General Perspectives on the Law of Energy Transition in Poland

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A. Introduction

Poland has experienced dynamic economic growth over the past decade. Poland's GDP growth in 2022 was 4.9 %,[1] which is above the European Union average of 3.5 %.[2] This development has contributed to a significant increase in energy demand in both the transportation and industrial sectors, as well as in households. As a result, total final consumption (TFC) increased from 70 Mtoe to 75 Mtoe between 2010 and 2019.[3] Meanwhile, the average annual power demand is now 23.7 GW, with peak demand at 27.6 GW.[4] Moreover, in Poland, households' electricity charges in 2022 were lower (€0.1464 per KWh) than the European average (€0.2525 per KWh).[5]

Despite the overall increase in energy consumption in Poland, public awareness of the need for energy transition, environmental care, and conservation is also growing year by year. Factors that played a key role in the development of environmental awareness included the development of science and technology, globalization and interdependence, social activism, and NGOs. In 2022, the Ministry of Climate and Environment surveyed the environmental awareness of Polish residents. According to 91 % of respondents, climate change is either an important or a very important issue. In addition, respondents identified large emissions of carbon dioxide, sulfur dioxide and nitrogen oxides, and other chemical compounds from industri-

1 Worldbank, 'GDP Growth Poland' <https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?locations=PL> accessed 26 August 2023.
2 Worldbank, 'GDP Growth European Union' <https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?locations=EU> accessed 26 August 2023.
3 International Energy Agency, 'Poland 2022 Energy Policy Review' <https://www.iea.org/reports/poland-2022/executive-summary> accessed 28 August 2023.
4 Energy Regulatory Office, '2021 Rynek Hurtowy' <https://www.ure.gov.pl/pl/energia-elektryczna/charakterystyka-rynku/10372,2021.html> accessed 31 August 2023.
5 Eurostat, 'Electricity prices (including taxes) for household consumers, first half 2022' <https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Electricity_price_statistics> accessed 29 August 2023.

al activities as the most important cause of air pollution in Poland.[6] On the one hand, Polish society is aware that an energy transition is needed, while on the other hand, the country's energy mix is largely based on coal, which has long been used as the primary energy resource. Consequently, this has resulted in a strong link between the hard coal and lignite mining sector and the Polish economy, thereby highlighting the challenges Poland faces in terms of energy transition.

B. The National Notion of Energy Transition

The Polish legislature does not use a single, legal definition of energy transition. However, Poland's energy transition is a broad socio-economic concept that aims, over the long term, to transform the country's energy system toward more sustainable, low-carbon and renewable energy. Naturally, this requires political commitment on the part of all political parties in the country and, importantly, the preparation of the coherent legal instrumentation needed to implement the changes. Among other things, the first step in this regard was the National Energy and Climate Plan 2021–2030, which was adopted by the Committee for European Affairs at its meeting on December 18, 2019.[7]

The strategic document indicating the direction of the energy transition is the Energy Policy of Poland until 2040. This document is one of nine strategies stemming from a document called the Country Development Management System. It is based on the country's medium-term development strategy, which was adopted on 14 February 2017 under the name Strategy for Responsible Development. The most important assumptions and investment areas of the energy sector were defined in accordance with the four pillars of the country's energy policy: equitable transformation, building a zero-carbon energy system, improving air quality, and energy sovereignty. These elements defined the so called Polish energy transition framework for businesses and local government units for the coming decades which are in line with the energy union and the objectives set for Poland.

6 Ministerstwo Klimatu i Środowiska, 'Badania świadomości ekologicznej mieszkańców Polski' <https://www.gov.pl/web/edukacja-ekologiczna/badania-swiadomosci-ekologicznej> accessed 08 August 2023.

7 For more on the issue of the National Energy and Climate Plan for the years 2021–2030, see below Section C 'Decarbonization Strategy'.

In the case of Poland, energy transformation is not only aimed at reducing dependence on coal but is primarily a process of reducing energy consumption, reducing greenhouse gas emissions, and promoting renewable energy sources. Energy transformation not only allows a reduction in business costs by introducing innovative solutions in the energy sector but also leads to the achievement of emission reduction targets (e.g. Fit for 55) to which EU member states have committed themselves.

Poland faces challenges in restructuring the energy sector transforming the socio-economic realities of coal mining and utilization on the one hand and increasing environmental awareness on the other. Most of the Polish public believes that an acceleration of the energy transition process is needed. Only a third of those surveyed assessed that the pace of this process is currently sufficient.[8]

C. Decarbonization Strategy

Poland, being a member state of the European Union, joined the Paris Agreement, meaning it did not submit a stand-alone Climate Implementation Plan (NDC) to the United Nations Framework Convention on Climate Change (UNFCCC). Nevertheless, Poland is actively participating in the European Union's joint efforts to achieve targeted emission reductions. In accordance with European Union legislation, Poland initially committed to reduce emissions by 7 % by 2030 compared to 2005 levels in sectors not covered by the Emissions Trading Scheme (EU ETS). However, in the context of the increased aspirations of the EU's Common Strategy to 2030, according to a proposal to amend the Regulation (EU) 2023/857,[9] the Polish target was raised to -17.7 % compared to 2005 levels.[10]

8 Bankier, 'Ogromne koszty polskiej transformacji energetycznej i równie ogromna luka inwestycyjna' (27 August 2023) <https://www.bankier.pl/wiadomosc/Ogromne-koszty-polskiej-transformacji-energetycznej-i-rownie-ogromna-luka-inwestycyjna-8595823.html> accessed 29 August 2023.

9 Regulation (EU) 2018/842 of the European Parliament and of the Council of May 30, 2018, on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet their commitments under the Paris Agreement and amending Regulation (EU) No. 525/2013 [2018] OJ L 156/26.

10 Regulation (EU) 2023/857 of the European Parliament and of the Council of 19 April 2023 amending Regulation (EU) 2018/842 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to

The National Energy and Climate Plan for the years 2021–2030[11] is to become the answer to the implementation of the decarbonization strategy. The document outlines assumptions and goals, as well as policies and actions to realize the 5 dimensions of the energy union, i.e. energy security, internal energy market, energy efficiency, decarbonization, and support for research, innovation, and competitiveness. As a result, the obligation imposed on Poland by the provisions of Regulation (EU) 2018/1999[12] of the European Parliament and of the Council has been fulfilled. This regulation provides the basis for managing the energy union and taking climate action that will meet the 2030 energy union goals and targets.

The National Energy and Climate Plan for the years 2021–2030 was adopted by the European Affairs Committee at its meeting on December 18, 2019. The National Plan was created based on national development strategies of various sectors (Strategy for Sustainable Development of Transport until 2030, National Environmental Policy 2030, Strategy for Sustainable Development of Rural Areas, Agriculture and Fisheries 2030) and considering the assumptions of the Energy Policy of Poland until 2040.

The National Energy and Climate Plan 2030 (draft update of 29 February 2024) includes the ESR – Effort Sharing Regulation.[13] Based on this regulation, for the other sectors (buildings, road and maritime transport, agriculture, waste, or small industry), so far called non-ETS reduction effort, so far referred to as non-ETS, has set an EU reduction target of 40 % in 2030 compared to 2005 levels. Until now this level has oscillated at 29 %. However, for Poland, a binding emission reduction target of -17.7 % was set for the non-ETS sectors compared to 2005. The existing contribution

meet commitments under the Paris Agreement, and Regulation (EU) 2018/199 [2023] OJ L 111/1.

11 Ministerstwo Klimatu i Środowiska, 'National Energy and Climate Plan for the years 2021–2030 – submitted in 2019' <https://www.gov.pl/web/klimat/national-energy-and-climate-plan-for-the-years-2021-2030> accessed 16 November 2023.

12 Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action, amending Regulations (EC) No 663/2009 and (EC) No 715/2009 of the European Parliament and of the Council, Directives 94/22/EC, 98/70/EC, 2009/31/EC, 2009/73/EC, 2010/31/EU, 2012/27/EU and 2013/30/EU of the European Parliament and of the Council, Council Directives 2009/119/EC and (EU) 2015/652 and repealing Regulation (EU) No 525/2013 of the European Parliament and of the Council [2018] OJ L 328/1.

13 Regulation (EU) 2023/857 (n 10).

goal (-7 % under the previous ESR)[14] was already considered by Poland as an ambitious commitment. Therefore, the current commitment is assessed even more so, as exceeding national capabilities.[15]

Initially, one of the goals was a 7 % reduction in greenhouse gas emissions on the mentioned non-ETS sector. However, this target was amended by Regulation (EU) 2023/857 to 17.7 %. Poland, in the National Energy and Climate Plan for the years 2021 – 2030 (draft update of 29 February 2024), has indicated that a level of 14.1 % is achievable for Poland in 2030. A key element positively influencing the country's sustainable development is the generation of energy from renewable energy sources (RES), so another of the targets was to increase RES by 21–23 % in gross final energy consumption. This target was also changed to a level of 31 %. Poland, however, has indicated that it is capable of achieving 29.8 % by 2030. In the original version of The National Energy and Climate Plan for the years 2021–2030, calculations at least related to energy efficiency improvements were made on the PRIMES 2007[16] scenarios. According to the revised directive in the update to the Plan, targets are set in relation to the PRIMES 2020 scenario.[17] The target, which from Poland's perspective will be the most difficult to achieve, is a 50–60 % reduction of coal in electricity production.

The European Commission's recommendations on the draft version of the National Energy and Climate Plan for the years 2021 – 2030 were released on 26 April 2024. The Commission notes that the assumptions presented by Poland for emission reductions, carbon sequestration, energy

14 National Centre for Emissions Management (KOBiZE), 'Poland's Eighth National Communication and Fifth Biennial Report under the UNFCCC' (Warsaw 2022) <https://unfccc.int/sites/default/files/resource/Poland_Report-NC8_BR5_27dec2022%20%281%29.pdf> accessed 04 July 2024.

15 Ministerstwo Klimatu i Środowiska, 'Krajowy Plan w dziedzinie Energii i Klimatu do 2030 r.' <https://commission.europa.eu/document/download/5118b15e-d380-49ae-b8bb-41cc81a28e15_pl?filename=PL_NECPupdate_Projekt_aKPEiK_tekst_ostateczny.pdf> accessed 02 July 2024.

16 The PRIMES (Price-induced market equilibrium system) model is based on 5-year steps, is suitable for medium- and long-term forecasts (up to 2070) and covers all EU and EFTA member states (except Liechtenstein) and candidate countries.

17 The EU 2020 Reference Scenario is the baseline scenario from which the specific scenarios and policy options used to assess options informing policy initiatives have been developed. This is all done as part of the European Green Deal package adopted by the European Commission in July 2021.

efficiency and the share of renewables remain lower than the official targets set out in Regulation (EU) 2023/857.[18]

However, the green transition efforts will be possible when additional EU funds are received, which will be allocated for a fair transition. It is therefore important to mention Poland's National Recovery and Resilience Plan,[19] which aims to rebuild the economic development that was lost during the Covid-19 pandemic. Initially, Poland was to receive €35.36 billion, of which €15.1 billion was to be allocated to green transformation. This would amount to 42.7 % of the funds received.[20] However, the amount currently stands at €59.8 billion, including €25.3 billion in grants and €34.5 billion in loans. This amount is €24.5 billion higher (a 69 % increase) than the original amount mentioned above. Includes an update of the maximum financial contribution in 2022, as well as two additional loans requested by Poland. In addition, it includes a non-refundable allocation for REPowerEU made available in 2023. The allocation of Poland is 8 % of the total financial contribution[21].

D. The National Energy Mix in the Context of the Energy Transition

Coal has a basic function in the energy and economic structure of the country. In 2020, Poland had the largest share of coal in power generation, TFC,[22] TES,[23] and electricity production. Moreover, Poland had the second-highest share of coal in heat production among International Energy Agency (IEA) member countries. This high percentage of coal use places

18 European Commission, 'Recommendation of 26.4.2024 on the draft updated integrated national energy and climate plan of Poland covering the period 2021–2030' C (2024) 2900 final <https://commission.europa.eu/document/download/b40cb8bb-4eaf-434b-a298-6f282fb8ed4a_en?filename=Recommendation_draft_updated_NECP_Poland_2024.pdf.pdf> accessed 04 July 2024.

19 Pol. Krajowy Plan Odbudowy i Zwiększania Odporności (KPO).

20 European Parliament, 'Briefing, Next Generation EU (NGEU) delivery – How are the Member States doing? Poland's National Recovery and Resilience Plan' <https://www.europarl.europa.eu/RegData/etudes/BRIE/2022/733665/EPRS-Briefing-733665-NRRP-Poland-FINAL.pdf> accessed 04 July 2024.

21 ibid.

22 TFC – Total final consumption.

23 TES – Total energy supply.

Poland second among IEA member countries in terms of CO2 intensity per unit of energy supplied and fourth in terms of CO2 intensity to GDP.[24]

In terms of EU member states, hard coal consumption in 2022 reached 160 million tonnes, of which Poland was responsible for the consumption of nearly 38 %. Responsible therefore for almost two-fifths of the total coal consumption in the European Union in 2022.[25] As a result, Poland has become the infamous leader not only of hard coal and lignite consumption but also of coal mining in the entire EU.

The large use of coal in the Polish economy is related to historical and geopolitical aspects, as well as rich deposits of the resource. After World War II, when the Polish People's Republic appeared on the map of Europe, it was a country dependent on the Union of Soviet Socialist Republics (USSR). Poland's relations with the USSR influenced the shape of Polish energy and economic policy. The investments related to the energy sector carried out at the time were mainly aimed at expanding the coal sector and the energy infrastructure based on it. This happened because mining (domestic extraction) was aimed at ensuring the country's energy security against potential threats from external supplies of energy carriers. At the time, energy based on gas or renewable energy sources was not a priority in energy policy and investment plans, as the main focus was on the dynamic development of heavy industry, requiring high energy inputs. Coal became the key source of energy for steel mills, steel plants, and other industries that formed the backbone of the centrally planned economy. Providing citizens with access to cheap energy was important to the communist authorities, and coal was one of the cheapest sources of energy at the time. Coal mining was therefore part of the state's strategy to meet the needs of society. From the perspective of its geopolitical location, Poland has rich deposits of hard coal. These deposits are found in the Upper Silesian Coal Basin, the Lublin Coal Basin, and the Lower Silesian Coal Basin.[26]

From the perspective of the gas sector, it is apparent that Poland, based on its own natural resources, is unable to meet its domestic needs. Prior to Russia's invasion of Ukraine, the Russian Federation was, on average, Poland's main supplier of fossil fuels over the past 20 years. The country's share of imports was 87 % for oil, 72 % for natural gas, and 62 % for coal. In

24 International Energy Agency (n 3).

25 Eurostat, 'Coal production and consumption up in 2022' <https://ec.europa.eu/eurostat/web/products-eurostat-news/w/ddn-20230622-2> accessed 28 August 2023.

26 Muzeum Geologiczne, 'Węgiel kamienny ' <https://www.pgi.gov.pl/muzeum/kopalnia-wiedzy-1/12580-wegiel-kamienny.html> accessed 28 August 2023.

2021, most coal was imported from Russia: more than 8.25 million tonnes (66.2 % of all imported coal). This coal mainly went to households and local heating plants.

As a result of Russia's aggression against Ukraine, serious concerns have also grown about the availability of hydrocarbons, not only in Poland but across Europe, resulting in a significant increase in the price of these raw materials. As a result, the Polish government has taken steps to secure coal and gas supplies. Among other things, intervention coal imports were made from sources other than the Russian Federation, including South Africa, Australia, Kazakhstan, and Colombia.[27] In the case of gas, when Gazprom halted gas deliveries to Poland in April 2022, a series of diversification measures were taken, resulting in a move away from Russian gas entirely at the beginning of 2023. By the same token, gas supplies were increased from the northern direction (Norway), the western direction (Germany), and by sea through the LNG terminal (USA) and domestic production. Also noteworthy is the fact that in 2022 Poland reduced its gas consumption by 17 % compared to 2021, according to data from the Ministry of Climate and Environment.

Consequently, due to the turmoil in the raw materials market caused by the disruption of supply chains, several legislative solutions were introduced in Poland to curb the rise in prices of energy carriers. Among other things, a law-based system was introduced for the purchase of preferential solid fuel for households,[28] as well as the so-called "energy shield," a set of legislative solutions that help combat rising energy prices. Citizens, including vulnerable consumers (those in energy poverty or unable to pay utility bills), and selected companies benefit from a few allowances and compensations. An example is the Law on Special Solutions for the Protection of Electricity Consumers, which compensates for increases in electricity prices. The same solution is applied to the gas market, where prices for households consumers are frozen as of January 1, 2023. There is also a VAT refund for gas for the lowest-income households and limit on the increase in heat prices to a maximum of 40 % compared to the previous year. The statutory solutions also involve the introduction of compensation for energy supply companies.

27 Ministry of State Assets, 'Summary report on intervention coal import and distribution in the 2022/2023 heating season' (Warsaw 2023).

28 The Act of October 27, 2022, on the preferential purchase of solid fuel for households (Journal of Laws 2022, item 2236).

From the perspective of the energy mix by fuel type in 2022, by far most of the electricity generated in Poland came from coal-fired power plants, which account for 50 %, almost 27 % from lignite-fired power plants, and only 6 % from gas-fired units. Renewable energy sources, primarily wind farms and photovoltaics, accounted for 16 %, and hydroelectric power plants accounted for less than 2 % of the electricity generated. It is worth noting that there is a year-on-year decline in coal production.[29] Polish legislator has defined renewable energy sourcesas: "renewable, non-fossil energy sources including wind energy, solar energy, aerothermal energy, geothermal energy, hydrothermal energy, hydropower, wave, current and tidal energy, energy obtained from biomass, biogas, agricultural biogas and bioliquids".[30] Renewable electricity generation accounted for 30.7 % of the national generation mix in April 2024, according to Energy Forum calculations. Wind farms made up 16 % of the above result. Photovoltaics were responsible for 10.5 per cent. Meanwhile, 1.8 % came from hydropower and 2.4 % from biomass.[31] From a March 2024 perspective, coal still accounted for the largest share of electricity generation. Hard coal (42.95 %) and lignite (20.84 %) dominated. However, a significant increase in green energy became noticeable, with wind farms contributing 14.45 % to power generation and other renewables 8.86 %.[32]

In May 2025, coal remained the primary source of electricity generation in Poland, with hard coal accounting for 37.33 % and lignite for 18.64 % of total production. Among renewable energy sources, wind power generated 13.01 % of electricity, while other renewables – such as photovoltaics, biomass, and hydropower – contributed a combined 19.25 %; hydropower plants alone provided 1.81 %. The share of natural gas in the energy mix amounted to 9.96 %[33]. The data of May 2025 clearly indicate an increase in

29 Polskie Sieci Elektroenergetyczne, 'Raport 2022 KSE' <https://www.pse.pl/dane-systemowe/funkcjonowanie-kse/raporty-roczne-z-funkcjonowania-kse-za-rok/raporty-za-rok-2022#r6_2> accessed 26 August 2023.

30 The Act of February 20, 2015, on the renewable energy sources (Journal of Laws 2023, item 1762).

31 Nowa Energia, 'Miesięcznik Forum Energii' (10 May 2024) <https://nowa-energia.com.pl/2024/05/10/miesiecznik-forum-energii-4/> accessed 01 July 2024.

32 Rynek elektryczny, 'Produkcja energii elektrycznej w Polsce LIPIEC 2024 r.' <https://www.rynekelektryczny.pl/produkcja-energii-elektrycznej-w-polsce/> accessed 29 April 2024.

33 Rynek elektryczny, 'Produkcja energii elektrycznej w Polsce MAJ 2025 r.' <https://www.rynekelektryczny.pl/produkcja-energii-elektrycznej-w-polsce/> accessed 22 June 2025.

the share of renewable energy sources, accompanied by a decline in the role of coal in the structure of electricity generation.

There are challenges of key importance for the Polish economy related to the energy transition. and thus, to the projected decline in the share of coal in the energy mix, which, according to plans, will not exceed 56 % by 2030 (although with high increases in the price of CO2 emission allowances, it could fall even to 37.5 % according to Energy Policy of Poland until 2040 (EPP2040) data). In the following years, the demanding task is to ensure a dynamic yet safe growth of power from renewable energy sources (RES) to reach a level of no less than 32 % in the structure of net domestic electricity consumption by 2030 (according to EPP2040). And while coal's dominance in Poland's energy mix continues, Poland has achieved a significant breakthrough toward energy transition. Thanks to government support for photovoltaics, PV installation capacity[34] increased from a meager 0.2 GW to an impressive 7.7 GW between 2016 and 2021. This growth was made possible primarily by the deployment of small, distributed PV systems in the residential sector, which in total provided 5.9 GW of capacity.[35]

In addition, Poland has an offshore wind strategy. It has signed contracts for a total capacity of 5.9 GW, which are eventually expected to come online by 2027, with plans to reach at least 11 GW by 2040. Moreover, Poland is a signatory to the Baltic Declaration for Offshore Wind Energy.[36] And while the dominance of traditional energy sources has been maintained so far, Poland is trying to actively pursue a sustainable energy future. On the other hand, legislation is also emerging that is hindering the realization of the energy transition rather than accelerating it. An example is the Windmill Law.[37] Initially, there was the 10H rule,[38] which meant that the construction of a wind power plant was limited by the rule that the minimum distance

34 The Ministry of Energy, in cooperation with the Ministry of the Environment, introduced the "My Electricity" program. The main objective of this program was to increase energy production from micro photovoltaic sources. The program's budget was approx. 200 million euros and was aimed at households.

35 International Energy Agency (n 3).

36 European Commission, 'Baltic Ministers endorse commitment for closer cooperation on offshore energy' <https://commission.europa.eu/news/baltic-ministers-endorse-commitment-closer-cooperation-offshore-energy-2020-09-30_en> accessed 29 August 2023.

37 Law of May 20, 2016, on investments in wind power plants (Journal of Laws 2021, item 724, as amended).

38 It was introduced by the Law of May 20, 2016, on investments in wind power plants (Journal of Laws 2021, item 724).

between the power plant and residential buildings, nature conservation areas, and forest complexes must be ten times the height of the turbine including raised blades, which is 500 meters. In fact, the rule has reduced the pace of development of onshore wind power projects. What's more, on April 23, 2023, amended regulations came into force, which changed the distance from 500 meters to 700 meters,[39] making the existing regulations far less favorable for wind investments.

Nuclear power will also begin to play a significant role in Poland's energy mix from 2035 onward. The goal of the Polish Nuclear Power Programme is to build and commission nuclear power plants in Poland. These power plants are to have a total installed capacity of about 6 to 9 GWe. To be able to achieve this goal, 5 basic tasks have been established for the governmental administration. These are: human resources development, infrastructure development, support for domestic industry (e.g. support for national companies to obtain and implement costly quality certification, support for clusters or other initiatives to bring together interested companies), strengthening the nuclear supervision system and proper public communication and information. The above investment is expected to contribute to the diversification of electricity sources, as well as to the stabilisation of energy prices. In addition, emissions will be reduced, and a stable power source will be. All the above factors shall improve the competitiveness of the Polish economy. Poland has a target of putting in place its first reactor with a capacity of 1 to 1.6 GW by 2033 and commissioning six reactors with a total capacity of 6 to 9 GW by 2043. The target is for RES and nuclear to account for 50.8 and 22.6 percent of market share, respectively, by 2040. The new strategy EPP2040 will also reduce the role of coal. In 2040, it is to have an 8 % share in the Polish energy sector.[40]

At the end of May 2024, the National Centre for Research and Development (NCRD)[41] prepared an update of the 'National Energy and Climate Plan 2021–2030'. NCRD has taken the electrification of the district heating sector as the right way to decarbonise it NCRD's analysis assumes that the

39 Law of March 9, 2023, on amending the Law on investments in wind power plants and some other laws (Journal of Laws 2023 item 553).

40 Ministry of Funds and Regional Policy, 'The National Recovery and Resilience Plan' (Warsaw 2022) 187 <https://www.funduszeeuropejskie.gov.pl/media/109762/KPO.pdf> accessed 30 August 2023.

41 NCBR – Pol. Narodowe Centrum Badań i Rozwoju, Engl. NCRD – The National Centre for Research and Development. NCRD is an executive agency of the Polish Ministry of National Education.

Polish electricity system will ultimately rely mainly on offshore and onshore wind power and photovoltaic power plants. Those energy sources will be supplemented by nuclear power and gas-fired biomethane power plants.[42]

E. Power-to-X Technologies – Alternative Energy Sources – Hydrogen

Hydrogen is increasingly being identified in the public space as one of the elements of the energy transition. The Polish legislature has included hydrogen-related issues in the Law of January 11, 2018, Electromobility and Alternative Fuel[43], and in the Polish Hydrogen Strategy until 2030.[44]

The Law of Electromobility and Alternative Fuels includes, among other things, conditions for the operation of clean transport zones and information obligations regarding alternative fuels. Moreover, definitions related to different types of hydrogen are included, including low-emission, electrolytic, and renewable.

The Polish Hydrogen Strategy until 2030 (PHS) is a strategic document that defines the direction of development of the hydrogen market in Poland. The PHS assumes six objectives to be implemented as part of the hydrogen market development strategy. These objectives in terms of envisaged time horizons, which are set for 2025 and 2030. Moreover, the implementation of the objectives contained in the PHS is expected to contribute significantly to the decarbonization of the sectors with the highest energy consumption, as well as to help implement green hydrogen production on an industrial scale.

The first goal is to implement hydrogen technologies in the power and heating industries. Within this goal, it is assumed that hydrogen will reach viability most quickly using renewable energy sources, such as offshore wind and photovoltaics.

Another priority is the use of hydrogen as an alternative fuel in the transportation sector, which will introduce sustainable mobility in Poland. In the

42 NCBR, 'NCBR opracowało "Koncepcję dekarbonizacji ciepłownictwa systemowego"' <https://www.gov.pl/web/ncbr/ncbr-opracowal-koncepcje-dekarbonizacji-cieplownictwa-systemowego> accessed 02 June 2024.

43 Law of January 11, 2018, on electromobility and alternative fuels (Journal of Laws 2023, Item 875, 1394, 1506, 1681).

44 Ministerstwo Klimatu i Środowiska, 'Polska Strategia Wodorowa do roku 2030' <https://www.gov.pl/web/klimat/polska-strategia-wodorowa-do-roku-2030> accessed 30 August 2023.

context of road transport, hydrogen is planned as a source of propulsion, especially for vehicles used in public transport and heavy transport. As an aside, it can be mentioned that the world's first hydrogen locomotive was built in Poland.[45]

Implementation of the third goal focuses on supporting the decarbonization of the industry. This is to be facilitated by using only low-carbon hydrogen. According to the Polish Hydrogen Strategy (PHS),[46] only blue and green hydrogen is assigned to low-carbon hydrogen, rejecting gray hydrogen without CCUS technology. Considering the PHS, the application of hydrogen technologies is particularly important in fuel production, non-metallic mineral extraction, chemical production, and steel production. An important factor in increasing the role of hydrogen in industry is the idea of creating hydrogen regional ecosystems, also known as hydrogen valleys. Currently, there are eight hydrogen valley projects in Poland, which cover almost the entire area of the country: Pomeranian Hydrogen Valley, West Pomeranian Hydrogen Valley, Greater Poland Hydrogen Valley, Lower Silesia Hydrogen Valley, Silesia and Lesser Poland Hydrogen Valley, Subcarpathian Hydrogen Valley, Central Hydrogen Valley, and Masovian Hydrogen Valley.[47]

Another goal is to develop hydrogen production in new installations. According to PHS guidelines, hydrogen production is to be characterized by low or zero greenhouse gas emissions. In addition, it is assumed that hydrogen production installations should be placed optimally near renewable energy sources and in centers of demand centers of demand, forming energy clusters, which will significantly improve Poland's energy security.

The fifth goal of the PHS is the efficient and safe transmission, distribution, and storage of hydrogen. Initially, the envisioned hydrogen transportation would involve rail and road. Meanwhile, cooperation at the EU level would support the development of hydrogen transportation infrastructure under the European Hydrogen Backbone program.

The final goal is to create a stable regulatory environment. This is the most important step towards developing a regulatory structure to enable

45 Pesa, 'Kolejowa premiera roku – PESA zaprezentowała lokomotywę wodorową na TRAKO' <https://pesa.pl/kolejowa-premiera-roku-pesa-zaprezentowala-lokomotywe-wodorowa-na-trako/> accessed 30 August 2023.

46 The strategic document that defines the direction of development of the hydrogen market in Poland.

47 Agencja Rozwoju Przemysłu, 'Doliny wodorowe' <https://arp.pl/pl/jak-dzialamy/doliny-wodorowe/> accessed 24 August 2023.

the use of hydrogen in transport as an alternative fuel. The second step is the development of a hydrogen legislative package that considers market aspects. The final stage in legislative activities concerning the PHS is expected to be the precise definition of legal issues related to the operation of the hydrogen market, with the aim of implementing EU regulations in this regard. In the Government's legislative and programme work list of 27 May 2024,[48] information on the draft Energy Law[49] was published. In addition to the fact that the above legislative measures are one of the milestones of the National Reconstruction Plan, the draft amendment enables the implementation of Objective 6 'Creation of a stable regulatory environment' of the PSW. This is because the amendment is part of a legislative package called the 'Constitution for Hydrogen'. The aforementioned draft was sent to public consultation by the Ministry of Climate and Environment and subsequently submitted for opinion. The draft amendment provides for, among other things, the creation of rules for the certification and designation of hydrogen operators, regulation of the licensing of hydrogen storage activities.

F. Perspectives of Energy Transition in Poland

Combining sectors in Poland, particularly through the electrification of the mobility and heating sectors, is key to achieving greenhouse gas emission reduction targets and accelerating decarbonization. This approach allows the use of surplus renewable energy and increased energy efficiency in many sectors of the economy.

Also, improving the energy efficiency of buildings to make them less energy-intensive will be an important step. Therefore, all new buildings that will be constructed in Poland (a building that has received a building permit after 2021, a project created according to old guidelines, the formalities of which have not been finalized, as well as a modernized or expanded building) must meet the relevant conditions, which are defined by the

48 Ministerstwo Klimatu i Środowiska, 'Draft Act amending the Energy Law and certain other acts (UD36)' <https://www.gov.pl/web/klimat/konsultacje-publiczne-projektu-ustawy-o-zmianie-ustawy--prawo-energetyczne-raz-niektorych-innych-ustaw-ud36> accessed 14 July 2024.

49 The Act of April 10, 1997, Energy Law (Journal of Laws 2024, item 266).

decree of the Minister of Infrastructure.[50] These have been included in the new energy standard commonly referred to as WT 2021.[51]

This standard is largely concerned with reducing the heat transfer coefficient of building components: for example, walls, roofs, and windows. Therefore, good insulation is required, including thermally insulated windows and energy-efficient exterior doors. What's more, the WT 2021 standard is expected to popularize RES, as they are required to reduce the share of non-renewable energy.[52] Conventional coal-fired stoves, oil-fired boilers, and modern gas-fired boilers face difficulties in meeting the stringent requirements of the WT 2021 standard. Therefore, to meet them, it becomes necessary to include renewable energy sources in the energy balance of buildings.[53] The WT 2021 standard was created in response to the pro-environmental policy of the European Union and the adoption of three standard demands, which are called the 3 x 20 energy and climate package.[54]

As a result, this will help reduce carbon emissions associated with energy consumption in the construction sector.

In the context of Poland's energy transition, there are also significant tensions between three key aspects: greening energy generation, ensuring the security of the energy supply, and maintaining energy affordability. These aspects may come into conflict and require finding an appropriate compromise.

Regarding the issue of greening energy generation, the goal is to increase the share of renewable energy sources (RES) thanks to which greenhouse gas and pollution emissions will be reduced. However, to be able to put RES

50 Regulation of the Minister of Infrastructure of April 12, 2002, on the technical conditions to be fulfilled by buildings and their location (Journal of Laws 2022.0.1225, i.e.).

51 WT – Pol. warunki techniczne, Engl. Technical conditions.

52 Regulation of the Minister of Infrastructure of April 12, 2002, on the technical conditions to be fulfilled by buildings and their location (Journal of Laws 2022.0.1225, i.e.).

53 Corab, 'Standard energetyczny WT 2021. Jakie ma wymagania?' (02 December 2021) <https://corab.pl/aktualnosci/standard-energetyczny-wt-2021-jakie-ma-wymagania> accessed 31 August 2023.

54 Directive 2009/28/EC of the European Parliament and of the Council of April 23, 2009, on the promotion of the use of energy from renewable sources amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC [2009] OJ L 140/16, but the directive was in force until June 30, 2021. It was repealed by Directive (EU) 2018/2001 of the European Parliament and of the Council of December 11, 2018, on the promotion of the use of energy from renewable sources (recast) [2018] OJ L 328/82.

energy into circulation, it is necessary to meet the challenges associated with the variability of weather conditions in Poland, as well as to carry out infrastructure modernization. The modernization of infrastructure as well as the entire energy transition will entail huge costs, which according to various estimates will amount to €135 billion by the end of 2030.[55] The investment costs will be spread over time, but at the same time passed on to consumers in the form of higher energy prices. In turn, this could have a negative impact on the competitiveness of the Polish economy and lead to deterioration in the financial situation of households. Therefore, the biggest challenge is to find a balance between carrying out an effective energy transition and maintaining affordable energy for citizens.

G. Summary

Poland faces the enormous challenge of meeting the demands of combating climate change and decarbonization, especially given the heavy reliance of the Polish energy sector, and consequently the economy, on coal. Efforts are being made to develop new projects and strategies, as well as legislative changes that lead to the energy transition. However, the pace of this work seems to be unsatisfactory in Poland. A good example is the RES sector including wind farms. Current plans are ambitious, especially in terms of increasing RES in the national energy mix, it will be very difficult to achieve a decisive reduction of coal in the energy supply chain without appropriate legislative changes. As a result, continuing to maintain dependence on coal not only slows down the energy transition process but most importantly generates unnecessary costs, given that the price of carbon allowances in the EU ETS system, according to all forecasts, will rise. Poland's energy sector thus now faces a difficult choice between the transformation of traditional power generation technologies and the need to remain competitive, in a low-emission future. Moreover, Poland's energy transition requires a huge financial outlay, according to the E&Y report,[56] in the order of €135

55 Bankier (n 8).

56 Polish Electricity Committee, 'Poland's Energy Transformation Path' (Warsaw 2022) 113, <https://pkee.pl/publications/raport-ey-i-pkee-polska-sciezka-transformacji-energetycznej/> accessed 27 September 2023.

billion.[57] This implies the need to support the energy companies on which the main burden of Poland's energy transition rests with EU funds. With additional EU funds, it will be possible to fill the investment gap resulting from Poland's goal of achieving climate neutrality.

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