently estimated that 150,000 of potential new plants with total capacity up to 800 MW (Krześniak, Hanas, 2015:18-19) will not adversely affect the energy sector of the country. Most of them will be interested in energy production for their own needs due to the steady increase in the cost of energy supply. Mr P. Smolen, the ERBUD board member for the Energy and Industry (Wojciechowska 2015: 13) indicates that the problem may be a declining volume of network transmissions with the increasing consumption of energy produced at the prosumer. Another issue of concern are the off-grid producers, who will not have their installations join the

network or will detach from it, as in such case the distribution volumes will decrease even further.

According to a survey conducted on commission of Optimal Energy (Mało wiemy, 2014:7)², 95% of respondents believe that Poland should produce more energy from renewable sources. Estimates show that with the possible scale of production of electricity and heat from micro-installations, at a potential number of 4.4 million households in rural areas, and its productive use in minute scale, eg. in 7%, as well as assuming an average micro-installation capacity of 3 kW, the installed power capacity could equal 1320 MW (OZE szansą na, 2014: 23-24).

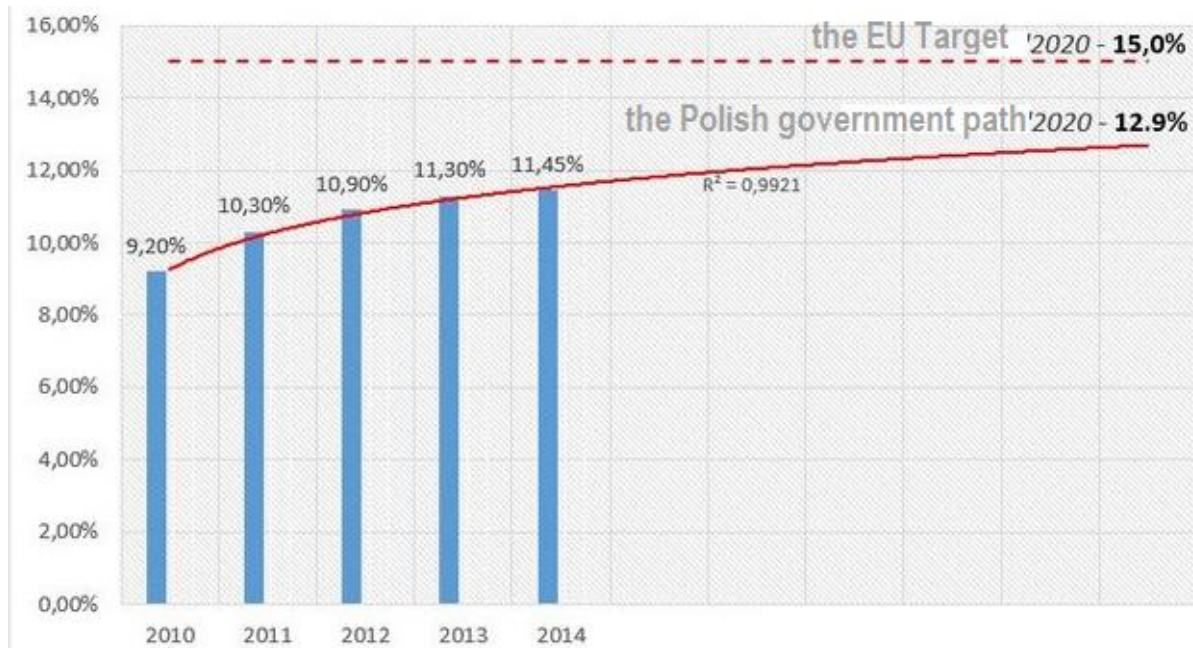
Prosumers, as new participants in the energy market, are likely to generate and consume energy at the site and sell the surplus to the grid. The independence from corporate energy supply would increase. Prosumerism promotes the growth of energy security in energy supply, eliminating disruptions in energy supply, and minimizing transmission losses. For many Polish citizens, becoming a prosumer is a chance for becoming an active agent in the energy market. Even the smallest home renewable energy source has an access to the local power grid. It is worth noting that the investment cost in distribution networks, can be spread amongst all energy users. As the analysis of the Polish prosumer profile indicates, they can afford PV panels and are interested in their installation, especially when it is relatively cheap and can lower their electricity bills.

Polish government still supports Polish coal, however, the reforms are inevitable in the light of the EU penalties which are a real threat to the Polish economy. According to the CSO data, final energy consumption from renewable sources in Poland amounted to 11.45% (Główny Urząd Statystyczny, 2015; Wiśniewski, 2015a) in 2014, which is a small change as compared to 11.3 % in 2013. There is a danger that if the rate of growth of RES remains at the same level, Poland will not reach required by the EU 15% by 2020, but that energy from renewable sources will only constitute 12.9% share of the market. There appears to be a dangerous trend to a stop in the growth in RES, visible for example in wind power (see Figure 5). The increase in electricity generation by wind turbines was at the level of 23.4%, which is two times lower than the increase in 2014/2013 (up to 47.2%) (Mężyński, 2014: 50). Wind turbines are the driving force in the RES

² The survey was conducted among 583 respondents who lived in Poland and were at least 25 years old. Most questions were directed to people responsible for choosing energy supplier in the household.

industry development and have been growing at the fastest pace in recent years. The president of IEO, Mr G. Wiśniewski (2015a) estimates, that if Poland falls short of 2.1% off the intended RES share, the country will be liable to make a statistical penalty transfer of 1.8 billion EUR, that is 7.5 billion PLN. Achieving the EU objectives will be quite difficult in Poland.

Figure 5. The pace of meeting the EU obligations by Poland



Source: (G. Wiśniewski, 2015a)

It is worth to mention that the whole renewable energy sector only amounts to 1% of the whole electrical energy market in Poland (Zajączkowska, 2015:9). The summer season sees solar energy investments as the most crucial, while Poland shows the lowest share of PV installations per capita, barely 1 W per person (Wiśniewski, 2015b: 25).

The prosumer market may serve a quicker way of meeting the EU norms, photovoltaic market in particular (Thon, 2015). According to the report “Technology Scenarios for the Polish Energy Market through 2050” it is likely that in 2050 prosumers will be responsible for the production of as much as 25 TWh of electricity, i.e. almost half of the electricity produced by decentralized sources. It is estimated that, production of energy in decentralized sources may rise from 4.7 TWh to 52 TWh by year 2050, whereas the largest increase, even up to 25 TWh, is expected in the field of photovoltaic prosumer installations.

Talking about the nearest future, it is estimated that in 2020 electric power from micro-installations and aggregate heat based on renewables will achieve 38,5 TWh (for electrical energy 2,9 TWh). In such a case, c.a. 2,5 million Poles could become the prosumers (Instytut Energetyki Odnawialnej, 2013).

6. Final remarks

Renewable energy sources (RES), as a part of the green economy, enhance energy security through reliance on domestic energy sources, help curb global warming, provide opportunities for satisfying the energy needs and contribute to the protection of human health caused by air pollution, especially in the threat of the low emission problem in many Polish cities during heating seasons. RES development is a crucial issue for sustainable energy development, which is the part of economics of sustainable development. Sustainable economics, the newborn science, indicates the need to change course towards a sustainable energy future - one that simultaneously meets the energy needs of a growing global population, and addresses environmental concerns, especially climate change (El-Ashry, 2014).

The penetration of new technologies in power generation, such as renewable energy sources, leads to positive changes in the energy mix, better use of resources, and rising energy efficiency. The new concept of house energy generation enables the prosumers to generate the power for their own needs in their own house and sell the surplus of power to the power grid.

Summarising, every fifth Pole may become a prosumer and play an active part in energy market, while reshaping the current energy system. Prosumers in Poland may improve energy security by decreasing dependence on imported fossil fuels and by diversifying energy supplies. Thanks to the energy generated domestically Polish economy would be less exposed to supply disruption and price shocks. However, it concerns a new approach to energy management at the national and local scale. Changes should have systematic and complex character. Unfortunately, nowadays in Poland we may observe the return to the coal support policy. The question is whether the threat of being disciplined by the European Commission will accelerate the introduction of support mechanisms for RES development, including prosumer micro-installations.

Consistent implementation of distributed energy will be an action requiring a change within the energy market forces, which is currently dominated by large energy companies. It will be an endeavour requiring a number of changes in technology, energy storage, perception and attitude of society and state authorities towards modern, environmentally-friendly forms of energy. These changes should result in a change of perceiving alternative energy investments as technologies which threaten the presently supported coal industry. They should rather be seen as a complementary, a supplement to the current energy mix and as conducive of increasing the country's energy security. For this, however, given the current political situation in Poland, citizens will have to wait a few more years.

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Profil polskiego prosumenta i jego tło polityczne

Streszczenie

Ciepłne elektrownie węglowe nie były w stanie i nie będą, w obliczu narastających zmian klimatycznych, zaspokoić zapotrzebowania na energię w kraju. Skutecznym rozwiązaniem istniejącego problemu jest dywersyfikacja źródeł energii i inwestycje w rozproszone, odnawialne źródła energii. Dodatkowo czynnikiem, który może zwiększyć bezpieczeństwo energetyczne obywateli jest generowanie energii elektrycznej na własne potrzeby w miejscu jej konsumpcji, czyli w gospodarstwach domowych. Prosument staje się realnym uczestnikiem rynku energii w Polsce. Na ile istotną rolę może on odegrać w systemie elektroenergetycznym? Jaki jest profil i potencjał polskiego prosumenta? Na tak postawione pytania autorka postara się odpowiedzieć w tym artykule, definiując pojęcie prosumenta, identyfikując regulacje prawne dotyczące UE i Polski w sferze energetyki oraz analizując perspektywy i możliwości rozwoju prosumeryzmu w kraju

Słowa kluczowe: polskie gospodarstwa domowe, prosument, odnawialne źródła energii, produkcja energii