The Polish Wind Energy Association

The State of Wind Energy in Poland in 2015









The State of Wind Energy in Poland in 2015

Dear Readers,

The year 2015 was an enormously important period for the wind power sector. The Act on Renewable Energy Sources, adopted last year, introduces a complete change of the support scheme for "green electricity" from renewable energy sources. Those market players who wanted to join the system based on certificates of origin rushed to complete their projects by the end of last year. But now, the "*to be or not to be*" of wind power investors will, to a large extent, depend on winning an auction for green energy. However, in the nearest future we will have to face a slowdown in the industry as a consequence of, among others, the lack of a transition period between the two schemes and the anticipation of the first auction.

Today we have the pleasure to publish the report "The State of Wind Energy in Poland in 2015", prepared by the Polish Wind Energy Association, where we present the most important facts and data on the wind power sector from the last year. Poland is in a particularly important moment for the development of the energy sector.

We are reducing our dependence on fossil fuels, and more and more investors acknowledge Poland's potential in renewable energy sources. Over the last four years the installed capacity in wind power has risen by almost 3,400 MW, reaching 5,000 MW at the end of 2015. This currently amounts to 13% of the entire power system in Poland, and the share of energy from wind in the total energy production has reached 6.21%.

We are replacing a mechanism based on green certificates with an auction scheme, which can be a certain challenge. However, the mechanism introduced by the RES Act is capable of encouraging new investors to build new, green capacity in the energy sector, by guaranteeing them stable and predictable revenues. It all depends, however, on specific provisions such as the size of the budget and the volume of energy allocated to future auctions. For a detailed description of the opportunities and threats related to the introduction of the auction system, see chapter "Legal framework for investment in wind power in Poland".

The provisions introduced by the RES Act do not solve the issue of enormous oversupply of green certificates, which is a problem not only for those investing in wind power, but also in other RES technologies. The provisions of the RES Act turned out to be insufficient to bring a solution to the problem whose sources date back to 2011. Therefore the RES Act needs an amendment with comprehensive solutions. This issue is described in the chapter "Oversupply of certificates of origin".

Apart from the shift from one system to the other, 2015 also brought changes to other important regulations affecting the industry, described in chapter "Environmental protection and investment: selected issues". In March 2015, the Polish Parliament adopted the landscape act[1], showing that it is possible to combine apparently contradictory interests of different sectors, and in October the President signed the amendment to the Environmental Protection Act, focusing on environmental

[1] The Act of 24 April 25 on the amendment of certain acts in order to strengthen the tools for landscape protection (JoL 2015 item 774)

impact of investment projects. Over the last months several draft acts on location of wind farms have also appeared, showing there is a need for discussion on this topic.

Some opponents of wind power claim that Poles are against investing in wind turbines. As an association, whose goals include debunking the myths on wind farms, we hired an independent company to carry out an opinion poll on the perception of wind power by the general public. The results of the poll have shown that on the one hand 72% of Poles, if given a choice of source of electricity for the homes, would choose a wind power plant (rather than coal-fired or nuclear), but have also revealed that some people still believe wind turbines can be harmful to health of both humans and animals. The results of the study, carried out by CBM Indicator, are discussed in the chapter "Public acceptance of wind energy power in Poland".

The more we utilize the potential of wind power, the more benefits it will bring, not only to investors but – more importantly – to the entire Polish economy. In 2015 PWEA was a partner of a study investigating the impact of wind power on the labour market in Poland. The report by the Warsaw Institute for Economic Studies (WISE) shows than in a stable regulatory environment and with favourable conditions for dynamic development, wind power will be able to create jobs for more people than hard coal mining, which has to face inevitable restructuring. The results of the study and future development scenarios, discussed in chapter entitled "The impact of wind power on the Polish labour market", demonstrate quite well how the benefits generated by the sector's presence in Poland are affected by the investment climate created by the decision-makers. Social and economic profits from wind farms can now be even larger, and it is up the government whether Poles will benefit from them.

The UN Climate Change Conference, held in December last year, showed that the world is turning towards putting the national economies on low emissions track, and the European Union, which we are part of, wants an ever further-reaching reduction of greenhouse gas emissions. At the same time, Poland is going to face a shortage of generation capacity. According to estimates of the Polish transmission grid operator PSE, a total capacity of 7 GW in outdated conventional units will have to be decommissioned by 2020, and as much as 12 GW by 2030, while there is only 6 GW of new capacity under construction. Moreover, maintaining the current generation structure will require a gradual entry into the purchase of CO_2.emissions allowances. This will first lead to a modest, and after 2030, when free allowances will run out, to a dramatic increase of energy prices. In the meantime, the cost of electricity produced from wind will continue to decrease. Wind power, which already today is the largest sector of renewables in Poland, can be the answer to many energy-related challenges that Poland has to face. The recent changes in this sector, its current situation and the development of the months to come will show to what extent the potential and capabilities of the wind power sector will continue to be exploited.

Presenting you the "The State of Wind Energy in Poland in 2015" report, I believe it will be a useful compendium of knowledge on the current situation in the wind power industry.

I hope you find the report interesting.

Wojciech Cetnarski
President of the Board
Polish Wind Energy Association

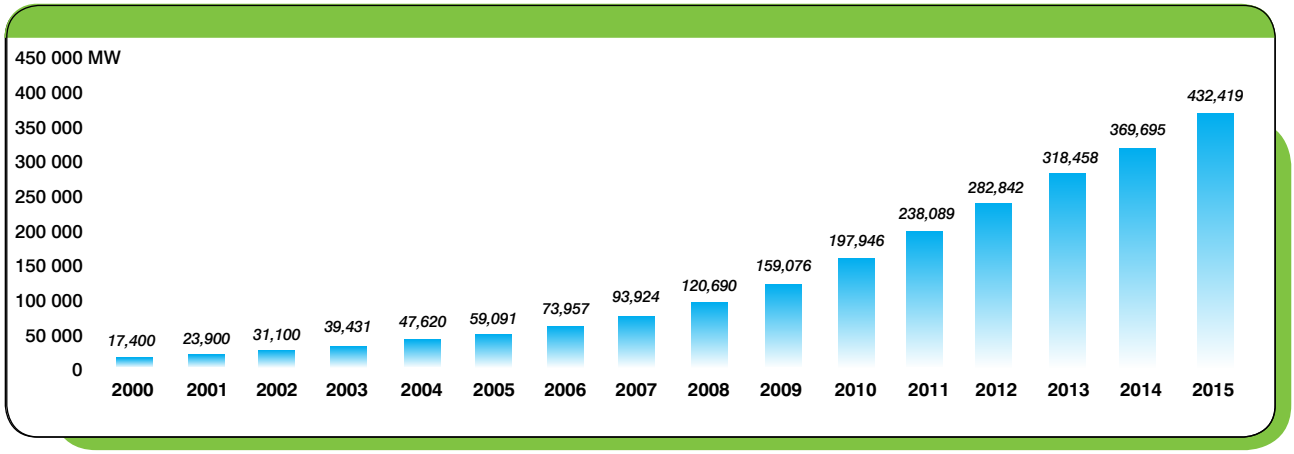
Table of contents

Wind power
in selected EU and non-EU countries compared to Poland

Today, wind power is present in more than 80 countries, out of which 24 have more than 1000 MW capacity installed in wind farms. In 2015 a total new capacity of 63 GW was installed globally. Therefore wind power has a total installed capacity of over 432 GW. New wind farms are built in Asia, Europe, the Americas, Australia, and even Africa. The largest new capacity in onshore wind was connected in China – 30.5 GW, the United States came second with 8.6 GW, and Germany third with 6 GW.[2]

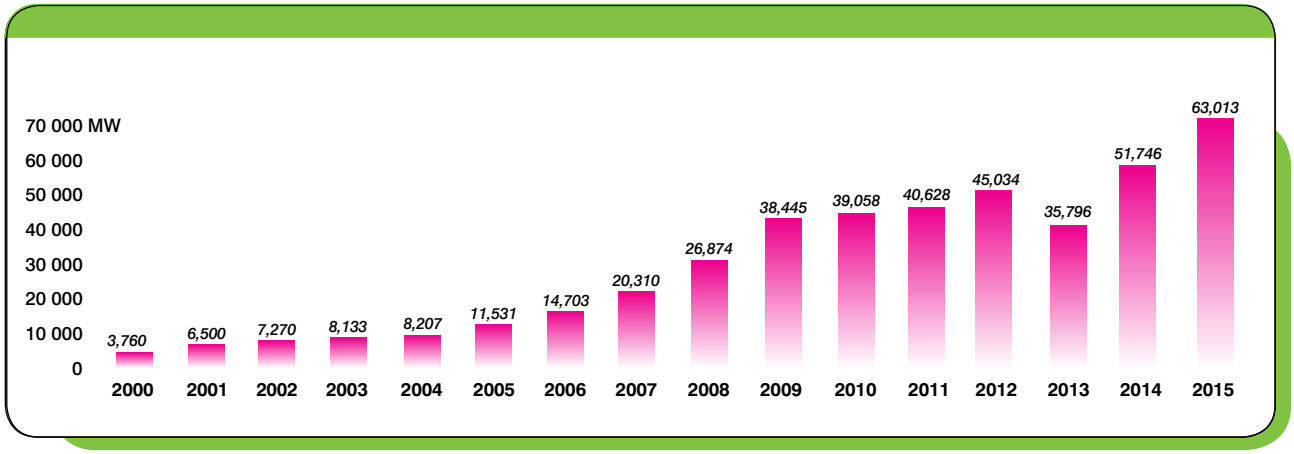
According to the European Wind Energy Association (EWEA), total installed capacity in wind farms in the European Union was 12.8 GW in 2015, with half of it in Germany. In terms of total capacity of newly installed wind turbines in 2015, Poland was second after Germany.

Fig. 1. Global annual installed wind capacity 2000-2015



Source: GWEC

Fig. 2. Global cumulative installed wind capacity 2000-2015



Source: GWEC

[2] "Global Wind Statistics 2015", Global Wind Economic Council, 10 February 2016

GERMANY: increasing RES share is necessary

Facts in brief:

- According to European Wind Energy Association data, total installed capacity in Germany at the end of last year was almost 45 GW. In 2015 only, more than 5 GW of new capacity was added in wind farms. [3]
- Renewables are the most important part of the German energy mix. Thanks to wind power, the share of RES in the German electricity consumption amounted to 32.5% in 2015. As for German electricity production, all RES generate 30%, with onshore and offshore wind taking the largest share of 13.3%. The shares of other renewables in electricity production was as follows: biomass – 7.7%, hydro – 3.0%, photovoltaics – 5.9%. [4]
- The shares of other sources in the German energy mix in 2015: brown coal/lignite – 24.8%, hard coal – 18.2%, nuclear – 14.1%, natural gas – 8.8%, oil and other sources – 4.9.[5]
- Increasing the share of RES in the energy mix is the most important element of the German strategy, with reduction of CO2 emissions and improving energy efficiency.

After the Fukushima nuclear plant disaster, Germany announced plans to phase out nuclear power, with immediate shutdown of eight oldest nuclear plants and closing additional ones in the coming years. A stronger shift towards renewables was therefore a natural consequence. In 2050, 80% of energy is to be generated from renewable sources, mainly wind and solar, and there are indications that this goal might be achieved. In 2015 the share of renewables in German electricity consumption was 32.5% with the largest share of 86 TWh contributed by wind power. [6]

The renewables sector in Germany employed a total of 371,400 people in 2013, that is double the number in France. In the global ranking of employment in renewables and wind Germany comes second after China. The German offshore wind sector itself employed approx. 19,000 people in 2014[7]. Onshore wind provided jobs for approx. 119,000 people, and the number is on the rise.

[3] "Wind in power. 2015 European statistics", European Wind Energy Association, February 2016

[4] "The energy transition in the power sector: State of affairs 2015. Review of major developments in Germany", Agora Energiewende, Berlin, January 2016

[5] "The energy transition in the power sector: State of affairs 2015. Review of major developments in Germany", Agora Energiewende, Berlin, January 2016

[6] "The energy transition in the power sector: State of affairs 2015. Review of major developments in Germany", Agora Energiewende, Berlin, January 2016

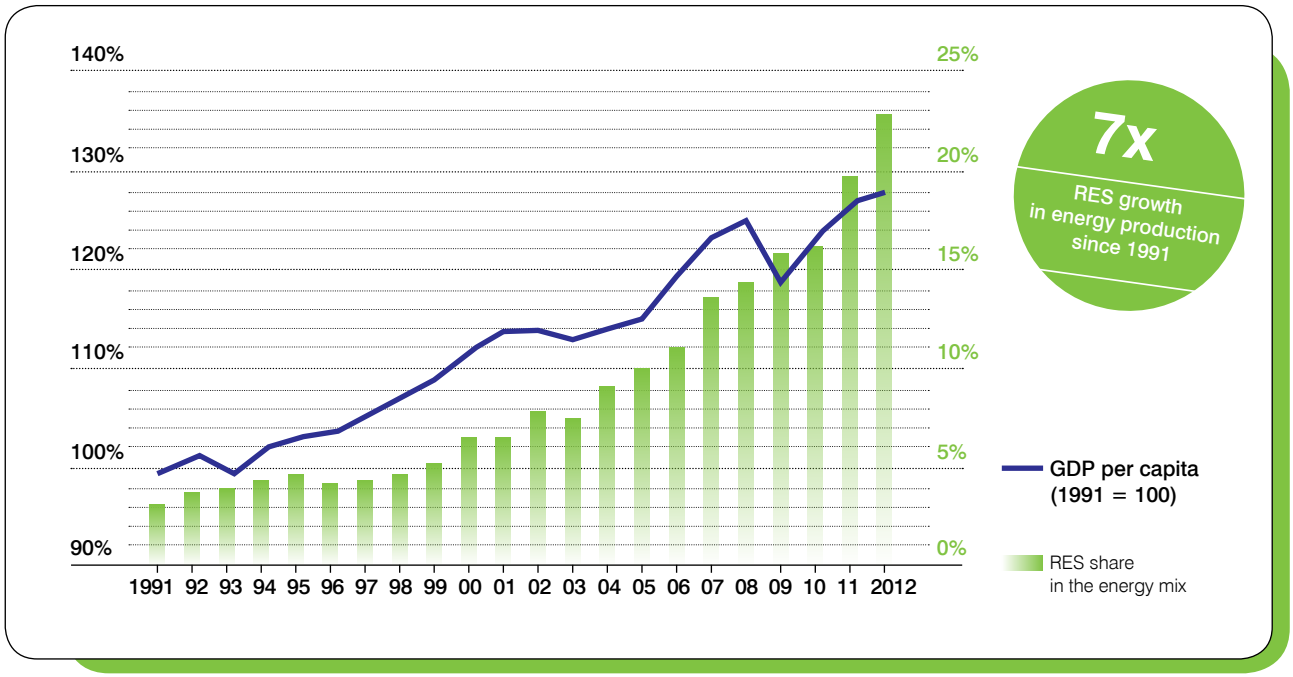
[7] "Renewable Energy and Jobs", Annual Review 2015, International Renewable Energy Agency (IRENA)

Table 1. Installed capacity in wind farms in Germany[8]

Data for the end of year	Installed capacity in wind farms (MW)
2015	44 947
2014	39 165
2013	34 250
2012	31 308
2011	29 060
2010	27 214
2009	25 777
2008	23 903
2007	22 247
2006	20 622
2005	18 415
2004	16 629
2003	14 609
2002	11 994
2001	8 754

The majority of Germans are supportive of RES development. A 2013 survey by TNS Infratest shows that 77% of Germans believe that RES can ensure energy security for future generations, and 72% think that they can contribute to climate protection.[9] The data also shows that renewable energy is driving the economy.

Fig. 3. Renewable energy driving the economy



Source: BMWi (Federal Ministry of Economy and Industry), AG Energiebilanzen, Destatis (Federal Statistical Office)

[8] GWEC data

[9] Data from: "OZE w Niemczech. Obecny stan rozwoju, grupy interesu i wyzwania", Report by OSW, June 2014

FRANCE: more renewables, less nuclear

Facts in brief:

- New capacity installed in France in 2015: 1,073 MW[10]
- Total installed capacity in wind – over 10 GW
- In 2015 wind farms generated 21.1 TWh of electricity, a 23% increase from 2014[11]
- Government plans for 2020 aim at 25 GW in wind (of which 6 GW offshore)[12]
- In 10 years only half of electricity produced in France is supposed to come from nuclear plants, compared to 75% in 2014.
- The energy transition law envisages 40% of electricity in France to be produced from RES by 2030.

During the election campaign, French President Francois Hollande announced strong support for development of new renewables. This purpose is to be served by the newly adopted energy transition law, whose plans were announced earlier by minister Ségolène Royal. Under these plans, by 2030 France would generate 40% of its electricity from renewables, reduce fossil fuel consumption by 30%, and provide support for electric vehicles and energy efficiency.

France currently operates 58 nuclear power plants. Soon some of them may share the fate of their counterparts across the eastern border. After the Fukushima disaster Germany announced the shutdown of all reactors by 2022. Most of French nuclear plants are 30 years old on average and require costly modernisation. Without it, half of them should be decommissioned by the end of this decade.

April 2015 saw the publication of a report entitled "100% Renewable Energy by 2050". In that report, the Environmental and Energy Management Agency estimated the production potential from all renewable sources. According to the calculations, it amounts to 1,268 TWh, i.e. triple the annual demand for energy in 2050. Such an enormous surplus leaves a lot of room for geographic planning and dropping the least profitable or problematic installations. The calculations also show that not much is going to change for the final consumer. The energy costs with a 40% RES share are almost identical to the costs at a 100% share. A second scenario, including costs such as grid maintenance, energy storage and operation of all installations, was estimated at EUR 50.4 billion vs 49.5 billion for the 40% scenario. The report suggests that "*in 2050 the costs of energy from fossil fuels is going to rise dramatically, and the RES costs will drop significantly*" and that "*the energy mix based in 100 per cent on renewables will generate costs comparable to the mix with a 40% RES share*". It is stressed that the calculations did not include external costs related to operation and maintenance of nuclear plants and management of nuclear waste.

[10] "Wind in power. 2015 European statistics", European Wind Energy Association, February 2016

[11] Data from the French transmission grid operator, RTE

[12] Global Wind Report, Annual Market Update 2014", Global Wind Energy Council

Table 2. Installed capacity in wind farms in France[13]

Data for the end of year	Installed capacity in wind farms (MW)
2015	10 358
2014	9 285
2013	8 243
2012	7 623
2011	6 800
2010	5 970
2009	4 574
2008	3 404
2007	2 454
2006	1 567
2005	757
2004	390
2003	253
2002	148

United States: more energy from RES by 2020

Facts in brief:

- Installed capacity in wind: 74,472 MW (over 52,000 turbines in operation) [14]
- New capacity in wind in 2015: 8,598 MW [15]
- March 2015: the Barrack Obama administration set more ambitious goals for wind power development in the U.S. The Department of Energy wants 10% of electricity consumed by the Americans to come from wind in 2020, with as much as 35% in 2050.
- In early 2016 there was an additional 9,400 MW wind capacity under construction.
- The United States set the 2025 target for CO_2 emissions reduction at 26-28% from 2005 levels (14-16% compared to 1990). That goal is to be met by a parallel development of shale-based energy sector and renewables.
- A 2012 report by the National Renewable Energy Laboratory (NREL) suggests that the United States have technical capabilities to produce 80% of its energy from renewables by 2050. This favourable outlook is based on the abundance of renewable resources and the country's location across several climate zones.

Most recently, the state of Hawaii has become the leading supporter of RES in the U.S. On 5 May, Hawaiian legislators passed a bill requiring the state to use 100% renewable energy, a first in the U.S. The "House Bill 623" makes Hawaii a world leader in RES legislation. By 2045 the latest, 100% of electricity on the islands is to come from renewable sources – such as wind, solar and geothermal.

[13] EWEA and "Global Wind Report, Annual Market Update 2014", Global Wind Energy Council

[14] Data from American Wind Energy Association (AWEA)

[15] Data from American Wind Energy Association (AWEA)

The Americans seem to be well aware of the fact that the cost of energy from wind turbines will continue to decrease. This results from technology developments including increasing turbine efficiency. By contrast, fossil fuels are limited, and their easily available deposits are not infinite, which will translate into rising prices of energy from conventional sources.

Table 3. Installed capacity in wind farms in the U.S.[16]

Data for the end of year	Installed capacity in wind farms (MW)
2015	74 472
2014	65 879
2013	61 110
2012	60 007
2011	46 929
2010	40 298
2009	35 086
2008	25 076
2007	16 725
2006	11 575
2005	9 149
2004	6 725
2003	6 372
2002	4 685
2001	4 275

CHINA: a record-breaking shift towards RES

Facts in brief:

- Installed capacity in wind farms: 145,105 MW[17]
- China is a leader in installed capacity in wind farms. 2015 was another record-breaking year, with 30,500 MW of new installed capacity in wind. China is the only country in the world to install more than 30 GW in wind in a single year, and the first with a total installed capacity exceeding 100 GW.
- In 2010 the share of renewables in the Chinese energy mix was 6%, and in 2014 it exceeded 11%. It is expected that in 2020 15% of total energy consumption in China to be covered by RES.

[16] AWEA and "Global Wind Report, Annual Market Update 2014", Global Wind Energy Council

[17] "Global wind statistics 2015", Global Wind Economic Council, 10 February 2016

China is the largest emitter of greenhouse gases in the world. In 2014 it emitted over 9,671 million tonnes of CO2 from burning of fossil fuels, amounting to 27.5% of global emissions.[18] The Chinese economy is primarily based on coal. However, the annual Bloomberg press agency report "Who's winning the clean energy race?" informed that in 2014 China invested $54 billion in green energy, giving it the first place in the world. The authorities in Beijing want green energy investments to be one of the drivers of the Chinese economy.

The Chinese authorities have noticed the profits that can be achieved thanks to manufacturing of wind turbines or solar panels. So we are facing a new trend of exports of modern technologies from China, and the government hopes that RES development will contribute to the implementation of yet another strategic goal – building an innovative economy and innovative society.

In addition, the fast-developing Chinese economy needs more and more energy, and today's China is a country based on coal. However, according to analysts, by 2040 one-third of electricity in China is to be generated from renewables, and the role of coal is expected to diminish. [19]

Table 4. Installed capacity in wind farms in China[20]

Data for the end of year	Installed capacity in wind farms (MW)
2015	145 104
2014	114 609
2013	91 413
2012	75 324
2011	62 364
2010	44 733
2009	25 805
2008	12 020
2007	5 910
2006	2 559
2005	1 272
2004	765
2003	568
2002	470
2001	404

[18] „BP Statistical World Energy Review", June, 2015

[19] 2015 The Outlook for Energy: A View to 2040. China edition", Exxon Mobil

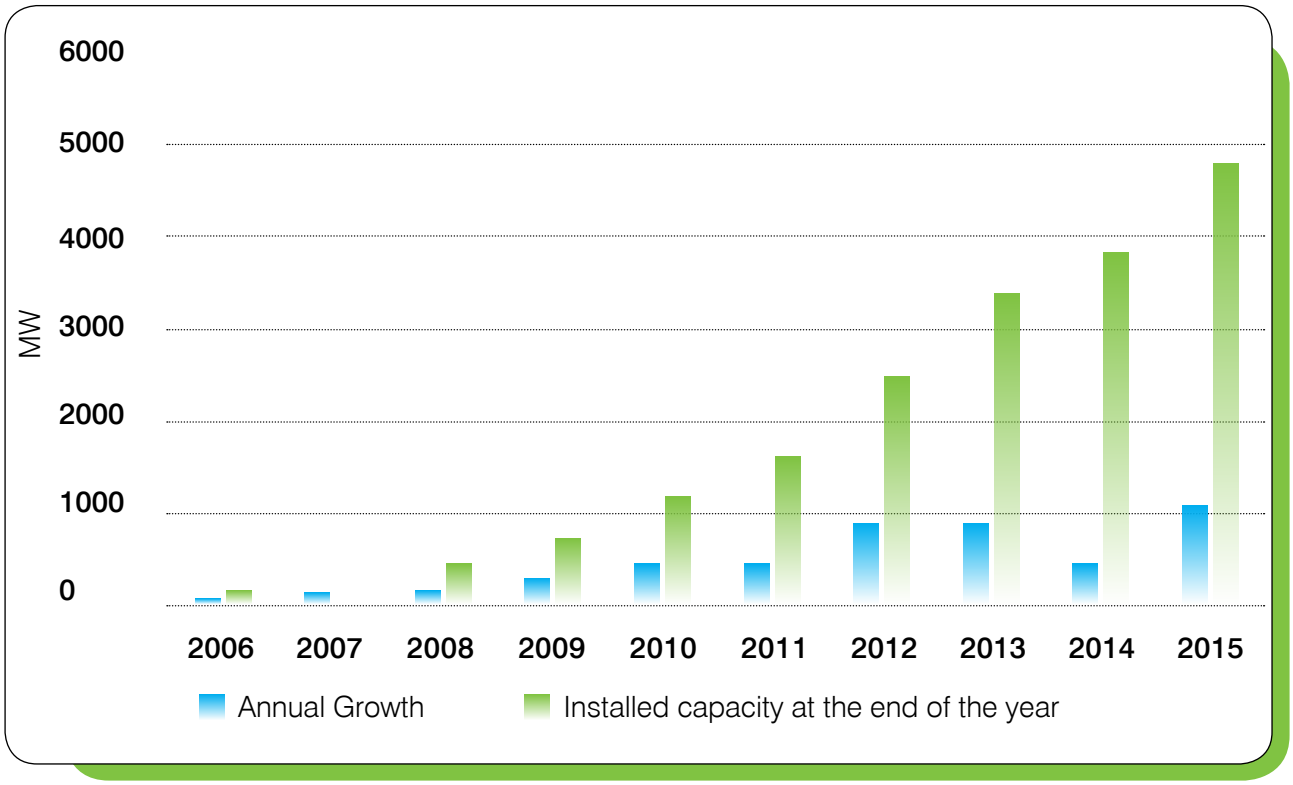
[20] GWEC data

POLAND: 5,000 MW in onshore wind in 2015

Facts in brief:

- According to PSE, available capacity in wind farms in Poland at the end of 2015 was 4,978 MW [21]
- The average capacity of a single wind farm in 2015 was 12 MW, similarly to previous year.
- The first industrial wind farm in Poland was built commissioned in 2001. Barzowice wind farm in Darłowo municipality, in West Pomeranian province, was made up of six turbines with a total capacity of 5 MW.
- The largest wind farm in Poland is located in Margonin. It has 60 turbines, 2 MW each, so the total capacity is 120 MW.
- Poland has one of the biggest potentials for offshore wind development. So far, 37 location permits have been issued. First offshore wind farms in the Baltic Sea, with a total capacity of 2.2 MW, may be built in early 2020s.
- The largest annual volumes of new capacity were installed in 2012 – 880 MW, 2013 – 893 MW and in record year 2015 – 1,145 MW. [22]
- In 2015, wind farms broke the record in electricity production; over the year they generated 10,041 GWh [23], an almost 40% increase compared to 2014.
- The biggest share of electricity in Poland is generated from coal. Conventional power plants, based on hard coal and lignite, generated over 83% of electricity produced in Poland in 2015.

Fig. 4. Installed capacity in Poland between 2006 and 2015: annual increases and total capacity at the end of each year



Source: PWEA report based on data from URE and PSE S.A.

[21] PSE data from the monthly coordination plan for January 2016

[22] URE and PSE SA data

[23] PSE data

With a total of 1,145 MW in new onshore capacity installed in 2015, Poland is second in Europe (after Germany) in terms of dynamics of wind energy development. Despite significant interest from investors and enormous potential (estimated at approx. 6 GW by 2030) there are still no offshore wind farms in Polish marine waters.

Although 1,145 MW in new capacity is certainly a record, previous years also saw a dynamic development in wind power. In 2012, the increase in installed capacity reached 54%, and 2013 added 38% compared to the end of 2012. In 2014 the pace of new developments in wind slowed down, with only 440 MW of new capacity installed (a 13% increase).

Table 5. Installed capacity in wind farms in Poland[24]

Data for the end of year	Installed capacity in wind farms (MW)
2015	4 978
2014	3 833
2013	3 389
2012	2 496
2011	1 616
2010	1 180
2009	724
2008	451
2007	287
2006	152
2005	83

In 2015, wind turbines generated 10,041 GWh of electricity, amounting to approx. 6.22% of domestic electricity consumption and about 6.21% of total electricity production in Poland.[25]

Table 6. Share of electricity production from wind farms in the total electricity production and domestic consumption

	2013	2014	2015
Total electricity production [GWh]	162 500	156 567	161 772
Electricity production from wind farms [GWh]	5822	7 184	10 041
Domestic electricity consumption [GWh}	157 985	158 734	161 438
Share of electricity from wind in total electricity production	3,58%	4,59%	6,21%
Share of electricity from wind in total domestic electricity consumption	3,69%	4,53%	6,22%

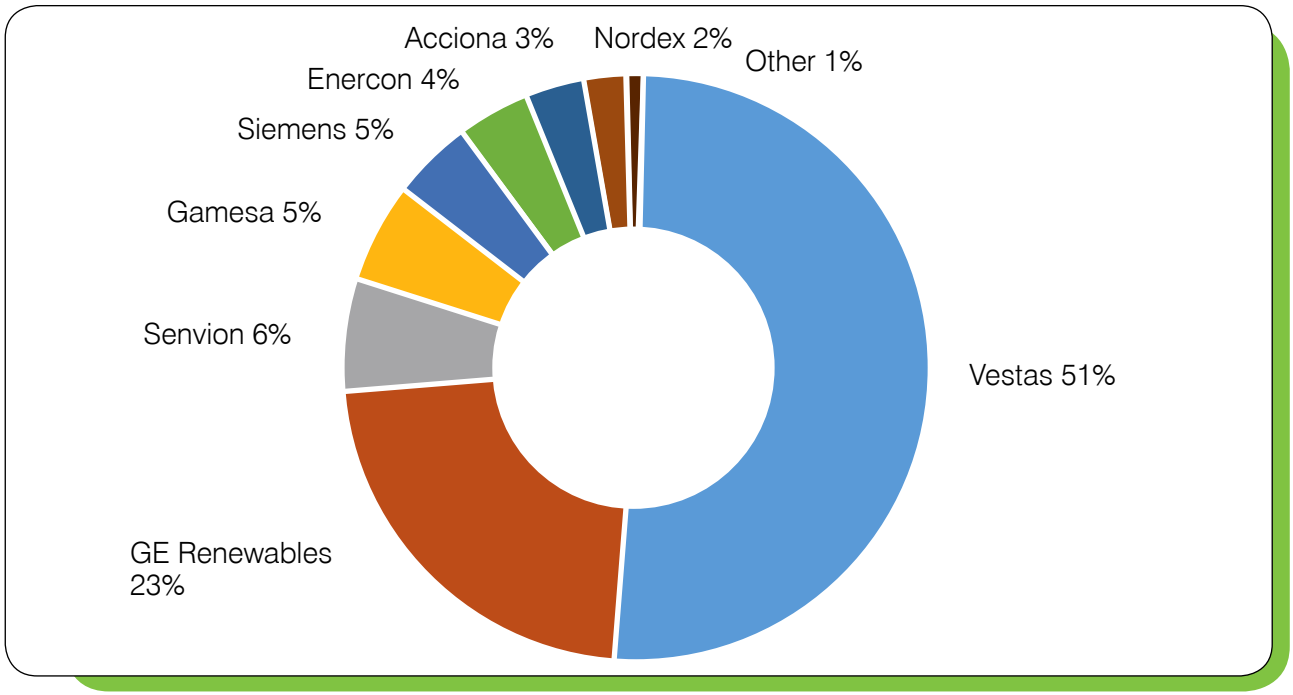
Source: Based on data from PSE S.A

[24] PWEA, based on data from URE and PSE SA

[25] PSE SA data

Among new capacity installed in Poland in 2015, the most popular were turbines manufactured by Vestas (over 700 MW) and GE (over 300 MW), jointly taking 74% of the market.

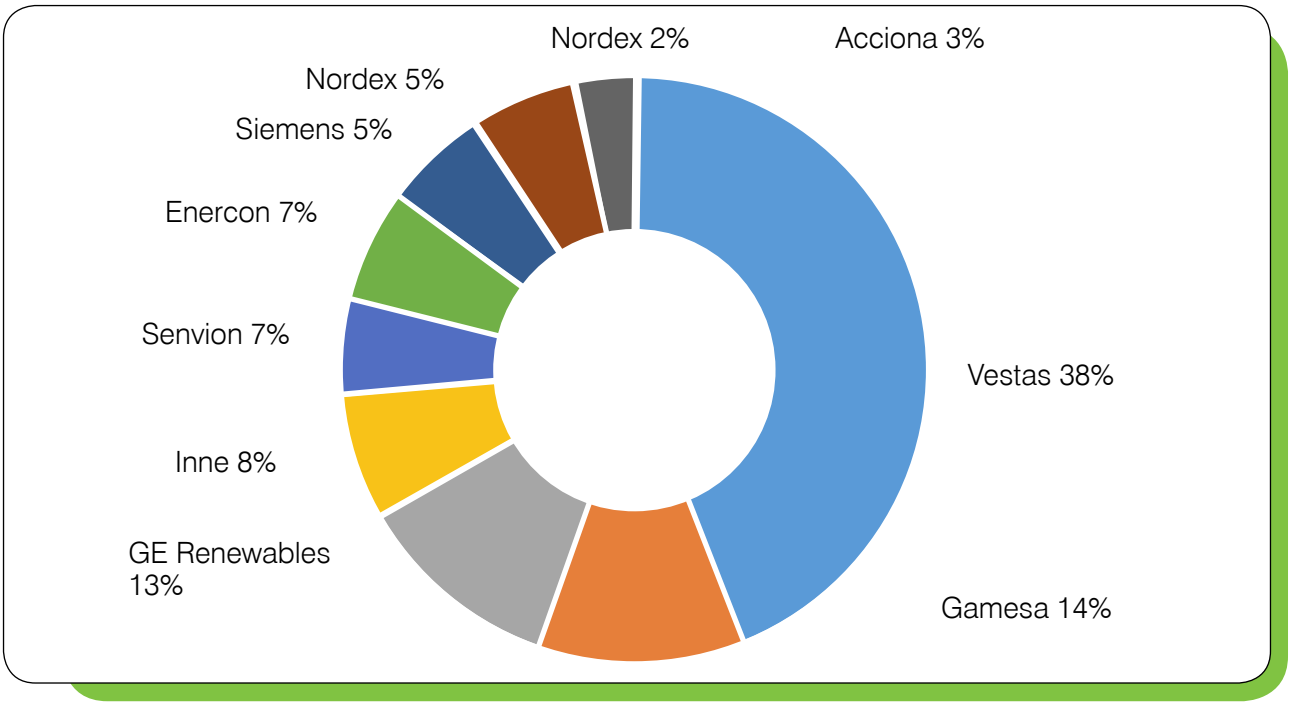
Fig. 5. Installed capacity in Poland in 2015 by wind turbine manufacturers



Source: PWEA

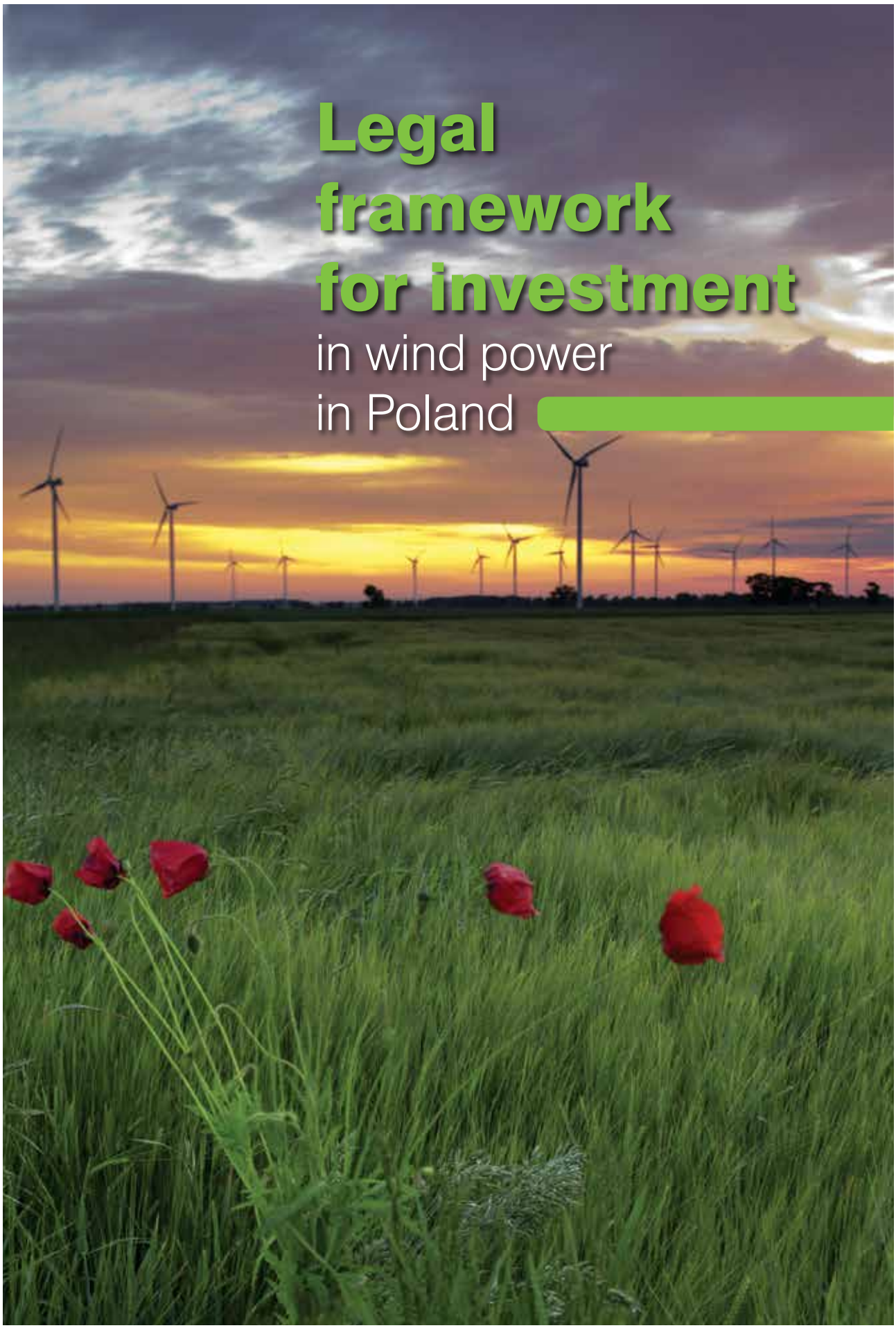
When looking at total capacity installed in Poland, Vestas also enjoys a leading position among manufacturers, with Gamesa and GE in second and third place respectively.

Fig. 6. Total installed capacity in Poland by wind turbine manufacturers



Source: PWEA

The analysis of ownership structure of wind farms in Poland leads to the conclusion that the majority – almost 80% of all wind farm projects – is owned by so-called IPPs (Independent Power Producers). Approximately 19% of all installed capacity in Poland is in the hands of state-owned companies (PGE Energia Odnawialna – 529 MW, Tauron Ekoenergia – 200,75 MW, Energa – 185 MW and ENEA – 56 MW).


Legal
framework
for investment
in wind power
in Poland

Legislative works on the Act on Renewable Energy Sources took over four years. The majority of new regulation came into force on 4 May 2015, upon their publication in the Journal of Laws, and many key provisions (primarily those relevant to the new RES support scheme, prescribed in Chapter IV) were supposed to become effective on 1 January 2016. However, in the end of 2015 a quick amendment of the RES Act was passed, postponing the coming into force of Chapter IV until 1 July 2016.

The four years of work on the new RES Act were a period of significant uncertainty, not only in the wind power industry, but also in the entire renewables sector. Both the support scheme, which initially was supposed to be only a modification of the green certificates system, and the detailed provisions were changed several times. Despite this, the final wording of the law is in many places imprecise, and will be amended in the first half of 2016, according to the government's declarations. However, the discussions and analyses during the work on the new support scheme confirmed that Poland is one of the most promising markets for investment in renewables in Europe.

The new support scheme – RES auctions instead of green certificates

The RES Act envisages a switch from the certificates of origin scheme to an auction scheme, based on recommendations and guidelines of the European Commission. [26] The government will announce auctions for green energy, previously specifying in relevant regulations the volume of energy it wants to purchase from producers and a maximum (reference) price that cannot be exceeded by producers taking part in the auction. The winners will have a guaranteed price for the electricity they produce over a period of 15 years. Thus, the system is intended to provide investors with stable (based on the system of contracts for difference) and predictable (indexed by CPI) revenues. This state guarantee is positively perceived by banks, who are ready to provide funding for RES projects. However, after the 15-year period the producers will cease to enjoy subsidies and will have to sell their electricity at market prices.

If the planned 2016 amendment of the RES Act does not introduce far-reaching changes, the auction-based support scheme will cover all installations commissioned after 1 July 2016. The owners of installations already in operation before that date will be able to decide whether they want to move to the auction scheme or remain in the modified system based on green certificates, by taking part is separate auctions for such installations. It should be noted, however, that the total support period for installation which first generated electricity before 31 December 2015 is also limited to 15 years (no longer than until 31 December 2035).

In order to take part in the auction, a project has to first undergo a pre-qualification procedure. It is about a formal assessment of the installation's readiness to produce energy, which is taken care of by the President of the Energy Regulation Office (URE).

Certificates of admission to the auction will be received by producers who prove they have:

- A building permit issued based on a local spatial development plan, or, in case of no such plan in existence, a zoning decision.
- A grid connection contract.
- A decision on environmental conditions for the planned installation.

[26] "European Commission guidance for the design of renewables support scheme", SWD (2013) 439 final, https://ec.europa.eu/energy/sites/ener/files/documents/com_2013_public_intervention_swd0 4_en.pdf; "Guidelines on state aid for environmental protection and energy in 2014-2020" http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52014XC0628(01)

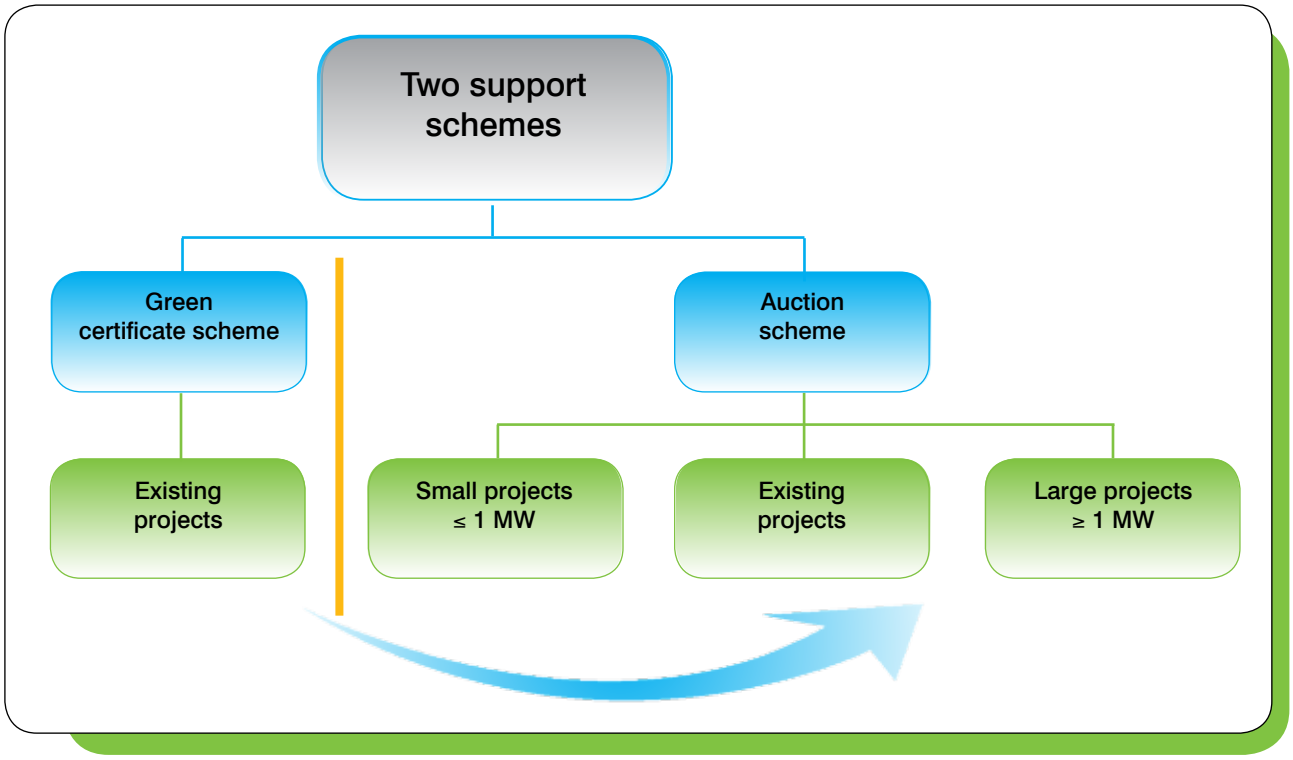
Both the building permit and the environmental decision have to be legally binding.

The auctions will be carried out using a dedicated internet platform.

DIVISION INTO "TECHNOLOGY BASKETS"

The auctions will be carried out in separate so-called technology baskets or pools. The division for new projects was made according to capacity (below and above 1 MW) and capacity factor (below and above 4000 MWh/MW/year). The producers who made a shift from the certificates of origin scheme to the new one will take part in separately organized auctions. The RES Act also requires at least 25% of auction volume to be generated in small installations with a capacity below 1 MW.

Fig. 7. New RES support scheme



The breakdown depending on capacity and capacity factor of each installation is a way to shape the renewables market. It automatically groups renewable energy sources in relevant baskets, significantly reducing competition between installations of different types and ensures that, for example, small photovoltaic installations do not have to take into account the energy generation costs in large wind farms. However, it is a fact that wind power is still the cheapest RES technology available in Poland, and seems to have no competition in the basket above 1 MW and below 4000 hours, which does not mean that there will be no competition between wind projects, as demonstrated by the auction simulation.

Auction simulation

There are many threats related to the introduction of the new auction scheme. This was demonstrated by Poland's first simulation of RES auctions, carried out jointly by the Polish Wind Energy Association, PwC consulting company and Domański Zakrzewski Palinka legal firm on 8-13 May, 2015. The simulation was run according to the rules stipulated in the RES Act. 90 companies took part, submitting bids for 140 projects in 8 different technologies, with a total capacity of 3,700 MW. The course and results of the simulation have shown that part of the actual auction can turn out to be a failure.

In theory, the auction system introduced by the new RES Act is technology-neutral, i.e. it should not favour any of RES technologies. Its introduction is also aimed at making RES electricity generation cheaper for Poland.

The course of the first RES auction simulation in Poland [27] has shown that technology neutrality is not confirmed a myth. The auction will be won by those who bid with the lowest price per megawatt-hour from green energy sources, but in specific baskets, and not lowest of all. The simulation was run in the closest way possible to the actual auction. Therefore there was a division into projects below and above 1 MW and limits were set for technologies operating below and above 4,000 hours per year. At the time of simulation the reference prices were not known yet (the Ministry of Economy announced them in a November 2015 regulation), so estimated maximum price levels were adopted for the test auction.

The final outcome of the auction was that in one basket there were eight times more bids than limits available, and in other baskets there were less projects than limits. The basket with the most bids also had the lowest prices, obviously much below the reference price. A different situation appeared in baskets with less competition, where bid prices were close or equal to reference prices. The division into technology baskets and sizes of auction volumes in particular baskets have effectively disturbed the technology neutrality.

THREATS IN THE AUCTION SYSTEM

Firstly, the budget ran out quicker than the volume and some "unused megawatt-hours" remained. This was due to the fact that the competition only in one basket and the resulting low prices did not compensate for higher bid prices in baskets where competition was less fierce and the bid prices were close to reference prices. This means that the introduction of the auction scheme does not necessarily equate to an absolute reduction of the cost of support.

Secondly, **the level of bid prices in the most competitive basket** (between PLN 240 and 323 per MWh with a reference price of PLN 405/MWh) **means that we are facing a risk of underbidding,** i.e. submitting unrealistic bids that will win the auction but will not allow for an RES project to be built, blocking other producers. This could mean that **a large part of projects may never be completed.**

Arkadiusz Sekściński, PhD, Vice-President of PWEA:

The results of auction simulation for large wind projects are over 100 PLN/MWh lower that the results of actual auctions in Italy, Holland or the UK. It is an indication that a phenomenon of underbidding can occur in Poland. The prices obtained in those countries only allowed for implementation of some projects.

[27] RES auction, run in May 2015 on zieloneaukcje.pl platform, carried out by PWEA, PwC and DZP

Thirdly, under the new auction system there is a very **real threat of failure to consume the entire volume of megawatt-hours** in particular baskets, due to the adopted rules for qualification of winning projects. The smaller the basket, the higher the risk of non-utilization, because if the declared production of the last auction-winning project is larger than the remaining non-allocated volume by even 1 MWh, then this entire volume will remained not utilized. This was particularly visible in the basket for existing projects. Although four times as many projects were submitted as there were MWh available, only 70% of available volume was used. The auction simulation has demonstrated that dropping the principle of volume non-transferability form new projects would have allowed for utilization of 99% instead of only 68% of available MWh.

PROPOSALS OF MODIFICATIONS TO THE AUCTION SCHEME

Some of the threats could be avoided even without changing the RES Act. It would suffice to have an adequate shape of executive regulations of the Council of Ministers on volume and value of megawatt-hours allocated for a specific auction. In turn, removing the division into projects operating above and below 4,000 hours would immediately increase the number of MWh to win the auctions and at the same time reduce the average cost of support per MWh for new projects. Thus, cheaper projects would have a bigger share in the new projects portfolio.

Positive effects could also be brought by allowing the transfer of unused MWh volumes to those baskets where the limit was already exhausted. It could be possible after the first, initial allocation according to limits for specific baskets. By such a change to the auction algorithm, the preferences for particular technologies would be maintained. However, if there was a lack of projects in some category, the increased flexibility of the auction algorithm would lead to better utilization of the MWh pool and the budget. Eventually, there would be more new capacity built, which appears to be the main objective of the new regulations.

Grzegorz Skarżyński,
Vice-President of PWEA:

The results of auction simulation show that the adopted system is not technology-neutral, meaning that the costs of support of renewables will not be reduced to the maximum. A strong competition in the segment of large wind project resulting from the significant reduction of auction volume for projects above 1 MW capacity and availability below 4,000 hour per year, introduced after the proposal from the Ministry of Economy, led to unrealistically low prices offered during the simulation, putting in question the actual possibility to build these projects.

The regulation on reference prices

The Regulation of the Minister of Economy on reference prices, published in the Journal of Laws on 8 December 2015, specified the following price levels:

Tab. 7. Final reference prices for RES technologies

No.	Technology	Price (PLN/MWh)
1	Biogas <1MW	500,00 zł
2	Biogas > 1 MW	470,00 zł
3	Landfill biogas	305,00 zł
4	Biogas from sewage treatment plants	335,00 zł
5	Biogas other than in items 3 and 4	340,00 zł
6	Biomass < 50MW (combusted in dedicated installations or hybrid systems)	415,00 zł
7	Biomass < 50MW (combusted in dedicated installations or hybrid systems , in high-efficiency cogeneration)	435,00 zł
8	Biomass > 50MW < 150MWt (combusted in dedicated installations or hybrid systems, in high-efficiency cogeneration)	420,00 zł
9	Biodegradation of parts of industrial or municipal waste	385,00 zł
10	Bioliquids	475,00 zł
11	Wind power, onshore <1MW	415,00 zł
12	Wind power, onshore >1MW	385,00 zł
13	Hydro power < 1MW	470,00 zł
14	Hydro power > 1MW	480,00 zł
15	Geothermal power	455,00 zł
16	Solar power <1MW	465,00 zł
17	Solar power >1MW	445,00 zł
18	Wind power, offshore	470,00 zł

The reference price for wind power installations with a capacity of more than 1 MW was set at 385 PLN/MWh, and for wind installations below 1 MW – 415 PLN/MWh.

It should be stressed that under the conditions applicable in 2016, these prices differ from the assumption formulated during the legislative work on the RES Act, that they should ensure potential completion of 80% of existing projects. In PWEA's opinion, the reference price should be determined based on average parameters for Polish wind projects and relevant macroeconomic parameters for Poland, such as the expected return on investment and the cost of debt. The parameter determining the level of reference prices finally announced by the Ministry of Economy was, unfortunately, adopted on a lower level. Such a lowered reference price can lead to increased pressure on reducing bid prices, exacerbating the issue of underbidding. These expectations are in line with both the results of the auction simulation carried out by PWEA, PwC and DZP, and the history of auctions in other countries.

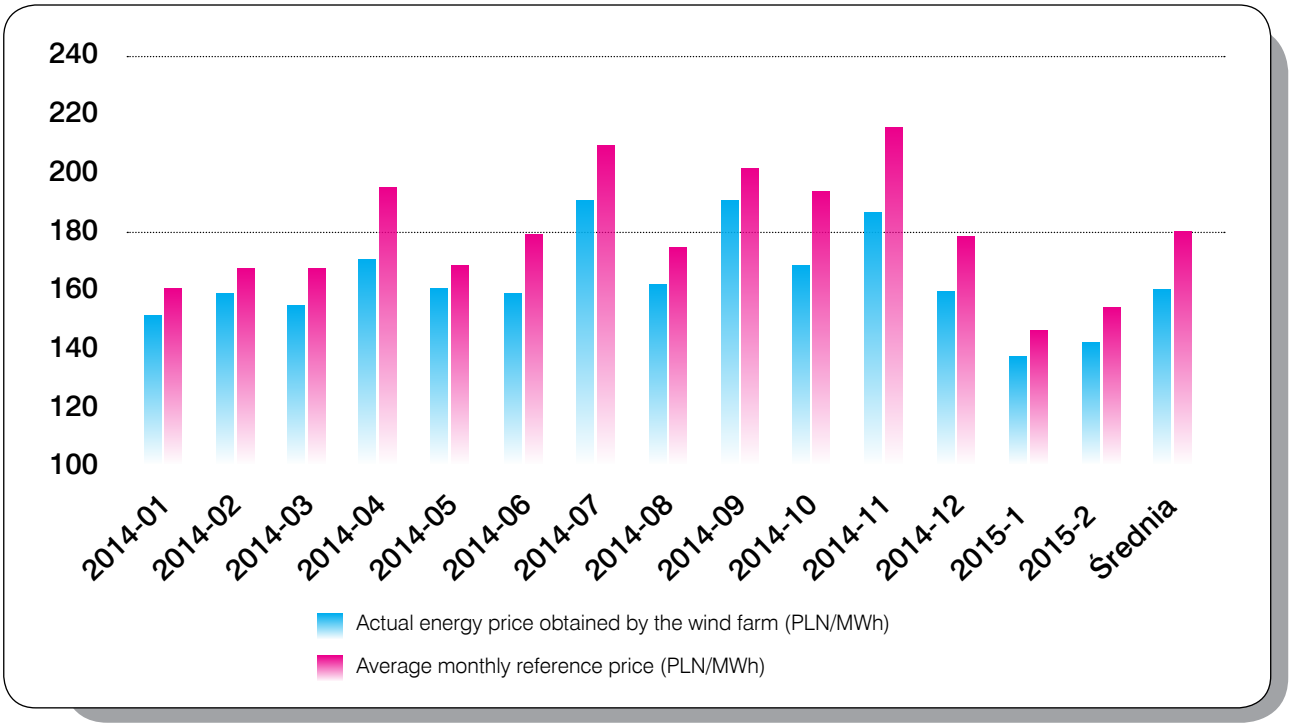
When analysing both the reference price level for particular technologies, the volumes of technology baskets and the auction simulation results, it appears that wind power installations with a capacity over 1 MW are, despite a relatively lower reference price, very competitive towards other technologies in the <4,000 hrs basket, but much less competitive for installations below 1 MW. However, in the latter case, the competition among projects seems to be less fierce due to the relatively bigger volume for that basket, which leads to expectations that among the auction winners there will also be small wind installations.

COST OF ACCESS TO MARKET – TRADE BALANCING AND PROFILE COST

Although when calculating the reference price the Ministry of Economy has taken into account the cost of balancing, it has completely neglected another important cost item which has to be deducted from the auction sale price of energy , i.e. the profile cost. Wind farms built under the auction system will be required to participate in the electricity market (they will not be able to sell their electricity at regulated prices), so they will sell at current price for each hour of production. However, the premium on top of the auction price will be calculated as a difference between the auction price and the average price of electricity. Therefore the actual average price of energy from a wind farm will always be lower than the average used for the calculation of the premium to the auction price, as wind farm produce relatively more energy in hours with lower prices than in high-price hours (peak hours). This difference is the profile cost. Increasing volatility of market prices will lead to profile cost increase. The profile cost phenomenon is illustrated in the chart below, where actual prices received by a wind farm (blue colour) in each month were always lower than the average prices used for calculation of the premium (marked in red).

Insufficient knowledge of the profile cost, what it is and how it affects the wind farm's revenues, is seen by PWEA as one of the risk factors for underbidding, due to the fact that neglecting the profile cost may lead to reducing auction bid prices.

Fig. 8. Market prices vs actual prices obtained by an existing wind farm between January 2014 and February 2015



Source: AXPO 2015 – PWEA Conference, Serock, 15 April 2015

In the explanatory memorandum to the regulation on reference price levels, the Ministry of Economy referred to the balancing cost at the level of PLN 35,000 (approx. 15 PLN/MWh), whereas in 2015 conditions, the profile cost amounted to approximately 20 PLN/MWh. The value of wind farm's total revenue, comprising revenues from market sales and the auction price premium, will be lowered by the multiple of the number of MWh sold and the approximately PLN 20, amounting to several per cent of the auction price.

REFERENCE PRICE IN POLAND COMPARED TO OTHER COUNTRIES

The Polish reference price for wind power above 1 MW, set at 385 PLN/MWh, is significantly below the European average.

Tab. 8. Reference price level in Poland, the Netherlands, Italy and the UK

Kraj	Cena referencyjna	Okres wsparcia	Produktywność
Poland	385 PLN/MWh	15 years	2,300 hrs
Netherlands	107 EUR/MWh (over 428 PLN/MWh)	15 year	< 2,500 hrs
Italy	121 EUR/MWh (over 484 PLN/MWh	20 years	1,800 hrs
UK	95 GBP/MWh (over 500 PLN/MWh)	15 years	2,400 hrs

Source: PWEA, based on data from: Assorinnovabili.it, Nederlandse Wind Energie Associatie, UK government, Poland's Ministry of Economy

All the above mentioned countries have much larger experience in development and support of wind power and its much higher share in total energy production. Moreover, they belong to the group of developed countries, where investment risks are lower in investors' perception compared to Poland, still a developing country. Thus, there are no grounds to set the reference prices in Poland at such a significantly lower level. In PWEA's opinion, assuming reasonable components of the reference price (including the profile cost), the reference price in Poland in 2016 conditions should amount to 430 PLN/MWh.

The regulation on volume and value of electricity allocated to auction

Even more important for the course and results of auctions than reference prices is the allocation of volume of MWh and the auction budget for a specific year. The regulation, published in the Journal of Laws on 8 December 2015, stipulated that in 2016 the government wants to purchase 4,736,044 MWh from existing installations, with a maximum value of PLN 1,744,694,319, and 50,449,950 MWh from new RES installations, of which 30,907,350 MWh can come from sources with capacity utilization lower than 4000 MWh/MW/year (i.e. the basket where wind farms are going to compete) with a value of PLN 18,201,331,716.

These values determine the size of the potential market for new investments in wind farms (with a capacity above 1 MW) at 600-700 MW. According to estimates, over 2,000 MW in wind projects have a chance to be qualified to participate in auctions (by meeting the statutory criteria). This means that in the first auction the competition is going to be very fierce. Much less wind projects below 1 MW seem to fulfil the auction qualification criteria, so the competition in that "auction basket" should be less stiff.

PROSPECTS FOR OFFSHORE WIND FARMS

In PWEA's opinion, offshore wind power should have a separate support scheme, independent of auctions for other RES technologies, perhaps even under a separate act of law. This is due to the characteristics of investments in offshore wind, related to initial outlays much higher than in case of other RES technologies, and much longer period of both preparation and implementation of

projects. It is hard to expect investors to spend amounts in the range of PLN 100 million on project preparation without being certain that the project will be implemented (by winning an auction). In order to actually develop offshore wind power in the Polish maritime zone and to utilize its potential, at least for the first commercial projects it would be reasonable to use a fixed feed-in premium system or capital subsidies. This is in line with the published guidelines of the European Commission, clearly stating that different support schemes can be used in justified cases for certain technologies. The Commission allows it if the Member State demonstrates that "only one or few projects or plants are eligible".[28]

470 PLN/MWh FOR OFFSHORE – WHAT NEXT

The reference price for offshore wind was set at 470 PLN per megawatt-hour. The analysis of economic parameters of offshore wind farms in other countries allows for presentation of current, realistic actual costs of energy production from this technology (LCOE – Levelised Cost of Energy). Data for the first half of 2015 published by Bloomberg New Energy Finance (for Denmark, Germany, UK, Netherlands, France and Belgium) show that energy production costs in the offshore wind sector are in the range of 580-730 PLN/MWh [29]. The cost of electricity generation from wind farms in the Baltic Sea could be lower, if solutions were adopted similar to those used in the UK or Holland, where the state bears the cost of preparation of project locations and organizes auction for particular area, with a completed environmental study. There is also a rule that the grid connection is taken care of by the transmission system operator or a third party, and not the investor (this solution was adopted e.g. in France or Denmark).

Poland has one of the biggest potentials for offshore wind development in the Baltic Sea Region. One of the actions to fully use this potential should be modifying the legal solutions dedicated to this technology.

[28] Communication from the Commission – Guidance on state aid on environmental protection and energy in 2014-2020,28/06/2014, 2014/C 200/01

[29] Bloomberg, New Energy Finance, H1 2015 OFFSHORE WIND MARKET OUTLOOK

Problematic notification of the RES Act

On 20 April 2015 the Polish government submitted to the European Commission the information on the support scheme aimed at generation of electricity from renewable energy sources (The RES Act). The government's intention was to obtain the Commission's approval for the new RES Act based on the 2014 Commission Regulation on block exemptions (GBER)[30], despite the fact that the RES industry and state aid experts argued this was an incorrect way to present the RES Act to the European Commission. At the same time, the Polish authorities presented to the Commission an evaluation plan regarding this support scheme.

On 23 October 2015 the European Commission, after reviewing the evaluation plan, stated that the GBER regulation will not be applicable to the support scheme presented in the new Renewable Energy Sources Act. As a consequence, the Ministry of Economy decided to submit the RES Act for notification to the European Commission via the Office for Competition and Consumer Protection (UOKiK – a formal partner for the Commission in notification processes).

The most important element determining the need for notification of the Act according to the information presented to the Commission in the UOKiK letter of 23 October 2015 was exceeding the notification threshold for a an aid programme stipulated in the GBER regulation, as the average annual budget of the new Polish RES support scheme will exceed the EUR 150 million limit allowing for exempting an aid programme from the notification procedure.

Brussels' lack of approval of the Act is rather unlikely, according to the UOKiK civil servants involved from the very beginning in the discussions with the European Commission on the new and old support scheme in Poland.

That is one of the reasons why in the end of 2015 there was a quick amendment of the RES Act, with one of the priorities being a 6-month postponement of the effective date of Chapter 4 of the RES Act, in particular regarding the issues on launching the auction scheme for purchase of electricity from renewable energy sources and mechanisms supporting generation of electricity in micro-installations with a total installed electrical capacity of less than 10 kW. In the opinion of the initiators of the amendment, postponing the coming into effect of Chapter 4 will allow the Minister of Energy to complete the legislative work related to the so-called technical amendment of the Act, aimed at removing interpretational, legal and wording ambiguities regarding the provisions of Chapter 4, and at the same time to complete the notification process with the European Commission.

Janusz Gajowiecki,
Deputy Director, PWEA:

In theory, the European Commission has half a year to issue a decision on whether the Polish regulations on RES support are compliant with the EU law. However, this procedure can be extended due to possible questions from the Commission to the Polish government. State aid experts believe that the notification process should be completed by the end of June 2016.

It is worth noting that in parallel, in 2015 the European Commission was investigating complaints regarding the Polish green certificate system (claiming excessive support for some RES technologies) introduced in 2005, which had never been notified in the European Commission based on the assumption it does not constitute state aid. The European Commission's decision on the green certificate system, covering all RES installation commissioned before 1 July 2016, should be expected in the first half of 2016.

[30] Commission Regulation (EU) no. 651/2014 of 17 June 2014 declaring certain categories of aid compatible with the internal market in application of Articles 107 and 108 of the Treaty (OJ L 187 of 26.6.2014, p. 1-78)

European experiences with auctions

Some important conclusions regarding the threats to the new auction system can be drawn from the analysis of experiences from other European countries who have already run RES auctions. In the Netherlands, the auction scheme for RES is in place since 2008 and it was modified almost every year. Some elements limiting the effectiveness of the system are being removed, such as the maximum possible productivity for a wind farm at 2,400 hours per year. Other solutions are being introduced, aimed at improving that effectiveness, e.g. different price brackets for projects depending on wind resources in their planned locations.

Despite the continuous optimization of the system, the results of auctions are not optimistic. In 2009, wind projects with a total capacity of 466 MW won the auctions, but only 90 MW have been completed. Out of 398 MW in winning wind projects in 2013, only 148 MW have been built. In total, of 1,636 MW in auction-winning wind power projects between 2008 and 2014, only 835 MW were built by the end of 2014, i.e. approx. 50%. Photovoltaic projects were also unable to avoid problems. In 2013 there were 104 MW in auction-winning PV projects, but in 2014 only 23 MW of new capacity was built (and that despite the fact that PV projects have a much shorter time to completion than wind farms).

Important lessons can also be learnt from Italian experiences with auctions. Similarly to Poland, in Italy the auction scheme replaced the green certificate system in 2012. Over the first years the Italian auction rules were stable, but it did not bring the expected results. Construction of 1,300 MW in wind project was contracted under the auction scheme, but only 400 MW were built by the end of 2013, with even less completed in 2014 – only 107 MW.

The third country whose experiences are worthy of drawing conclusions from is the United Kingdom. On the one hand, the results of the first auction in the UK were announced in March 2015, and the final number of projects with investors declaring development was not known at the time of writing, making full analysis of the scheme rather difficult. On the other hand, however, investors of two auction-winning photovoltaic projects announced their withdrawal just several weeks after the auction results had been published.

CONCLUSIONS FOR POLAND

The history of auctions in the Netherlands or Italy confirms that underbidding in Polish RES auctions in highly likely. Moreover, the scale of that phenomenon will be even greater than in other European countries, due to the fact that in Poland instruments preventing underbidding have been introduced to a smaller extent compared to Italy, the Netherlands or the UK. In the first country, a bid price can only be up to 30% lower than the published reference price, and in Holland particular technologies can place bids only in specific price brackets and it is not possible to offer to build an installation at an unrealistically low price. In Poland, on the contrary, the only protection against underbidding is the requirement to present a bank guarantee at the level of PLN 30,000 per MW.

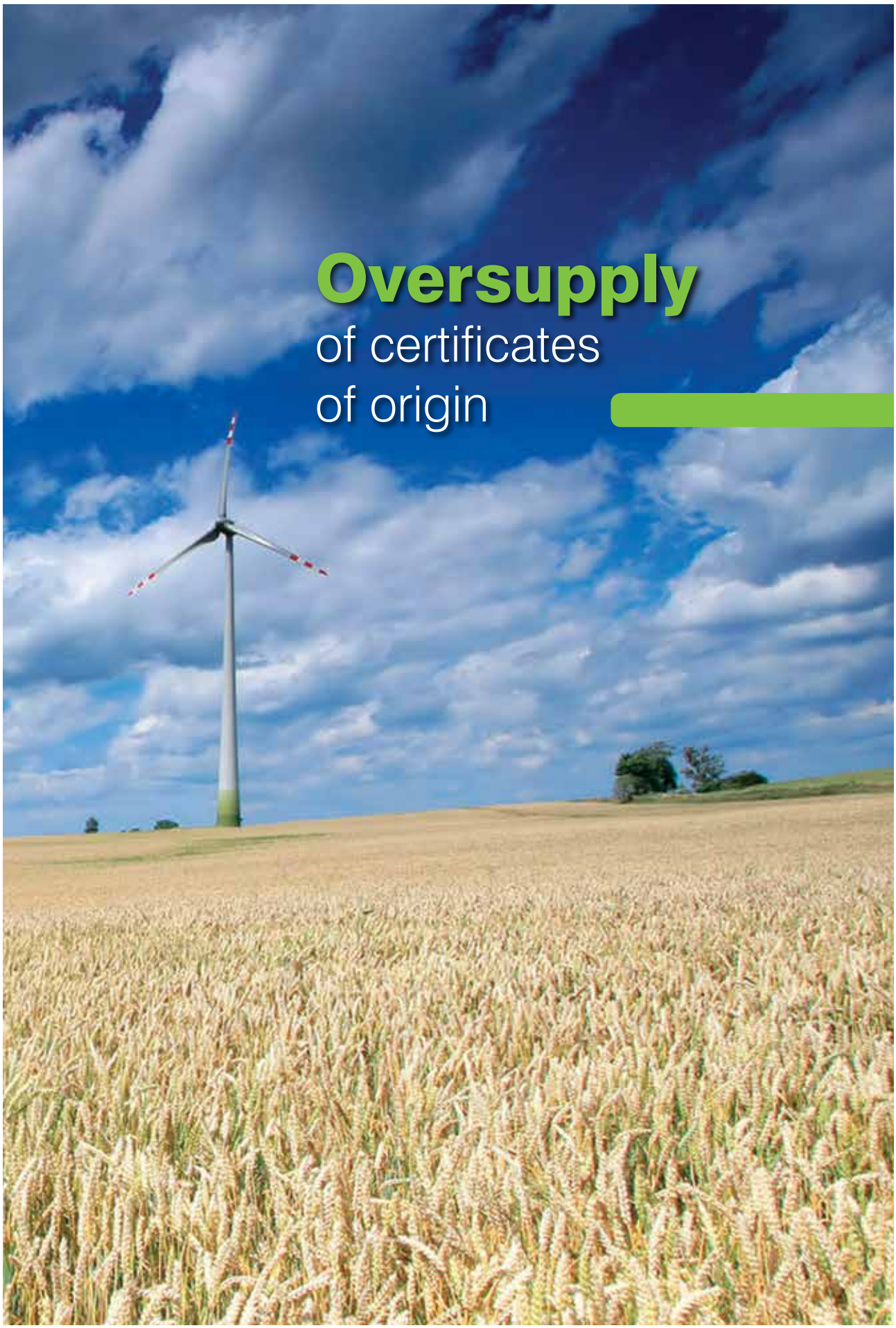
The Italian example also demonstrates the direct relationship between the number of projects submitted to auctions and the prices offered. In the first two auctions, in 2012 and 2013, when the number of competing projects was relatively lower, the prices offered, although lower than reference prices, were on average at a level higher than the minimum allowed price. In 2014, with many more projects taking part in auctions, bid prices were close to the minimum, i.e. 30% below the reference price.

In Poland no minimum price level was introduced. This suggests that there might be situations similar to those in the UK, where the auctions were won by PV projects at unrealistic prices and the investors had to withdraw from their projects.

It very unlikely that the objectives of the RES Act's regulatory impact assessment will be met, i.e. for all auction-winning projects to be built within two years. Both in Italy and the Netherlands the investors failed to complete their projects in the shortest time possible. Moreover, a secondary market appeared for projects that are being sold to other investors. In Italy that market is estimated at approx. 40% of the entire contracted volume, out of which less than 20% of projects have been eventually completed. This happened despite the fact that projects ready for construction were allowed to participate in auctions.

All these countries are considering changes in pre-qualification and increasing the penalties in case of failure to complete projects. However, the Polish auction scheme does not provide any milestones during the investment process. No lessons have been learnt from the British model, for example, where the effects of auctions will certainly be visible faster and better thanks to more strict times for completion and providing such milestones.

It has been once again confirmed that the division into so-called "baskets" for different technologies reduces the effectiveness of the entire system. Wind projects will be forced to fiercely compete with one another, whereas PV or biomass projects will not. Removing at least some of the divisions into technology "baskets" (e.g. the division into projects operating above and below 4,000 hours per year), or allowing for transfer of unused volume to baskets where there is significantly more projects than volume allocated to auction, would significantly improve the effectiveness of the entire system.



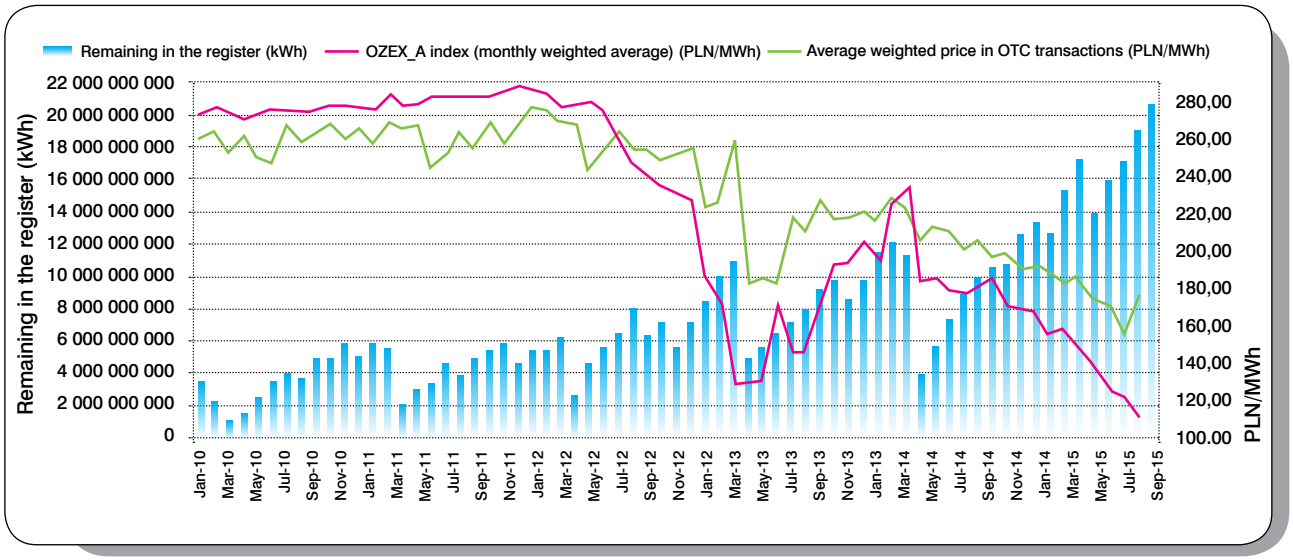
Oversupply
of certificates
of origin

The fundamental instrument of support for RES installations in Poland are green certificates. The certificates, issued by the Energy Regulatory Office (URE), are traded at the Polish Power Exchange (TGE/PolPX) and purchased by companies obliged to buy energy from RES. The value of this obligation, expressed in percentage of the volume of electricity sold to end users, is regulated by the Minister of Economy. In case of failure to meet this obligation, the companies pay a substitution fee set by the Regulatory Office. From 2005 to early 2012 the value of green certificates remained slightly below the substitution fee. This was due to frequent revisions of the value of obligation resulting from the pace of investment in RES installations.

The oversupply problem

Certificate prices started to fall in 2012, and in February 2013 their price fell below PLN 100 per MWh, whereas in 2011 the price was close to PLN 300. In the second half of 2013 the prices started to rise, but this turned out to be temporary and soon afterwards the prices of green certificates fell again to a level close to PLN 100 per MWh. They remain at this level until today, as illustrated in the chart below.

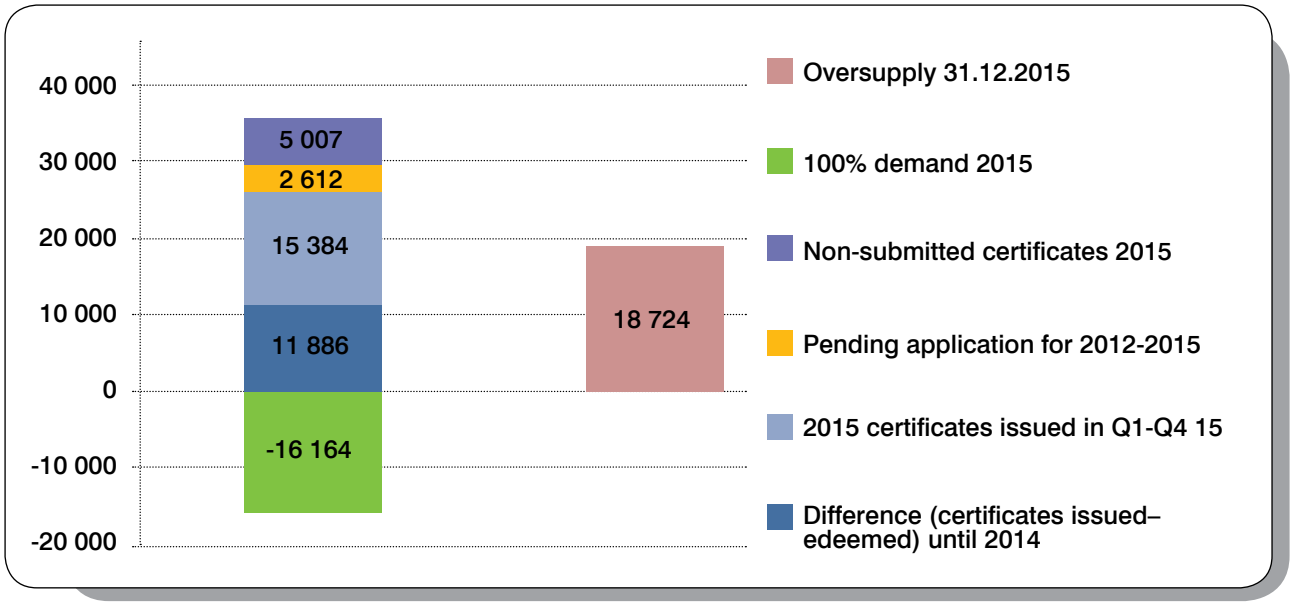
Fig. 9. Price trends in the green certificate market



Source: TGE S.A.

The oversupply of green certificates continued to grow and amounted to 18,724 GWh at the end of 2015, which is more than 100% of forecasted annual demand for green certificates for 2015.

Fig. 10. Oversupply of green certificates as of 31 December 2015 (GWh)



Source: PSEW based on data from URE and ARE

Since 2014, PWEA has been publishing quarterly updated figures on oversupply of green certificates on their website.

What the RES Act has changed

The main reason for the price slump was the faulty regulatory policy. The primary impulse for the appearance of oversupply, which resulted in such a dramatic fall of green certificate prices, was the fixed obligation quota for 2010-2012, set in 2006 and never revised afterwards, despite the fact that the National Renewables Action Plan for those years included the increases in both installed capacity and production from renewable sources. The 2012 revision of the quota for the coming years was insufficient, and the 2015 RES Act repeated the quota volumes for 2015 and 2016 at the level set in 2012, i.e. before the first slump on the green certificate market in early 2013, and when it was known that these volumes are too small compared to the generation capacity of RES installations. Simultaneously the RES Act introduced reliefs for energy-intensive companies, reducing the demand for green certificates.

The intention of the Ministry of Economy was to restore the balance on the green certificate market by limiting the rights to receive green certificates by depreciated installations (15-year support period, excluding large hydro above 5 MW from the system), and cutting in half the support for co-firing, i.e. a technology which in 2009-2012 developed in an uncontrolled way due to very low investment costs. These provisions were included in the RES Act, but they became effective only in 2016, at least three years too late to successfully stabilize the green certificate market.

Thus, the adoption of the RES Act has not stopped the negative trends in the green certificate market. The simulation model of supply and demand developed by PWEA clearly shows that limiting the oversupply to the level of approximately 50% of annual demand for green certificates in 2020 is possible, but it would have to be based on maintaining the maximum obligation quota at the level of 20% until 2020. It is a simple consequence of lack of revisions to the system over the last four years.

The new energy market design in Poland and the EU

THE ENERGY UNION

On 25 February 2015 the European Commission presented a communication on "Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy" (COM/2015/080). According to the basic concepts, the foundation of the Energy Union will ultimately be a joint energy system, effectively utilizing locally available energy resources and strongly developing modern, low-emission technologies. A fully integrated internal energy market will allow for integration of renewables and ensure secure energy supply to consumers, while maintaining competitive energy prices.

The Energy Union aims at maintaining EU's leading position in the use of renewable energy sources. Reaching the planned RES share of at least 27% (primarily in the power sector) is a step towards making the EU less dependent of fuel and energy imports from less stable regions of the world. The communication puts special emphasis on the development of national energy strategies, in line with the European Union goals. That is why it is important for energy strategies developed in the Member States, including Poland, to fully incorporate the fundamental assumptions of the EU's climate and energy policy, including the Energy Union.

In the Communication, the European Commission has repeatedly stressed the need for such a design of the energy market that would ensure best possible integration of renewables in the power systems. This requires system stabilization based on reasonable principles and gradual inclusion of renewables into all market components (including balancing), as well as allowing RES to provide ancillary services.

The new energy market design

Last year the European Commission carried out public consultation on a new energy market design (COM(2015) 340).

Europe has to face a change in the electricity market design and be able to respond more flexibly to a larger number of distributed energy sources. The new design is aimed at supporting the effective integration of all market players. According to the European Commission, a solution to possible problems can be increasing the share of renewables, regional system adequacy assessment, expanding cross-border interconnectors and developing a pricing system that would best reflect the current supply and demand.

The European Commission is aware that reaching the goals of the energy union will require a fundamental transformation of the European energy system (including a reform of the European electricity market), ensuring more predictability in integration of wholesale and retail trade and attracting further investment.

Reaching the EU targets on climate and energy by 2030 means that the share of energy from renewables will probably reach 50% of total energy production. The markets are currently not flexible enough, both with regard to supply and demand, to be able to support such increased share of energy from renewable sources in the market. The new market design should ensure that the energy markets can withstand such transformation at a minimal cost. This can be achieved by removing the existing barriers to renewables and by ensuring that the market sends correct signals regarding sufficient investment in flexible capabilities necessary to absorb the increased share of energy from renewables in the system. The road to a successful and low-cost integration of renewables leads through well-functioning short-term electricity markets, active from the day ahead to the very consumption, allowing full access to flexible technologies.

The European Commission's objective is to fully integrate renewable energy source into the power system by ensuring that the markets are ready to absorb the energy from renewables on equal

grounds to energy generated by conventional sources. In case of lack of adequate generation capacity, the Member States should primarily consider faster roll-out of smart metering systems and expansion of cross-border interconnectors.

REGIONAL COOPERATION

Creating a strong regional energy market is one of the key aspects of discussion on the new market design. The European Commission, European Parliament and European Council all encourage regional cooperation between Member States. The foundation for such cooperation should include joint coordination of energy strategies based on joint adequacy forecast and assessment of generation capacity, demand for energy, age and expansion needs of grid infrastructure (including adequate interconnectors) and RES potential in each country of the region. Such an assessment would allow for optimal utilization of available resources and production of electricity at lowest prices possible. Regional cooperation will not only reduce RES integration costs, but it is also very important in the context of security of energy supply in the region and ensuring that prices are kept on a competitive level .

The Memorandum of Understanding on the reinforced Baltic Energy Market Interconnection Plan (BEMIP), signed in June 2015 by Denmark, Germany, Estonia, Latvia, Lithuania, Poland, Finland and Sweden, was an important development with regard to strengthening the cooperation between the Baltic Sea states. The document aims at closer cooperation in the energy sector between the countries around the Baltic Sea, which is of key importance to the region's energy security and to optimal utilization of RES potential in particular countries.

The European Commission has proposed for the Baltic Sea Region to implement three pilot solutions for the entire energy market in Europe:

- creating a proposal for a joint action plan until 2030 on development of RES in the region; the plan would be developed by 2018
- coordination or development of a joint support scheme for offshore wind farms in the region with required infrastructure (Baltic Grid)
- far-reaching changes in the energy market leading to better market integration of RES

European Commission's DG Energy has strongly emphasized that regional cooperation on RES is indeed in line with the Energy Union concept and expressed hope that by 2018 the Baltic Sea states will draw a road map of green energy development after 2020, becoming leaders within the EU.

Discussion on capacity market

State aid in the form of capacity market is starting to dominate the debate in the media and in the corridors of Polish ministries. The coal-based generation sector also believes that the capacity market is a recipe for necessary investments in coal-fired energy.

According to PSE (the Polish grid operator), by 2020 it can be necessary to decommission outdated conventional units with a total capacity of 7 GW, or even 12 GW by 2030. There is only 6 GW in new capacity under construction. According to the coal-based energy sector, without state support the market today cannot see the need or possibility to build new capacity. A question has to arise whether the state has the right to take part in such investments to ensure security of energy supply.

There are many ideas on the introduction of capacity markets in Poland, but in principle all come down to the fact that the capacity market is about paying the generators not for electricity sold and produced, but for their readiness to ensure specified generation capacity at a given time, i.e. keeping certain generating units available.

Some Member States have already introduced solutions supplementing the single-commodity energy market, called capacity mechanisms, aimed at ensuring security of supply in the long term. Others are working on such ideas. The notion of "capacity mechanism" includes many types of detailed solutions, where capacity is acquired in advance or subsidised. A general classification of capacity mechanisms is presented below.

It should be noted that some capacity market elements are already in place in Poland, such as the successful introduction by PSE of the operating capacity reserve. Under this mechanism, certain generators do not switch their units off, although their operation on the market is not profitable. Payment for such a reserve is ensured by a several hundred million budget in PSE's tariff.

Another capacity market element to soon become operational in Poland is the tender for the so-called intervention cold reserve service. It is a certain capacity that is taken out of the market and remains in the sole disposal of the transmission system operator in case of power shortage in the system. In Poland, the "intervention cold reserve" will operate as a temporary measure to improve security of energy supply in 2016-2017, with an option for a 2-year extension.

Whereas the wind industry has no reservations towards the capacity market elements currently in place, it principally does not understand and opposes the introduction of a capacity market in the shape proposed by the CHP sector in Poland, which is not aimed at investment in new generating capacity, but rather at keeping the old, unprofitable power plants alive. Such an approach has a number of negative consequences (including drop in energy prices on the wholesale market) and will bring the operation of market mechanisms to a halt.

EU-level developments and experiences from other Member States with regard to capacity market

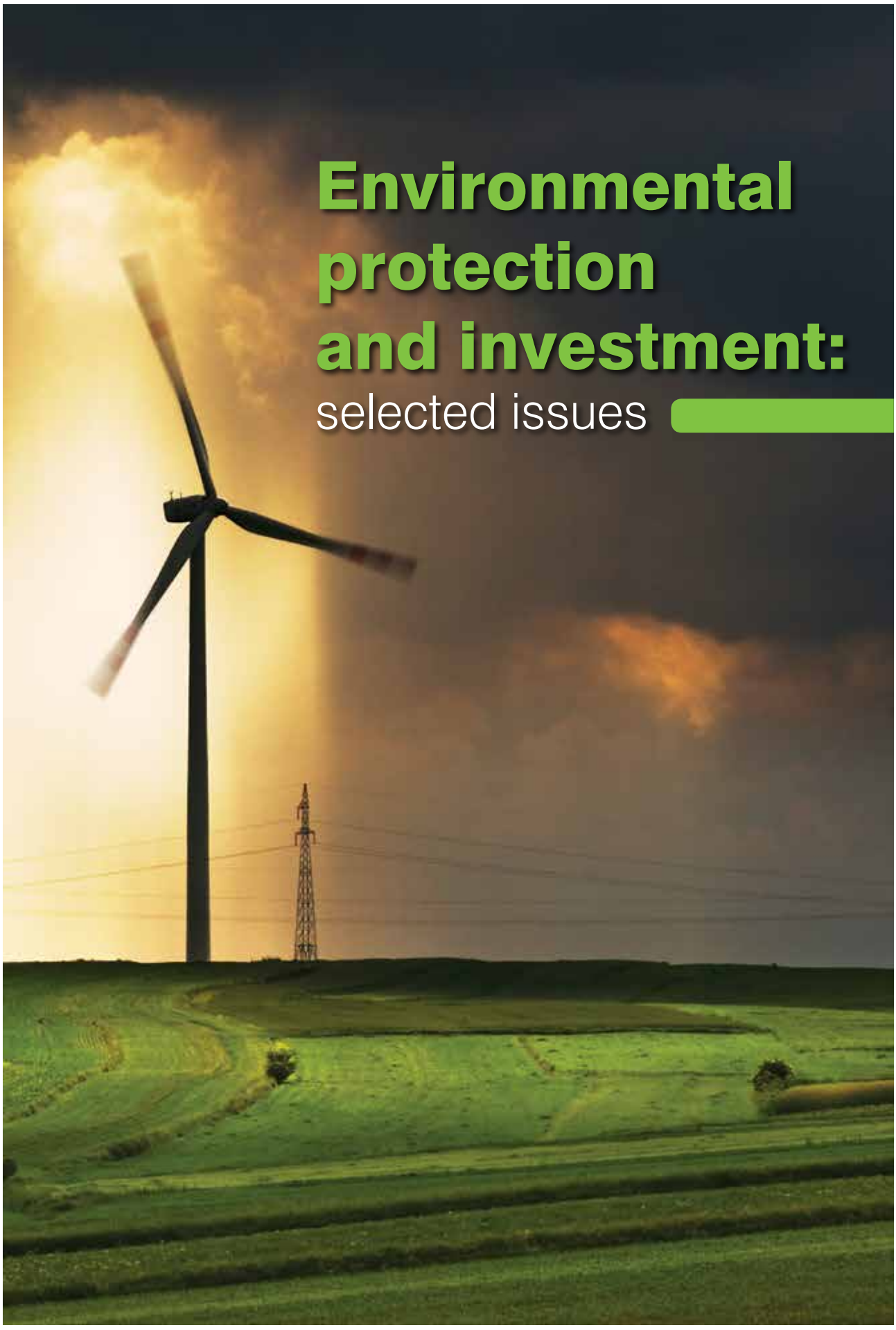
According to the European Commission, preventing disturbances in electricity supply should not go beyond absolutely necessary measures. Relevant public bodies should first allow market mechanisms to function in order to generate necessary investments.

If there are doubts as to whether the market itself is able to ensure generation adequacy and security of supply, then before taking action in the form of state intervention it is recommended to carry out an objective (fact-based) and comprehensive assessment regarding generation adequacy in that market. Relevant authorities are encouraged to include two main factors in such assessment – the forecasted effects of application of EU legislation on internal energy market, and the forecast of generation adequacy in the entire EU, currently under development by the European Network of Transmission System Operators for Electricity (ENTSO-E). Such assessment must also take into account the potential of investment in transmission infrastructure, including interconnectors and increased involvement from end users.

According to the requirements of the directive on security of electricity supply, the European Commission should be informed about the generation adequacy assessment carried out. If the comprehensive assessment shows the existence of a serious problem with generation adequacy, the Member States are encouraged to consider alternative measures, which may solve or minimize the problem in an equally successfully manner as state intervention. These measures include supporting and facilitating demand-side actions, by e.g. faster roll-out of smart metering systems and expansion of interconnectors, in particular with neighbouring countries who generate electricity surpluses or have different energy source capable of supplementing the energy portfolio of a given state.

If alternative measures are also insufficient to solve the problem of inadequate generation capacity, further measures may include: a strategic reserve, a temporary tendering procedure (its one-off character has to be made clear), or, if these measures also fail, a market-wide mechanism ensuring generation adequacy. Regardless of the measures selected, the Member States in their activities should take into account the objective of phasing out subsidies to energy generation from fossil fuels by 2020. A tendering procedure aimed at acquiring new generation capacity allows for the most economical solution to be found, if it is organized in an open and transparent way, without discrimination of any technology or any action increasing the flexibility of the power system, with inclusion of demand-side operators and – to the largest extent possible – operators from other Member States (e.g. up to the maximum import capacity). The tender criteria may include requirements on technical parameters and effects on CO_2 emissions in order to avoid pressure to use new generating capacity.

According to the wind power industry, an alternative to the capacity market is to use ancillary services in case of a rather inflexible power system, based on old thermal units, as is the case in Poland. Detailed and clear specifications are of key importance for such services to exist. Ancillary services from wind farms could function on similar principles as those offered by conventional units, i.e. be rendered against payment and provided for the system operator. This would increase the possibility for integration of variable sources in the system (connection capabilities), and on the other hand it would improve the security of the national power system. Therefore PWEA is involved in preparation of an implementation concept for ancillary services in Poland, aimed at showing how many benefits, apart from energy generation itself, are brought by wind farms to the entire power system.



Environmental protection and investment:
selected issues

The Polish Environmental Impact Assessment Law after amendment

The Environmental Impact Assessment (EIA) involves multiple stages and aims at protecting the environment against adverse consequences of investment and meeting environmental quality standards regarding emissions and noise. The EIA procedure applies not only to specific projects, but may also be required already at the planning stage, i.e. strategic environmental impact assessment.

The process of amending the EIA Act (the act of 3 October 2008 on the Provision of Information on the Environment and its Protection, Public Participation in Environmental Protection and Environmental Impact Assessments, JoL 2013, item 1235, with later amendments) was initiated based on a letter from the European Commission to the Polish Government. In that latter, the Commission raised the issue of inaccurate implementation of Directive 2003/4/EC into the Polish Law on the Provision of Information on the Environment and its Protection, Public Participation in Environmental Protection and Environmental Impact Assessments.

The amendment also aimed at harmonizing the Polish law with Directive 2003/4/EC of European Parliament and of the Council of 28 January 2003 on public access to environmental information and repealing Council Directive 90/313/EEC (Official Journal L 41 of 14 Feb 2003, p. 26). Additionally, the several years of experience in having the EIA Law helped identify changes required to clarify certain doubts and introduce provisions pertaining to previously unregulated issues.

The amendment process started on 5 December 2014, and ended on 29 October 2015 when it was signed by the Polish President and became effective.

While drafting the law, a decision was made to resign from the controversial obligation to provide cumulative impact assessment at the stage of developing a project information sheet, as well as providing the assessment for projects for which an application was filed to obtain the administrative decision on environmental conditions. Instead, at the EIA stage, the law introduced the obligation to submit information about links with other projects, in particular accumulation of impacts from other projects that are completed, under implementation or planned, where administrative decisions on environmental conditions have been issued.

The amended law introduces a possibility of changing administrative decisions based on the Polish Construction Law without the need to obtain the decision on environmental conditions in specific instances, namely in the case of decisions to withdraw from an approved design with regard to specific parameters of a building facility (volume, build-up area, height, length, width and number of floors), provided that such changes do not necessitate changing the decision on environmental conditions.

The above mentioned provision indicates the possibility to change such specific parameters of a building facility in the obtained building permit decision, under the condition that such changes do not lead to larger or different environmental impact of the project, based on which individual conditions for implementation had been specified in the environmental decision.

Changes have also been made to extend (to 6 years) the period when the decision on environmental conditions can be used apply for the building permit. Additionally, the law introduces an extended 10 year validity of the decision on environmental conditions. Previously, the application for the building permit, preceded with the decision on environmental conditions, could exceptionally

be filed within 6 years after the decision on environmental conditions became effective, provided the authority issuing the decision on environmental conditions agreed that the project was phased and conditions specified in the decision did not change. Now this period is 4 years longer.

The procedure leading to the environmental decision, which involves developing the EIA, requires public participation in the decision making process. This can be done for instance by collecting comments and motions regarding the planned project from all stakeholders. The amended EIA Law extends the period for filing such comments from 21 to 30 days. This results directly from the transposition of recent amendments to the Directive 2011/92 to the Polish law.

The amended law also requires environmental documentation to be developed by qualified specialists by introducing the requirement of graduation from selected major courses (e.g. chemistry, natural science or agriculture, forestry and veterinary) or graduation from any other studies but having at least 5-year experience in teams developing EIA reports or forecasts, or, alternatively, participation in developing at least 5 EIA reports or forecasts. The compliance with the above requirement is proved by producing a compliance statement, accuracy of which is subject to criminal liability.

One of the amendments by the Senate, adopted by the Parliament, specifies that in case the decision on environmental conditions requires the EIA to be repeated, the planning party is required to deliver the EIA for the project.

According to the new law, an entry to the land register no longer has to be attached to the application for the decision on environmental conditions. It can be replaced by a document produced by the land and building register authority which specifies parties to the procedure and at least one plot number and possibly the entry number to the mortgage register, name and surname or firm and address of the registration body for the site concerned and the range of the project impact area.

The amended act is also aimed at preventing conflicts of interest when a body issuing the environmental decision, e.g. municipality, is at the same time an investor. In such a case, the decision on environmental conditions for the project is issued by the director of the Regional Environmental Authority.

The recent amendment of Directive 2011/92 requires member states to introduce sanctions ensuring effective implementation of their national EIA laws. The amended law introduced financial penalties for breaching certain provisions of the environmental decision. Administrative financial penalties (from PLN 500 to PLN 1,000,000) could be imposed for breaching the following provisions of the environmental decision: conditions for the use of land during project implementation, obligation to prevent, mitigate and monitor the impact of a project on the environment, requirements to reduce cross border environmental impact, providing environmental compensation, and submitting ex post project analysis. The fines are to be imposed by the Regional Environmental Inspector after considering the number and significance of irregularities. The decision on imposing the financial penalty can be appealed to the Chief Environmental Inspector.

Discussion on the location of wind farms

Wind power still causes a number of controversies among the general public. Those controversies most frequently apply to the impact wind turbines have on human health and on the environment. Therefore, in the past several months, initiatives have been appearing to change the rules applicable to designating the location of wind farms in order to limit the possibility of establishing such farms.

In the existing legal regime, the main and the most important condition for designating a location for a wind farm is compliance with the so-called environment quality standards. This means that every project needs to develop advanced analyses showing that the implementation of a project is in line with the law, primarily as regards the impact on the environment and health of people. Calculations are developed for "the worst-case scenario", i.e. the operation of the planned turbine model at peak power output at night. The distance of wind turbines from residential houses is determined based on several factors. These include terrain configuration, proximity of residential houses, height of turbines and acoustic influence. These items are subject to individual, in-depth analysis for each specific project.

Over the past several months, Polish MPs have been working on three drafts relevant for determining the location of wind farms.

LANDSCAPE LAW – THE DRAFT BY THE PRESIDENT OF POLAND

The draft law contains provisions amending several other laws, including the Construction Law, Spatial Planning Law and the Environmental Law. In its original version, the Landscape Law included a concept of a "dominant" (spatial dominant, previously referred to as landscape dominant), namely a building or structure with major visual impact on the landscape.

The definition of the concept seemed the most controversial. Although height could be a justified criterion, the concept of a spatial dominant could not bring solutions in cases such as the presence of natural features, e.g. mountains that are higher than any man-made structures that could be built in their vicinity. Towards the end of the drafting process, an even more controversial idea was introduced, namely to extend the concept of a dominant with the criterion of its volume.

Another controversial issue was the intention to introduce Urban Landscape Protection Rules to the law, rules which were to be adopted by regional parliaments as a local law similar to local master plans. Finally, the legislator introduced landscape audits instead.

Landscape audits, however, involved the risk that projects which should enhance the value of municipalities (by taking care of their nature and landscape) could become a factor limiting or hampering their development. According to that concept, findings of the audit implemented by the province might reduce the planning competence of a municipality. Resolutions on audits were to be adopted by regional parliaments and determine local conditions. Thus, regional governments could decide on excluding certain areas from development. This should not have a negative impact on the development of municipalities, since the draft included a requirement to consult any planned restrictions.

Landscape audits involved a challenge that could not be met, i.e. the cost of developing such audits. The impact assessment of the draft law assumed that the cost of developing such audits in all Polish provinces would be PLN 6.4 million. The amount seemed to be too small as indicated by the Jagiellonian Institute in their study discussing the impact of landscape law implementation. [31]

Experts from the Institute concluded that the landscape audit introduced by the law was nothing else but the ecophysiographic study, which already existed, extended with an urban inventory of the entire region. After examining the current market prices for such audits, the Institute stated that instead of PLN 6.4 million, the cost of landscape audits might vary from PLN 150 million to PLN 750 million!

[31] Expert study on consequences of implementing landscape law, Jagiellonian Institute, May 2014.

Finally, the landscape law introduced some limitations on developing new building facilities applicable to landscape protection zones (LPZ) only. Consequently, limitations are valid solely in LPZ designated by resolutions of regional parliaments and ONLY in protected landscape areas and landscape parks.

Introduction of such restrictions to locating building facilities needs to be justified by one of two factors, namely a priority landscape has to be designated within a protected landscape area or in a landscape park. Municipalities, however, need to be consulted while drafting a resolution on such restrictions in case the limitation to the development of a municipality is excessive in relation to provisions of the study of conditions for development or the local master plan in comparison with values to be protected.

The Landscape Law of 20 March 2015 is clearly an example of compromising interests which at the first glance seem contradictory. The presidential draft was developed not only by MPs and senators but also urban planners, architects, local government officers and representatives of sectors influenced by provisions of the law.

THE AMENDED LAW ON SPATIAL PLANNING AND DEVELOPMENT – THE OPPOSITION DRAFT

The second draft focusing on the issue of wind farm location was submitted by Law and Justice party (PiS) MPs. According to that draft, the distance of wind turbines above 500 kW to residential buildings and forests should be not less than 3 km. Introduction of such a fixed limitation would in fact completely eliminate the possibility to locate any wind farms in Poland.

Such controversial provisions raised justified doubts as regards the compliance between the draft and the constitution.

The draft also raised concerns about its compliance with the Constitution, since it interfered with the tasks carried out by local governments. Provisions of the draft setting a buffer between wind farms and other facilities would infringe the constitutional autonomy of local governments in the spatial planning process. Therefore, the law would interfere with competences of the local government. Needless to say, the prohibition to develop such a large area reduces the inherent planning capacity of local governments. Thus, defining a buffer zone excluded from a specific development would contradict the Constitution, since the legislative branch interferes with the constitutional competences of the local government.

The draft also included a proposal for the distance provision to be retroactive, which again gave rise to concerns about the compliance with the Constitution, since it would require dismantling of already existing installations.

Eventually, the draft received a negative recommendation of the parliamentary Infrastructure Committee and Local Government Committee, and was rejected during its third reading.

THE AMENDED LAW ON SPATIAL PLANNING AND DEVELOPMENT – THE DRAFT BY PARLIAMENTARY LOCAL GOVERNMENT COMMITTEE AND INFRASTRUCTURE COMMITTEE

The third draft to introduce regulations on location of wind farms was the draft amending the law on spatial planning and development and the building law, submitted in late 2014.

Provisions included in the draft developed by the committees implied an obligation to cover locations of all RES installations, excluding micro-installations (i.e. with a capacity above 40 kW), by the study of conditions and directions for development (further referred to as the "Study").

The drafting party proposed regulations which provided for a parallel development of changes to the Study and the Master Plan, provided the two documents underwent public consultations separately. Public consultations of the Master Plan were supposed to precede the adoption of a new Study. This could have a positive effect by expediting the planning process at the municipal level and ensure cohesion between the two documents.

Thus, the local Master Plan would become the only basis for location of RES installations with a capacity over 40 kW.

A full master plan based planning procedure is more accurate and complete than an administrative decision on conditions for development. It also has one more advantage, namely it involves public participation in the process of adopting a master plan. The obligation to determine the location of wind farms based on the master plan would certainly lengthen the procedure, but more importantly the procedure would be reasonably based on the local law. According to the current rules, the lack of a master plan does not prevent a party from developing a wind farm, and in such an instance a project can be implemented based on the administrative decision on development conditions.

The PWEA had a positive opinion on the direction of proposed changes, based on the fundamental principle that all larger RES installations have to be located based on local Master Plans.

After the second reading, the draft was submitted back to the committee for reporting. The joint committees for Infrastructure and Local Government and Regional Policy did not manage to start working on the draft, therefore the legislative work on this amendment was not completed in the previous term of the Parliament.

Criticism on determining the location and construction of onshore wind farms – a report by the Supreme Audit Office

In July 2014, the Supreme Audit Office (NIK) published an audit report on "Determining the location and building of onshore wind farms". The audit aimed at assessing the correctness of procedures implemented by public administration bodies, in particular compliance with spatial development rules, environmental protection and mitigating the impact of onshore wind farms. The audit covered 28 municipalities and examined administrative procedures leading to decisions on environmental conditions for planned wind farm projects. Further examination covered planning procedures directly linked with investment plans, including those related to local studies of conditions and directions for development and master plans.

Due to a number of controversies regarding the very critical conclusions of the report, the Polish Wind Energy Association decided to verify the report with more detailed information concerning planned and already operating wind farms. In fact, the audit results showed that in majority of audited municipalities (more than 80%) no major irregularities were discovered, and the general audit results were positive.

The Supreme Audit Office pointed to irregularities related to locating wind farms on land owned by local decision makers found in 11 municipalities. However, PWEA's verification proved that the actual conflict of interest in terms of locating wind turbines or supporting infrastructure on land owned by decision makers or their relatives could be found in 7 municipalities (in total 10 cas-

es). After a thorough analysis, no irregularities were found in all other instances. It turned out that locating wind turbines on land owned by decision makers applied to individual plots or turbines comprising larger wind farms. The scale of this phenomenon was much smaller than suggested in the report's conclusions or in the media release from the Audit Office.

PWEA's analysis demonstrated that the Supreme Audit Office carried out a very general and selective analysis of documentation audited, which led to formulating inaccurate and negative conclusions. A particularly severe example was found in the Municipality of Orły, where in fact the mayor (and owner of plot with wind farm) was not a decision making body regarding the adoption of the study of conditions and the local master plan, since relevant resolutions were adopted by the local council. Moreover, the mayor was not a party issuing an administrative decision on environmental conditions. This was, in fact, produced by the mayor of a neighbouring municipality since the major part of the wind farm was actually located there.

The audit findings contain chaotic and incomplete presentation of information and errors in quoted sources (e.g. numbering of resolutions) and misrepresentation of facts (e.g. incorrect information on the actual number of turbines operating in Municipality of Rzepin).

The accusation contained in the Audit Office report, regarding failure to perform public consultations while developing wind farms, does not correspond with audit reports developed by Local Audit Offices which only indicated some minor formal errors in administrative procedures (planning, decisions on environmental conditions). Such errors did not, however, significantly prevented citizens from participating in procedures and public consultations of draft planning documents. Comments and objections made by stakeholders, not only parties to those procedures according to the Code of Administrative Proceeding, but also NGOs, local associations, etc., prove that specific projects were actually consulted. The fact of disregarding specific comments due to their irrelevance and the lack of supporting arguments does not mean that the public was not informed properly about planned wind farm projects.

Some irregularities mentioned in the Audit Office report result from imprecise laws rather than premeditated activity of local administration. The prove for the above can be found in decisions quoted in the report that were made by public courts, supervisory bodies and local courts of appeal.

Despite PWEA's actions presenting unjustified, overly critical conclusions regarding the location process of wind farms, the Supreme Audit Office report still remains one of the arguments raised when motions are raised to introduce limitations to wind farm location. One example is the June 2015 draft resolution on a moratorium on development of wind farms, excluding micro and small installations, until relevant laws defining conditions for developing wind farms are adopted. The MPs who filed the draft used the same arguments as those included in the Audit Office report.

Due to its controversial nature, the resolution stood little chance to become effective and was finally abandoned.

A similar initiative from MPs appeared in December 2015, when the Committee of Agriculture and Rural Development adopted a formal request addressed to the government concerning regulations on designating locations for wind farms and agricultural biogas plants. The document requested the government to promptly regulate issues pertaining to wind farms, in particular determining the distance to residential buildings, and to locating agricultural biogas plants. Additionally, in their formal request, the Committee expected that the government undertake steps related to the development of RES in rural areas. Again, the same arguments were raised as those specified in the Audit Office report.

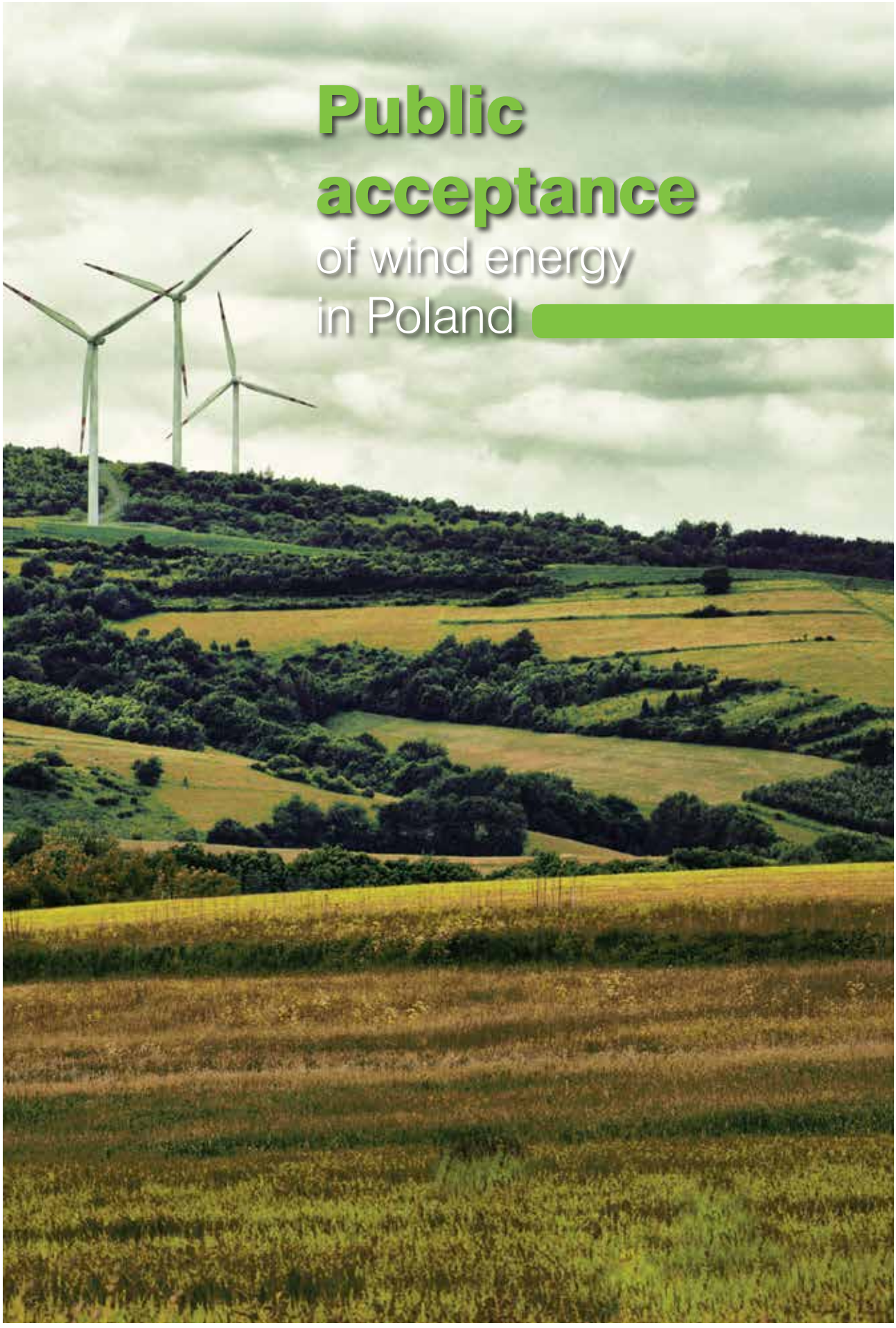
Noise regulations and the wind energy sector

The current maximum noise levels are specified in the Regulation of the Ministry of Environment on permitted noise levels in the environment (JoL 2014, item 112). The regulation specifies different types of facilities or activities generating noise, designation of land (its functions), as well as time of day and night. In early 2015, the Ministry of Environment established a team to review possible changes to existing noise regulations. The team involved acoustics experts, representatives of research institutions, as well as representatives of the wind sector and specialists from the Ministry. The work of the team was finished, and due to the change in the position of Minister of Environment, the new government may start the work on changing the noise regulation.

The proposals included a postulate to measure noise at ground level regardless of the time of day at specific wind speed and direction, whereas the measurement of background noise should be made with turbines switched off. The acoustic power level declared by the turbine manufacturer was to be established for at least three turbines of a given model. Another proposal was for the permitted noise level to be determined for all kinds of residential areas (instead of different noise levels for farm and residential buildings as it is today). These proposal significantly exceeded the practice of noise measurements and standard applicable in other European countries with much higher penetration of wind power.

Some experts considered it justified to provide turbine noise levels measurements in four seasons of the year to develop of a comprehensive picture of acoustic situation in the vicinity of a wind farm. Their measurements, performed each time at the same points on one of wind farms, showed differences in nose levels measured in spring, summer, autumn and winter.

The majority of experts opted for modifying or supplementing existing measurement methods to take into consideration specific nature of wind turbine operation rather than adopting new, complicated, and practically difficult measurement methods and completely new procedures that may lead to controversies.



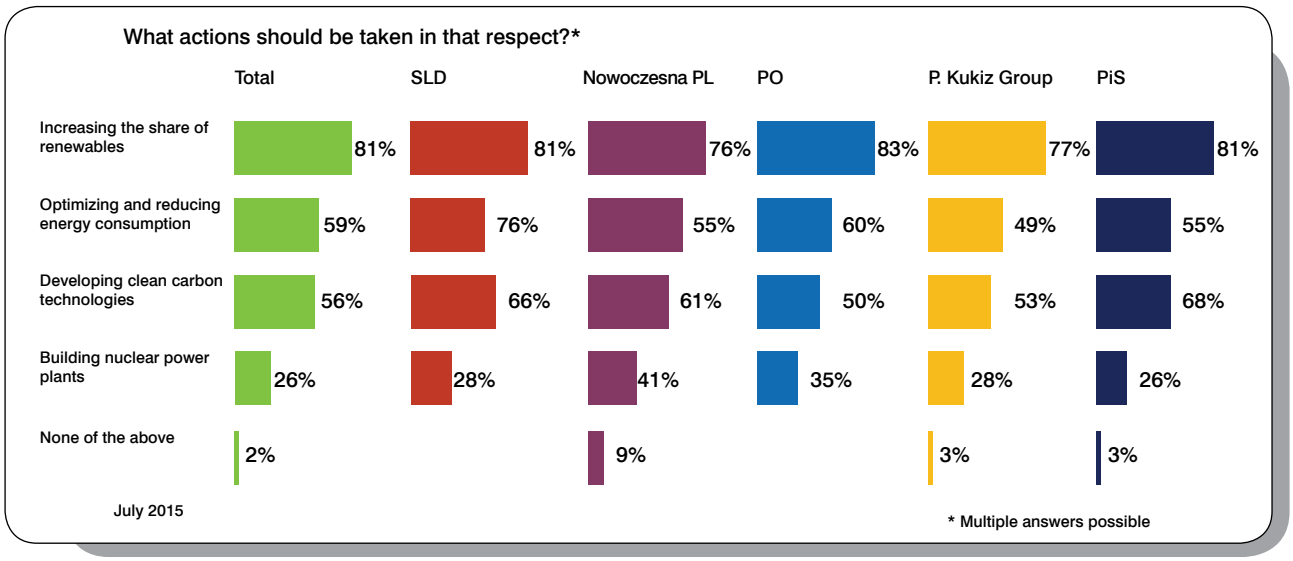
Public acceptance of wind energy in Poland

Public acceptance of wind energy is a very important aspect which affects the industry. For a number of years the opponents of wind turbines have been using similar arguments, many of which are exaggerated, and some are simply untrue. They argue that turbines are too noisy, they harm birds and bats and have negative health effects on humans. In most cases, protests against wind farms are caused by lack of access to reliable information and studies. Despite significant coverage of anti-wind sentiment in the media, the level of public acceptance for wind power is high, as confirmed by numerous public opinion polls in 2015, including the survey carried out by CBM Indicator[32] at the request of PWEA, looking at the perception of and attitude towards wind energy compared with other energy sources. The survey was also to show if there were significant differences in the attitude towards wind energy depending on the respondents' political preferences. The respondents were surveyed using the *Mixed-mode*, CAWI (online questionnaire) and CATI (Computer-Assisted Telephone Interview), on 10-26 June 2015. A nationwide sample representative for sex, age, province and size of town or place was surveyed.

Poles on climate change and energy deficit

Respondents were first asked about the climate change issue. It turned out that as much as 92% of the respondents believed climate change, including air pollution, to be an important problem. 86% of the respondents stated that politicians should tackle the problem of energy shortage which may emerge in several years. It will be noted that the survey was carried out before "Level 20" power supply limitations were introduced in August. As much as 81% of the 86% of Poles conscious of the problem said that, because of the energy shortage, the share of renewables should be increased (among the PO and PiS voters, these were 83% and 81% of respondents, respectively). Energy conservation and reduced energy consumption, development of the so-called clean carbon technologies or construction of a nuclear power plant had much lower results.

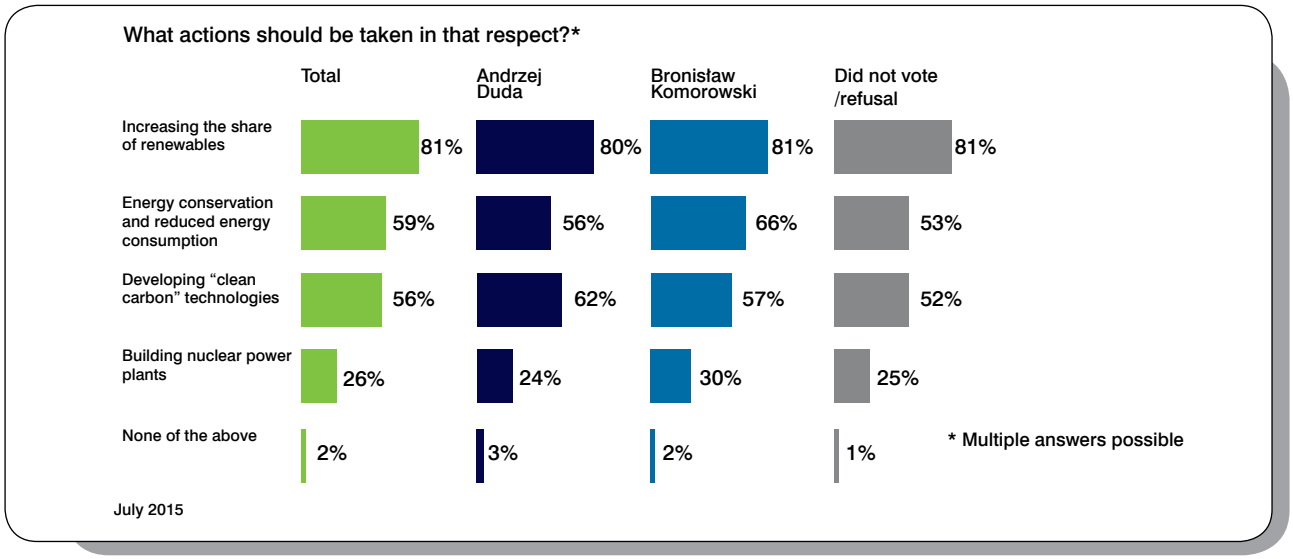
Fig. 11. Actions related to energy shortages



[32] Established in 1990, CBM Indicator is one of Poland's oldest opinion poll agencies. The founders and many of the firm's employees are associated with the academia. CMB Indicator has been audited for quality as part of the Pollster's Work Quality Control Programme for more than ten years now and the firm receives certi ficates for many survey categories every year. The certi ficate for 2015 comprised five categories of research: PAPI, CAPI, CATI, CAWI and quality surveys.

Similar results can also be seen among those who declared themselves as Andrzej Duda or Bronisław Komorowski voters.

Fig. 12. Actions related to energy shortages

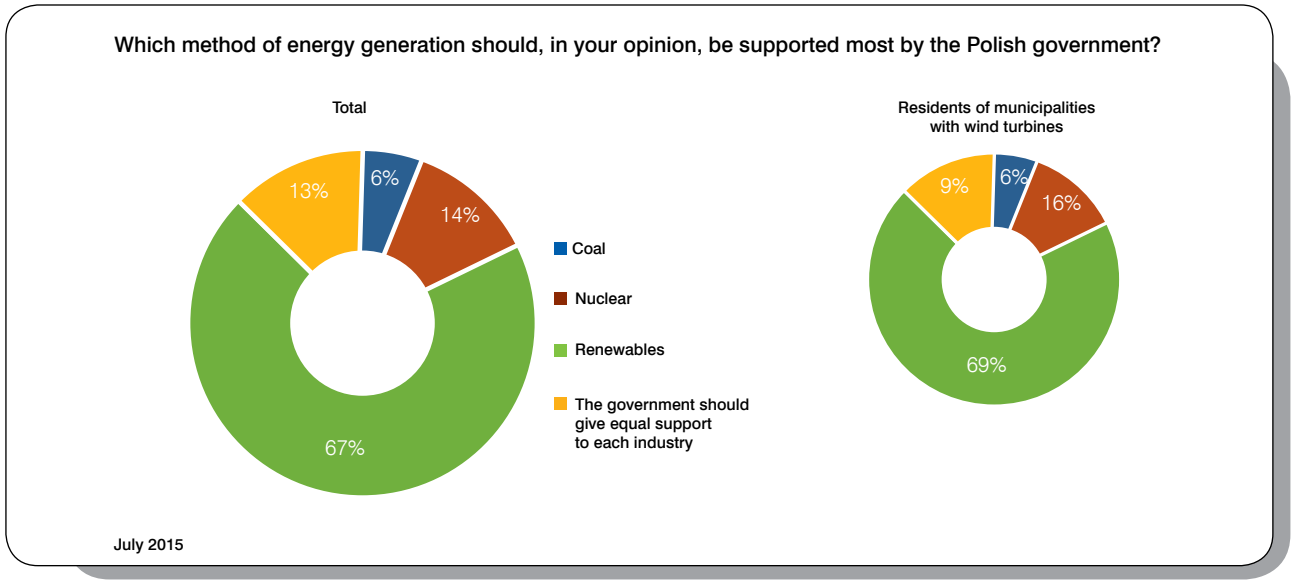


Therefore, the belief that the share of renewables in the power industry should be increased is independent of political preference.

Government support

The survey of CBM Indicator also showed that Poles want the support for renewables more than investment in coal-fired or nuclear power plants. This is what 2/3 of the respondents believe.

Fig. 13. Government support



The respondents' support for nuclear power turned out to be almost five times lower than for renewables. On the other hand, it is only one in sixteen respondents who wants the coal-fired power industry to be supported. For residents of municipalities where windfarms are already installed, the support for green energy is even a little bit higher.

The survey showed that – contrary to popular belief – Poles see many benefits of developing renewable energy sources. An overwhelming majority believe that RES contribute to environmental protection (89%), reduce our dependence on energy import (84%) and help create new jobs (72%). Most of the voters, regardless of political preference, also do not believe renewables to be harmful to animals or humans.

Wind farms compared to other energy sources

The Indicator's survey also showed that Poles choose wind farms when they can decide on the source they want their homes to be supplied from. With a nuclear power plant, a coal-fired plant, a biomass plant and a wind farm to choose from, the latter is selected by 72% of the people surveyed. Wind farms have also been assessed to be the most environmentally friendly (81% of respondents) and economical (67% of respondents) source.

Fig. 14. Comparison of power plants – part 1

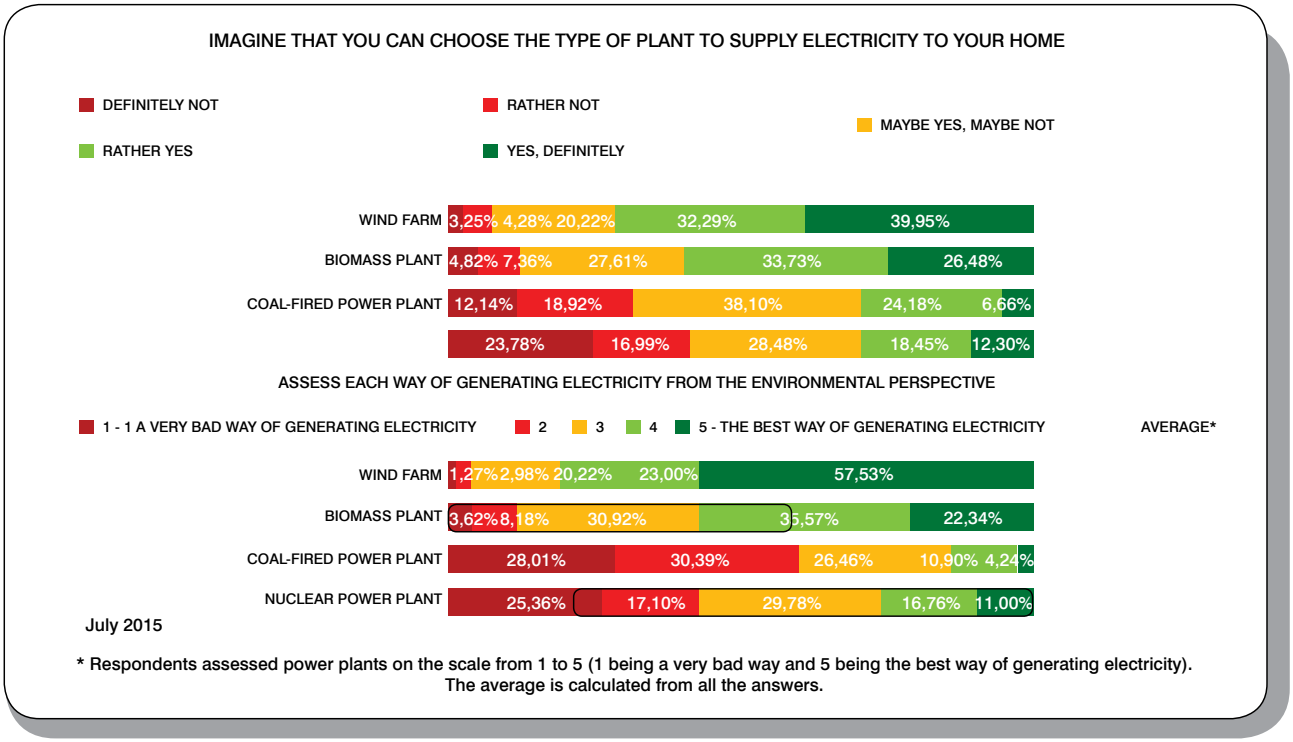
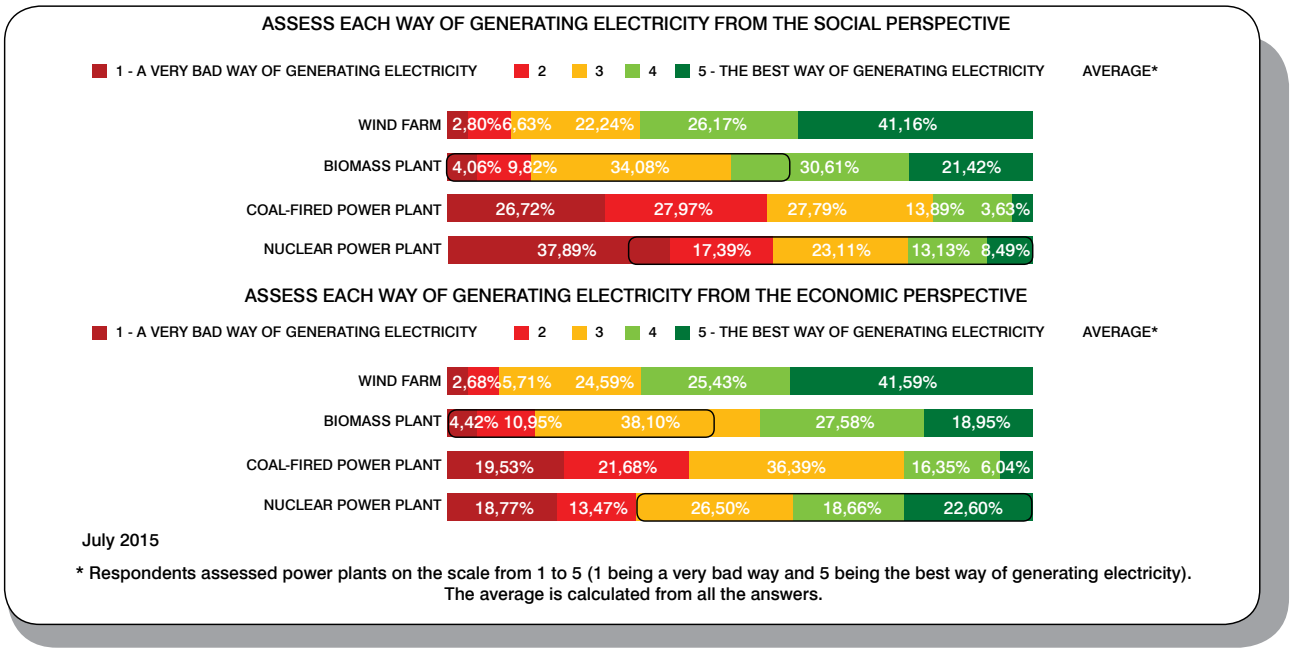


Fig. 15. Comparison of power plants – part 2



* Respondents assessed power plants on the scale from 1 to 5 (1 being a very bad way and 5 being the best way of generating electricity). The average is calculated from all the answers.

The respondents' most negative attitude was towards a nuclear power plant since as many as 41% would not use it if they were to choose. And 31% of respondents would not choose a coal-fired plant. Even more people (58%) also considered coal-fired sources to be the least environmentally friendly ones. Wind farms have the lowest number of opponents and were considered to be the most beneficial in all the respects the interviewers asked about.

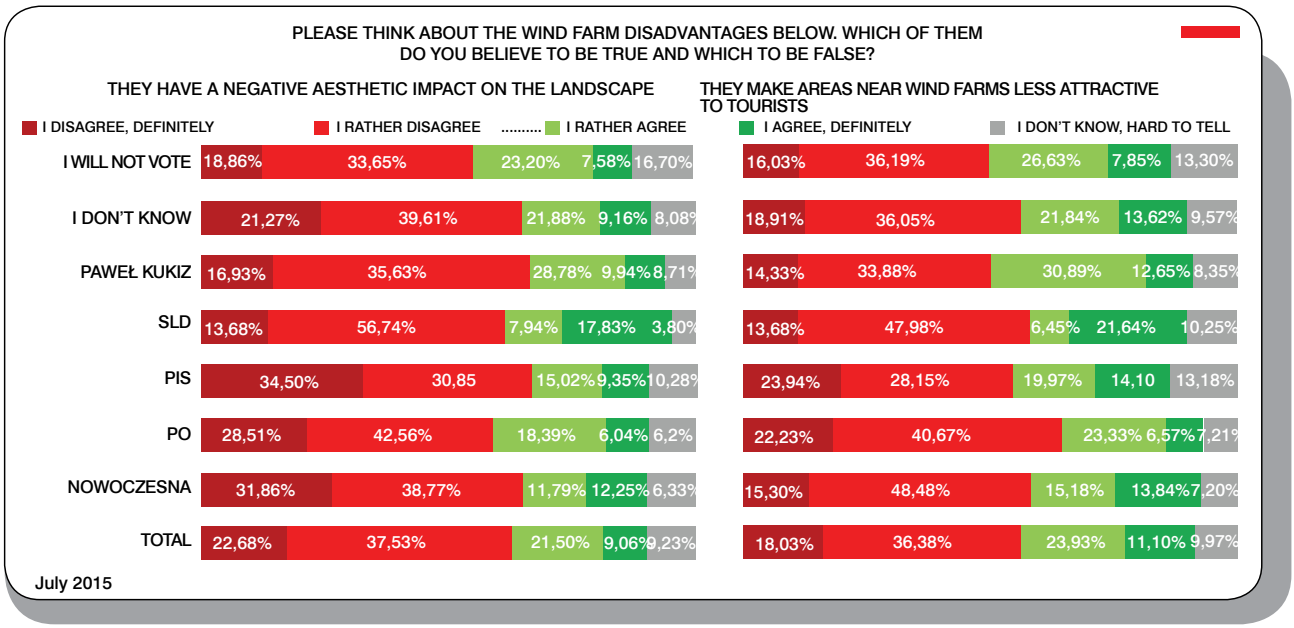
Advantages and disadvantages of wind farms

CBM Indicator also surveyed Poles' attitudes to some of the alleged disadvantages of and myths associated with wind farms.

DISADVANTAGES OF WIND FARMS ACCORDING TO RESPONDENTS

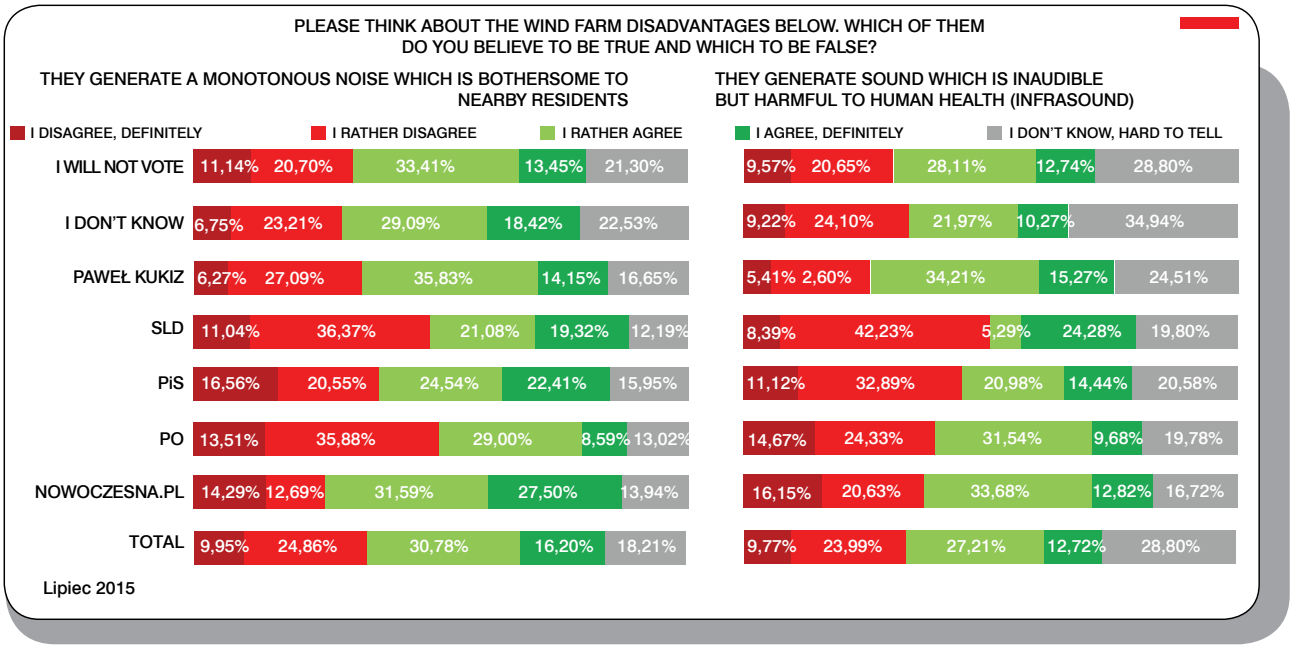
The majority of respondents considered the allegation of having a negative aesthetic impact on landscape (61%) and making areas near wind farms less attractive to tourists (54%) untrue.

Fig. 16. Disadvantages of wind farms – part 1



The belief that those myths about wind energy are false was found to be independent of the respondents' political preferences. The number of people who believe that wind turbines generate noise which is bothersome to nearby residents and of those who do not believe it is more or less the same. 47% of the respondents have this concern while 45% believe the opposite.

Fig. 17. Disadvantages of wind farms – part 2



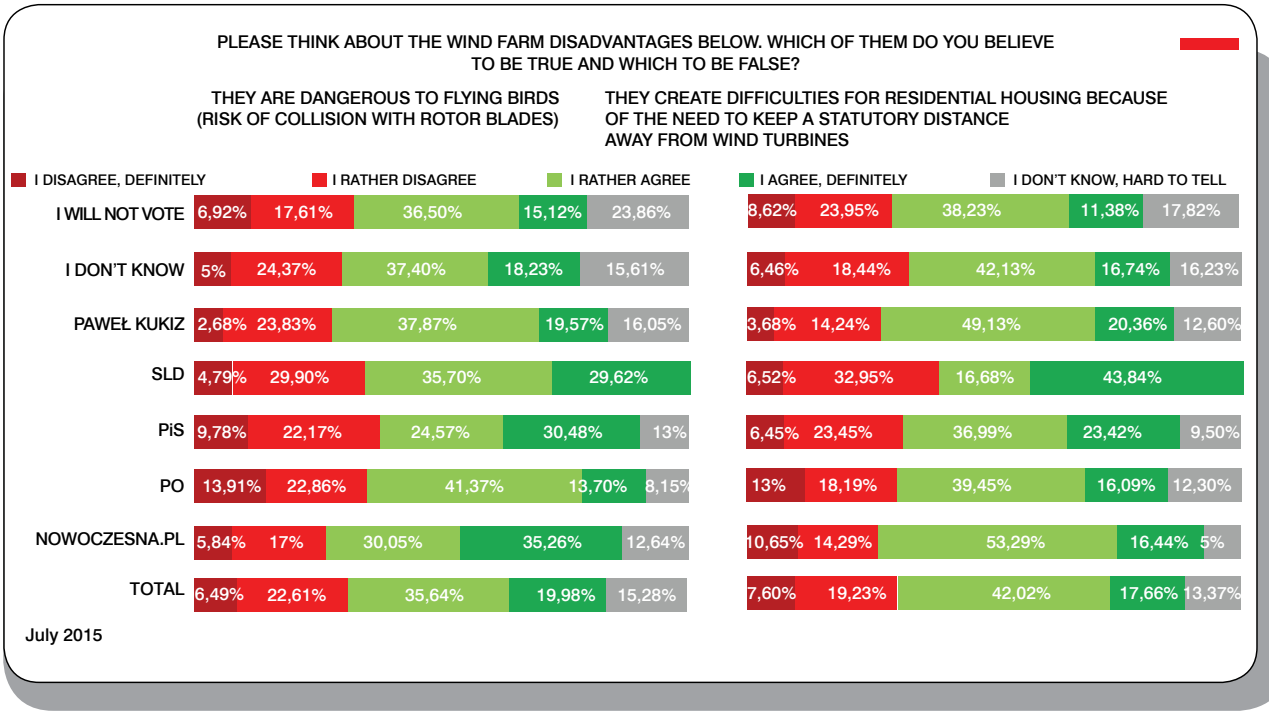
40% of respondents were afraid of infrasounds (compared with 34% not afraid of such sounds); however, as many as 26% had no opinion.

The biggest disadvantage of wind power in the eyes of respondents were the limitations is the use of property due to the need to keep statutory distance between wind turbines and buildings. This was indicated by 60% of people.

It also appears that the most deeply rooted myth on wind power among the general public is its negative effect on birds. This is what 56% of respondents believe. In fact, well-designed wind farms, as demonstrated, among others, by the US study entitled "A Summary and Comparison of Bird Mortality from Anthropogenic Causes with an Emphasis on Collisions"[33] of 2005 which shows wind turbines to have caused only 0.01% of bird mortality during the year (compared with, for example, buildings and windowpanes, cats and vehicles, responsible for 59%, 10% and 8% of bird deaths, respectively).

[33] „A Summary and Comparison of Bird Mortality from Anthropogenic Causes with an Emphasis on Collisions", W. Erickson, G. Johnson, D. Young Jr., USDA Forest Service Gen. Tech., 2005

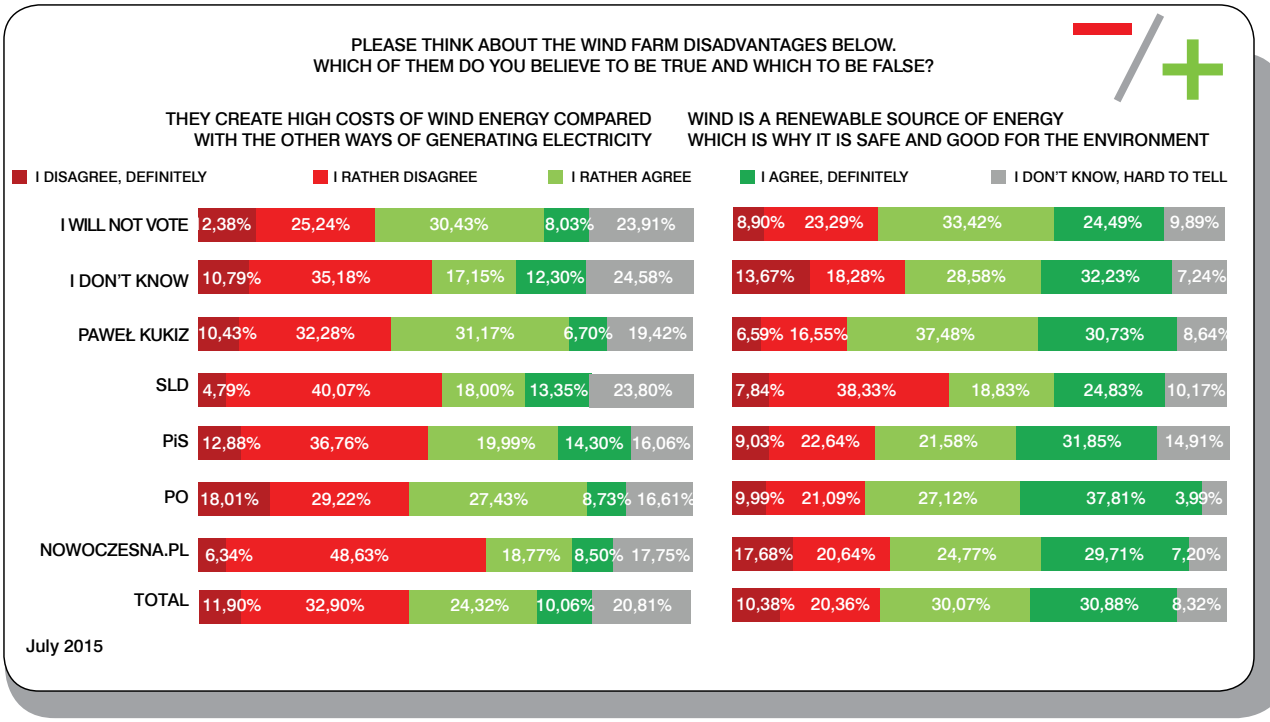
Fig. 18. Disadvantages of wind farms – part 3



ADVANTAGES OF WIND FARMS IN THE LIGHT OF CBM INDICATOR'S RESEARCH

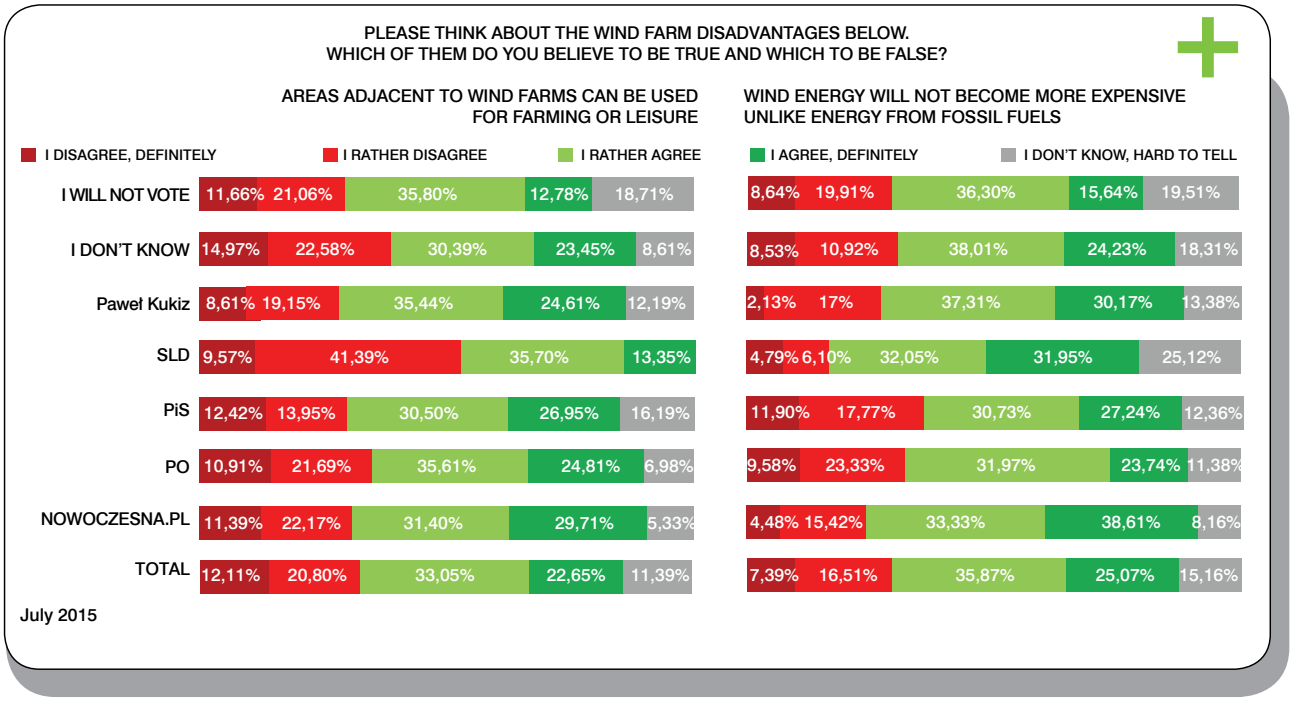
The respondents mostly disagreed (45%) with the opinion that wind power is more costly compared to other energy source. 34% of respondents were of a different opinion (that wind power is more expensive).

Fig. 19. Advantages and disadvantages of wind farms



Nearly two thirds of the respondents also believe that wind energy is safe and good for the environment. 55% of people also realize that land adjacent to wind farms can be used for farming or leisure.

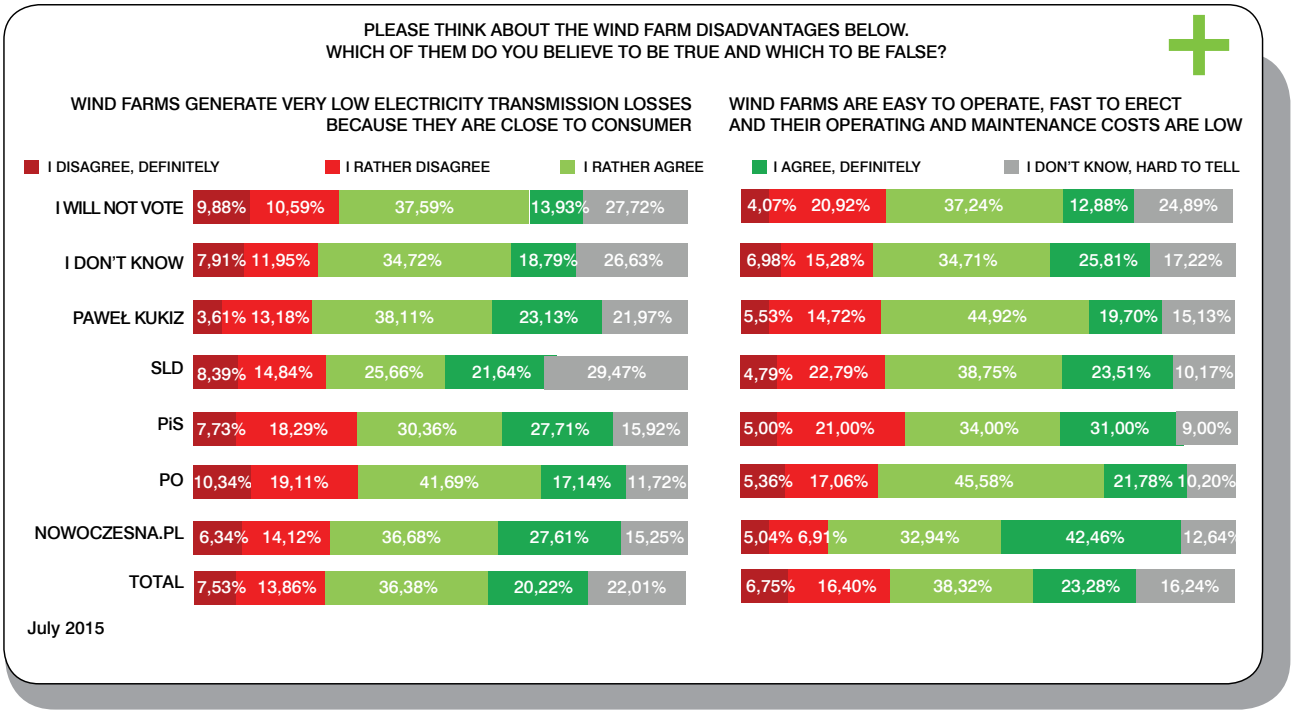
Fig. 20. Advantages of wind farms – part 1



Indicator's research has shown that the majority of Poles are convinced that wind energy will not become more expensive in contrast to energy from fossil fuels. This opinion is shared by the majority of respondents, regardless of their political views. The percentage of people who believe in stable prices of wind energy (61%) is several times higher than those who think this to be false (24%).

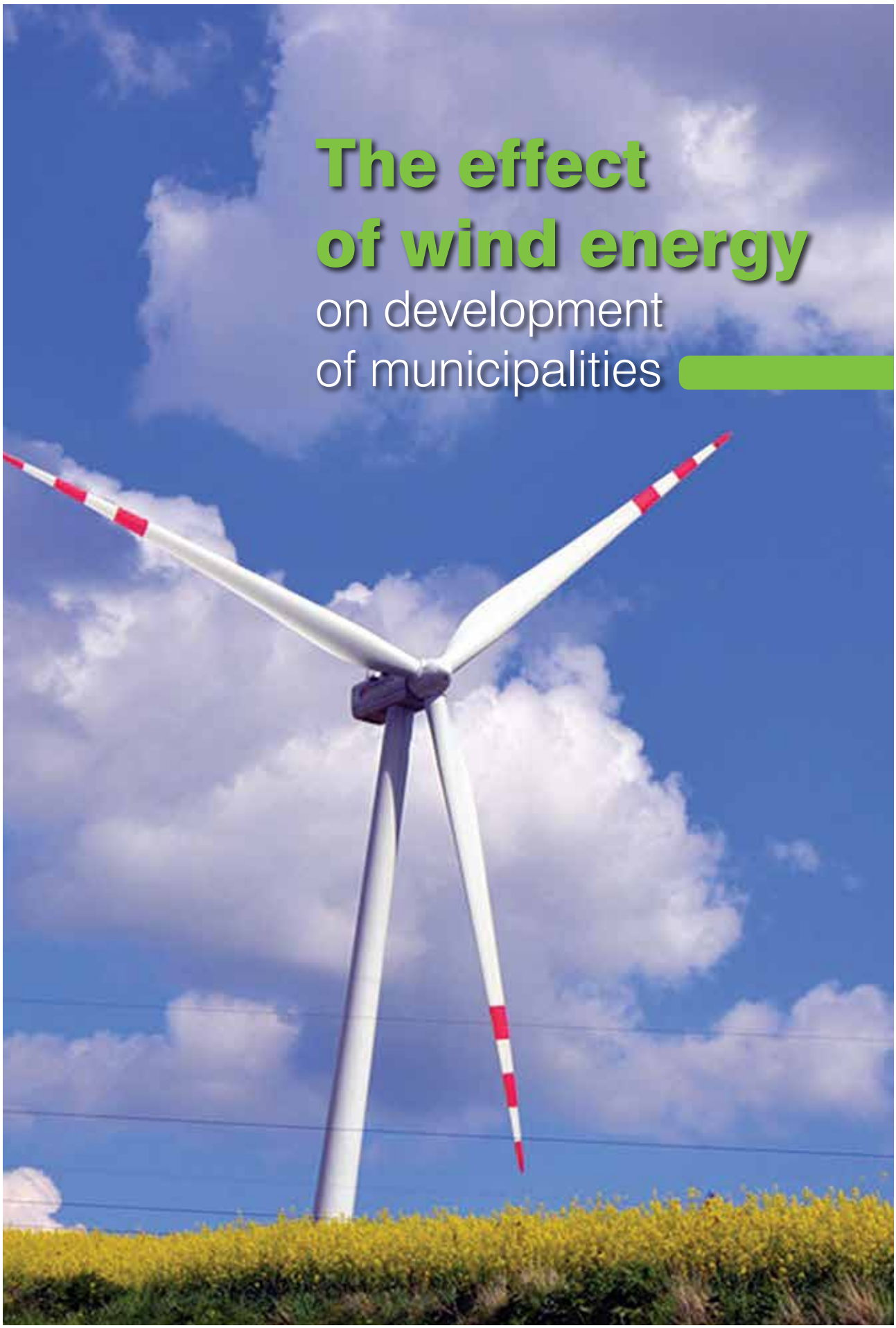
Other important advantages of wind farms in the opinion of Poles include their proximity to customer which results in lower transmission losses, as well as short erection time and low operating costs. Also here there are no significant differences in opinions depending on declared political preferences.

Fig. 21. Advantages of wind farms – part 2



The opinion poll clearly shows that most Poles do not share the opinion that wind power leads to higher electricity prices because its costs are higher than for other energy sources. This applies to voters of all the political parties, both the governing party PiS (65%) and PO, the main opposition party (69%).

CBM Indicator's survey shows that, contrary to some beliefs, Poles do not have a negative attitude towards renewables or wind energy. Even more so, two thirds believe that the government should support renewables more than other ways of generating electricity.



The effect of wind energy on development of municipalities

The growing number of wind farms in Poland leads to a more visible effect on the development of municipalities where they are located. This is shown by the PwC report "Wspólny Głos Branży" (*Common Voice of the Industry*) published in 2016.

It follows from the report that those municipalities where wind farms are located received additional revenues into **their budgets at an average of 5.5% in 2015 which means that their budgets are increased annually by an average of PLN 1.1 million.** Nationwide, the highest benefits are gained by municipalities from five provinces which, in total, produce 72% of the wind energy. These are West Pomeranian, Pomeranian, Kujawy-Pomerania, Wielkopolskie and Łódzkie provinces.

The average annual revenue in municipal budgets from wind farm related taxes per 1 MW of installed capacity is:

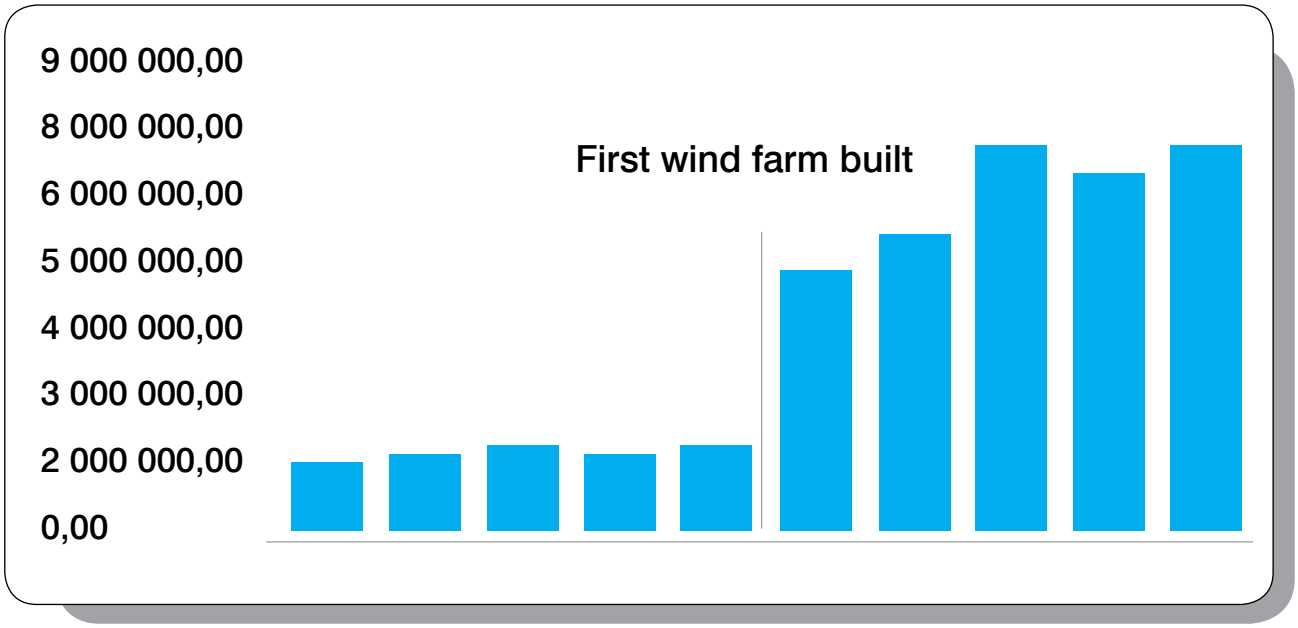
- more than PLN 45,000 of real estate tax
- more than PLN 2,500 of personal income tax
- more than PLN 4,500 thanks to corporate income tax

Therefore, on average, each 1 MW in wind farms provides additional tax revenues to municipalities of more than PLN 50,000.

A detailed analysis of seven local government budgets showed the average tax revenue from wind farms to be over PLN 3,800,000 per year for each of the municipalities. Representatives of local government highlighted that wind farms also provide benefits which are not shown in the municipal budget. The most frequent value added effects are municipal and council road repairs (the cost of one kilometre is estimated at approx. PLN 250,000). Another benefit for municipalities are school repairs. Investors pay part of their costs, which takes the burden off local government budgets. A common practice is also to buy equipment ranging from desks and chair to educational items and specialist equipment. Another example of how municipalities benefit is where repairs of existing or construction of new pitches or sports fields are funded.

A good example of benefits coming from wind farms is the municipality of Margonin, with Poland's largest wind farm of the total capacity of 120 MW. It allows to meet the demand for electricity of 90,000 households. This is why Margonin is one of the best-recognisable municipalities to become a success thanks to wind farm construction. However, the benefits are not limited to the image only, which is shown when PwC analysts scrutinised Margonin's revenues.

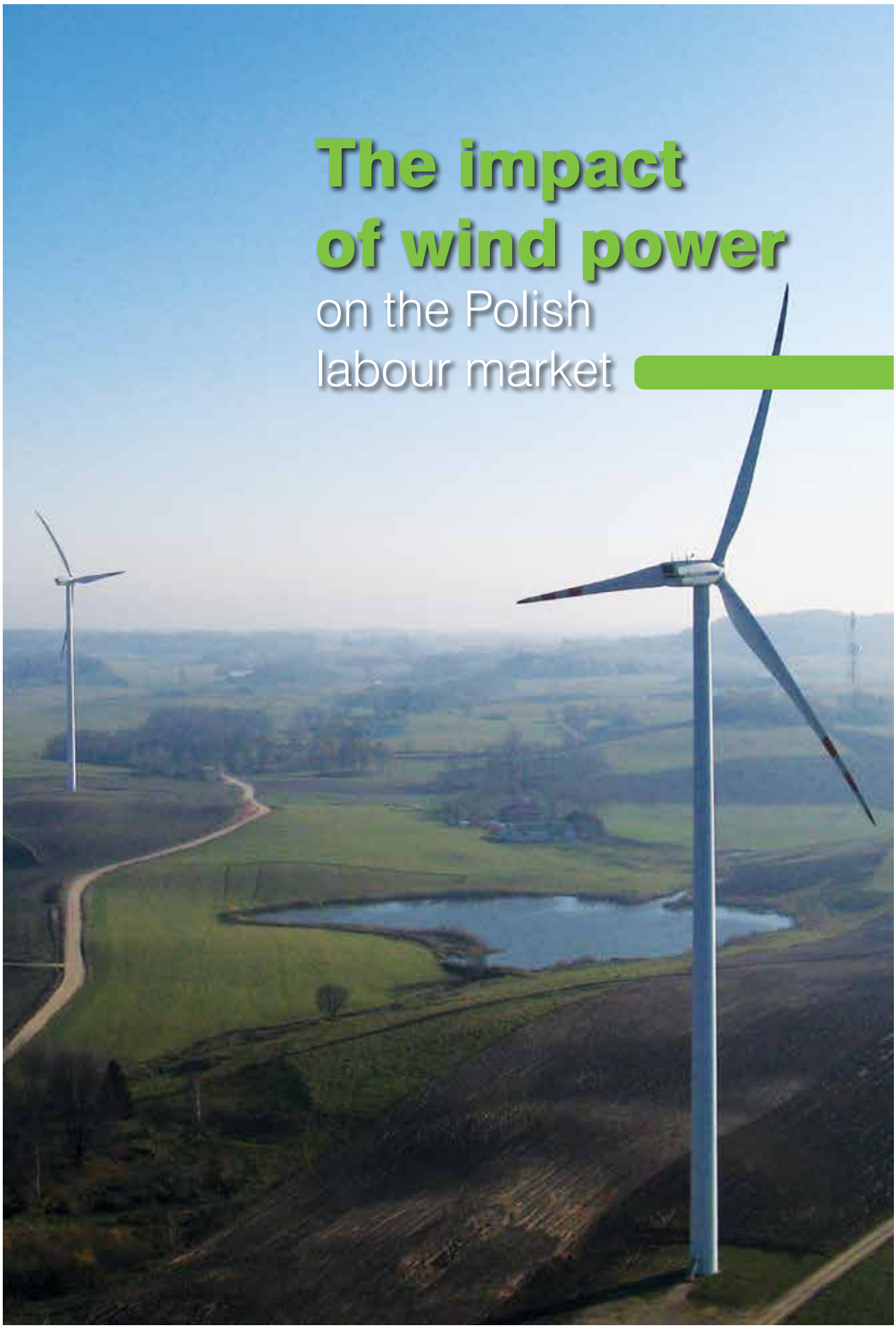
Fig. 22. Changes in revenues of Margonin Municipality (PLN)



Source: *Wspólny Głos Branży* (Common Voice of the Industry) report by PwC

As noted by PwC analysts, it cannot be clearly concluded that several times higher revenues in the budget result from the construction of wind farms only. However, it is to be remembered that the wind farms have a significant effect on the municipality's economic situation. What is also important are the additional benefits of wind farm construction which allow to save considerable funds and use them for additional investment projects.

Another municipality to tap into the potential of wind energy is Kobylnica, one of the first municipalities to have agreed to a construction of wind farms. There are several dozen wind turbines there with a total installed capacity of 130 MW. Thanks to the turbines, the municipality gains, approximately, an additional PLN 4m every year (from real estate tax and rent) which accounts for about 10% of its budget revenues. The money is used, among other things, to build water and sewage systems and new roads, repair cultural facilities and upgrade schools and sports facilities.



The impact of wind power on the Polish labour market

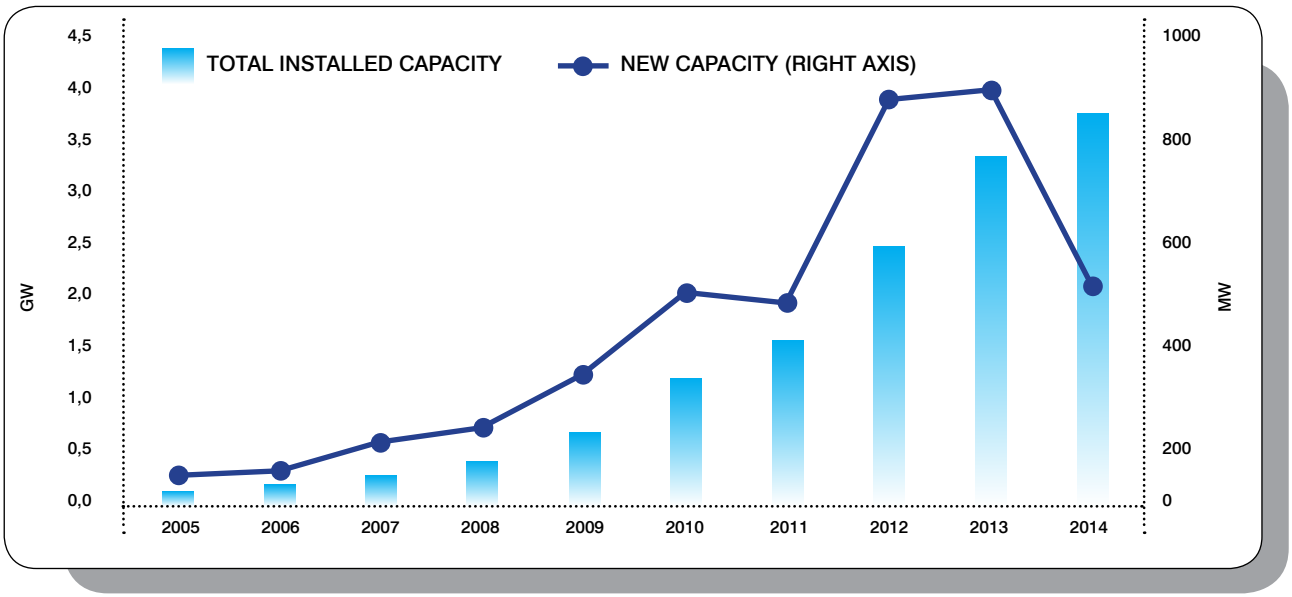
WISE report conclusions in brief

- In 2014, the wind power sector provided jobs for 8,400 people in Poland (including 2,800 in the industry), out of which 3,400 jobs were created in the direct environment of the sector. For comparison, the cement industry employs ca. 6,000 people in Poland, and the oil refinery sector – 9,000.
- Construction of a 10 MW onshore wind farm creates 114 jobs during the construction stage and additional 5 permanent jobs during the operation period.
- Reversing the negative trend in employment requires giving a new impulse to domestic investments in wind projects, whereas in the next decade the dynamics of employment created by the wind power sector will be primarily determined by the scale of investment in offshore wind farms.
- In 2030, in the dynamic wind power development scenario, the Polish wind sector will provide 42,000 jobs (including 11,000 in industry), with ¾ in the offshore sector. In the stagnation scenario it will be 4,000 jobs.
- In 2030, the wind power sector could provide more jobs than the hard coal mining sector, which – according to WISE – will employ between 4,000 and 16,000 people after the inevitable restructuring. Contrary to the mining sector, whose long-term prospects result from factors beyond Polish control (i.e. the situation on the global coal market, a ban on subsidizing non-profitable mines in the EU, etc.), the development of the wind power sector will, to a large extent, depend on the shape of regulations created within Poland.
- The wind power sector creates diverse jobs in manufacturing, service and construction, requiring different qualifications and skills. Its development ensures not only increased number, but also improved quality of jobs around the industry.
- Polish companies and the Polish labour market are losing potential profits due to the ever-changing, unpredictable energy policy of the state. They will gain, if Poland focuses on a consistent transformation of the energy sector and looking for attractive niches in the global market for low-emissions energy technologies. It is a real opportunity to create several tens of thousands of new, stable jobs in the entire economy.

Jobs created by the wind power sector in Poland in 2005-2014

During the last decade Poland experienced a 50-fold increased in installed capacity in wind, from 83 MW in 2005 to almost 5,000 MW in 2015. The green certificate system was driving the investments between 2005 and 2010, but uncertainty regarding the future support for RES and the fluctuations on the green certificate market led the sector into a period of strong disturbances. New capacity installed in 2011 was lower than in 2010, but the next 2 years brought an investment boom (with a total of 1.8 GW installed in wind), followed by another slowdown (only 450 MW installed in 2014). Due to the change of the support scheme, 2015 will see an increase in installed wind capacity (under the old support scheme), and in 2016-2017 an investment gap is expected (from the first auction to the completion of first wind farms operating under the new support scheme).

Fig. 23. Existing and new wind capacity in Poland in 2005-2014

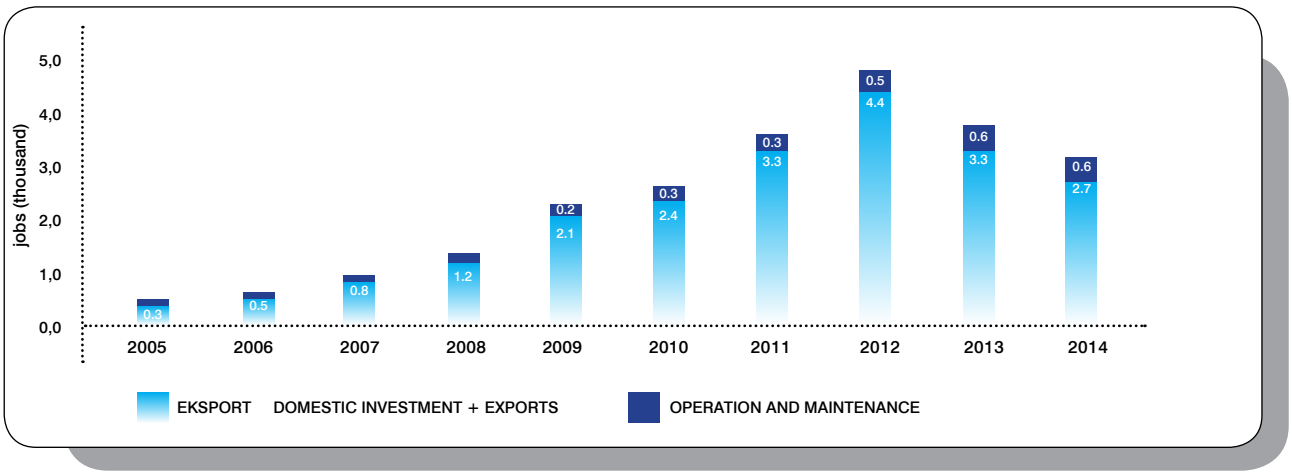


Source: WISE, based on URE data

The scale of investment, changing year to year, has translated into the number of domestic jobs related to wind power. The biggest number of employees are required at the turbine manufacturing and wind farm construction stage, especially when the wind power sector in the country is at an early stage of development and the number of wind farms requiring service is low. Therefore, the years 2005-2012 were a period of dynamic growth of employment in the sector. Whereas in 2005 the wind power sector created approx. 300 direct jobs, 7 years later, at the peak of the boom, direct component suppliers provided employment for approx. 4,400 people – both for the domestic power sector and for exports. At the same time, direct employment in operation and maintenance of existing wind farms rose from several tens to approx. 500 people.

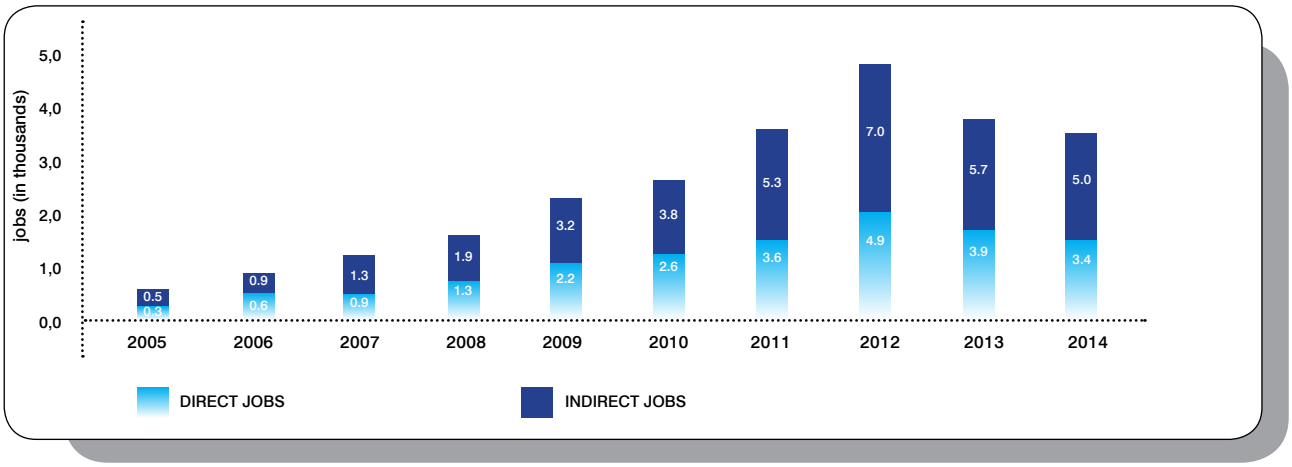
The reduction of investment in 2014 resulted in a drop of direct employment linked to wind power to 3,400 people in 2014 – despite further growth of employment in operation and maintenance of increasingly numerous wind farms in Poland.

Fig. 24. Direct jobs linked to wind power in Poland, in 2005-2014



Source: WISE calculations

Fig. 25. Total number of jobs linked to wind power in Poland, in 2005-2014



Source: WISE calculations

For each person directly employed in manufacturing of products and provision of services for the wind power sector there is approx. 1.5 indirect jobs created by sub-suppliers. Both the creation and loss of one job in the direct surroundings of the wind energy sector translates into creation or loss of more than one job in other sectors. Based on the currently installed capacity it can be estimated that the construction of 10 MW in onshore wind creates 39 direct jobs in the year of investment.

Tab. 9. Jobs generated in Poland by investment and maintenance of wind farms in 2014

	DIRECT	INDIRECT
JOBS CREATED BY 10 MW OF NEW WIND CAPACITY	39	114
JOBS CREATED BY 10 MW OF EXISTING WIND CAPACITY	2	5

Source: WISE estimates

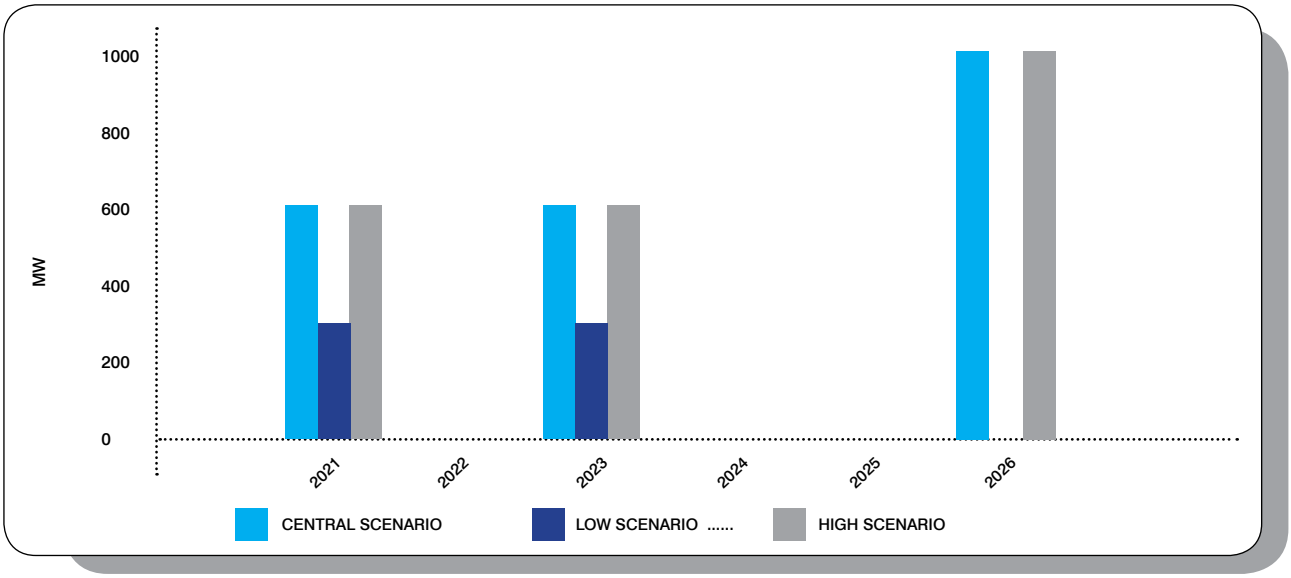
Together with indirect employment, this translates to 11.4 jobs created per 1 MW of new capacity in the investment period. Keeping these jobs in the future requires continued investments in wind power and the expansion of Polish companies to international markets. Gradual increase of wind capacity in Poland, and – in the longer term – replacement of old wind farms with new ones, will ensure continued employment for people involved in wind project development. In turn, the operation and maintenance of existing wind farm with a 10 MW capacity is linked to 2 direct and 3 indirect jobs. As a result, the total number of wind power-dependent jobs in Poland was 8,400 in 2014 and almost 12,000 two years earlier. The biggest share (ca. 40%) in job creation comes from services, due to their significant economic importance and relatively high labour intensity. About 1/3 of jobs in wind power are in industry, which translated into employment for 2,800 people in 2014.

Expected impact of wind power on the Polish labour market by 2030

The shape of the European Union's energy and climate policy clearly indicates the need for further increase of the share of renewables in the national power mix. However, the dynamics of changes, the specific level of the national RES target for 2030, and the contribution of wind power to meeting that target still depend on future decisions made within Poland. Therefore the potential impact of wind power on the Polish labour market until 2030 was determined based on scenario analysis, with three options for the sector's development in Poland: central, low and high scenario. They can be treated as three different scenarios of the public policy, favouring the development of wind power to various degrees.

The forecast for 2015-2017 is common for all scenarios. Investments in onshore wind in 2015 were higher than in 2014, but this was a one-off growth, resulting from the shift in the support scheme for renewables (last year for project to be qualified for the green certificate system). The introduction of the new, auction-based support scheme will translate into a slowdown of investment in wind capacity until 2017. In the coming years, the dynamics of investment may change depending on the adjustment processes within the sector and possible other changes to the regulatory environment. It is expected that between 2018 and 2030 investments in onshore wind will amount to 400 MW/year in the central scenario, 200 MW/year in the low scenario (in case of negative regulatory framework, e.g. reference prices at RES auctions making the development of a large part of wind projects impossible), and 600 MW/year in the high scenario. It should be stressed that re-accelerating the development of wind power is a necessary condition for Poland to meet its binding target of RES development for 2020. Therefore the implementation of the low scenario for Poland will not only suppress the investment impulse for wind power, but also lead to a high risk of having to bear the costs of failure to meet the provisions of the EU's energy and climate package.

Fig. 26. New capacity in three scenarios in consideration – offshore wind farms



In all three scenarios, offshore wind farm appear in Poland only in the next decade. We expect the first two large offshore wind farms 600 MW each to be built in 2021 and 2023, with the scale of investment in the low scenario being half of the volume in other scenarios. Offshore investments are continued in the central and high scenario after 2025. In the central scenario there is a one-off investment effort – commissioning of an additional 1 GW in offshore wind in 2026, meaning the total offshore wind capacity will be 2.2 GW. In the high scenario there is a dynamic expansion of wind capacity in the Baltic Sea and the North Sea. We do not determine to what extent this is based on investments in the Polish or foreign markets, we only expect Polish companies to find their share in that market by building their competitive advantage. The summary of total installed capacity in 2014, 2020 and 2030 is presented in the table below.

Tab. 10. New capacity in three scenarios in consideration

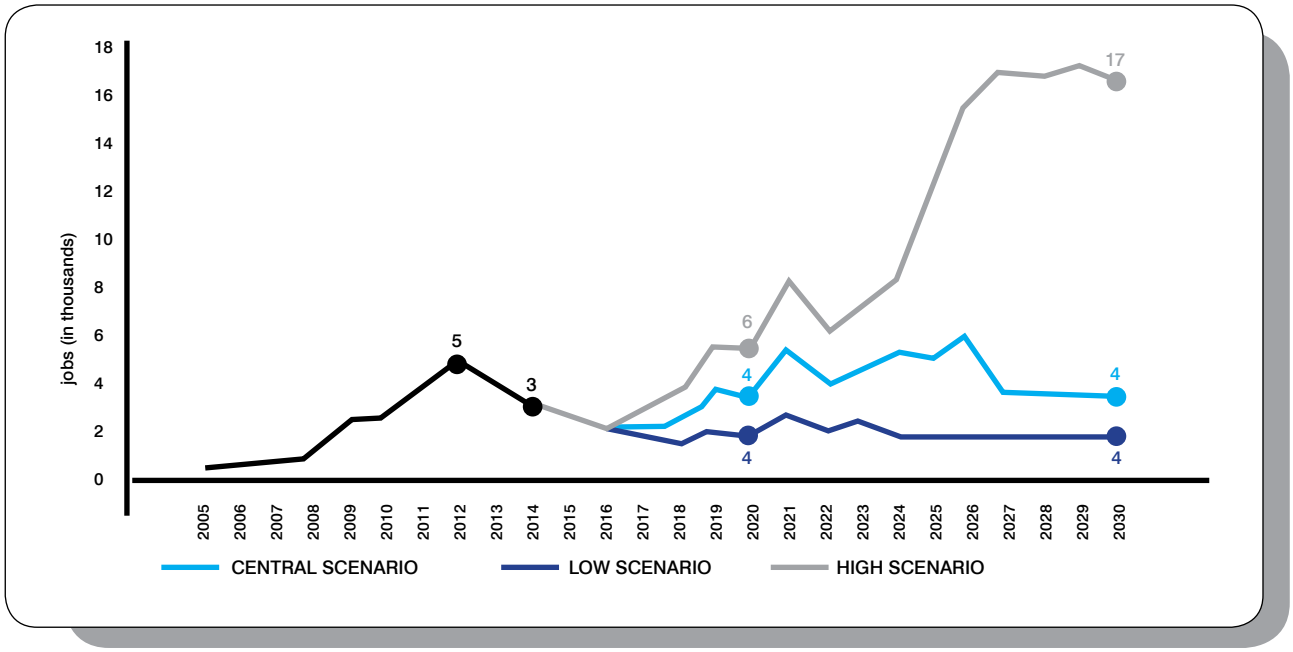
	ONSHORE WIND FARMS			OFFSHORE WIND FARMS	
	2014	2020	2030	2014	2030
LOW SCENARIO		5.7	7.7		0.6
CENTRAL SCENARIO	3.8	6.3	10.3	0	2.2
HIGH SCENARIO		6.9	12.9		2.2 EXPANSION IN EXPORTS

Source: WISE estimates

Similarly to 2005-2014, the dynamics of employment linked to the wind energy sector in Poland will vary. We expect the total number of jobs to drop from 8,400 in 2014 to approx. 5,500 in 2016. This will result from investment stagnation in the industry due to the changes in the RES support scheme (the will be a gap between the completion of last wind farms supported under the green certificate system and the commissioning of first wind farms under the auction scheme). This trend will be reversed in case of re-acceleration of investment. Depending on the scale of rebound, by the end of the decade the number of jobs can return to the current level (in central scenario) or even exceed it by 5,000 (high scenario). In case of continued stagnation (low scenario), the number of jobs supported by the wind power sector will shrink by 3,000 by the end of the decade.

Until 2020 the difference between the low and high scenarios will be 9,000 jobs, out of which 4,000 will be in direct employment.

Fig. 27. Direct jobs linked to wind power in Poland, in 2005-2014

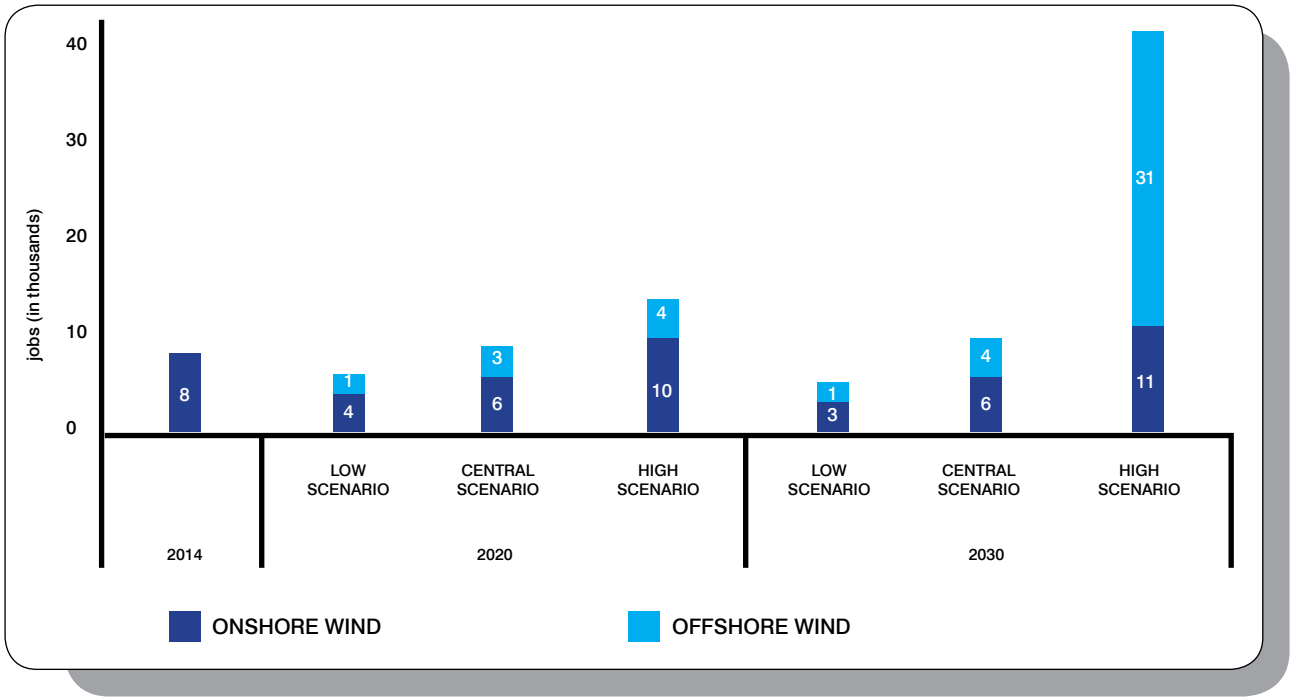


Source: WISE estimates

In the next decade, investments in offshore wind will determine the changes in employment related to the wind power sector. In the low scenario, the small scale of investment will result in abandonment of development of domestic supply potential for goods and services to the sector, translating into a low number of jobs in the domestic industry. In the central scenario, investments in offshore wind will give a strong impulse for job creation, which will cease to exist after completion of projects in 2026. In the high scenario, Polish manufacturers and service providers will benefit from the development of offshore wind – both in Poland and in Europe – allowing them to create a large number of permanent, high-quality jobs. In such a case, we expect that by 2030 over 30,000 additional jobs could be created in Poland thanks to investments in offshore wind. It has to be noted, however, that the development of manufacturing capacity among Polish suppliers of products and solutions to the offshore wind sector will be easier if the scale of domestic investment in that area exceeds the level specified in the central scenario.

In all scenarios there is a gradually growing number of people directly and indirectly involved in operation and maintenance of existing wind farms, resulting from a steady growth of capacity that requires servicing. By 2030 the demand for goods and services related to maintenance of wind farms is going to generate more jobs than investments and exports in the low and central scenarios. Only in the high scenario the ongoing expansion of offshore wind farms results in new capacity still generating more jobs than operation and maintenance of the old capacity.

Fig. 28. Jobs linked to wind power in Poland, in 2005-2014



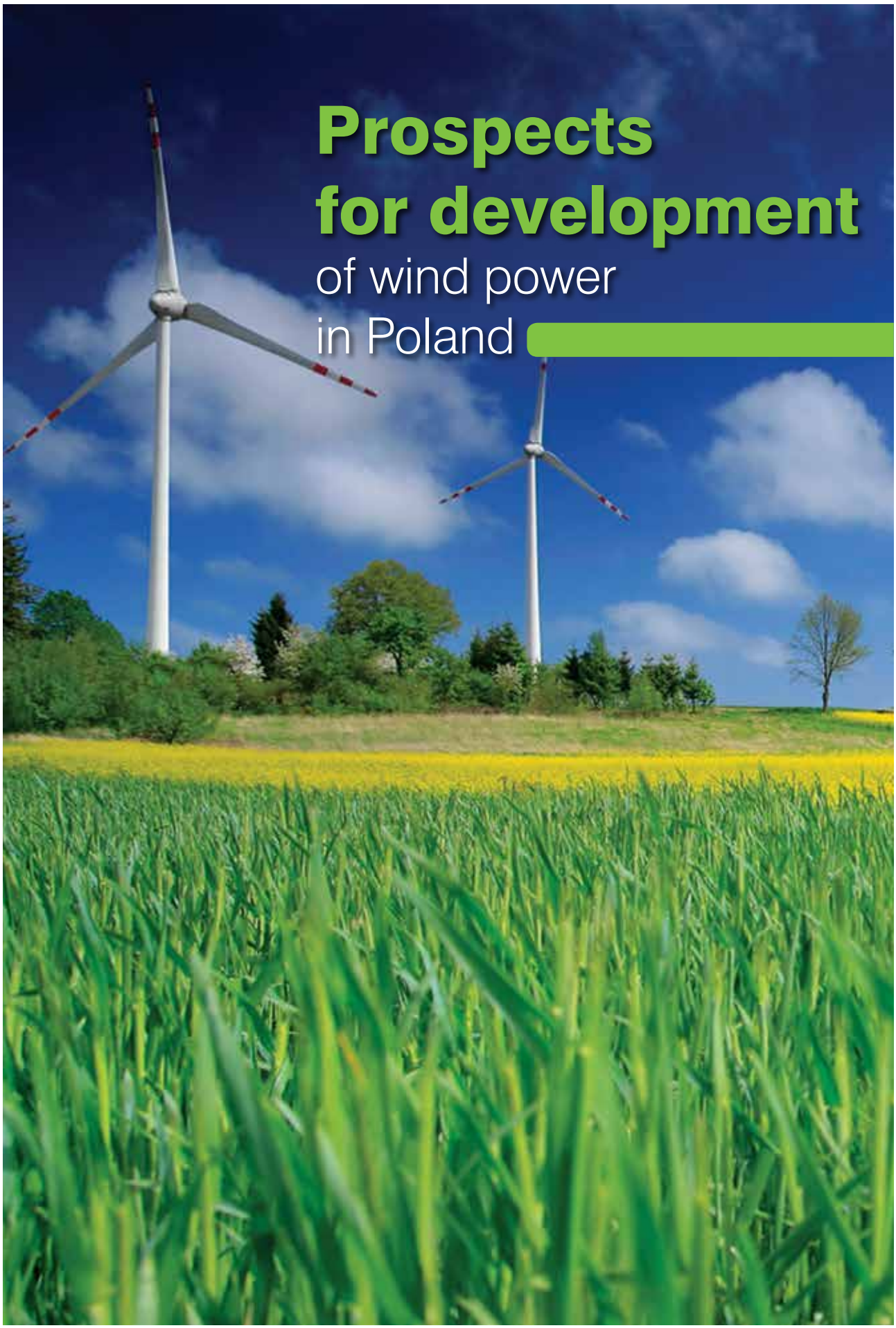
Source: WISE calculations

Over the next decade, the differences between particular forecast scenarios grow bigger. In 2030 the difference between the low and high scenario will reach 38,000 jobs, mainly due to investments in offshore wind. In the high scenario, the long-term focus on wind power will lead to creation of over 10,000 permanent jobs in the industrial sector, whereas in the low scenario it is only 1,000, and in the central scenario – 2,000 jobs.

The fulfilment of particular scenario will therefore translate to the following changes in the number of jobs linked to wind power in 2014-2030:

- low scenario – a 50% drop in the number of jobs,
- central scenario – a 10% growth of job numbers,
- high scenario– a 5-fold increase in the number of jobs.

Interesting conclusions come from the comparison of the current and future employment in the wind power sector and in mining. Depending on the regulatory environment, the number of jobs in wind power may gradually decrease or sharply rise until 2030. In hard coal mining, a significant drop in employment is determined by market conditions. According to WISE forecasts from early 2015 (Bukowski et al 2015, p. 32), the crisis and the restructuring of the industry caused by economic factors will lead to a decrease in the number of people working in the sector from over 100,000 in 2013 to 4,000-16,000 in 2030 (depending on the success of remedial actions, construction of new mines and coal price levels on global markets). The need for such a deep reduction of employment is not a result of the energy and climate policy or RES development, but is due to geological conditions and a very low efficiency of Polish coal extraction. The only way for the Polish mining sector to become competitive again is by drastic cost-cutting and closure of permanently unprofitable mines.



Prospects for development of wind power in Poland

Wind farms are an increasingly important part of the Polish power system. The fact that 2015 saw two important industry records broken shows how big the potential is for wind power in Poland. Installing approximately 1,145 MW in new capacity and generating over 10 TWh of electricity in one year should, in theory, be perceived in a positive manner, especially that after four years of legislative work Poland has finally adopted the Renewable Energy Sources Act, replacing the green certificate system with an auction scheme. Unfortunately, the lack of a transition period between the two support schemes means that 2016 will see no new investments launched, and only completion of projects started in 2015. The increase in installed capacity will only be in the range of 200-300 MW at most. As the first auctions will take place no earlier than in the 4th quarter of 2016, this also means that 2017 will only see the completion of several wind projects whose construction will have been started immediately after the auction win. Therefore new installed capacity for 2017 is estimated at no more than 200 MW. Capacity increases in the following years will depend on the MWh volumes and budgets allocated to auctions in 2017 and 2018, but also on how quick the investors will be to build their auction-winning projects.

One things is certain – after years of rapid growth of installed capacity in wind farms, 2016 and 2017 will be a period of a very strong slowdown.

Decreasing the growth rate may have negative consequences for the fulfilment of Poland's obligations on energy production from RES for 2020. Poland still does not have a sufficient generation potential in the RES sector to meet that target. The lack of own generation capacity may lead to either purchasing the electricity from abroad – statistical transfer – or to relaunch of cofiring, which will not bring any positive investment signals.

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The Polish Wind Energy Association (PWEA) is a non-governmental organisation established in 1999 supporting and promoting the development of wind energy. The Association brings together leading companies operating on the wind energy market in Poland: investors, developers, turbine and component manufacturers, both from Poland and abroad. PWEA is a member of the European Wind Energy Association (EWEA) and the Polish Member Committee of the World Energy Council. PWEA's main areas of activity include: active participation in consultation of legal acts (laws and regulations), strategies, sectoral policies and programmes, and taking action for introduction of new legal solutions fostering the development of wind energy in Poland; close cooperation with ministries directly or indirectly linked to the energy sector and renewables; cooperation with the European Commission's Directorate-General for Energy, Directorate-General for the Environment, Directorate-General for Research and Innovation, cooperation with Members of the European Parliament and Members of Parliament from committees of both houses of the Polish Parliament, as well as promotion of knowledge on wind energy and organization and participation in events gathering industry representatives from Poland and abroad.

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