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The Impact of Poland's Energy Transition on the Strategies of Fossil Fuel Sector Companies—The Example of PKN Orlen Group

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Abstract: Sustainability and decarbonisation are buzzwords in today's economy. The fossil fuel sector has had a great impact on development of many countries and it is interesting how this sector is going to survive in the era of climate neutrality imposed by the European and national decarbonisation policies. PKN Orlen is one of the largest industrial corporations in Poland and Central Europe representing the energy and fossil fuel sector. The article sets out to identify the main areas of PKN Orlen's strategic plans resulting from the energy transition process in Poland. For this reason, the research question posed in this study is: to what extent and in what direction has Poland's energy policy influenced the new strategy of PKN Orlen? Poland's most recent energy policy was adopted in 2021, therefore an attempt to assess the impact of this policy on the strategy of a large player in the fossil fuel sector in such a short time horizon proves the originality of the study. The applied methodological approach, including case study, comparative analysis, and in-depth interview, was determined by the specific nature of the research problem and the fact that the analyzed sector and entity are strategic from the point of view of the country's economy, which imposes the confidentiality of some data related to the study and determines the possibility of making them public. As shown by the research, PEP2040 had an indirect impact on shaping the strategy of PKN Orlen, while the main source of knowledge about the current and future trends is the analysis, evaluation and synthesis of various sources of information, including those from consulting companies.

Keywords: strategy; energy policy; energy transition; fossil fuel sector

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1. Introduction

The fossil fuel sector has had a huge impact on the economic development and wealth of many countries [1–3]. Cost-intensive investments related to exploration, extraction and processing of fossil fuels, as well as the enormous demand for coal and liquid fuels have transformed these companies into giants on international markets. In many cases, these are state-owned entities (Sinopec, Rosneft, Gazprom or Orlen). The imperative of sustainable development [4,5] and the pursuit of climate neutrality (Green Deal), which are reflected in global, European and Polish policies [6], are treated by some scholars as a vision of dismantling the fossil fuel sector [7], and for others as an opportunity for the fossil fuel sector to take over the control of the renewable energy sector [8,9]. The above-mentioned issues pose challenges for companies operating in the fossil fuel sector, which should be translated into appropriate strategic plans of these companies. Therefore, in this paper, we analyze how the energy transition affects one of the largest players in the fossil fuel sector, both in Poland and in Central and Eastern Europe—KN Orlen.

The energy transition in Poland [10], in the line with the Paris Agreement [11] and the European Green Deal [12], reflects the growing impact of sustainable development on the global economy. The idea of sustainable development was officially introduced by Brundtland in 1987 [13], who recognized the interactions between economic, ecological and social systems. It should be underlined that as early as in the 18th century, when

the Malthusian model of population growth became popular, Malthus drew attention to the limited resources of the Earth, which would therefore not be able to feed the growing human population [14]. With economic development and technological progress, the dangers of the Malthusian trap began to be ignored. However, as early as the second half of the 20th century, concerns about the non-renewable nature of some natural resources resurfaced, threatening production and long-term economic growth. In the scientific discourse, sustainable development is defined in various ways. Some scholars argue that improving and maintaining a healthy economic, ecological and social system for human development is the core of sustainable development [15]. Some scholars, such as for example Stoddart et al. [16], Breuer et al. [17] or Mensah and Enu-Kwesi [18] refer to generational issue, explaining the role of efficient and equitable distribution of resources within and between generations. Other authors emphasize the importance of the interaction of the social, environmental and economic spheres [19,20]. The balance and integration of social, environmental and economic models is crucial to assure benefits for mankind [21,22].

Today, environmental issues are crucial for sustainable development. *Transforming our world: Agenda 2030 for Sustainable Development* [23] adopted by UN members in 2015 in Goal 7 raises the issue of universal access to affordable, reliable and sustainable energy. Keeping the rise in temperature below 2 degrees Celsius (or even 1.5°) above pre-industrial levels [24] was the main consensus achieved among the parties to the Paris Agreement, leading to a range of environmental and economic consequences for the parties [25]. Countries were obliged to elaborate national solutions (Nationally Determined Contributions) based on their national circumstances and capabilities as feedback to global policy aimed at building climate resilience [26,27]. Following the main pillars of the Paris agreement and to reduce the emission of the greenhouse gases (mainly carbon dioxide) responsible for global warming, the European Commission introduced the European Green Deal [12] constituting a European roadmap, which presents the directions and guidelines for European countries to become climate-neutral by 2050. The European Green Deal assumes, inter alia, supplying clean, affordable and secure energy, mobilizing the industry for a clean and circular economy and a zero-pollution ambition for a non-toxic environment.

The scenarios of decarbonization and climate-resilient future presented by the European Green Deal seem to be feasible, as many analyses and forecasts confirm the increase of the share of renewable resources in energy production up to two-thirds within the next 30 years [28]. Even though in some analyses it is predicted that the global demand for coal is set to remain significant in the coming years (mainly due to the unrelenting demand for this fuel in China and India) [29], in long term it is estimated that due to low costs and coupled with energy efficiency, the share of renewable energy sources (RES) will be over 80% in 2050, with the domination of wind and solar energy [29,30]. The pandemic of COVID shook the energy market—in 2020 there was a decrease in energy demand by 5%, in CO_2 emissions by 7% and a drop in investments by 18% [31]. Assuming that after the pandemic is brought under control in 2023, the demand for energy will increase to its pre-crisis level, the demand for renewable energy will continue to grow, and thus the consumption of coal in the energy mix in 2040 will fall below 20% [31].

In Poland, the total energy consumption in 2019 amounted to 4405.8 PJ. The share of hard coal amounted to 37.0%, brown coal 9.1%, crude oil 26.3%, natural gas 16.1%, renewable energy carriers 9.3%, and other carriers 2.2%. Indigenous production of primary energy in Poland has been falling since 2015. The share of hard coal as a primary energy carrier has been also declining, but it still remains the most important source of energy. In 2019, its share was 56.2%. The second largest carrier in terms of production was lignite with a share of 15.2%. The share of natural gas in production was 5.5%, crude oil 1.5%, and the share of other, largely renewable energy sources, 18.3%. In 2019 the largest share in direct energy consumption (34.6%) was held by the industrial sector. Other sectors dominating in direct energy consumption were transport (28.1%) and households (21.7%) [32]. The large role of fossil fuels in Poland's energy mix translates into a high level of CO_2 emissions compared to the European Union. The latest data show that Poland is responsible for

11.2% of CO_2 emissions in the EU, which places it in third place after the largest emitters: Germany and Italy [33].

The infamous position among the emitters is not surprising, as Poland's Energy Policy until 2025, adopted in 2005, assumed that the resources of hard coal and lignite would continue to provide the basic fuel for energy production [34], also due to the cost of generating electricity and heat from these sources. This document emphasizes the need to ensure the safety and efficiency of hard coal supplies for the Polish and EU economy, and also puts great emphasis on the development of the liquid fuels and natural gas markets. Nevertheless, the policy also requires the rational use of renewable energy sources (RES), which should be one of the important components of sustainable development of the state [34]. In connection with the tightening of cooperation and the development of a Community energy policy, Poland's Energy Policy until 2030 was introduced in 2009 [35], emphasizing the need to increase energy efficiency, but also the development of the use of renewable energy sources, including biofuels, and the reduction of environmental impact of the energy sector.

Ultimately, Poland's Energy Policy until 2040 (PEP2040) [10], adopted by the government in 2021, assumes a transition to the path of sustainable development in the energy sector, which is to lead in 2040 to a level where more than half of the installed capacity will be zero-emission sources. The phase-out of fossil fuels is to take place thanks to the implementation of offshore wind energy into the Polish power system and the commissioning of a nuclear power plant. Moreover, PEP2040 envisages transformation of all areas related to energy sources, including, inter alia, increasing the use of alternative fuels in transport [10]. It is highlighted that the transition proposed in PEP2040 is evolutionary, not revolutionary. This is to allow for spreading changes over time and limiting the risk of failure to achieve technological and economic maturity of new technologies. The key principles characterizing PEP2040 include: transformation, security, development, investments, and emission reduction. Three main pillars lie at the heart of the policy [10]:

1. Just transition, including transformation of coal regions, reduction of energy poverty and new industries related to renewable energy and nuclear energy.
2. Zero-emission energy system, based on offshore wind energy, nuclear energy and local and civic energy.
3. Good air quality encompassing transformation of the heating sector, electrification of transport and "house with climate".

The above-mentioned assumptions should lead to energy security, competitiveness and energy efficiency and reduced environmental impact of the energy sector. To reach these goals, specific indicators should be achieved, in line with global environmental measures. The indicators relating to the respective pillars are presented in the Table 1 below.

Table 1. Key components of Poland's Energy Policy until 2040.

Energy transition taking into account electricity self-sufficiency	Installed capacity in offshore wind energy will reach: approx. 5.9 GW in 2030 and up to 11 GW in 2040		There will be a significant increase in installed photovoltaic capacity approx. 5–7 GW in 2030 approx. 10–16 GW in 2040
Increase in the share of RES in all sectors and technologies. In 2030, the share of renewable energy in gross final energy consumption will be at least 23% not less than 32% in electricity (mainly wind and PV) 28% in heating (increase by 1.1 pp per year) 14% in transport (with a large contribution of electromobility)	In 2030, the share of coal in electricity production will not exceed 56%		The reduction in the use of coal in the economy will take place in a manner ensuring a just transition
Energy efficiency will increase— for 2030, a target of 23% reduction of primary energy consumption (compared to PRIMES2007 projection)	TSOe and DSOe investment programs will be focused on the development of renewable energy sources, active consumers and local balancing		In 2033, the first power unit of a nuclear power plant will be launched, with a capacity of approx. 1–1.6 GW Subsequent units will be implemented every 2–3 years, and the entire nuclear program involves the construction of 6 units
By 2040, the heating needs of all households will be covered by district heating and by zero- or low-emission individual sources	Natural gas will be a bridge fuel in the energy transition	In 2030, the gas network will be able to transport a mixture containing approx. 10% of decarbonized gases	The infrastructure of natural gas, crude oil and liquid fuels will be expanded, and the diversification of supply directions will be ensured
A number of activities will be aimed at improving air quality, including: development of district heating (4-fold increase in the number of effective heating systems by 2030) low-emission direction of transition of individual sources (heat pumps, electric heating) moving away from burning coal in households in cities by 2030, in rural areas by 2040, maintaining the possibility of using smokeless fuel until 2040, increasing the energy efficiency of buildings, development of low-emission transport, in particular aiming at zero-emission public transport by 2030 in cities of over 100,000 residents		Reduction of the phenomenon of energy poverty to the level of max. 6% of households	
By 2030, **GHG emissions will be reduced by approx. 30% compared to 1990**		The most anticipated development of energy technologies and R&D investments includes: energy storage technologies, smart metering and energy management systems, electromobility and alternative fuels, hydrogen technologies	

Source: [36].

The development and adoption of Poland's Energy Policy until 2040 was a necessary step for the Polish government to follow the global and European climate policy requirements; however, this document received some criticism. Even though environmental targets are demanding challenges for Poland, they are still not as ambitious as the approach of the European Union [37,38]. Some authors indicate that it differs from the energy transition taking place in the world, which contributes to building an innovative

economy [38], because it does not contribute to a rapid conversion from fossil fuels towards alternative energy sources, which may result in further dependence on energy sources emitting greenhouse gases [39]. It was also emphasized that it leads to the consolidation of the centralized model, with the domination of state-owned energy corporations—instead of promoting the distributed energy model [38].

The structure of the Polish energy sector has been shaped for many years. State institutions established and developed during the centrally-controlled economy gave rise to the currently existing corporations that belong to the list of the largest industrial companies in the country. PKN Orlen (an oil refiner and petrol retailer), PGNiG with its headquarter based in Warsaw (an oil and gas company), PGE based in Warsaw (a power producing company) and Lotos based in Gdańsk (crude oil production, refining and marketing of oil products)—these state-owned companies are the top 4 [40]. The assumptions of PEP2040 force changes in the functioning of the biggest players in the Polish energy market, therefore companies such as PKN Orlen or PGE at the end of 2020 published their new strategies aiming at climate-neutrality by 2050.

Considering the above, the research problem is to check whether the current energy policy of a given country, based on the concept of sustainable development and the pursuit of decarbonization of the economy, implies significant changes in the development strategy of companies in the fossil fuel sector. Against this background, an attempt was made to find an answer to the question whether and to what extent Poland's energy policy influenced the shaping of the development strategy of one of the largest companies in this sector in Poland and Central Europe, i.e., PKN Orlen. We want to identify the main areas of plans and strategic actions of this company resulting from the energy transition process in Poland, which constitute the research aim of this paper. It is worth noting that Poland's energy policy was finally approved in 2021, and its draft versions were published in 2019 and consulted in 2020. It should therefore be emphasized that the assessment of the impact of PEP2040 on PKN Orlen's strategy focusing on investments related to the reduction of greenhouse gas emissions, announced in November 2020, is a study with a very short time horizon and testifies to the originality of the work.

2. Materials and Methods

2.1. Research Design

In order to obtain comprehensive knowledge on the impact of energy policy on PKN Orlen's operating strategy, a method consisting of 3 phases of research was used:

- Phase 1. Analysis of available materials such as annual reports [41,42], strategic documents [43] or presentations for investors [44]. PKN Orlen is a company listed on the stock exchange; therefore, it is required to fulfil its disclosure obligations. Information provided by this type of entity is the basis for investors assessing the company's financial situation and its development prospects. Reliable information is the main condition for making rational decisions. Therefore, the published financial reports and strategic documents have been subjected to a thorough analysis, which allowed us to outline the functioning of PKN Orlen on the domestic and foreign market, as well as to outline the evolution of changes in its strategic documents.
- Phase 2. The in-depth interview was the second phase of the research. It is worth noting that, although PKN Orlen is a joint-stock company, its activity covers the area of energy, which is one of the strategic areas from the point of view of the functioning of the state and is therefore subject to a confidentiality clause. Conducting an in-depth interview with persons authorized to provide information about PKN Orlen is a key argument supporting the choice of this research technique. An adequately informed respondent (in the case of PKN Orlen it was a person appointed from the press department) is able to provide detailed information without exposing the company to a loss of confidential information. An in-depth interview makes it possible to address sensitive issues that, for obvious reasons, often cannot be discussed [45]. The in-depth interview, which took place on 17 September 2021, was structured, while

the respondent was also allowed to speak freely. During the interview, 16 questions were asked.

- Phase 3. Interpretation and conclusion

It is worth emphasizing that interviews have been a popular and practical method of qualitative research and a way of collecting data for many years [46]. Basically, an interview is a specific type of conversation [47] which, provided that it is conducted diligently, allows for an in-depth study of a specific topic, and at the same time allows for extensive interpretive research.

2.2. The Functioning of PKN Orlen on the Domestic and International Energy Market

The company PKN ORLEN S.A. was established in September 1999 as a result of the merger of Petrochemia Płock S.A.—the largest Polish refinery and producer of petrochemicals, and CPN S.A.—a major distributor of motor fuels. At the time of its establishment, the PKN Orlen S.A. capital group included over 160 companies and in terms of sales revenues it was one of the largest industrial corporations in Central Europe. The main area of activity of the group was the production of liquid fuels, asphalts and binders, lubricating oils, other petrochemical products, including polypropylene, polyethylene and products for syntheses. At the end of 2000, the group had the country's largest retail network with 2077 petrol stations. On the other hand, its share in the Polish wholesale market of petrol and diesel oils was estimated at approx. 60%. Since then, the group has significantly developed its activities, as a result of which it currently operates directly on 6 home markets (in Poland, Czechia, Germany, Lithuania, Slovakia and Canada). The entire capital group includes: PKN Orlen as the parent company and other entities located in Poland, Germany, Czechia, Lithuania, Malta, Sweden, the Netherlands, Slovakia, Hungary, Estonia and Latvia, as well as the U.S. and Canada. According to the report of the Company's Management Board for 2020, the largest shareholders of the company include: the State Treasury (27.52%), Nationale Nederlanden OFE (7.34%) and Aviva OFE Aviva Santander (6.29%).

Currently, the core business of the Orlen Group is the production and distribution of electricity, crude oil processing and production of fuels, petrochemicals and chemicals, as well as the sale of the Group's products on the retail and wholesale markets. The Orlen Group is also involved in exploration, recognition and extraction of hydrocarbons. The business model of the capital group covers the following operating segments:

- Production—oil and natural gas
- Downstream—refineries, petrochemicals and energy—production and sales
- Retail—sale of products such as: petrol, diesel oil, LPG and a range of non-fuel products and services offered in shops, restaurants and car washes.

In the area of production, the group has its own base of oil and gas resources (2P), with average daily extraction in Canada and Poland of approximately 18,000 boe/d in 2020. The full offer of the Orlen Group includes over 50 petrochemical and refining products sold in 110 countries on 6 continents. The list of the most important products of PKN Orlen in terms of generated sales revenues (42) is presented in Table 2.

The group conducts retail sales using the largest network of 2855 fuel stations in the region of Central and Eastern Europe, located in Poland, Germany, the Czech Republic, Slovakia and Lithuania. In addition, at the end of 2020, there were 114 electric car charging stations operating in the ORLEN Group's network. The retail sales segment in 2020 was additionally expanded by taking over a network of 1209 RUCH outlets located outside petrol stations, where the company intends to develop sales of various types of products and catering services.

PKN Orlen is also the largest industrial producer of electricity in Poland. After the acquisition of the Energa Group in 2020, the installed capacity of the company's energy assets in Poland reached the level of 6.7 GWt (heat) and 3.2 GWe (electricity). This entity is also one of the largest electricity distributors in Poland, with a power grid with a length of 191,000 km, covering about 1/4 of the country's territory and serving 3 million electricity consumers.

Table 2. TOP 10 PKN Orlen products in terms of sales revenues in 2020.

Product Name	Sales Revenues (PLN Million)
Diesel	34,318
Petrol	17,082
Heavy fuel oil	1911
LPG	1781
Asphalts	1603
Propylene	1528
PTA	1384
Ethylene	1278
JET-A	1189
Polyvinyl chloride	1102
Polypropylene	985
Eco-thermal fuel oil	923
Polyethylene	884

Source: own study.

In September 2020, as the first fuel company in Central and Eastern Europe, PKN Orlen declared the strategic goal of climate neutrality by 2050. In addition, in 2020, the Concern was awarded the title of Top Employer Polska 2020 and included in the list of World's Most Ethical Companies.

2.3. PKN Orlen's Previous vs. New Strategy—Comparative Analysis

The directions of PKN Orlen's development until 2030 were set out in its strategic plans that have been subsequently revised in terms of the operating segments served, due to changes in the macro-environment, and in particular the directions of energy transition in Poland and globally. In the company's development strategy for 2017–2021, updated at the end of 2018, apart from a specific adjustment of financial goals, attention is drawn to the announcement of the development of low-emission energy and a more cautious approach to the company's mining activities. Another major change in the operating strategy took place in 2020, when a completely new development strategy for the PKN Orlen Group was presented with a perspective until 2030. A summary of the basic assumptions of the above-mentioned strategic plans is presented in Table 3.

According to the analysis of strategies implemented and investments made by PKN Orlen, until 2018 the group focused its main attention on the development of the existing areas of activity towards operational improvement and maintaining good financial foundations. During this period, the segments with the strongest development were petrochemicals, refineries and mining. In the following years, as a result of global changes in energy policy and the resulting preliminary adjustments, and in the subsequent period of intensive remodeling of PKN Orlen's development strategy, the group began to gradually reduce its involvement in the mining area, which resulted in the fact that this segment of operating activity has become the area where the least capital expenditure is allocated. On the other hand, the energy segment has clearly gained importance, which is confirmed, inter alia, by the structure of investment outlays as well as the number and scope of the group's investments in 2017–2020 (see Tables 4 and 5).

Table 3. Basic assumptions of strategic plans for key operating segments of PKN Orlen Group for 2017–2030.

	Strategy for 2017–2021	**Strategy Update for 2019–2022**	**Strategy Until 2030**
Downstream	Integrated assets and the strong position of Downstream	Intensification of petrochemical production, further integration of refining assets and development of low-emission energy	Efficient refining production. Integrated and advanced petrochemical production. Low-emission energy
	- raw material security - operational excellence—effective sales	- raw material security - operational excellence - strengthening the market position	- in the field of refineries—consolidation of assets, deepening of processing and improvement of efficiency and development of biofuels and alternative fuels (e.g., hydrogen) - in the field of petrochemistry—expansion of basic chemicals and development in advanced chemicals and development of recycling - in the field of energy—development of gas energy, dynamic development of renewable energy sources, hydrogen and energy storage
Retail	Development of the offer and high customer satisfaction of the retail	Development of the sales network and strengthening relationships with customers	Integrated retail
	- modern fuel sales network - unique shopping experiences - operational excellence	- modern fuel sales network - unique shopping experiences - operational excellence	- development of retail network and the non-fuel segment—new comprehensive services and formats, improving brand strength
Extraction	A cautious follow-up strategy	A cautious follow-up strategy	Sustainable extraction
	- increase in extraction in Poland and Canada—careful continuation	- further increase in production in Poland and Canada—careful continuation—operational excellence and financial strength	- investments in integrated assets and bargain acquisitions - a balanced portfolio of assets, mainly gas

Source: own study.

Table 4. Structure of capital expenditure in 2017–2020 by operating segments of PKN Orlen (in PLN million).

Segment	**2017**	**Share (%)**	**2018**	**Share (%)**	**2019**	**Share (%)**	**2020**	**Share (%)**
Refinery	1066	23.2	1271	29.7	1721	31.5	3174	35.3
Petrochemistry	1327	28.8	1060	24.8	950	17.4	1912	21.3
Power engineering	532	11.6	120	2.8	318	5.8	1722	19.2
Retail	678	14.7	832	19.4	1391	25.5	1329	14.8
Extraction	778	16.9	740	17.3	632	11.6	400	4.4
Corporate functions	221	4.8	257	6.0	445	8.2	455	5.0
TOTAL	4602	100.0	4280	100.0	5457	100.0	8992	100.0

Source: own study.

Table 5. The largest investment projects implemented by PKN Orlen in 2017–2020—by operating segments.

Segment	Investments
	2017
Refinery	Construction of a metathesis installation in Płock.
Petrochemistry	Construction of a polyethylene (PE3) installation in Litvinov.
Power engineering	Construction of CCGT in Włocławek and Płock with infrastructure
Retail	Launch of 89 petrol stations (including: 39 in Poland, 11 in Germany and 39 in Czechia Modernization and rebranding of 55 petrol stations (including: 23 in Poland and 32 in Czechia). Opening of 102 new Stop Cafe and O! SHOP points
Extraction	Continuation of exploration and production work in Poland and Canada
	2018
Refinery	Construction of a metathesis installation in Płock.
Petrochemistry	Construction of a polyethylene (PE3) installation in Litvinov. Construction of PPF Splitter installation in Lithuania.
Power engineering	Construction of CCGT in Płock with infrastructure
Retail	Launch of 64 new petrol stations (including: 44 in Poland, 9 in Germany and 11 in Czechia). Modernization and rebranding of 109 petrol stations (including: 13 in Poland, 1 in Germany and 95 in Czechia). Opening of 306 new points with the Stop Cafe/Star Connect offer (including convenience stores under the O! SHOP brand
Extraction	Continuation of exploration and production work in Poland and Canada
	2019
Refinery	Construction of a metathesis installation in Płock. Construction of a node for separating paraffins from MaxEne reforming raw material in PKN ORLEN Purchase of a license and a base design for the installation for the production of 2nd generation bioethanol in Orlen Południe Construction of glycol installation in Orlen Południe Projects under the Cavern Strategy in Poland Construction of Research and Development Center in Płock
Petrochemistry	Construction of a polyethylene installation in the Czech Republic Construction of PPF Splitter installation in Lithuania Development of fertilizer production capacity in Anwil
Power engineering	Construction of a boiler room for the Steam Cracker installation in the Czech Republic
Retail	Launch of 64 new petrol stations (including: 43 in Poland, 6 in Germany, 7 in Czechia and 8 in Slovakia), Modernization and rebranding of 132 fuel stations (including 127 in Poland and 5 in Czechia), Opening of 297 new points with the Stop Cafe/Star Connect offer (including convenience stores under the O! SHOP brand)
Extraction	Increasing production and the number of exploration wells
	2020
Refinery	Construction of a visbreaking installation in Płock Construction of a propylene glycol installation in Orlen Południe
Petrochemistry	Completion of construction of the main part of the Polyethylene plant in Czechia Development of fertilizer production capacity in Anwil Construction of installations under the Petrochemical Development Program
Power engineering	Modernization of TG1 turbine set in CHP plant in Płock Projects in ENERGA Group focused on production and distribution Preparatory project for construction of offshore wind farms in the Baltic Sea
Retail	A total of 51 petrol stations were opened, cooperation at 30 stations was closed/terminated, and 12 stations were modernized 65 new Stop Cafe/Star Connect points (including convenience stores) opened
Extraction	Continuation of existing mining projects in Canada and Poland

Source: own study.

Another operating segment of the PKN Orlen Group, which will lose its importance, inter alia, as a result of environmental and consumer trends, development of new technologies and related energy transformations in the world, is the processing of crude oil into

fuels. Hence, the current development strategy of the group assumes the transformation of PKN Orlen into a low-emission multi-energy group. The process of creating this type of unit will be based on 4 pillars, as presented in Table 6.

Table 6. Pillars of the development of the low-emission multi-energy concern PKN Orlen.

Efficient plants	By 2030, reducing CO_2 emissions by 20% on current assets (in the refinery and petrochemical segment)	• Energy efficiency—60 projects • Pilot projects and feasibility studies, incl. for green hydrogen • Application of the best available technologies in new investments
Clear energy	A leading producer of low and zero-emission energy in Poland—a 33% reduction in CO_2/MWh emissions by 2030.	• Investments in offshore wind farms • Investments in renewable energy onshore: wind farms and solar farms
Low emission fuels	5 major investments in the production of biofuels	• Fuel biocomponents: HVO, co-HVO, UCOME, lignocellulosic bioethanol, biomethane • Alternative fuel stations: hydrogen, EV, CNG and LN
Green financing and organization	Orlen is a regular issuer of green and sustainable development bonds	• Orlen is a competitive brand under the Green Deal conditions • Over PLN 120 billion in revenue: a strong financial position and a reliable partner in the implementation of an ambitious portfolio in renewable energy

Source: [44].

The company plans that approximately 50 percent of the capital expenditure by 2030 will be incurred on projects allowing for development of new branches of business related to new energy sources as well as fuels and low-emission petrochemicals, which will be an important source of revenue from crude oil processing. About 10 percent of the investment will be spent by the group on future investments such as hydrogen and recycling. The remaining investments will be related to projects aimed at increasing the efficiency of the group's current assets, taking into account the reduction of their CO_2 emissions. PKN Orlen intends to increase the availability of alternative fuels, inter alia, by building a minimum of 1000 fast electric chargers and developing sales of hydrogen fuel and LNG/CNG. It plans to expand its shop and catering services beyond petrol stations and expand its own network of parcel collection points and e-commerce offer thanks to the acquisition of the Ruch network. The implementation of the actions included in the strategy is to increase the non-fuel margin by 50 percent compared to 2019.

Therefore, in the perspective of 2030, PKN Orlen adopted the following financial and operational goals:

- Annual EBITDA LIFO (before write-offs) of approximately PLN 26 billion.
- Total capital expenditure (CAPEX) of approximately PLN 140 billion.
- Total investment in sustainable development of over PLN 30 billion.
- Reduction of CO_2 emissions by 20%.
- Over 2.5 GW of installed RES capacity.
- Over 3500 petrol stations and over 1000 fast charging stations for electric cars.

Achieving these goals is related to the ambitious aspirations of the group, which include, among others:

- Leading position on the European market—presence in over 10 countries along the entire value chain (EBITDA increase over 2.5 times compared to 2019).
- Leader of energy transformation in the region—the largest portfolio of attractive assets in renewable and low-emission energy with the possibility of future conversion to hydrogen.

- Provider of integrated services for customers—meeting energy and purchasing needs based on current and new distribution channels and digital technologies.
- A socially responsible company—investments in sustainable development, energy transformation, decarbonization, recycling, social initiatives.
- A stable source of value building—focus on maximizing the return on investment while maintaining a stable balance sheet.

Although the new strategy of the PKN Orlen Group was developed in detail and made public at the end of 2020, the company at the same time was already implementing a number of strategic activities that fit into the published development plan and which are continued in 2021. The most important of them include:

- Acquisition of capital control over the Energa Group in April 2020—acquisition of a block of 80% of shares, a call for the remaining shares and work on the operational integration of assets. As a result, in September 2020, PKN Orlen became the owner of 90.92% of the share capital of Energa.
- Launching the process of acquiring PGNiG, currently awaiting approval from the Office of Competition and Consumer Protection on the merger.
- Dynamic development of the retail segment—including expansion of the Stop Cafe 2.0 format network, the process of taking over full control of the RUCH company
- Actions aimed at taking control of Grupa Lotos—approval of the European Commission was obtained on July 14, 2020.
- Advanced preparations for the construction of offshore wind farms—completion of environmental research and commencement of design for the first wind farm.
- Purchase of three onshore wind farms with a total capacity of approximately 90 MW located in Zachodniopomorskie (West Pomerania) and Pomorskie (Pomerania) voivodships.

Summing up, it should be stated that the strategic plans of the Orlen Group until 2030 show that the main path of transformation of the audited entity is to be determined by renewable energy and modern petrochemicals. This does not mean that the company plans to completely abandon other operating segments, but that they must be thoroughly modernized in terms of higher efficiency and low CO_2 emissions. Moreover, the planned strategic activities are to lead to further diversification of the group's revenue sources. If the company succeeds in implementing the adopted strategy of operation, it will become a multi-energy group, with operations based on renewable and gas energy, effective, low-emission refinery and petrochemical production, own hydrocarbon extraction and an integrated offer for individual customers. It is estimated that the new group will have total revenues of approximately PLN 200 billion per year and EBIDTA of approximately PLN 20 billion. This means that in terms of capitalization and financial results, it will be equal to, and perhaps even exceed, its European competitors.

3. Results and Discussion

An in-depth interview identified the most important issues influencing the shape of PKN Orlen's current strategy. PKN Orlen indicated the unprecedented need to transform the sector is objective and results from three key factors:

- First, the growing concern for the environment, which is the result of the increasing awareness of the consequences of climate change. This results in stronger regulatory pressure and pressure from investors to transform energy companies.
- Second, the change in existing strategies results from the rapid pace of technology development. Dynamic improvement of cost effectiveness of renewable energy sources and the electrification of the industry are just some of the changes that open up new—so far often unprofitable—areas for business development.
- Thirdly, it is crucial to change the preferences of social pressure and expectations towards service providers and fuel companies.

These factors were the starting point for work on PKN Orlen's long-term strategy. As the respondent underlined, they also defined the framework in which the Polish Energy

Policy until 2040 was created. In response to the observed trends, fuel companies must adapt their model to the new realities. In the face of upcoming changes in the business environment, fuel and energy companies—in order to survive the transformation and continue their business activities in the long term—must revise their strategies and reassess the attractiveness of existing areas of activity. It is impossible to develop dynamically without reconfiguring their assets and identifying new, prospective business areas that will be able to ensure the possibility of long-term growth. Therefore, in the Strategy of the ORLEN Group 2030, the goal is to be a leader in energy transformation in the region, including by building the largest portfolio of assets in the medium and low carbon energy sector.

According to the respondent, international policy is also an important background for strategic changes for PKN Orlen. The EU's Green Deal policies are aimed at covering the entire range of emissions, from extraction of the raw material, in the entire chain of the Orlen Group. As a result of the Green Deal, the reduction of greenhouse gases in the so-called scope 3, i.e., at customers and suppliers, will become a *de facto* challenge for the Orlen Group. The Green Deal changes the environment of the Orlen Group—it creates additional pressure on revenues, changes the automotive market, increases the importance of bio raw materials and alternative fuels. Therefore, as underlined by the interviewee, it cannot be excluded from the strategic planning of the Orlen Group. The current Strategy of the Orlen Group until 2030 was developed on the basis of the most up-to-date knowledge of market and regulatory trends—including the assumptions of the European Green Deal.

In the in-depth interview, we asked about the impact of the analyses and observations of the fuel and energy market conducted by PKN Orlen on the shape of the group's strategy. The Orlen Group makes strategic decisions based on market and industry analyses. As part of analytical work, the Orlen Group prepares a number of internal studies on market trends, regulatory trends and the functioning of the competitive environment. These studies are prepared both through the analysis of market data (the so-called desk research), as well as using the knowledge of reputable suppliers of external analyses (e.g., IHS Markit, S&P Platts). Moreover, in the case of projects of a strategic nature, the Orlen Group uses the knowledge and competences of international economic and strategic advisors who, when preparing their recommendations, take into account the most current trends in energy markets.

During the interview, the example of other fuel companies was given (e.g., Sinopec plans to spend USD 4.6 billion on the development of hydrogen technologies by 2025 in order to achieve climate neutrality by 2050; Shell is investing in wind power and solar systems) and we asked whether the actions of similar entities have an impact on Orlen's strategic activities. It turned out that in the strategic planning process, the Orlen Group takes into account the activities of competitors and companies that are comparable or operating on analogous markets. However, strategic planning taking into account trends and prospects for the Orlen Group's key markets located in Central and Eastern Europe appears to be more important than tracking the activities of global players.

The authors also noticed that the structure of capital expenditures in 2017–2020 shows certain trends, e.g., a decrease in expenditure on mining and an increase in investments in the energy sector, but PKN Orlen still invests the most in refineries and petrochemicals which is at odds with green technologies. An interviewee underlines that as part of the 2030 Strategy, the Orlen Group adopted a portfolio approach to managing business segments. Following this logic, Orlen distinguishes three business line portfolios: "Maximize Value", "Strategic Investments" and "Investing in the Future". These portfolios differ in terms of their strategic approach and assumptions about the pace and mode of growth.

- As part of the "Value Maximization" portfolio, the Orlen Group strives for maximum operational efficiency of business segments that will not generate significant value in the long run. This is, for example, the refining segment, oil extraction and retail fuel sales.

- The second portfolio consists of the largest investments in this decade—"Strategic Investments". These are the assets that will be developed in this decade with a view to generate profit in the coming decades as well. These include petrochemicals, renewable energy, gas energy and non-fuel retail.
- The third portfolio of the Orlen Group's strategy is innovation and "Investing in the future". The company realizes that the success of the energy transformation rests mostly on technologies and business models that are not available on the market today, that need to be invented, designed and implemented. Such areas include, among others, efficient large-scale energy storage, new mobility, and hydrogen technologies.
- In the context of the above, decisions on the allocation of capital expenditures were first made at the level of the above portfolios, and then for individual business segments.

As for the logic of segmentation into individual business segments adopted in the Orlen Group's Strategy until 2030, PKN Orlen assumes that the key investments in the "Maximizing Value" portfolio are planned for the first half of the decade. In the second half, the group plans to implement investments mainly from the portfolio of "Strategic investments" and "Investments in the future".

As the research results show, efficient plants, clear energy, low-emission fuels and green financing and organization are the main lines of action envisaged in PKN Orlen's strategy so that the company can compete in the future in terms of sustainable development. The Polish energy transition influenced the shape of the current strategy, but indirectly. Analyses of market trends, consulting services of external companies and own experience in knowledge management are also important for the development of strategic plans in the case of PKN Orlen. The specifics of factors shaping PKN Orlen's strategy are presented in the Figure 1.

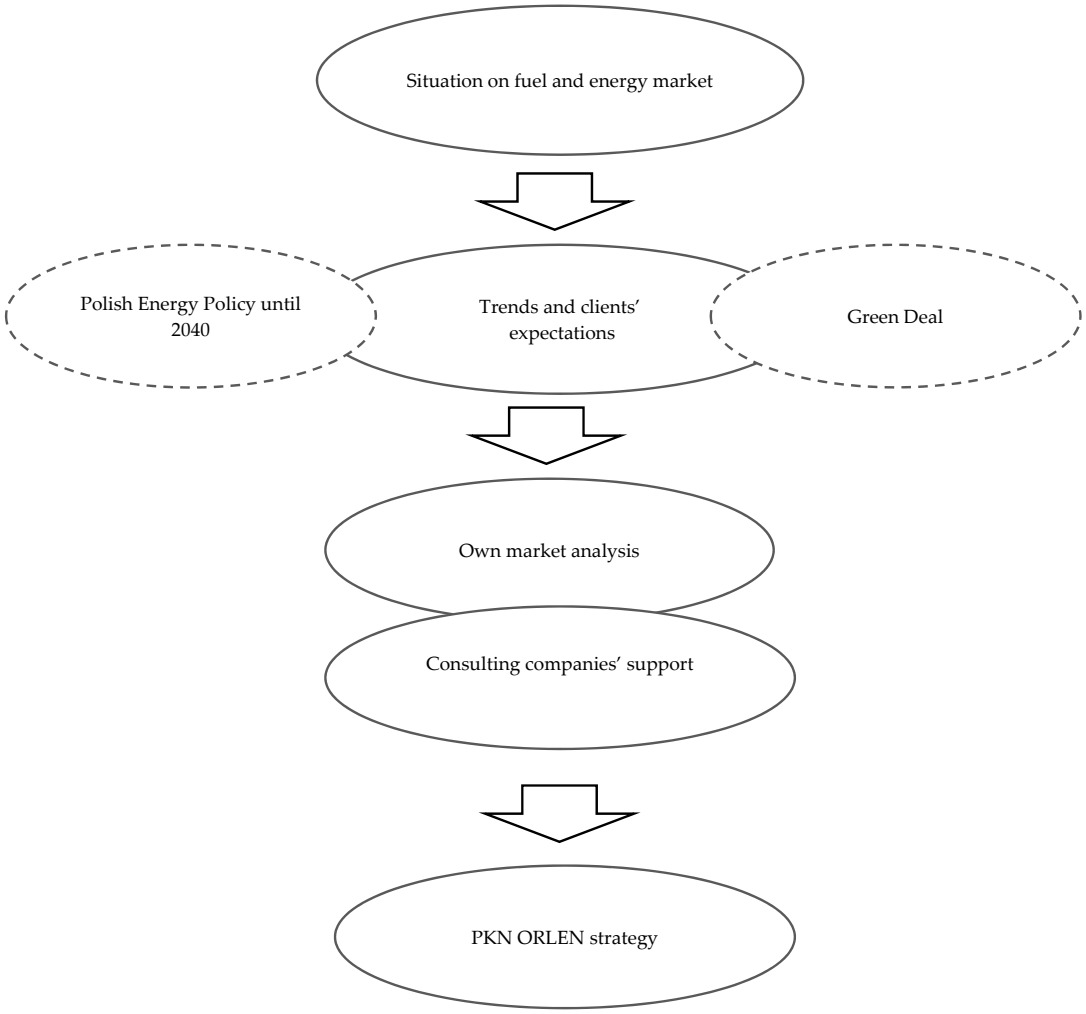

Figure 1. Factors shaping the strategy of PKN ORLEN.

The study conducted highlighted several limitations that should be discussed in order to avoid any confusion in the analysis of the study itself and its results. The main limitation is the strategic nature of the sector and the investigated company from the point of view of the Polish economy, resulting in a confidential nature of some data and difficulties to obtain or refusal to disclose such data. This issue determined the selection of research tools, which was described in the research methods.

Other limitations of the conducted research are of various nature, including:

- time—resulting from the adopted time horizon of analyses: the short but, on the other hand, up-to-date time horizon of the analysis corresponds to the initial stage of the implementation of the new operating strategy in PKN Orlen and the fact that Poland's energy policy is a document approved only in 2021;
- subject—the analysis covers one selected entity: however, it is the largest entity on the market in Poland, the largest in Central and Eastern Europe and a major player on the fossil fuel market;
- scope—attention was focused on the analysis of the impact of the energy policy on changes in the development strategy, ignoring a number of important and existing changes, e.g., the impact on the capital structure of the concern, financial results, etc.

Therefore, at present it is not possible to draw broader conclusions related to the undertaken research problem. Due to the indicated limitations, the conducted research should be treated as a pilot, requiring a further extension of the scope and deepening of the analyses, which the authors plan to do in subsequent periods.

Nevertheless, further research directions emerge from each type of limitation. It should be noted that Poland's new energy policy was only adopted earlier this year, therefore its impact on development strategies, especially in relation to the domestic market, may be more noticeable in the following years of operation of the audited company, which justifies the need for further research in the coming years. Taking into account the long-term nature of the country's energy policy objectives—it could be conducted in intervals of, e.g., 3 or 5 years. There is also a need for analyses using other methods, such as the *ex post* and *ex ante* approach, allowing for in-depth analysis and inference. The results of the research conducted allow the Authors to conclude that companies as large as the audited entity, operating on the global market, shape their development strategies based on the analysis of various macro factors and directions of global changes in energy policy. Such factors should be identified. Another potential research issue is to investigate how the Polish energy transition impacts other companies in the fossil fuel and energy sector. What is more, there is a need of a more detailed analysis of the impact of the Polish energy transition on changes in the entities of the fossil fuel and energy sector, such as the impact on their capital structure, financial results or organizational culture. Another hint for researchers is the analysis of mergers of important players in the energy market and how such mergers could affect the potential of companies that have to cope with functioning in the green economy.

4. Conclusions

The conducted research allowed for the achievement of the set goal, namely the identification of the main areas of strategic activities of PKN Orlen resulting from the energy transition process in Poland. The activities undertaken in the field of efficient plants, clear energy, low-emission fuels and green financing and organization are to lead to the transformation into a multi-energy group. Such a green multi-energy company will base its functioning on:

- renewable (wind, solar) and gas energy,
- effective, low-emission refinery and petrochemical production,
- own hydrocarbon extraction,
- an integrated offer for individual customers.

Moreover, as the research shows, it can be seen that the strategic plans and the activities undertaken so far indicate that the company has started the transformation process.

As the study showed, Poland's Energy Policy until 2040 had an indirect impact on shaping the strategy of PKN Orlen. The in-depth interview indicated that building knowledge about current and future trends requires the analysis, evaluation and synthesis of many data and information sources. Both the current market trends, own analyses and support from external consulting companies are the elements that allow PKN Orlen to create prospects for the energy market. However, it is of key importance for the Orlen Group to identify the business implications of individual trends and to make decisions that are optimal in a given context.

Summing up, the presented study has a wider application, especially at a time when the concept of sustainable development becomes a paradigm of modern global economy. That is why it is so important to follow and study changes in the fossil fuel sector, whose functioning so far has been fundamentally contrary to the idea of sustainable development. Increasingly broader understanding and acceptance of the idea of sustainable development have also found their place in energy policies on various level and reflected in national energy policies. It is important, however, to what extent such a policy has a real impact on the strategy and functioning of companies from the energy sector, including the fossil fuel sector.

The obtained results indicated both the need for in-depth analyses in relation to the examined entity, as well as for expansion both in the temporal, subject-related and spatial context. According to the presented limitations, the research results may constitute the basis for a broader and in-depth diagnosis of the situation in this area. Moreover, they may constitute a starting point for the design of research on evaluation of energy policy tools in terms of their effectiveness due to the scope of influence on development strategies of companies in the sector. For the proper assessment of the indicated issues, it is necessary to broaden and deepen the analyses by including other companies or groups, increasing the time horizon and making comparisons on an international level.

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