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## **A STUDY OF THE LABOUR MARKET OF RENEWABLE SOURCES OF ENERGY IN POLAND<sup>1</sup>**

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**Summary:** The main purpose of the article is to analyse the renewable energy sources labour market in the country based on the example of survey studies conducted in Lower Silesia in 2010 commissioned by the Marshal's Office. The author took part in the discussed project as a member of the research team and is the co-author of the final publication. The study was conducted as part of a project by the Department of Economic Development of the Marshal's Office of the Lower Silesian Voivodeship in 2010 entitled "Prognoses and analyses of the potential of the Lower Silesia to use renewable energy sources". The article has analysed the following: employment in the RES sector, revenues and savings due to RES, and human resources. The author has also identified the pro-employment effects in the RES sector on the domestic and EU markets; she has also made prognoses for the demand for work in the RES sector. Study results show that the increase of employment in the sector resulting from the increase in production and installed power shall be related to biomass, solar power, and wind power technologies. From the data pertaining to employment in Lower Silesia one may conclude that the RES sector employs mostly specialists, managers, and physical labourers. Unmet demand for physical workers in the forestry and agricultural sectors is visible.

**Keywords:** renewable energy sources, labour market, investigations.

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*The future starts today, not tomorrow*

Jan Pawel II

### **1. Introduction**

Energy policy of Poland until 2030 [*Polityka energetyczna Polski... 2009*] predicts an increase of the prices of electric energy for industry of 61% and for households of 44% in the years 2010-2020. Prices of network heating shall rise in the considered

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

period by more than 40% for both groups of customers [*Polityka energetyczna...* 2009]. The main reasons for the increase in prices are greater environmental demands from the providers of energy, higher payments for the permissions to emit CO<sub>2</sub>, as well as the prices of primary media of energy. The consequent energy policy of the EU meant to decrease the amount of CO<sub>2</sub> emissions, and increase the use of RES (renewable energy sources) in each of the member countries, obligating also Poland to achieve 15% share of renewable energy in the final gross energy use in the year 2020 [*Directive 2009/28/EC of the European Parliament*]. Therefore it seems necessary to intensify the use of alternative energy sources, that not only meet environmental requirements, but also, as shown in the latest report of Ecofys for the European Commission, are cheaper technologies from the conventional methods of producing heat or electrical energy. The report demonstrates that the cheapest source of energy are land wind farms (cost of energy is 105 €/MWh). The cost of producing energy from coal oscillates between 164 and 233 €/MWh, in gas sources: 129-164 €/MWh, with photovoltaics it is 217 €/MWh, and in atomic power plants: 133 €/MWh [Alberici, Boeve, Breevoort 2014].

The main purpose of this article is to analyse the labour market of renewable energy sources in our country using the example of survey studies of the Lower Silesian Voivodeship in 2010 commissioned by the Marshal's Office<sup>2</sup>. The subjects of analysis shall be: employment in the RES sector, revenues and savings due to RES, and human resources. The author shall also identify pro-employment effects in the RES sector on the domestic and EU markets, and make a prognosis of the demand for labour in the RES sector.

## 2. The RES labour market in the EU and in Poland

In Poland the pro-employment effects of RES technologies (the number of employees per unit of energy produced) are higher than the average in the EU (see Tab. 1). The reason for this may be the lower technological sophistication relatively to the leading countries (for example, in the case of Germany, regarding new photovoltaic or wind technologies). One may estimate that the development of RES shall cause the growth of employment in absolute numbers, but a decrease per unit of energy [Graczyk 2011]. We must keep in mind the way that the number of employees per 1000 MWe is counted. For example, in large Polish energy companies with government capital it shall be higher than in completely privatized power plants. The results demonstrate that so-called auxiliary services, necessary to keep the plant in operation, are outsourced (power engineering). Repair and transport services are not employed

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<sup>2</sup> The author took part in the discussed project as a member of the research team and is the co-author of the final publication. The research was conducted as part of the system project of the Department of Economic Development of the Marshal's Office of the Lower Silesian Voivodeship in 2010 entitled "Prognoses and analyses of the potential of the Lower Silesia to use renewable energy sources" as part of the PO KL and realized by IMAS and Sygma Sp. z o.o.

by privatized power plants. Repair employees often run their own private firms. In practice the same number of people work at the power plant, but some of them are not employed by the plant itself.

Another example is the pro-employment effect seen in the case of wind power engineering, where the installation of ever more modern turbines with greater power contributes to the decrease of the number of employees per unit of power.

**Table 1.** Employment in the RES sector in Poland and the EU in 2008

Technology	Unit of measurement of production	European Union			Poland		
		Energy production	Employment	Number of employees per unit of production	Energy production	Employment	Number of employees per unit of production
Altogether			657 740			20 720	
Solid biomass	Mtoe	70,292	195 540	2781,82	4,739	11 900	2511,08
Wind energy	TWh	117,953	187 250	1587,507	0,833	1 600	1920,768
PV	MWp	9 689,952	105 845	10,92	1,011	50	49,46
Biofuel	ktoe	7 968,98	57 010	7,15	97,00	4 170	42,99
Solar energy	MWth	19 982,7	42 400	2,12	255,9	1 200	4,69
Geothermal energy	ktoe	689,2	29 395	42,65	11,5	100	8,70
Biogas	ktoe	7542,1	24 490	3,25	131,7	500	3,80
Small hydro	GWh	43545,5	15 540	0,36	895,6	1300	1,45

Source: [Graczyk 2011; *Etat der energies renouvelables en Europe* 2009].

For the assessment of the RES labour market it also is important to know the advancement of a given technology. In biomass technologies based on solid biomass Poland has a lot of experience and a large scale of production; pro-employment effects are lower than the European average [Graczyk 2011].

A great impact of the state's energy policy on the RES labour market is visible. In accordance with the provisions of the project of the law act on renewable energy sources [*Projekt ustawy o odnawialnych...* 2013], the development of microgeneration is preferred, including photovoltaic projects. In the last quarter of 2012 an increase of photovoltaic projects was noted, generated by production companies (photovoltaic cells), as well as by those which introduce solutions regarding energy efficiency. There was an increase in the demand for specialists experienced in the purchase and selection of photovoltaic installations mounted on buildings or factories (see Tab. 2). There was also an increase in experienced experts in acquiring land in relation to the necessity to efficiently implement procedures related to finding and leasing real estate in demand on the market. In the sector of wind power most companies declare that they have sufficient human resources. Still in demand are

**Table 2.** The most popular positions for specialists sought in the RES sector in 2013

Specialists sought in the RES sector in 2013	Monthly gross salary [PLN]
Land acquisition expert	6 000-10 000
Photovoltaic installation purchase and selection specialist	7 000-9 000
Biogas and heating installation designer	7 000-10 000
Electrical engineer	8 000-14 000
Construction engineer executing construction on part of the investor or contractor	10 000-15 000

Source: [Maciaszek 2013].

those who are able to execute construction on part of the investor, contract engineer, and contractor company. Currently the entities operating in this market have begun to develop projects of photovoltaic farms with an output exceeding 10 MW. We are also expecting an employment boom in the biogas market related to a series of acquisitions of development companies. The demand shall be directed towards project managers on the realization side, designers of biogas and heating installations.

### 3. Survey studies in Lower Silesia

The purpose of the survey studies was to identify and analyse the issues regarding the labour market in the RES sector in the area of Lower Silesia in Poland. The research was conducted in 2010 by the IMAS company among companies/institutions engaged in the RES sector, that are employees in the sector, and among representatives of Labour Offices. Almost all counties of Lower Silesia were represented in the studied sample. The most numerous group came from Wrocław county (20%), next Oleśnica (9%) and Dzierżoniów (7%). Interviews were conducted with people holding the highest positions – owners and co-owners (43% of interviewed persons), directors, presidents, board members of the firm/institution (32%).

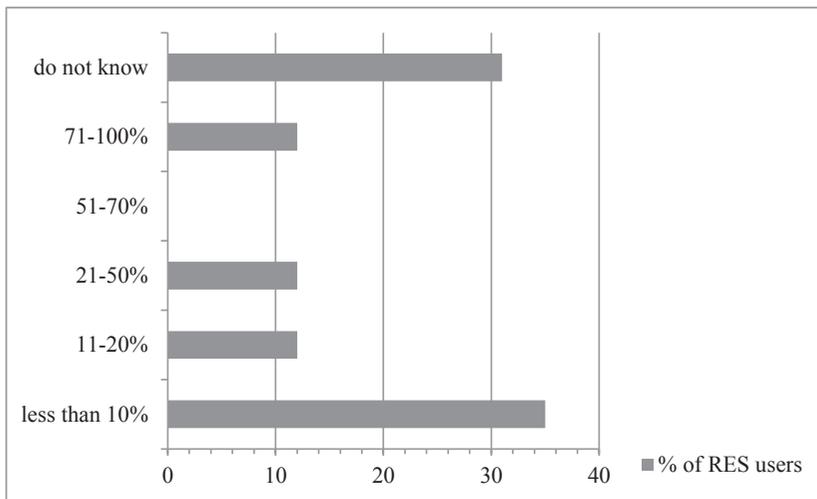
Among employers three main groups were identified. The first, that made up 35% of the studied sample, included producers, distributors, and sellers of electrical energy or gas. The second (26%) included so-called users, that is companies or institutions that use RES products and devices, e.g. heat pumps and solar panels. The third group consisted of producers and sellers of renewable installations (24% of interviewees). A large majority of studied firms were service firms (53%), one company in four could not unambiguously state its dominant activity (26%), and 14% of companies operated in industry, 6% in commerce, and only 1% in transport. One firm in three was a one-man business and 32% were limited liability companies. Nearly half of the studied firms have worked in the sector for 5 years, 36% from 5 to 10 years, and only 16% for more than 10 years. Young firms produced and distributed mainly RES devices (29%) or only energy (31%). Firms that operated for no more than 10 years were mostly the users of RES equipment (36%), and the

firms with the longest time in the business sold energy or produced it. Half of the studied firms were microenterprises, employing no more than 9 people. One in five firms (23%) employed 10 to 49 people (a small firm). Medium-sized firms (20%) employed 50 to 249 people, and the largest (8%) over 250 people.

Among the areas of RES in which the firms operated solar power dominated (28%) together with biomass (34%) (combustion boilers). The activity of companies focused mainly on tree biomass and straw. 15% of studied firms were involved with wind power, 11% with geothermal, and 7% with water power [*Badania i analizy...* 2010].

### 3.1. Revenues and savings due to RES

It was studied what savings were made by firms thanks to the employment of RES for own requirements. Figure 1 shows the percent of savings generated by RES. As many as 35% of interviewees declared 10% savings. However, almost a third of users could not estimate the percentage of savings. Commercial users of RES that gained revenue from them (49% of them) gained at most 20% of revenues thanks to the use of these technologies. A minority of users (30%) had at least 70% revenues

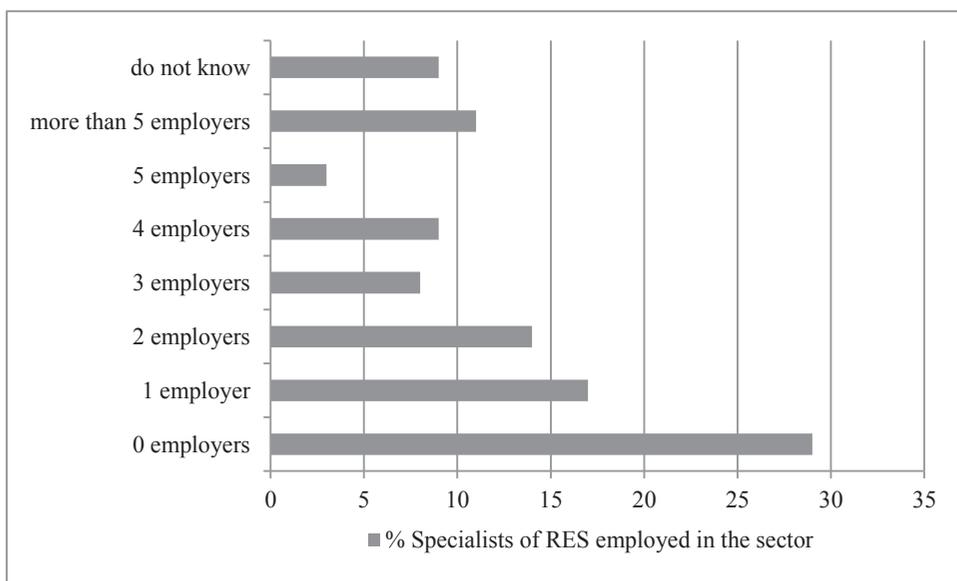


**Figure 1.** Savings made by firms thanks to the employment of RES for own requirements

Source: own elaboration based on [*Badania i analizy...* 2010].

### 3.2. Employment in the RES sector

Over 70% of employers declared employment of at least one worker related to the RES sector (see Fig. 2). Almost 30% of enterprises did not employ workers



**Figure 2.** Specialists of RES employed in the sector [%]

Source: own elaboration based on [Badania i analizy... 2010].

related to RES. Only 11% of enterprises employed more than 5 workers. It is worth noting that these were mainly companies working in the sector for less than 10 years, producers or distributor of energy or of RES equipment. Employed persons worked as engineers, specialists (38%), managers (32%) or physical labourers (54%). The employed specialists have engineering degrees related to environmental protection, environmental engineering, power engineering, mechanical engineering, or economics [Badania i analizy... 2010].

### 3.3. Prognoses of demand for labour in the RES sector

Most of the studied companies (57%) do not plan to employ workers in the RES sector in the next three years. One in ten shall expand their business and employ more than 5 new workers. Among the firms that plan to increase employment, most intend to offer positions to specialists, engineers, managers, and physical labourers. Administrative jobs are offered relatively rarely. Among specialists mostly persons with the following degrees find employment: economic, mechanical engineering, power engineering, and environmental engineering. According to the analysis of data regarding the demand from potential employers in Labour Offices in Lower Silesia, the demand for specialists related to RES is much higher: fitters, machine operators (974 offers), technicians (419 job offers) and farmers (301 offers). Significant

demand was also offered for non-specialized workers, e.g. for field work, plant cultivation, and animal husbandry (409) [*Badania i analizy...* 2010].

### 3.4. Assessment of human resources in the RES sector

Most entrepreneurs did not have trouble recruiting new employees, one in five judged it to be an easy process. Employing a sought specialist seemed to employers, especially to producers or distributors of energy, to be much more difficult than of other potential workers. The most important obstacles mentioned by entrepreneurs are lack of professional experience, lack of proper knowledge, competences, skills, and too high financial expectations. Most firms, however, do not see any problems with recruiting (56%) [*Badania i analizy...* 2010]. Data from the Lower Silesian Voivodeship Labour Office show that the supply exceeds the demand for specialists, technicians, machine operators and fitters many times.

The case is reverse when it comes to auxiliary workers for field work, forestry, plant cultivation, or animal husbandry. An unmet demand for physical jobs may mean problems for firms involved in biomass, because most substrates require the employment of physical labourers (see Tab. 3). One must remember the fact that people registering in Labour Offices are the ones who do not find employment outside the offices, and the demand for specialists may be realized outside the offices. According to the estimates of the Lower Silesian Voivodeship Labour Office 25%, and according to the estimates of the County Labour Office as many as 37% of registered unemployed citizens are low-qualified persons. One should also consider the motivation of these people to find work, as well as their determination and other factors determining whether they start work not necessarily related to the qualifications of the employed persons (some substrates for the production of biogas, municipal waste or fecal matter, for example, may be unpleasant and socially not acceptable).

**Table 3.** Demand and supply of physical labourers

Occupation	Registered in Labour Offices at the end of 2009	Sought physical labourers at the end of 2009
Auxiliary field workers	33	138
Plant cultivation workers	33	138
Forestry workers	18	133

Source: [*Badania i analizy...* 2010].

Interviewees were also asked if they saw any obstacles for the introduction of RES. One entrepreneur in three pointed to difficulties with subsidies (economic considerations), one in four to bureaucracy, 15% to lack of knowledge or support, and almost one in ten to logistical matters. Accommodation of human resources needs of

the RES sector mainly consisted of external training (three out of five employees). Over a half of this group used external free or subsidized training, and 30% of the group fully paid training.

Labour offices did not, however, offer specialist training for the RES sector. Entrepreneurs were also asked if the company had been filing applications or was leading projects co-financed by the EU or from other public sources in relation to employment in the RES sector. 64% of interviewees said no. One in four interviewees plans to file for subsidy, 13% had already finished projects or are leading them at the moment (mostly European Union projects). Interviewees also had support from public funds, mostly subsidies from the NFOŚiGW or WFOŚiGW (Infrastructure and Environment Operational Program) and the Rural Areas Development program for activity not related to increasing the qualifications of workers. Those who did not benefit from support most of all did not see the need for it, did not see possibilities for support due to the specific character of their industry, but a lot of them simply did not see a possibility for support or were scared off by the excess of bureaucracy.

#### 4. Conclusions

Energy policy of Poland until 2030 [*Polityka energetyczna Polski... 2009*] assumes that in 2020 about 94% of energy used from all renewable sources shall be provided by the four leading technologies: wind power, biogas, solid biomass, and transport biofuels. Increase in employment resulting from the increase in production and power installed with relation to these technologies shall amount to about 56 thousand people in the years 2010-2020, and the total increase in employment for all developed RES technologies in Poland until the year 2020 may reach 60 thousand people [Graczyk 2011]. These prognoses are concordant with the research results from Lower Silesia, where the main areas of RES for the studied companies were solar power and biomass. Wind power was third. An increased supply of labour in these areas of RES was also noted by expert on the sector [Maciaszek 2013]. The research of M. Pol and S. Czaja also confirm a large potential of solid biomass (wood, straw from wheat and canola) in Lower Silesia compared to other voivodeships: Lesser Poland, Silesia and Opole [Czaja, Pol 2014]. Another stimulant of the development of the RES market is political backing. The primary goal of the Lower Silesian Development Strategy is to improve the competitiveness of the region and quality of life while respecting the rules of sustainable development. In the priority named "Building an economy based on knowledge" one of the activities is the support for the transfer of new technologies [Circula 2005]. This also includes support for the RES sector. The growth of local businesses is favorable to innovations and enlivens the job market.

From the data pertaining to employment in Lower Silesia one may conclude that the RES sector provides employment mainly for specialists, managers, and physical labourers, who are perhaps less likely to find employment in other positions. The development of employment in the RES sector is a very slow process. Companies

show moderate interest in new workers. This is additionally confirmed by the fact that as many as 8 Labour Offices out of 15 studied stated that in none of them specialists in the fields were sought. One interviewee declared that a mechanic-welder was sought in his county for a RES investment [*Badania i analizy...* 2010].

Based on the data from Labour Offices one may conclude that on the level of basic competences staff are available for employers. Employers who stated that they had trouble finding suitable specialists suggested the necessity of training, improving knowledge and skills. The problem therefore is not the availability of specialists on the market, but rather their level of qualifications, as well as their unrealistic financial expectations relative to possessed skills.

An unmet demand for physical labourers in the agricultural and forestry sector is also visible. Development of the RES sector in the direction of the disposal of animal faeces, agricultural and food waste will surely increase the demand for simple physical labour, which together with the present trend of insufficient labour supply, may contribute to a slowing pace of the development of the sector.

Adjustment of human resources needs to the demands of the development of the RES sector is done mostly through the training of new or already working employees. A large part is supported from EU and domestic sources, among which the most popular is the WFOŚiGW. Labour Offices do not currently offer specialist training related to RES, and do not analyse the needs of the sector. A positive element is the fact that they declare changes in the next 10 years (7 out of 16 studied offices) towards conducting in-house training (8 institutions), actively contacting employers from the sector, facilitating internships, and support for employers via the reimbursement of costs of creating a job (3 offices). Trainings are an important element helping to provide the supply of labour, especially in light of the fact that potential employees are of average or low qualifications, which, together with the low demand in the sector for qualified workers, is one of the reasons for excess supply of work. Lack of knowledge about the RES sector and low level of awareness among Labour Office workers is a significant barrier for the development of the sector.

The communities of Lower Silesia should become involved in support for investments that increase local energy security that are beneficial for the environment and generate new jobs. All of these conditions are met by investments in renewable energy sources that reduce emissions and increase the quality of atmospheric air. Investments related to creating local heating systems or electrical power systems seem especially beneficial.

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## BADANIA RYNKU PRACY ODNAWIALNYCH ŹRÓDEŁ ENERGII W POLSCE

**Streszczenie:** Głównym celem artykułu jest analiza rynku pracy odnawialnych źródeł energii w kraju na przykładzie badań ankietowych prowadzonych na obszarze Dolnego Śląska w 2010 roku na zlecenie Urzędu Marszałkowskiego. Autorka brała udział w omawianym projekcie jako członek zespołu badawczego i jest współautorką finalnej publikacji. Badania zostały przeprowadzone w ramach projektu systemowego Wydziału Rozwoju Gospodarczego Urzędu Marszałkowskiego Województwa Dolnośląskiego w 2010 roku pt. „Prognozy i analizy potencjału Dolnego Śląska dla wykorzystania odnawialnych źródeł energetycznych”. W artykule analizie poddano: zatrudnienie w sektorze OZE, przychody i oszczędności z tytułu OZE i możliwości kadrowe. Autorka zidentyfikowała również efekty prozatrudnieniowe w sektorze OZE na rynku krajowym i UE oraz dokonała prognozy popytu na pracę w sektorze OZE. Wyniki badań pokazują, że wzrost zatrudnienia w sektorze wynikający ze zwiększania produkcji i mocy zainstalowanej będzie przypadał na technologie związane z biomasą, energią słoneczną oraz wiatrową. Z danych dotyczących zatrudnienia na Dolnym Śląsku można wywnioskować, że w sektorze OZE zatrudnienie znajdują głównie specjaliści, kierownicy oraz osoby wykonujące pracę fizyczną. Widoczny jest też niezrealizowany popyt w sektorze rolnym i leśnym na pracowników fizycznych.

**Słowa kluczowe:** odnawialne źródła energii, rynek pracy, badania.