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LABOR MARKET IN POLAND IN THE CONTEXT OF RENEWABLE ENERGY SECTOR DEVELOPMENT

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ABSTRACT: The aim of this article is to assess job-creating potential of renewable energy sector development and its macroeconomic effects on the labor market in Poland. The paper focuses primarily on electricity generation technologies like wind power stations and solid biomass. Nowadays, Polish policymakers are in search of win-win solutions to the triple challenge of unemployment, climate change and international commitments. The other problem that needs to be dealt with is maintaining and restructuring Polish coal mining industry, which is and will be for the upcoming years the main source of electricity production in Poland. Those actions' aim is to create new jobs, build industries and attract new foreign investments. The following research methods were used in the article: analysis of statistical data obtained from Eurostat and organizations dealing with the collection of statistical data on RES and analysis of literature on the subject. According to the analysis, the labor market in the renewable energy sector is developing rapidly, which will result in the future development of new sectors, which will increase employment in the industry, attract new foreign investments and develop local communities.

KEY WORDS: renewable energy, labor market, economic effects, sustainable development economy

Introduction

Energetics is the key area of industry in most countries of the world in economic, social and political context and therefore fuel and energy complex is under the special supervision of state and while being quite strictly regulated. National security as a whole depends on this complex and its economic constituent elements. The increasing degree of internationalization and globalization of the energy sector and growing energy interdependence between individual countries, confirm the thesis about the countries' inability to ensure their energy security without solving the problems of international energy security at the regional and global levels with particular emphasis on renewable energy sources.

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 and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC which imposed on Poland the obligation to increase the share of renewable energy in the final gross energy consumption by the end of 2020. The Directive sets new conditions for the development of renewable energy production and provides a common framework for the promotion of renewable energy sources. At the same time, it establishes mandatory national general objectives in order to create a possibility to achieve 20% share of renewable energy in the gross end-use of energy throughout the EU in 2020. The goal for Poland is to achieve a 15% renewable energy (RES) share of total final energy consumption by 2020. All those actions have a huge impact on the labor market in Poland and in the EU in general.

The purpose of the article is to analyze Polish labor market in the context of renewable energy sources development, analyzing the current state and future possibilities, RES impact on regional development on an example of Kisielice community.

Results of the research

National security depends on ensuring energy security in terms of diversifying not only sources of supply (using a wide range of energy sources) but also suppliers, routes and transport mechanisms. A country's energy system, based on a few large coal power plants is more susceptible to sabotage than a system based on a dozen scattered low- and medium-power sources. The problems of Polish and EU energy dependence and employment reduction in such industries as mining can be partly solved by developing strong

renewable energy sector as well as building credible partnerships with suppliers, transit countries and buyers. International solutions are also needed to reduce global greenhouse gas emissions.

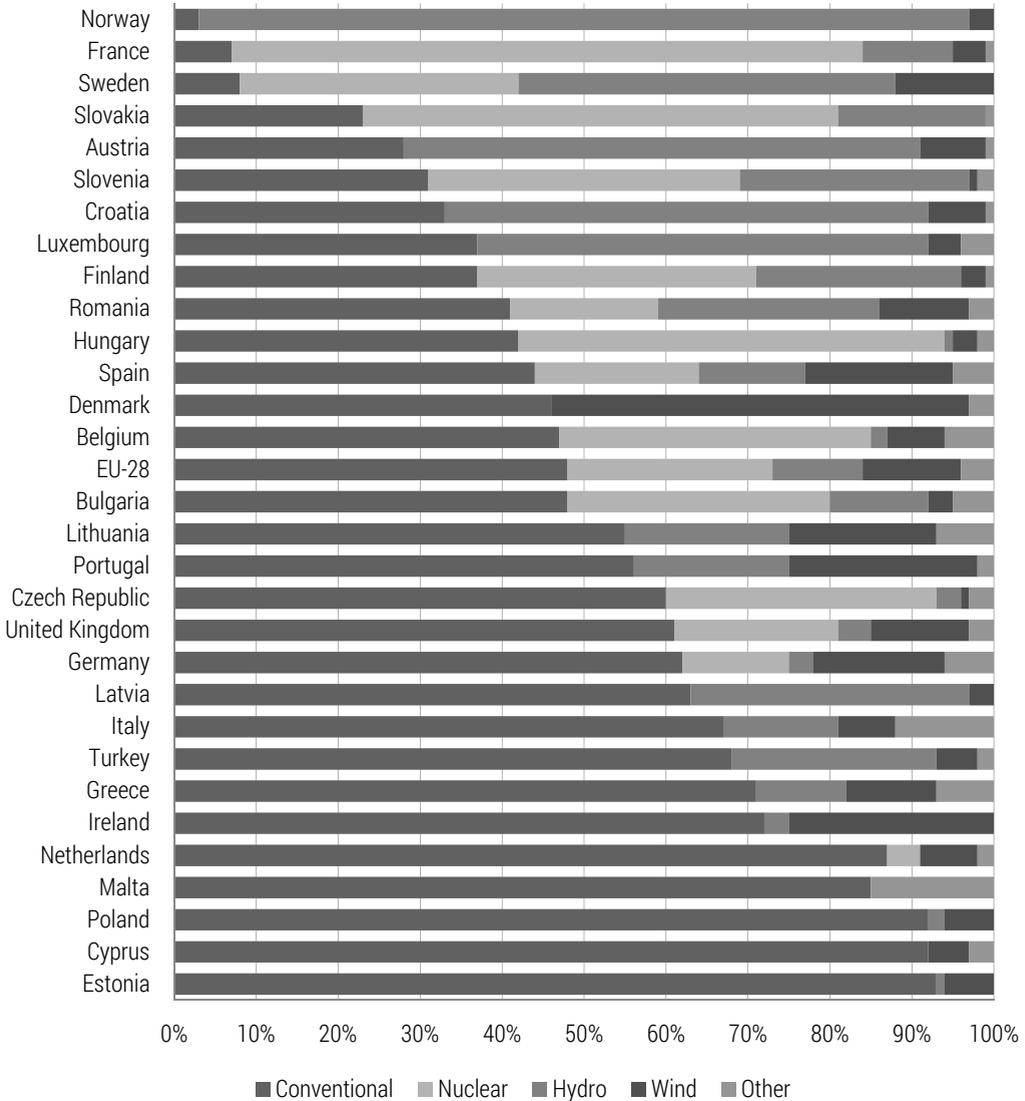


Figure 1. EU breakdown of electricity production by source in 2016 [%]

Source: author's own work based on EUROSTAT.

The diversification of electricity sources in the EU countries by energy source is shown in figure 1. According to data presented in figure 1, Poland occupies the third place in terms of using traditional energy sources, such as coal for electricity production. Poland's power industry has always been based on coal, that is why the largest power units were created near the coal and lignite mines.

Considering the actual conditions and effects of renewable energy sector development, it is important to take into account, in accordance with the constitutional guiding principles of environmental protection, the principle of sustainable development, economic and social factors that determine the development of a given energy sector. At the same time, we cannot forget about the conditions resulting from the need to protect the environment, including natural and landscape values. Poland's energy industry is faced with the need to modernize and strengthen the National Electricity Grid. Worn-out coal-fired power stations need to be replaced with new production capacity. Some of them will still be based on coal, which will continue to be the main source of energy in the next few decades, according to "Poland's Energy Policy until 2030" (Ministerstwo Gospodarki, 2009).

Development of the labor market

The effects of renewable energy industry on the labor market can be observed on the scale of the whole country and the European Union in general. In the European Union, renewable energy sector in 2015 provided employment for 1 139 050 people, including 43 300 people in Poland. In this country, there are many more people employed in RES sector per unit of energy produced as opposed to the average in the UE (table 1). The reason for that might be lower technological sophistication relatively to the leading European countries, for example, in case of Germany – regarding new photovoltaic or wind energy technologies (Graczyk, 2014), or Norway – where its electricity generation is 97% renewable and the Norwegian government is planning on increasing sustainable energy use even more (Invest in Norway, 2017).

Table 1. Energy production and employment in renewable energy sources (RES) sector in Poland and EU in 2016

Technology	European Union			Poland		
	Energy production (ktoe)	Employment (jobs)	Number of employees per unit of production	Energy production (ktoe)	Employment (jobs)	Number of employees per unit of production
Hydropower	30053.0	46150	1.54	202.4	1450	7.16
Wind energy	24491.8	332350	13.57	833.0	11500	13.81
Solar PV, CSP and water heaters	9279.8	148050	15.95	4.9	3850	785.71
Solid biomass	7800.9	314700	40.34	776.2	18800	24.22
Biofuels in transport	13239.3	95900	7.24	780.3	6000	7.69
Heat pumps	8607.1	110900	12.88	25.7	750	29.18
All other renewables	8100.4	91000	112.34	77.9	950	12.2
Overall	101572.3	1139050	203.86	2700.4	43300	879.97

Source: author's own work based on EurObserv'ER, 2017b; EurObserv'ER, 2017c.

It can therefore be assumed, that dissemination of renewable energy technologies will result in increased employment in absolute terms but also in decreasing employment per unit of production, which means increased productivity, and consequently a decrease in unit costs.

The scale of the phenomenon above depends on the current advancement in the application of the technology. The data presented in table 2 indicates, that for example in the case of solid biomass technology and wind energy, in which Poland has a considerable scale of production and experience, employment per unit of production is already lower than the European average. This means that the Polish experience makes it possible to produce more electricity and heat with lower labor input, which makes Poland's RES competitive and attractive for foreign investments. Furthermore, calculations from table 2 and predicted data on the electricity production in Poland till 2030, presented in "Poland's energy policy until 2030" in attachment #2 (Ministry of Finance, 2009) obviously prove, that in 2015 Poland had already outperformed the forecasts.

Table 2. Employment in the sectors of solid biomass (SB), wind energy (WE) and solar energy (SE) in terms of primary energy production in selected EU countries (2015)

Country	Employment (jobs)			Energy production			Number of employees per unit of production		
	SB (2015) – direct & indirect	WE (2015) – direct & indirect	SE (2015) – direct & indirect	SB (2015) Mtoe)	WE (2015) TWh)	SE (2015) MWh)	SB	WE	SE
Germany	45 400	142 900	10 600	12.062	79.206	13 038	3763.88	1804.15	0.81
France	50 000	22 000	5 900	9.661	21.249	2 059	5175.44	1035.34	2.86
Sweden	27 400	6 500	100	9.129	16.268	327	3001.42	399.55	0.30
Italy	22 000	26 000	3 000	7.340	14.844	2 809	2997.27	1751.54	1.07
Finland	23 700	3 300	50	7.901	2.327	37	2999.62	1418.13	1.35
Poland	18 800	11 500	2 750	6.268	10.858	1 413	2999.36	1059.12	1.94
UK	22 300	41 100	750	3.824	40.310	492	5831.58	1019.59	1.52
Spain	15 800	22 500	4000	5.260	49.325	2 586	3003.80	456.15	1.55
Austria	15 450	5 500	2 800	4.474	4.840	3 655	3453.28	1136.36	0.77
Portugal	7 800	2 500	450	2.603	11.608	826	2996.54	215.36	0.54
Romania	11 100	1 100	200	3.521	7.045	136	3152.51	156.13	1.48
UE	314 700	332 350	37 300	91.444	301.893	34 332	3441.45	1100.88	1.09

Source: author's own work based on EurObserv'ER, 2017, p.64; EurObserv'ER, 2017a, p. 10.

The worldwide renewable energy sector employed 9.8 million people, directly and indirectly (with a 1.1% increase in 2016 over 2015). The most consistent increase has come from jobs in the solar PV and wind categories, it has more than doubled since 2012. In contrast, employment in solar heating and cooling and large hydropower has declined. These employment trends can be attributed to several underlying factors. Falling costs and supportive policies in several countries, for instance, have spurred deployment of renewables at a record pace, and have resulted in job creation. However, these positive changes were moderated by lower investments, rising automation and policy changes, resulting in job losses in some major markets, including Brazil, Japan, Germany and France (International Renewable..., 2017).

The shape of the EU climate and energy policy clearly indicates the need to further increase the share of RES in the national energy mix. However, the dynamics of change, the specific value of the national RES target for 2030 and

the contribution of wind energy to its fulfillment still depend on future political decisions. Therefore, the potential impact of wind energy on the Polish labor market until 2030, based for example on the study "Impact of wind energy on the Polish labor market" (Bukowski, Śniegocki, 2015) was determined on the basis of a scenario analysis, where three development scenarios of the sector in Poland: central, low and high were analyzed. It was assumed, that during 2018-2030 investments in onshore wind farms will be as follows: 400 MW/year in central scenario, 200 MW/year in low scenario, and 600 MW/year in large scenario. It should be stressed that the re-acceleration of the development of wind energy sector is a prerequisite for the realization by Poland a binding target for the development of RES till 2020. Therefore, the realization of a low scenario means not only Poland's extinction the development impetus for wind energy, but also a high risk of incurring the costs of failing to comply with the provisions of the EU climate change package.

Polish RES sector reforms, introduced by the Renewable Energy Sources Act 2015 (the 'RES Act'), which came into force on 1 July 2016 marked a significant step forward, however, subsequent amendments to the RES Act have illustrated that the Polish government is in a difficult position of striking a balance between developing RES for energy diversification and rescuing its coal industry. It is estimated that around 80% of Polish coals mines (mainly concentrated in the south-west region of Silesia) are unprofitable, the sector employs around 104000 people, with another 208000 people on miners' pensions (Pacula, 2017). Poland has Europe's largest hard coal reserves, thermal coal and lignite accounted for 84% of the country's electricity generation in 2015 (Easton, 2016). Despite governmental subsidies, Poland's coal mining industry debts are still huge (Wood, Broom, 2017).

It is to be expected that despite the increased productivity of the industry, wind energy in Poland will generate more jobs per unit of energy than coal energy sector in subsequent decades, especially after employment restructuring in hard coal mining.

Comparing employment level for RES sector with other sectors shows the scale of the impact of renewable energy development on the labor market in Poland and on the country's economy overall. Currently, the total number of jobs (table 2) created because of the development of wind energy (11 500), solid biomass (18 800) and solar energy (2 750) exceeds employment in the coke industry (4 000), cement (6 000) and lignite mines (5 000). In 2030 wind energy might create more jobs than coal mining which, after the inevitable restructuring, according to Warsaw Institute of Economic Studies (Bukowski, Śniegocki, 2015) will employ about 4 to 16 thousand people. In contrast to the mining industry, the long-term perspectives arise from factors, which are beyond national control (for example the situation on the

global coal market, the ban on unprofitable mines in the EU and other). The development of wind power sector will depend, to a large extent, on the shape of the regulations introduced in Poland. It is worth noticing, that jobs that are dependent on wind energy sector are not concentrated in large industrial plants, and therefore less visible than employment in traditional heavy industry and mining. It should also be taken into account that rising automation in extraction, overcapacity, industry consolidation, regional shifts, and the substitution of coal by natural gas in the power sector result in job losses in the fossil-fuel sector in some countries. Poland has two options in this sector – either to invest in the mining sector (for example in new technologies) to increase efficiency and reduce costs, in order to be competitive on local and international levels – which would lead to a reduction in the number of employees or to continuously subsidize the mining industry in order to artificially sustain the sector and its employment. Moreover, climate policies and the rise of renewable energy usage may add pressure on the sector. In some power markets, the increased integration of variable renewable energy in the grid is already creating financial issues for incumbent fossil fuel based generators (IRENA, 2017).

Employment in the coal industry is decreasing due to several factors such as power plants closing, overcapacity and improved mining technologies. China, for example, produces nearly half the world's coal, but excess supply and a slowing economy have led the government to plan closing of 5600 mines (Stanway, 2017) as well as cancelling plans to build more than 100 coal-fired power plants (Forsythe, 2017) which can lead to the loss of 1.3 million coal mining jobs, which equals 20% of the total workforce in the Chinese coal sector (Yan, 2017). The Chinese government intends to spend more than \$360 billion through 2020 on renewable power sources and to increase employment in this sector to 13 mln people (Total investment..., 2017).

The solar energy sector in Poland is one of the few exceptions with a rising statistics. According to the data presented in table 2, Polish solar industry employs 2 750 people and generates a turnover of 230 million euros.

According to the author's research (Wasiuta, 2014), the construction of different types of RES sources in communities provides an additional source of income for them. The results of the study indicate that the construction of – for example – wind power plants is not only an opportunity for the local community to create additional employment, but it is also an opportunity to enrich the community with various types of taxes.

In the times of frequent protests organized by local community members against the construction of wind turbines it is worth looking at places where wind farms coexist with the residents. The Kisielice community (*Gmina Kisielice*) in Poland is an interesting example of such situation. The local authori-

ties have found a way for a modern, ecological direction of change while ensuring a continuous flow of financial resources, also being the first and only energy self-sufficient community in Poland. Wind energy has been implemented there consequently since the late 1990s. The local community is happy, farmers are happy when their land is chosen for an investment, because they get a fair salary. Also the protection of the environment is a positive aspect for everyone while using RES sources. Projects aimed at using biomass and cogeneration for heating in the community have been implemented since 2003, led to the closure of coal-fired boiler houses, coal and oil heating systems in detached houses are being abolished successively. According to authors research (Wasiuta, 2013) – 80% of respondents consider it to be significant or moderately significant that the development of renewable energy will contribute to regional development in the forms of self-employment and increasing jobs in that region which contribute to the development of different economic sectors, the development of transport infrastructure. Furthermore, according to authors research (Wasiuta, 2013) – more than 96% of analyzed communities consider tax revenues to the municipal budget to be one of the biggest benefits of RES development for the municipalities.

Summary and conclusions

Renewable energy sources sector creates diverse jobs in production, services and construction, requiring a variety of qualification and skills. Its development not only increases but also improves the quality of jobs in the industry.

The slowdown in the development of second biggest Polish RES sector, which is wind energy sector resulted from regulatory uncertainty when working on a law on renewable energy sources has led to a reduction in the scale of the related employment by 3.5 thousand people (Bukowski, Śniegocki, 2015) in 2012-2014. Due to the unfavorable regulatory environment, this trend will probably continue over the next few years.

Increase in employment requires a new impetus of investments, which in the next decade the dynamics of jobs created for example by wind energy sector, primarily will be determined by the size of expenditures for the construction of offshore wind farms.

Dissemination of any renewable energy technology will result in an increase in employment in absolute terms, but the decrease in employment per unit of production. Employment in relation to installed capacity in Poland is higher than the average in the EU (table 1). There is considerable potential for growth in revenues from renewable energy production (for example from income tax) and increasing employment in this sector.

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