

Hanna KOSHLAK

Department of Sanitary Engineering, Kielce University of Technology,

al. Tysiąclecia Państwa Polskiego 7, 25-314, Kielce, Poland

Corresponding author: hkoshlak@tukielce.pl

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DEVELOPMENT OF RENEWABLE ENERGY SOURCE IN POLAND

Abstract: *The article analyzes statistical data on the production of electricity from fossil and renewable energy sources over the last twenty years, presenting forecasts, prospects and factors that will stimulate the growth of renewable energy sources in the Polish energy balance.*

Keywords: *electricity production, energy mix, renewable energy sources.*

Introduction

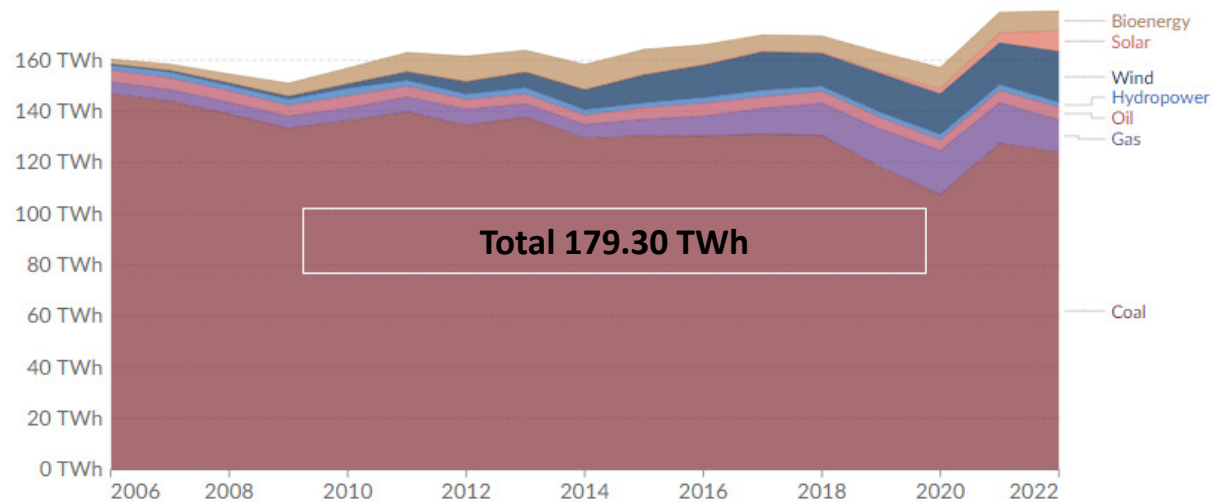
In the 21st century, the energy mix of most countries around the world is still dominated by fossil fuels. There is an increase in energy demand and this trend will not abate in the coming years, which may lead to even greater changes in the energy sector. If this trend continues, the burning of fossil fuels will have serious consequences for the global climate, as well as for human health.

To reduce CO₂ emissions and local air pollution, the world needs to quickly transition to low-carbon energy sources – nuclear and renewable technologies. Low-carbon development, including renewable and clean energy technologies, is a particularly promising area for developing future cooperation, transforming existing relationships, and promoting increased action around the world through greater use of diplomatic resources. The globally adopted 2030 Agenda for Sustainable Development and the Paris Agreement on Climate Change commit to a transition to low-carbon technologies in record time. To have a better than 66 percent chance of limiting warming to 1.5°C or less, the world would need to achieve net-zero greenhouse gas emissions by 2050, 30 years from now, according to the UN Intergovernmental Panel on Climate Change. Many fossil fuel exporting countries, including Poland, have enormous potential for increased cooperation on sustainable energy development. Today, one of the promising energy resources is renewable energy sources, which enjoy growing cost advantages and are becoming an internationally recognized main energy resource [1].

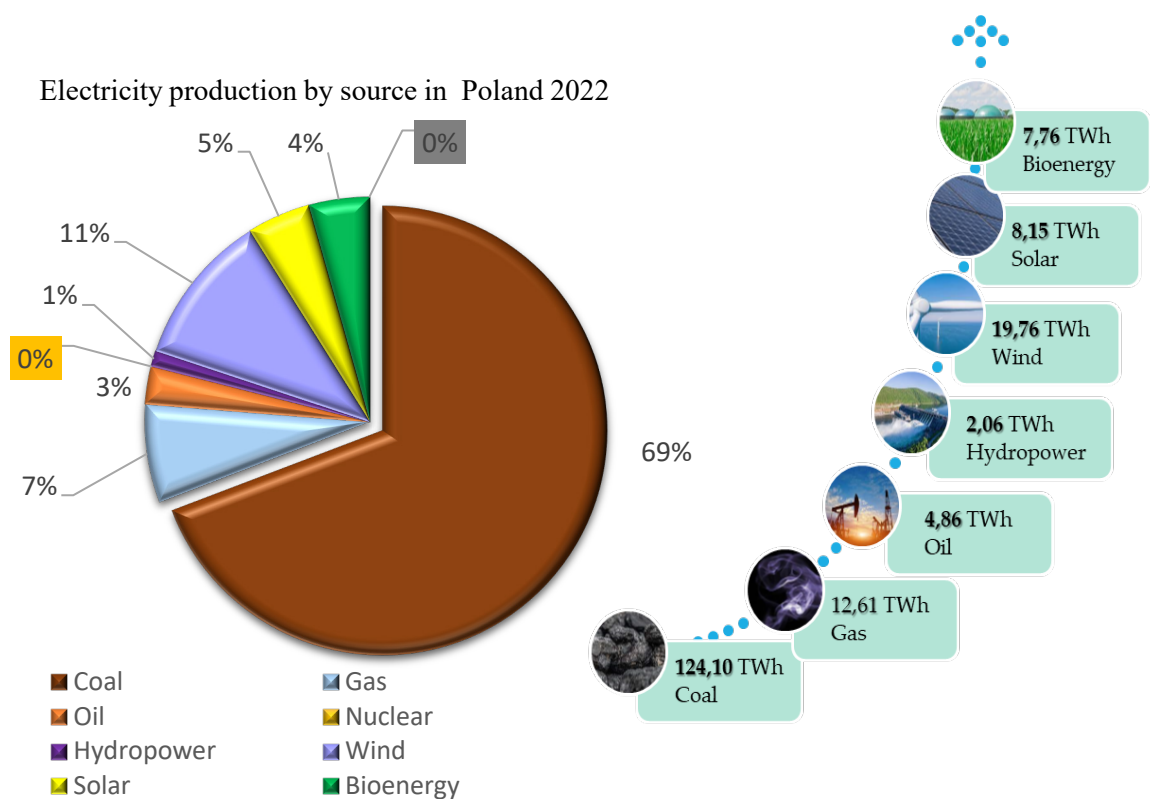
Poland is a significant source of carbon dioxide emissions, the main sources of which are coal power and industry. It is estimated that these industries emit about 150 million tons of carbon dioxide per year. The share of coal in the country's electricity production exceeds 70 percent. Although Poland had the highest share of coal in electricity production among IEA member countries in 2020, as well as the second highest share in heat production, in 2023, thanks to government programs to financially support the development of renewable energy sources, Poland has made significant progress in advancing the energy transition. Government support for solar photovoltaics (PV) has made Poland one of the fastest growing PV markets in the EU. The purpose of this study was to identify prospects for the development of renewable energy sources in Poland. Data on electricity production from fossil and renewable energy sources over the last twenty years are analyzed, forecasts, prospects and factors that will stimulate the growth of renewable energy sources in the Polish energy mix are presented.

Electricity production by source

In Poland, electricity is mainly produced in power plants. The most important fuel for electricity production in Poland in 2022 was coal with a share of 69%. Renewable energy sources produced 36.70 TWh. This value amounted to about 20% of the total amount of electricity produced – 179.30 TWh. Figure 1 shows electricity production data by source in Poland in 2022.



a)



b)

Figure 1. Electricity production data by source [2]

Electricity production remains dominated by fossil fuel (Fig. 1b), with the largest share coming from coal (69%), followed by wind (11%) and natural gas (7.03%). Coal plays a central role in Poland's energy system and economy. Among IEA member countries in 2020, Poland had the highest shares of coal in energy production, TES, TFC and electricity generation, and the second-highest share in heat production. The high shares of coal place Poland second among IEA member countries for CO₂ intensity of energy supply and fourth for CO₂ intensity of GDP.

Rapid growth in solar

Despite the continued dominance of coal, Poland has had notable success in pushing for energy transition. Government support for solar photovoltaics (PV) has made Poland one of the fastest growing PV markets in the EU. From 2016 to 2021, Poland’s PV capacity increased from just 0.2 GW to 7.7 GW, driven mostly by residential deployment of small-scale distributed PV systems 5.9 G (Fig. 2).

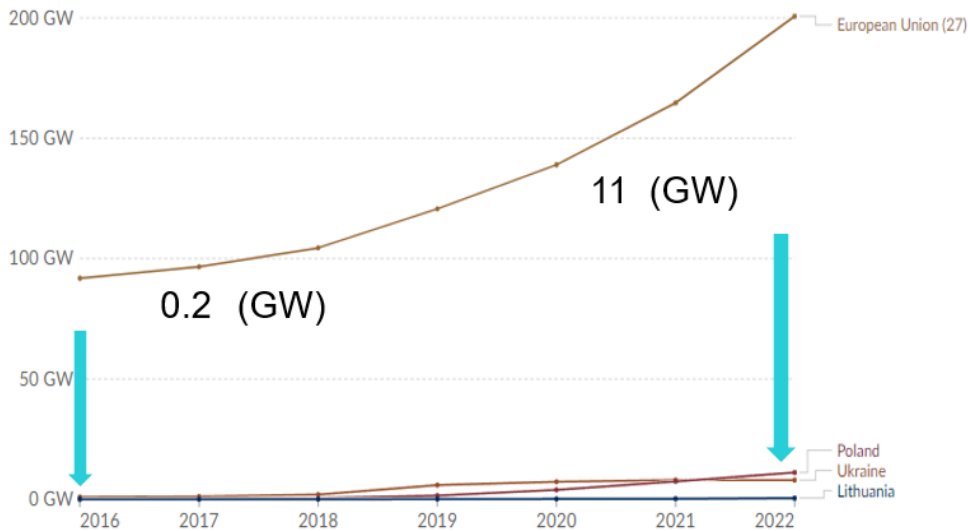


Figure 2. Installed solar energy capacity [3]

Large PV investors are supported by the government via RES auctions, which have been organized each year since 2016 by the Polish Energy System Regulator. This has resulted in more than 1000 projects with a total capacity of over 1.6 GW that will be eligible for government premium payments over 15 years.

Wind power

The amount of energy produced from wind sources and introduced into the Polish power system is systematically increasing. There are more than 1339 installations in Poland using wind as a renewable energy source with a capacity of more than 6 GW (Fig. 3). These installations account for about 65% of Poland’s renewable energy capacity.

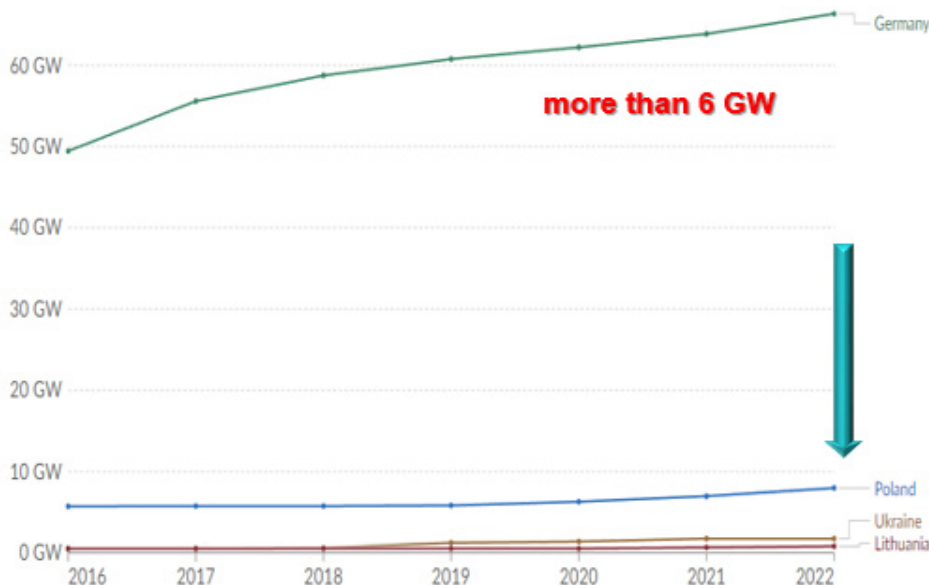


Figure 3. Installed wind energy capacity [3]

Poland also has a comprehensive and well designed offshore wind strategy that has resulted in deals for 5.9 GW of capacity to come online by 2027 and plans for at least 11 GW by 2040.

To meet Poland's 2020 and 2030 RES obligations, the Polish government plans extensive development of its offshore wind farms. The Polish Energy Policy (PEP) Road Map 2040 provides for a visible participation of offshore wind in Poland's 2027 energy mix, and the first mature projects should appear by 2024. In the 2040 prospectus, the strategic document sets the potential of 10.3 GW [4].

Biofuels

Traditional biomass – the burning of charcoal, organic wastes, and crop residues – was an important energy source for a long period of human history.

With a population of 38 million, almost half of all land used for agriculture and being a net energy importer, Poland has the feedstock, workforce, growing economy, and commitment to environmentally sustainable growth needed to foster a thriving biogas sector. Agricultural biogas plants are supported by a new energy auction and are expected to drive biogas growth in Poland. Figure 4 shows modern biofuel production in Poland.

In 2013 and 2015–2017, there was a significant decrease, and the rest of the period saw stabilization or a slight increase in biofuel production.

The highest electricity production from biofuels of 12.44 TWh was recorded in 2023, while the lowest electricity production of 0.07 TWh was recorded in 2004.

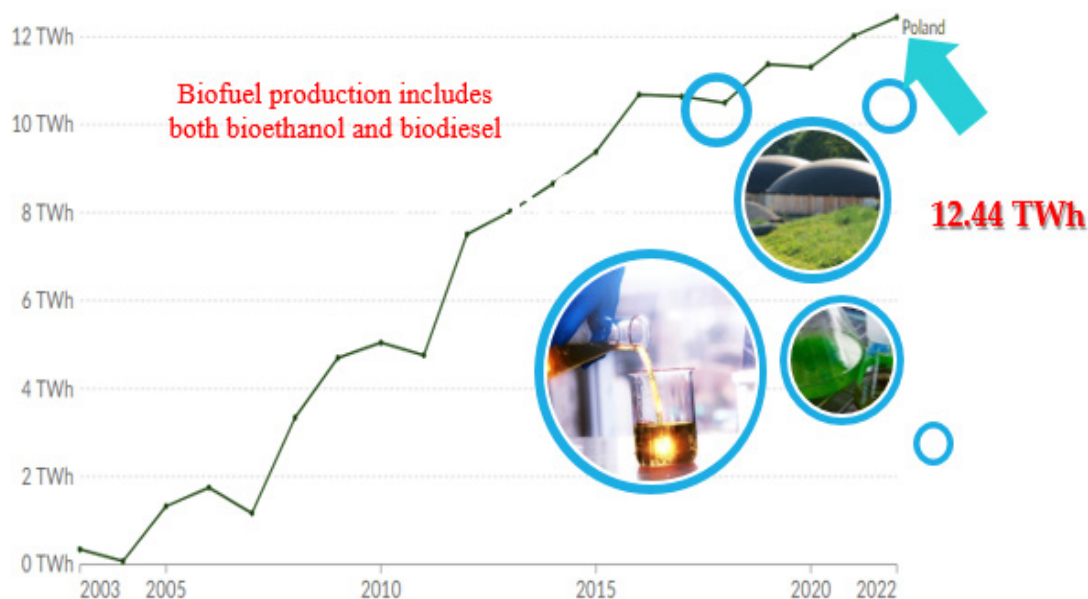


Figure 4. Biofuel energy production [3]

Conclusion

In 2023, the main sources for the generation of electrical energy in Poland were coal (69.21%), wind (11.02%) and natural gas (7.79%).

In December 2022, the total electricity production from all generation sources in Poland amounted to 179.30 TWh. Electricity production from renewable energy sources amounted to 36.7 TWh, which already accounts for 20.4% of the total energy balance. Currently, wind power dominates electricity production from renewable sources at 11%. In second place is photovoltaics with 4.55%, in third place are biomass power plants (4.33%), followed by hydroelectric power plants with 1.15%.

Electricity production in Poland in 2022 reached a record level of 179.30 TWh. This was largely due to a large increase of almost 9 TWh in wind and solar power generation.

Currently, wind energy and photovoltaics are two segments of renewable energy sources that record the fastest development dynamics. In the longer term, biogas plants and biofuels, whose potential remains untapped, may gain a considerable portion in the mix.

References

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