

An Attempt to Evaluate Absorption of the Funds from the Operational Program Infrastructure and Environment within Action “Generation of Energy from Renewable Sources”

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Abstract

The aim of the study was the evaluation of the absorption of funds from the Cohesion Fund within the Operational Program Infrastructure and Environment for 2007–2013, Priority IX: Environmentally-friendly power infrastructure and power effectiveness, Action 9.4 – Generation of energy from renewable sources. The source material constituted data acquired from the Department of European Funds of the Ministry of Energy (institution implementing the action). The methods of comparative analysis were used for the purpose of the evaluation. The final result of the analyzed action was the performance of 64 facilities in 71 locations for total value of PLN 5 749 million, with co-funding of PLN 1 520 million. Circa 82% of this amount was allocated to 55 investments in “wind power” and the remaining part to 12 biogas plants (9,3%) and 4 power plants powered with solid biomass (8,7%). As a result of the performance of the studied action, the power of the sources generating electric energy increased by 823 MWe, including wind power—by 704 MWe, in plants powered with solid biomass—by 102 MWe, in biogas plants—by 17 MWe. Whereas, in terms of quantity of electric energy projected to be generated within one year, the proportions were slightly different and were as follows: in wind power—1 790, in biomass power plants 650 GWh, in biogas power plants 144 GWh. Among the studied projects, biomass power plants were characteristic of the most favorable values of investment contributions for 1 MWh of planned production of electric energy. Their average value was much lower than in the case of a biogas plant (by 178%) and wind power plants (220%).¹

Keywords: support systems, Operational Program Infrastructure and Environment, renewable energy sources

JEL: Q28, Q42

Introduction

Energy is one of the most important factors determining development and economic growth since each management process must be power supplied. Power management is a key to availability of natural resources and control of their flows determines the power of human control and his relative impact on nature as well as shapes the form of economic systems and influences the individual lifestyle. The importance of energy was highlighted as early as in the 19th century by: Say (in 1803), Mill (in 1848), and Bastiat (in 1850), a precursor of the Austrian school of economics. Significant positive interdependencies between its use and economic growth or energy consumption and economic efficiency measured both in macro and micro scale confirm the significant role of energy (Ayres, Ayres, and Warr 2003; Cleveland et al. 1984; Cleveland, Kaufman, and Stern 2000;

1. [In the journal European practice of number notation is followed—for example, 36 333,33 (European style) = 36 333.33 (Canadian style) = 36,333.33 (US and British style).—Ed.]

Cleveland and Ruth 1997; Hall, Cleveland, and Kaufmann 1986). The analysis of time series also shows that energy and GDP are positively correlated with one another and the increase in energy consumption in sense of Granger causality results in GDP increase (Brown et al. 2011).

From 1850 to 2000 global energy consumption increased 20 times, including consumption of fossil fuels by over 150 times. As a result of the very high and continuously growing consumption of energy mainly generated as a result of fossil fuel combustion and transport development at the turn of the 1960's and 70's, the first signs of an energy crisis started to appear. Intense use and processing of traditional energy sources also has a very negative influence on the natural resources. The main environmental hazards are climatic changes caused by anthropogenic atmosphere warming as a result of the increasing concentration of greenhouse gases, mainly CO₂. There is a justified fear that this phenomenon can constitute a life threat to the majority of people and even the entire civilization (Folmer et al. 1995). Hence, the initiatives of many environmentalists and international organizations aiming to take actions in order to limit the emission of greenhouse gases. One of the reasons for the increase of the use of renewable energy sources which, in all scenarios considered by the International Energy Agency (IEA), replace conventional fuels, grows appropriately with the exhaustion of their reserves and growth of energy prices connected with it. The essence of the climate policy is, therefore, the focus of economic activity on a development path which is less dependent on (or finally independent) of traditional energy sources which are fossil fuels.

Due to the fact that the costs of energy generation (mainly electric energy) from the renewable sources are much higher than in the case of sources using non-renewable energy sources, the development of this market depends on the amount of subsidies (Żylicz 2012). Particular countries decide on the support of energy production from renewable energy sources since it is currently the main manner of performance of national index aims, resulting from the energy-climate package and also, in the near future, from the global climate agreement made during the XXI Conference of the Parties (COP) of United Nations Framework Convention on Climate Change (UNFCCC) held on 30 November – 12 December 2015. The European Union significantly contributes to enhancement of this sector. Since 2000 the most important co-funding sources are the European Regional Development Fund (ERDF) and Cohesion Fund. In 2000–2006 the support from both Funds directed to the projects in this sector was EUR 0,6 billion and, in the next program period (2007–2013), it was EUR 4,7 billion.² In Poland, these funds were allocated in the scope of regional operational programs (ROP) and Operational Program Infrastructure and Environment (OPIE). The study presents the results of the research the aim of which was the evaluation of the absorption of funds from the Cohesion Fund within the Operational Program Infrastructure and Environment for 2007–2013, Priority IX: Environment-friendly power infrastructure and power effectiveness, Action 9.4 – Generation of energy from renewable sources.

1 Research materials and methodology

The source material constituted data acquired from the Department of European Funds of the Ministry of Energy (until 16 November 2015 in the structure of the Ministry of Economy) which was the institution implementing the action. The selection of methods and scope of the support should be compliant with the principle of reasonable management, in practice, the criterion of efficiency constitutes its basis. In the conducted analysis, the index of capital expenditure (in PLN) related to the power of installed devices (in MWe) and amount of electric power planned to be generated within one year (in MWh) was used for the purpose of evaluation of the effectiveness of the capital expenditure and use of financial aid measures spent on production of electric energy from renewable sources.

2. See: Special Report No 6/2014 “Cohesion policy funds support to renewable energy generation—has it achieved good results?” OJ C 215, 9.7.2014, p. 4–4.

2 Characteristics of Action 9.4 – Generation of energy from renewable sources

With the accession of Poland to the European Union there has been a significant increase in availability of financial resources for promotion of the use of energy from renewable sources. At the domestic level, in 2007–2013, it was the Operational Program Infrastructure and Environment (OPIE) within the Cohesion Fund (CF), particularly the following actions: 4.5 – Support for enterprises in the scope of air protection; 9.4 – Generation of energy from renewable sources; 9.5 – Production of biofuels from renewable sources; 9.6 – Networks facilitating the receipt of energy from renewable sources and 10.3 – Development of industry for renewable energy sources. OPIE in the scope of renewable energy sources (RES) was focused on the performance of domestic power policy, traditionally targeted on the development of large, centralized energy generation sources. One of the most important instruments of financial support for such investment was Action 9.4. Its primary aim was the increase of production of electric and thermal energy from renewable sources and, at the same time, reduction of impact of the energy sector on the environment and enhancement of the energy security of the state. The performance of this task was to contribute to faster performance of the obligations resulting from directive 2001/77/EC of the European Parliament and the Council of 27 September 2001 on support of production in the internal market of electric energy generated from renewable sources and directive 2009/28/EC of 23 April 2009 on promotion of use of energy from renewable sources, amending and, in consequence, revoking directives 2001/77/EC and 2003/30/EC.

Within Action 9.4, the following could apply for financial support: entrepreneurs, local government units or their unions, associations and agreements, entities providing public services in the scope of performance of their own obligations of local government units (LGU) as well as churches, church legal persons, their associations and other religious organizations. This action included the investments in the scope of construction or increase of power of units of generation of: electric energy with the use of wind energy, water in small water power plants (up to 10 MW), biogas and biomass, heat at the use of geothermal or solar energy as well as generation of energy from renewable sources in cogeneration (in systems which do not meet the criterion of high-performance cogeneration). In the performed projects, the connections to the nearest existing network were considered, whereas the possibility of support for technology of co-combustion of fossil fuels and biomass or biogas as well as construction or re-construction of power facilities burning municipal waste were excluded. Particular terms of support are specified in the Regulation of the Minister of Economy of 3 February 2009 on award of public aid for investments in the scope of construction and further construction of units generating electric energy or heat from renewable energy sources.³ The Beneficiaries received payment in the form of a developmental grant as the reimbursement of the incurred and documented eligible expenses or as the advance for future expenses. These funds were targeted for enterprises of the value above PLN 20 million gross, except for the investments in the scope of generation of electric energy from biomass or biogas as well as construction or further construction of small water power plants, for which the minimal value of the project was established at the amount of PLN 10 million gross. The aid insensitivity calculated as the relation of a gross grant equivalent and eligible expenses depended on the investment location (from 30 to 50%) and size of the enterprise (it could be increased by 10 percentage points for an average entrepreneur or by 20 percentage point for a micro and small entrepreneur). The maximum amount of support, however, could not be higher than PLN 40 million, which resulted in the fact that part of the projects (especially those of high value) received co-funding lower than one arising from the maximum levels specified in the scope of the map of regional aid. The planned financial allocation from the EU funds for the aforementioned action in the Operational Program Infrastructure and Environment approved by the European Commission on 7 May 2007 was EUR 379,54 million.

The selection of projects for co-funding was performed by way of a closed competition, conducting two receipts of applications on 16 March – 14 April 2009 and 17–31 May 2010. The submitted applications for co-funding were evaluated on the basis of official criteria and substantive criteria

3. See: Rozporządzenie Ministra Gospodarki z dnia 3 lutego 2009 r. w sprawie udzielania pomocy publicznej na inwestycje w zakresie budowy lub rozbudowy jednostek wytwarzających energię elektryczną lub ciepło z odnawialnych źródeł energii. DzU z 2009 r. nr 21 poz. 112.

of 1 degree (project readiness for performance, capital expenditure for 1 MWh of planned energy production, for installation of 1 MW and average operation time in a year) and 2 degree (correctness of financial, economic analysis, correct identification and assignment of project expenses in terms of their eligibility, project technical readiness for performance).

3 Research results

Within two application receipts, 280 applications were submitted for competition 9.4 – Generation of energy from renewable sources, for the amount of PLN 5 103 million. The applicants mainly applied for co-funding of the construction of wind power plants and biogas plants (fig. 1). The higher number of wind power plant projects resulted from, for example, high evaluation of support attractiveness expressed by applicants (as the most profitable from RES) and simpler procedures of acquisition of necessary administrative permits. For small water power plants, in addition to potential environmental decisions and reports of evaluation of environmental impact, water legal permits were required. The other factor favoring wind power were the adopted criteria of project nominal value (PLN 20 million, and in case of biogas plant PLN 10 million). The majority of potential applicants was not able to meet this requirement (projects in the scope of water power plants, solar installations, biogas with power up to 0,5 MWe).

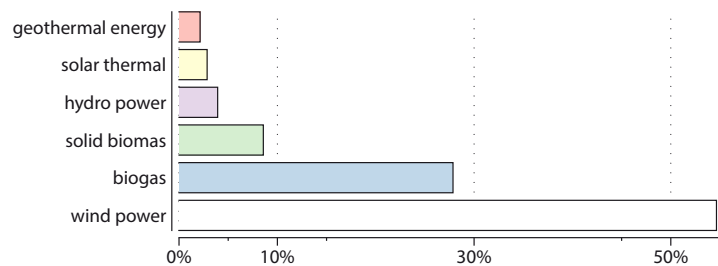


Fig. 1. The structure of applications for co-funding submitted in the scope of Action 9.4 – Generation of energy from renewable sources, according to RES types

Mainly entrepreneurs were the applicants. In the studied action, there was not one applicant of the type: church, church legal person and its association as well as other religious organization. Little interest in submitting applications was also noted among local government units, their subsidiaries—unions, associations and LGU agreements and entities providing public services in the scope of performance of obligations of local government units. The primary cause turned out to be too high a minimum project value (PLN 20 million, and in the case of biogas plant PLN 10 million). In addition, the projects in this scope could be sometimes performed under much more favorable conditions, e.g. in the scope of the Regional Operational Programs or funds of NFEP&WM.

213 applications met the formal criteria. The reasons for rejection of the applications at the stage of pre-selection were various, however, they mainly referred to the completeness of the application, including lack of appendices or negative evaluation of the project feasibility. The majority of these which acquired the positive evaluation (127) applied for co-funding of the construction of wind power plants, next biogas plants (51) and power plants using solid biomass (18). The remaining are investments from the scope of water (10), geothermal (4) and solar collector (3) power. Over a half of the applications concerned the investment location in the voivodships: Zachodniopomorskie (33), Łódzkie (29), Pomorskie (23) and Wielkopolskie (22) so in these regions which are characteristic of very favorable conditions for development of wind power and biogas plants (fig. 2).

The final result of the analyzed action was the performance of 64 facilities in 71 locations for total value of PLN 5 749 million, with co-funding of PLN 1 520 million (table 1 and fig. 3). Circa 82% of this amount was allocated to 55 investments (48 projects) in “wind power” and the remaining part to 12 biogas plants (9,3%) and 4 power plants powered with solid biomass (8,7%). The biomass power plants were characteristic of the highest capital intensity which results from their

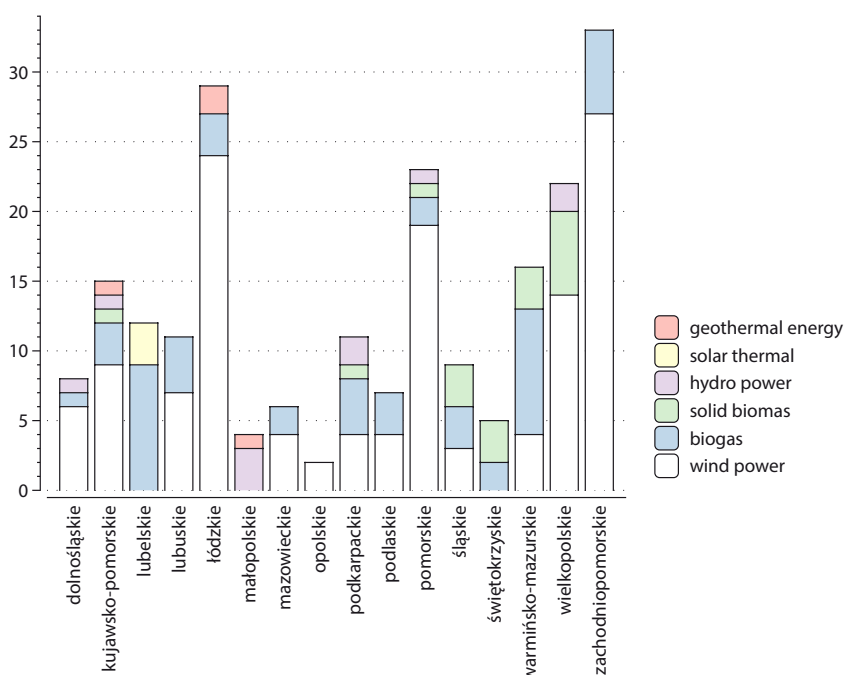


Fig. 2. The number of applications for co-funding applied in the scope of Action 9.4 – Generation of energy from renewable sources, which met the official requirements acc. to voivodships and RES types

Tab. 1. The number of performed projects and incurred capital expenditure in the scope of Action 9.4 – Generation of energy from renewable sources

| RES type | Number of projects | Project value (PLN million) | | | | Co-funding (%) | | | Average power (MWe) |
|----------------------|--------------------|-----------------------------|-----|---------|-------|----------------|-----|---------|---------------------|
| | | Min | Max | Average | Total | Min | Max | Average | |
| Wind power plants | 48 | 21 | 294 | 97,4 | 4 677 | 12 | 64 | 26,6 | 14,7 |
| Biogas plants | 12 | 17 | 40 | 25,5 | 306 | 24 | 58 | 46,4 | 1,4 |
| Biomass power plants | 4 | 49 | 282 | 191,5 | 766 | 14 | 25 | 17,2 | 25,5 |

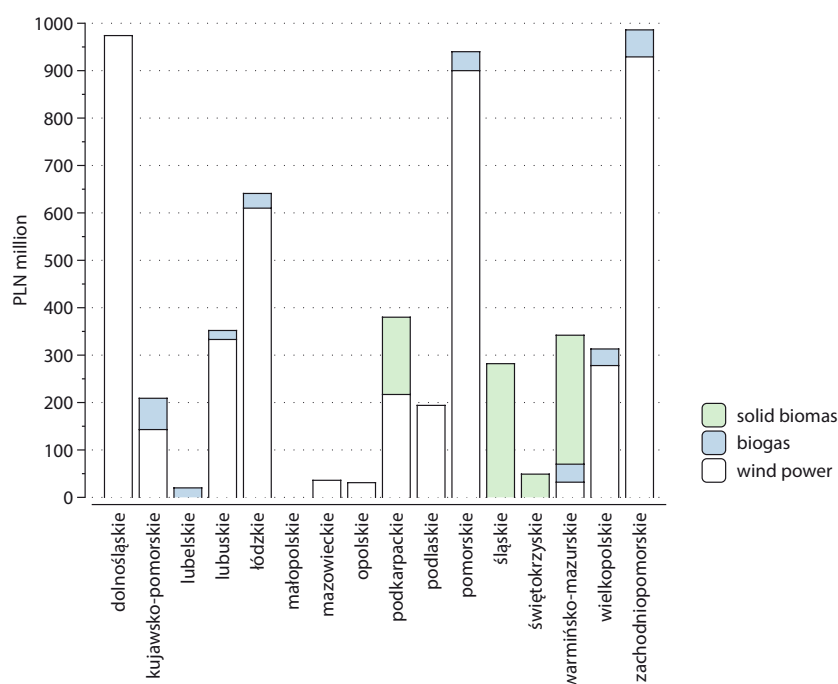


Fig. 3. The value of co-funding of the projects in the scope of Action 9.4 – Generation of energy from renewable sources, which acquired the support according to voivodships and RES

specifics. Average capital expenditure for performance of one facility were two times higher than in the case of wind power and seven times higher than the cost of biogas plant performance. Whereas, the level of co-funding had the reverse dependency and biogas plants had the most favorable index. On this basis, it can be stated that in the period of application receipt, biomass and wind power plants were characteristic of the highest profitability of electric energy generation.

Among these enterprises there were no water power plants nor investments in the scope of geothermal or solar power. The key influence on the fund distribution was the project performance readiness, 16 points out of 44 could be awarded for fulfilment of this criterion. It was evaluated on the basis of having the following documents: building permit, approved technical design, decision on environmental conditions, consent for investment performance and confirmation of financing own contribution. The industry best prepared, both in organizational and financial terms, for application for these funds was wind power. Despite existing barriers and limitations, companies from this section developed more and more effective methods of operation and dealing with market difficulties. In 2005–2008 the installed power in wind power plants increased four times (from 121 to 526 MWe). In the other industries this increase was much lower—in biogas plants it was 57% (from 30 to 52 MWe) and in power plants using solid biomass 63% (from 25 to 40 MWe) (Berent-Kowalska et al. 2012). On the basis of this statistics, it can be stated that investors interested in wind power were better prepared for application procedures.

Over 86% of the performed investments were located in northern and western Poland. The spatial distribution both in terms of value of performed projects and acquired co-funding was at a similar level (fig. 4 and 5). A decisive factor of location of these undertakings was an economic potential of renewable energy sources. Investments from the scope of wind power mainly depended on the access to available surfaces for mounting wind turbines as well as limited infrastructural and environmental conditions (Wiśniewski 2011). In the case of biogas plants, key factors influencing this potential must include, in addition to biomass, environmental and social conditions. As a result of performance of these projects, the power of sources generating electric energy increased by 823 MWe, including: in wind power—by 704 MWe, in plants powered with solid biomass—by 102 MWe and in biogas plants—by 17 MWe (fig. 6). Whereas, in terms of quantity of electric energy projected to be generated within one year, the proportions were slightly different and were as follows: wind power—1 790 GWh, biomass power plants 650 GWh and biogas plants 144 GWh (fig. 7). The reduction of disproportion between installed power and quantity of energy generated

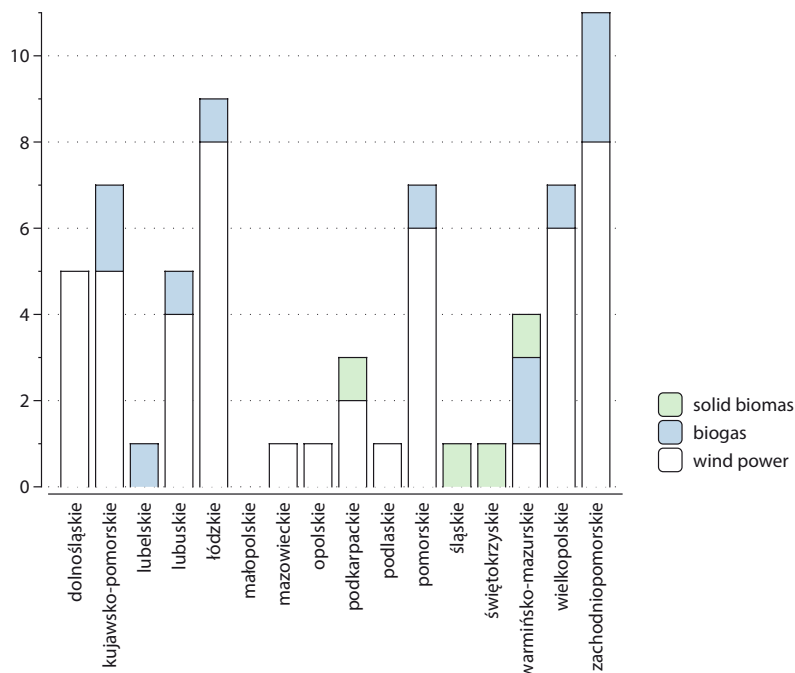


Fig. 4. The number of the projects in the scope of Action 9.4 – Generation of energy from renewable sources, which acquired the support according to voivodships and RES types

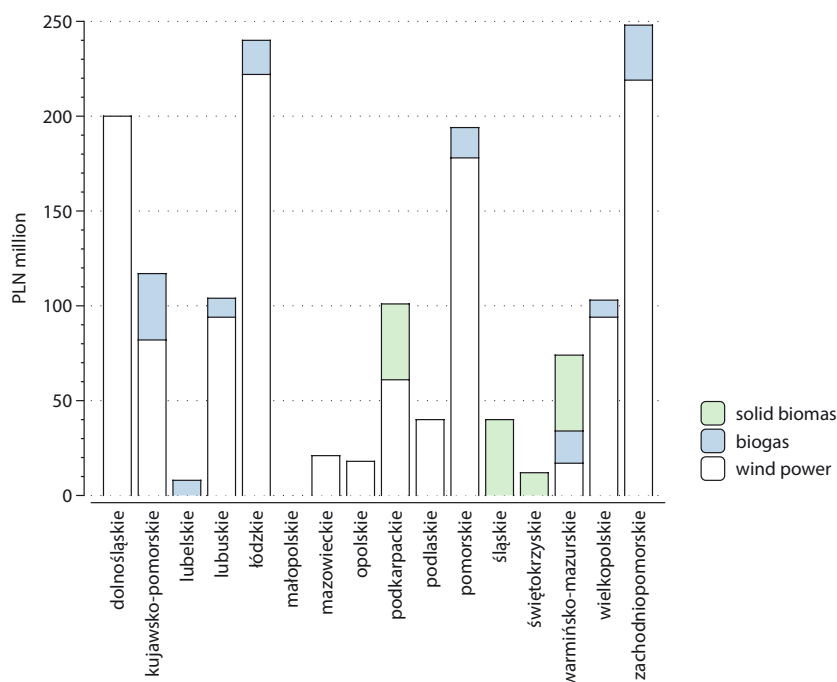


Fig. 5. The value of the projects in the scope of Action 9.4 – Generation of energy from renewable sources, which acquired the support according to voivodships and RES types

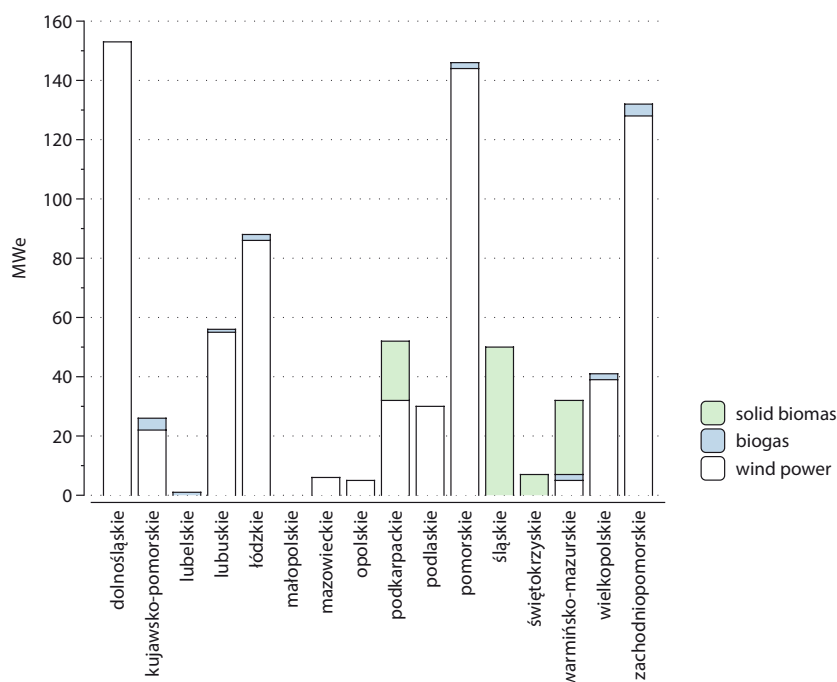


Fig. 6. The installed power in the scope of Action 9.4 – Generation of energy from renewable sources, according to voivodships and RES types

by windmill and the power industry powered with biomass results from significantly longer average operation time of biogas plant and power plant. It is a significant advantage of these sources since it does not require a so-called “hot reserve” in the power disposition system.

The data presented in table 2 shows that wind and biogas power plants were characteristic of the lowest capital expenditure and biogas plants of the highest. However, considering the fact that the main aim of Action 9.4 was the increase of production of electric and thermal energy from renewable sources, the most appropriate measure are unit capital expenditures for energy generation. Among the studied projects, biomass power plants were characteristic of the most favorable

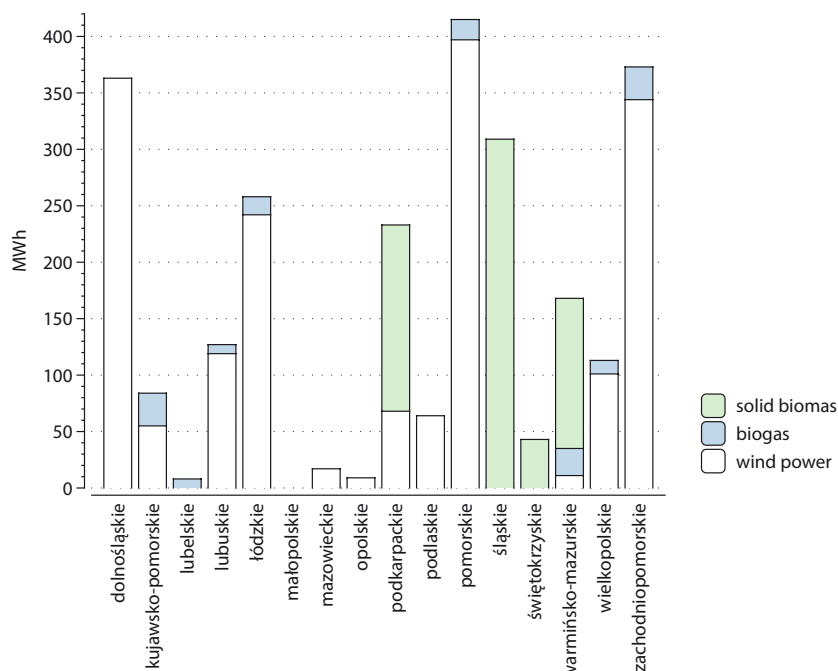


Fig. 7. The quantity of installed power for generation of electric power in the scope of Action 9.4 – Generation of energy from renewable sources, acc. to voivodships and RES types

Tab. 2. Unit capital expenditure for performed projects in the scope of Action 9.4 – Generation of energy from renewable sources

| RES type | Installed power (PLN thousand/MW) | | | Generated energy (PLN/MWh) | | |
|----------------------|-----------------------------------|--------|---------|----------------------------|-------|---------|
| | Min | Max | Average | Min | Max | Average |
| Co-funding | | | | | | |
| Wind power plants | 833 | 5 016 | 1 770 | 273 | 3 117 | 691 |
| Biogas plants | 4 574 | 11 328 | 8 188 | 747 | 1 478 | 977 |
| Biomass power plants | 800 | 2 000 | 1 298 | 129 | 301 | 203 |
| Total | | | | | | |
| Wind power plants | 5 125 | 10 644 | 6 643 | 1 778 | 5 894 | 2 593 |
| Biogas plants | 12 310 | 20 686 | 17 664 | 1 351 | 3 092 | 2 107 |
| Biomass power plants | 5 649 | 10 841 | 7 529 | 914 | 2 042 | 1 180 |

values of this index. Its average value was much lower than in case of biogas plants (by 178%) and wind power plants (220%). The conducted analysis also indicates that the support awarded to the electric power plants for biomass was characteristic of the highest efficiency of achievement in the result index. For this reason, the fact that only four projects of this type were awarded co-funding in the scope of the analyzed action with such favorable evaluations can be thought-provoking. Most of all, it resulted from significant capital expenditure, nearly twice higher in relation to wind projects and eight times higher from biogas projects (tab. 1), which considerably impeded, particularly in the period of crisis, assurance of own capital.

The performed investments even in the scope of one industry were characteristic of very differentiated product indices (capital expenditure for installation of 1 MWe) or result indices (capital expenditure for 1 MWh of planned production of electric energy). They cannot be explained only with returns to scale. The calculated coefficients of correlation between installed power and unit capital expenditure, both in reference to generated energy and installed power, despite their having negative values and being significant, had relatively low values. Due to the attempt of calculation, for wind projects $r = -0,34$ and biogas projects $r = -0,34$.

Summary

The conducted studies show that the investments performed in the scope of the Operational Program Infrastructure and Environment for 2007–2013, Priority IX: Environment-friendly power infrastructure and power effectiveness, Action 9.4 – Generation of energy from renewable sources, had significant contribution to the performance of the National Action Plan for energy from renewable sources, which is also the plan of performance of the 15% aim of participation of RES energy in the balance of gross final energy consumption established for Poland within directive 2009/28/EC. The final result of the analysed action was the performance of 64 facilities in 71 locations for total value of PLN 5 749 million, with co-funding of PLN 1 520 million. Circa 82% of this amount was allocated to 55 investments in “wind power” and the remaining part to 12 biogas plants (9,3%) and 4 power plants powered with solid biomass (8,7%). As a result of the performance of the analysed action, the power of sources generating electric energy increased by 823 MWe, including: in wind power by 704 MWe, in plants powered with solid biomass by 102 MWe, in biogas plants—by 17 MWe. However, in terms of quantity of electric energy projected to be generated within one year, these proportions were slightly different and were as follows: in wind power—1 790 GWh, in biomass power plants 650 GWh, in biogas power plants 144 GWh. The reduction of disproportion between installed power and quantity of energy generated by windmills and the power industry powered with biomass results from the significantly longer average operation time of biogas plants and power plants. It is a significant advantage of these sources since it does not require a so-called “hot reserve” in the power disposition system. Among the studied projects, biomass power plants were characteristic of the most favorable values of investment contributions for 1 MWh of planned production of electric energy. Their average value was much lower than in the case of a biogas plant (by 178%) and wind power plants (220%). The presented research results were elaborated on the basis of the analysis of submitted applications and covered only the capital expenditure. It would be recommended to continue them in the scope of a detailed analysis of their performance. The collected experience can be used for better allocation of funds for generation of energy from renewable sources.

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