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We would like to thank the leading companies in the photovoltaic industry that participated in the PV market research for the purposes of the report



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Institute for Renewable Energy (IEO) was founded in 2001. as an independent research group/think-tank. It is the first private research institute in Poland with a deep knowledge of the entirety of issues in the field of renewable energy, starting from energy policy and law, electricity price forecasts and tariffs, PPA contracts, economic and financial analyses in electricity (solar and wind energy) and heating (RES, heat storage, sector integration) and ending with technical and design issues. It constantly monitors the RES market and the activities of the state administration and EU institutions in this respect in the "watchdog" formula.

IEO has extensive experience in working as a technical and business advisor (due-diligence, assumptions and concepts of technical solutions, functional and utility programs, feasibility studies, business plans, Terms of Reference, author's and construction supervision, introducing innovations in the enterprise) in investment processes with the area of renewable energy implemented by companies and local governments as well as in research and demonstration projects carried out in EU research programs.

IEO conducts post-graduate studies, trainings and conferences in the field of technology, market, economics and renewable energy law for domestic and foreign energy companies (chambers of commerce and energy companies).

IEO has carried out several dozen expert opinions and analyses on the energy market, business models in renewable energy and in the production of equipment for renewable energy sources, as well as economic analyses and forecasts for government and public institutions, the European Commission and business customers, as well as dozens of international and national research projects. For nine years, IEO has been publishing the annual report "The Photovoltaic Market in Poland".

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COMMENT BY PRESIDENT OF IEO



We present to the Readers the ninth edition of the annual report "The photovoltaic market in Poland" with the conviction that it preserves and describes a unique moment in the development of the PV industry and the entire national energy sector. In 2020, photovoltaics became an investment hit in the energy sector and an economic vehicle. In the difficult time of two lockdowns caused by the global pandemic, domestic photovoltaics made a significant contribution to maintaining investment processes in the amount of PLN 9.5 billion and provided Poland with 35 thousand jobs.

In 2020, 1.5% of the electricity produced in the country came from photovoltaic sources. In 2021 it will be 3.5%, and in 2025 solar energy will provide approx. 10% of electricity. Photovoltaics becomes a permanent element of the national energy system, and in the daily and summer peaks of energy demand, it becomes its basis, providing a power reserve and reducing energy costs in the entire energy system for all energy recipients, not only prosumers.

The rapid development of PV power raises challenges on the side of energy grids, the market regulator and on the side of technology suppliers and solution providers allowing for better integration of photovoltaic sources with the energy system and better integration of photovoltaic panels into the spatial order. With actions paving the way for solar energy to expand, you cannot wait for the problems to grow.

This report is the most up-to-date diagnosis of the state of technology, market and industry development. In view of the extremely fast pace of development of photovoltaics, the report indirectly highlights the need to develop a long-term action plan to improve the conditions for the operation of PV sources in the power grid. This includes, for example, sector integration, storage of surplus energy in hot water, development of hybrid installations and efficient use of available space (e.g. agrophotovoltaics, two-sided modules, floating installations, integration with building facades).

Photovoltaics allows various stakeholders to benefit from the effects of market growth: energy consumers, prosumers, professionals developing photovoltaic farms and innovative industry providing technologies. So far, the manufacturing industry of devices for photovoltaics has not been the main beneficiary of the market development. The year 2020, however, highlighted the need to shorten supply chains and become more independent from imported technology.

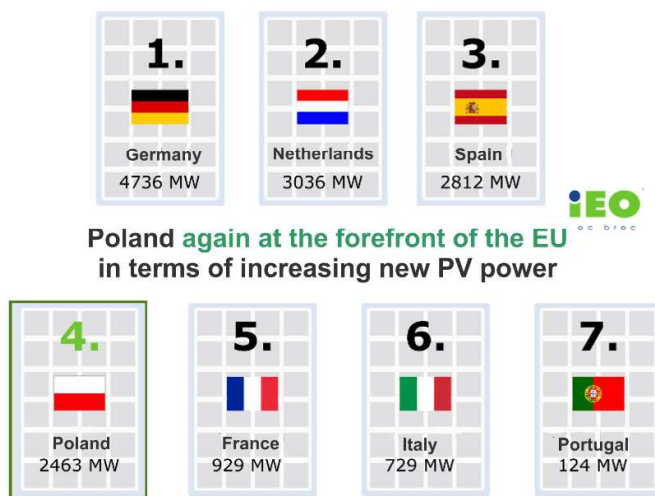
It is worth looking at the development of photovoltaics broadly and in the long term. The spectacular development of photovoltaics in Poland was built on hitting the right time window and reducing technology costs, but most of all it is based on cooperation between stakeholders and trust in the regulatory environment. The authors of the report hope that the latest market data collected thanks to the cooperation with the entire industry, subject to a broader analysis in this report, will be used to make further good decisions for the investor and public administration.

SUMMARY

The photovoltaic boom continues

The photovoltaic market in Poland is going through a development boom. In the last five years, at the end of 2020, Poland was in the first place in the European Union in terms of the growth rate of photovoltaic power, calculated on the basis of the cumulative annual growth rate - CAGR. For Poland, the cumulative (combined) growth rate in 2016-2020 was 114 %, with the EU average of 10.3%. Therefore, in the medium term, we are the European leader in terms of the PV market growth dynamics and in 2020 we approached the world's top 10 countries in terms of power growth (13th place). Successive, better and better international forecasts confirm the strength, potential and growing position of the Polish photovoltaic market.

The installed power is gradually increasing, and the growth rate has been extremely high for two years. 2020 was the best year in the history of photovoltaics development in Poland. The installed power in photovoltaics at the end of 2020 amounted to 3,936 MW, which means an increase by 2,463 MW year on year and translates into a 200% increase year on year. Individual prosumers made the greatest contribution to the increase in new power. Thus, according to Solar



Power Europe, in 2020 Poland was in 4th place in terms of increasing the installed PV power in the European Union. Only Germany, the Netherlands and Spain overtook us. According to the forecasts of IEO Poland, in 2021, once again in a row, it will maintain a high rate of power increase and the 4th place in the EU. The IEO estimates that at the end of 2021, the installed PV power in Poland may exceed 6 GW. Forecasts also indicate that the total turnover on the photovoltaic market in 2021 will exceed PLN 9 billion.

Power forecast, leading market segments, growth limits

According to the IEO forecast, there are no indications for a slowdown in the photovoltaic market in the medium term. PV farm projects prepared for RES auctions, including large-scale ones, will have the main share in the increase in power in the coming years. Even if the pace of development of micro-installations slows down temporarily, the photovoltaics as a whole will not feel this fact in the next few years. It is a flexible, scalable technology, operating in several segments and many market niches. In addition, this year the role of business prosumers will also clearly increase, whose IEO forecasts growth at least 200 MW, and this trend will intensify in the coming years. **According to the IEO forecast, the installed power in photovoltaics in 2022 will double its value at the end of 2020 and at the end of 2025 it may reach even 15 GW.**

In 2021, photovoltaics may encounter the first regulatory restrictions and related to the limited availability of new projects, both prosumer and farm projects, to the grid infrastructure. Although they

do not yet constitute hard barriers limiting further growth, the restriction of access to the Internet may inhibit new investments, even when regulations, the market and the social atmosphere are favourable

RES auctions as the basis for the development of the photovoltaic market

After 5 years from the announcement of the first auctions, the auction system has become the most important instrument to support the photovoltaic market in Poland. In 2020, the RES auction basket for solar and wind technology with a power of less than 1 MW was once again dominated by solar energy. In 2019, the auction for projects above 1 MW was won by only 3 solar farm projects, but it was a harbinger of increasing competition of photovoltaic technology in this basket. **In the renewable energy auction in 2020, photovoltaic installations shared the available volume almost half with wind farms.** The distribution of auction prices for the large basket of winning bids shows that large solar and wind projects offered prices at a similar level. This confirms the thesis about the similarity of these markets and the fact that these technologies can already fully compete with each other and one can expect increasing auction volumes for large-scale PV projects.

The market of solar farms up to 1 MW is developing the most dynamically thanks to the auction system. Very strong competition in the "small" auction basket results from the large supply of these projects on the Polish market. According to IEO data, the conditions for connection to the distribution and transmission network are over 5,000. PV projects up to 1 MW with a total connection power of 4.7 GW. At the same time, according to IEO analyses, at the end of Q1 2021, the conditions for connecting to the grid already had several hundred large solar farm projects with a total power of 5.6 GW..

PV industry and technology supply chain to the market

The PV market is not only the sale of installations to end users, but the entire supply chain generating added value for the economy. According to IEO analyses in photovoltaics, in 2020 the number of full-time employees in the industry could reach even 14.5 thousand while the number of people temporarily working in other forms of employment in photovoltaics may reach 21,000. It is a total of 35.5 thousand jobs in the domestic photovoltaic sector. Employees from the photovoltaic industry constitute a significant group of stakeholders who care about the development of the sector. This opens opportunities for the government and/or the regulator to dialogue with the industry and reach an agreement on the development of directions and support for the development of the entire photovoltaic sector in Poland.

The first steps to start a dialogue aimed at strengthening Polish industry and supporting the development of the industry have already been taken. **In September 2020, a letter of intent for the development of the photovoltaic industry in Poland and the development of a draft sector agreement was signed at the Ministry of Climate.** The letter of intent, the party of which is the Minister of Climate and the Government Plenipotentiary for Renewable Energy Sources, was signed by organizations promoting the development of the PV industry and leading industrial companies producing PV modules and other key components specific to photovoltaics.

Taking into account the industry perspective becomes important in the face of the challenges of ensuring wide access to domestic technologies (technological security) as well as the risk of disruptions of supply and rising prices of imported equipment. This risk can be mitigated by regulatory incentives and supporting the Polish photovoltaic industry and promoting the increase of European and national local content, e.g. by conducting an active industrial policy in the field of promoting local production of PV devices. The national local content in the supply of components and devices for photovoltaic installations in 2020 was 23%, and according to the investment plans of Polish industrial companies, it may increase to almost 40% in 2025.