Introduction

While the low emissions-oriented EU Energy Union is gaining momentum, Poland remains the sole defender of coal in the EU arena and is often perceived as a potential obstacle on the way to a green energy Europe. A close examination of the Polish energy industry clarifies the roots of this stance and the likelihood it will be maintained over a long-time horizon.

In this article, we closely analyze the legacy of coal production in Poland, taking into consideration the historical and geopolitical background, and provide an explanation for its present-day role, discussing its significance for the economy but also the industry's recent turmoil and strategic incompatibility with the assumptions of the EU climate policy. Additionally, we briefly analyze the dynamics of the Polish energy mix in recent years and question if the country's negative image on the European stage is truly deserved. Finally, we describe different scenarios regarding the role of coal in future energy generation, referring to strategic plans of Polish policy-makers and offering our own predictions. While our analysis focuses on hard coal due to its historical and current dominating role in the domestic energy system and public discussion, we also take into consideration lignite when formulating forecasts and opinions regarding future shape of the Polish mix.

I. How the Polish coal industry rose to prominence

The significant role of coal in the Polish economic and social development has been neither accidental nor temporary. A combination of past developments and present-day policies have long made the Polish energy industry, and to some degree the whole economy, highly dependent on the use of coal as the primary energy source. In this part, we highlight the crucial factors that have both historically built the position of "black gold" and will continue to impact the Polish stance towards it in the upcoming years.

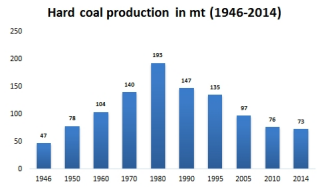
Historical development

The history of hard coal extraction in areas belonging to the present-day Poland dates back to the 17th and 18th centuries where first, often open-pit, mines were operated in the Lesser

Poland, Upper Silesia and Lower Silesia regions. As the importance of black gold increased in a subsequent time due to the Industrial Revolution's spread across the continent, mining became part of the regional culture and heritage.

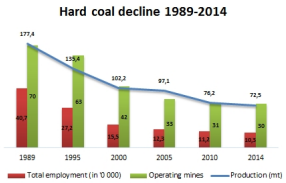
Yet, the industry growth in the 17th and 18th centuries should not be seen as a significant nationwide experience due to three fundamental reasons: Firstly, the scale of this growth was considerably smaller than in other parts of Europe; secondly, Upper and Lower Silesia had long been under German rule at that point; lastly, the Polish state disappeared from the map for 123 years in 1795. This however changed in the 20th century when hard coal became the necessary fuel for industrialization and modernization processes taking place after WWI and predominantly WWII. Despite all the imperfections of the socialist, centrally planned economy in the pre-1989 era, it provided a strong impulse for industrial progress, with a strong focus on heavy, energy-intensive sectors (e.g. metallurgy, shipyard, chemicals). These developments of the 1960s and 1970s, combined with the immense reconstruction of war-destroyed infrastructure, had to be powered by the only energy source that was available, the abundant hard coal in the now-Polish Upper Silesia.

The production output of hard coal rose from less than 47 mt in 1946 to a record 201 mt in 1979, making Poland one of the leading producers worldwide. Hard coal was also an important export good – both as one of few foreign currency sources in post-war years and when Poland became the top exporter with close to 40 mt sent abroad in 1981. As the socialist state was approaching its long-awaited end, in 1988 Poland was the fourth biggest producer (after China, US and USSR) and hard coal satisfied 66% of primary energy demand and 64% of electric energy demand.



The hard coal industry played a vital role throughout the whole era of 1945-1989, fueling the economy, providing hundreds of thousands of jobs, as well as serving as the backbone of the whole electric energy system. As democratization processes unfolded in 1990s, free market reforms were widely undertaken and a number of the least efficient coal mines were shut down. By 1995, production decreased to 135 mt and the total employment was slashed to 272 thousand workers from 407 thousand at the outset of reforms. The second restructuring wave

came in the end of 1990s, after the same market-oriented politicians came back to power and introduced a complex program of significant closures and reductions which caused considerable social costs in the long run. Janusz Steinhoff, the Minister of Economy (1997-2001) responsible for this restructuring plan recalled recently that his team reformed coal mining fastest worldwide, twice as fast as Margaret Thatcher did. On the other hand, it has to be remembered that dismissed miners received very generous severance pays which were mostly consumed and did not generate any sustainable growth for the region. Today's critics of these reforms argue that the large-scale restructuring devastated multiple communities economically and socially, pushing them towards structural unemployment.



The declining trend continued over the following years, caused by a combination of several factors, including more demanding geological conditions, poor management by the state (major mines have never been privatized), price competitive rivals or more recently, low benchmark world prices.

Present day industry scale

While the analysis above clearly indicates the golden period of Polish hard coal is long gone, the industry is still of high importance for the Polish economy and an exception in Europe. In 2014, the aggregate output of the industry amounted to 72.5 mt, net import was equal to 2 mt and employment totaled 103 thousand jobs. Below we provide four major arguments demonstrating how the industry's current scale as well as past developments preserve the position of coal in Poland.

Firstly, hard coal is still the cornerstone of the Polish electric energy system, which has never been diversified and traditionally relied solely on coal. In 2014, hard coal combustion provided over 50% of the domestic electric energy generation; over 21 GW of 39.3 GW installed capacity in the

system was powered by it. A considerable percentage of these facilities are fully amortized and will be gradually phased out by 2020, but the majority of hard coal power plants will still remain the major component of the base load, as their rapid replacement would be highly questionable, both technically and financially. In this context, it is important to remember that relying on hard coal generation is not equal to relaying on Polish production.

Secondly, even though the hard coal mining sector's significance decreased substantially since 1989, it still has considerable impact on the Polish economy. It provides substantial income to the Polish central and local budgets in the form of taxes, social security payments, dividends, local environmental fees for mining damages, air pollution, etc., and exploitation fees, etc. – all adding up to more than 20 payment categories. In recent years, the value of these burdens totalled between 7 and 9 billion PLN. In 2013, the biggest categories were social security payments (3.73 billion PLN) and VAT contributions (2 billion PLN). Together, lignite and hard coal mining sectors paid 8.4 bln PLN in 2013. As the budget income reached 279.1 bln these payments amount to 3%. Critics of this argument hold that similar budget contributions would be provided regardless of the technology of electricity generation, e.g. if coal were replaced by natural gas or renewable energy. However, radical decarbonisation and large scale closures in the mining sector would most likely seriously disrupt the established patterns/sources of multiple budgets' inflows and it would take some time before new ones could replace them.

Thirdly, the coal industry has long been the flywheel of development for hundreds of its suppliers, intermediaries and subcontractors. Industry estimates indicate that its orders generate approximately 300,000 stable jobs outside mining. One of the biggest beneficiaries is the railway transportation sector as hard coal's share in overall amount of goods carried reached 40.48% in 2014. PKP Cargo, Poland's largest, and Europe's second largest railway freight provider operates over 70% of the total domestic coal shipments. 51% of its revenue in 2014 was generated from the transportation of solid fuels where hard coal was a major category. Another good example of profitable cooperation with the coal industry are the Polish mining machinery producers Famur and Kopex, which have built their strength supplying mechanization solutions for Polish mines. Despite the fact they have both pursued geographic diversification, the Polish market is still an important part of their business. The prosperity of these companies is important also from the viewpoint of the Polish economy which generally lacks industrial producers that excel in innovation, incur considerable R&D outlays and cooperate with domestic scientists/universities.

Finally, while the role of the hard coal industry for the whole Polish economy has significantly decreased and its rapid closure would not cause any extensive crisis, "black gold" it is still one of the economic foundations of Upper Silesia – traditionally the most industrialized, but recently

also slightly impoverished, region of the country. Due to a historical concentration of mines, the coal industry has long been the main contributor to the public and household budgets of several big and medium-size cities in the region. It provides thousands of well-paid jobs, often in areas where miners face very few employment alternatives. Therefore, despite the fact that both regional and central authorities have taken actions to transform and reorient the Upper Silesia economy towards other sectors, any rapid closure of the coal industry could not be successfully mitigated at this point in time and would lead to a substantial rise in the structural unemployment of the region. This argument should be seen in the specific socio-cultural context. As hard coal has historically been one of the major drivers of Upper Silesia growth, it has steadily become a part of life ethos. The position of a miner has been widely respected in the social hierarchy and considered prestigious in numerous local communities. Moreover, the majority of mines still belong to state owned enterprises, strengthening the belief of workers and their local communities that they partially own them. In effect, any not negotiated and not coordinated fall/reduction of the mining sector in the Upper Silesia would most likely lead to violent push-back and potential local unrest.

Lignite

These facts and numbers should be seen in comparison with statistics of lignite – historically a fuel far less important than hard coal - which today plays an important role in the Polish energy mix, particularly after construction of the gigantic Bełchatów Power Station (5,354 MW) at the end of the Eighties. Lignite production reached 63 mt in 2014, which is only 13% lower than that of hard coal. However, due to its characteristics, lignite is consumed only domestically, with production concentrated in only a few open-pit mines located in close proximity to power plants. As a consequence, its impact on the economic and social level is far smaller than in the case of hard coal. Moreover, due to the generally uneconomic transportation of lignite, domestic facilities are not endangered by import and thus enjoy more stability.

Hard coal and lignite fueled electricity generation together constitute approximately 84% of Poland's total domestic power generation (50% hard coal, 34% lignite), demonstrating its key role in the system and the scale of challenges were Poland to consider eliminating coal from its energy mix in upcoming years.

II. Economic context

Notwithstanding the importance of complex social, cultural or historical aspects related to the

Polish coal industry, from the viewpoint of ordinary citizens and enterprises, it is the amount on the energy bill they pay each month that matters and shapes attitudes. In this context, Polish prices must be put into comparison with other EU countries.

As the fast development of renewables in several EU countries drives down energy wholesale prices, the major financial burden of existing renewable support schemes is imposed on households, which is reflected in retail prices. According to data released by Eurostat in May 2015, household electricity prices (per 100 kWh) in the EU during the second half of 2014 ranged from €9 in Bulgaria to €29.7 in Germany and more than €30 in Denmark. The presence of countries implementing the most ambitious Renewable Electricity Standards in the top tier of the classification indicates a considerable link between the share of RES in the domestic energy mix and the level of household prices.

Poland was classified in the lower end of this range, with the average price of €14.1 per 100 kWh. Moreover, the share of taxes and levies (also those used for the support of renewables) included in the price is also low, 22% as compared to 57% in Denmark and 52% in Germany. However, when expressed with the use of purchasing power standards (PPS) - an artificial common reference currency that eliminates general price level differences between countries - the average electricity price in Poland amounts to €24.3 per 100 kWh, higher than in Denmark (€22) and slightly lower than in case of Germany (€28.5). As this indicates, there is little space for any of the large-scale taxation which would be necessary were Poland to choose to force extensive renewables deployment. Experiences of other, much richer EU member states only increase Poland's cautiousness. High renewables' subsidies have led to electricity price increases, being an additional burden for depressed European economies in recent years. Generous support schemes resulted in legal and regulatory uncertainty as the debate regarding their sustainability has been present all around Europe, including Spain the UK and Italy . Feed-in-tariffs were under consideration in all these places. Germany, EU's major RES advocate, has made a decision to introduce a new,
auction-based RES support scheme
which is supposed to implement
more cost-efficient support mechanisms
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The average wholesale price of electricity in 2Q 2015 amounted to approx. €4.26 per 100 kWh (the difference with the previously mentioned €14.1 results from distribution costs, mark-ups and taxes). As this is slightly higher than in many European wholesale markets, the absence of large-scale RES generation avoids considerable "RES fees" on the retail level. In this context, coal-based generation offers Poles relatively low energy prices that are vital for both poorer layers of society and energy-intensive industry. Any rapid transformation towards "green generation" would result in the imposition of an inescapable financial burden on households and

pose a threat to the competitiveness of businesses. It is therefore not surprising that there is a lack of political will and social acceptance for a Polish “Energiewende” project. On the other hand, some studies argue that the impact of low energy prices on the competitiveness of the Polish industry, often underlined by defenders of the status quo, is overestimated . For the majority of Polish companies the cost of electricity is of marginal significance; it exceeds 5% of all costs for about 10% of all industrial plants. The cost of energy makes a strong impact on the competitiveness of about 10% of Polish enterprises. Yet, the study does not indicate the scale of these enterprises and their significance for the national economy.

The above pro-coal rationale strengthens and conserves the status quo with its major downsides: an economy dependent on cheap resources instead of innovation and differentiation as well as low environmental awareness among citizens. Additionally, critics of coal generation point to its significant external costs, predominantly air pollution that substantially increases the probability of diseases and health disorders among ordinary Poles. Due to the fact that direct costs are much more apparent and, additionally, no one is able to precisely estimate these externalities, coal generation cannot be phased out in a rapid manner in Poland. Therefore, renewables will advance only at rate that is a negotiated compromise between the EU demands and the Polish state and citizens’ ability to finance it.

III. Geopolitics

While voices calling for more interdependence and common energy markets are heard nowadays all around the EU, Poland's past provides rationale for limited trust in its Western as well as Eastern neighbors. The Polish-Lithuanian Commonwealth had been partitioned by Prussia, Russia and Austro-Hungary three times, finally in 1795. For this reason Poland did not exist for more than hundred years, until 1918. Subsequently, the Republic of Poland belonged to the Eastern Bloc and its sovereignty was severely constrained by the USSR between 1944 and 1989. Overall, Russia's activities for more than 200 years limited Poland's freedom which still leaves its stamp. Poles also remember well that when faced with German aggression in 1939 the UK and France failed to fulfill alliance commitments. Finally, during the 1945 Yalta conference the Western powers agreed to Russian domination over Central Eastern Europe. It is therefore not surprising that, as Oxford professor Dieter Helm once noted, some Poles see an analogy between the Nord Stream underwater gas pipeline from Russia to Germany (missing out Poland) “and the agreement between Ribbentrop and Molotov in 1939 to supply oil to Germany in exchange for carving up Poland.” The high price Poles paid for their history taught them to be overly cautious for reliance not only against Russia but the Western part of Europe too. While past certainly does not determine future, anyone who is interested in the role of coal for Poland must take into account the fact that for an important share of its elites history plays a role in everyday decision making.

Because of these tough experiences Poland strives for energy security nowadays, which is nothing new as many countries have pursued the same strategy. According to Eurostat , Poland is one of the least dependent states on energy imports in the EU at the level of 25.8%. Solid fuels are largely predominant in primary energy production, responsible for 80.5% while renewables accounted for 12.1%, gas for 5.4%, and oil for 1.4%. Around 90% of electricity (89.03% in 2013, in 2012 – 90.44%
) is generated from coal. This clearly indicates how important coal is for Poland's energy security. The new “Polish energy policy until 2050” strategic document treats energy independence as equal to political independence. Polish coal deposits should ensure self-sufficiency – but this is not the case.
The most recent data inform
that the country imported almost 6 thousands of tonne (tot) in 2007, which reached the level of nearly 15 tot in 2011 and subsequently fell down to more than 10 tot in 2014. Moreover the directions of import have also changed to unfavorable direction as the share of the US and Czech coal declined while dependence on Russia grew. Increasing the share of gas in the energy mix would eventually mean increasing reliance on Russia. While steps to diversify sources of gas supplies have been undertaken (the Gas Interconnector Poland-Lithuania (GIPL)

has been just opened
and the other one with the Czech Republic is
in operation since 2011
, the LNG Terminal in Świnoujście is
being finalized
, a gas link with Denmark
is in design
,) Poland imports the majority of its gas supply from the East. The Polish energy sector should be seen not only in terms of gas dependency but also in terms of the increasing role of Russian coal. The future of Poland's “energy independence” is uncertain.

Choices made by Poland and Germany exemplify how states see the role of energy resources they have at their disposal. The important role of the energy sector for Polish security is stressed by the fact that it has been mentioned few times in the 2014 National Security Strategy of the Republic of Poland
, even though it remains focused on fossil fuels. As the authors argue “the strategic task in the domain of energy security is to start extracting energy resources from domestic unconventional deposits, to develop network and generation infrastructure on the basis of coal, nuclear and gas fuels, and to ensure diversified access to sources and routes of raw material supply.” Therefore “it is important to reconstruct the electricity generation sector, taking into consideration the priority which is the use of national deposits of primary energy sources (hard coal, lignite, gas, also from unconventional deposits)”. The argument for low-emission sources of energy is considered by the document from a purely environmental perspective. In Germany, which imports 87% of hard coal it consumes, the state of affairs is seen differently. The Energiewende

project - which is aimed on energy independence using natural resources available in the north of the country - will enable the state to reduce dependence on oil and gas imports and reach carbon dioxide reduction targets simultaneously.

While both countries aim to cut down dependence on foreign energy supplies the difference in approaches is stark. Poland aims to base its energy independence on coal while Germany pursues electricity generation based on renewables. Yet, these divisions reach much further. Renewables-based energy systems require connections and international cooperation while coal-based ones can operate alone. Social attitudes toward interdependence and trust within the international realm are therefore reflected in the way states approach energy systems.

IV. Perspectives on Polish coal

Ever since the EU climate policy approved by major political powers on the continent has indicated fossil fuels will be steadily replaced by renewables, the fate of coal seems to be decided. Coal based electricity generation has been hindered by decreasing wholesale electricity prices (the effect of RES support schemes), CO_2 emissions market as well as growing public disapproval, fuelled by environmentalist groups and RES technology producers. This trend has direct consequences for the energy market, as major European utilities (e.g. GDF Suez) have recently decided to take massive asset write-offs on their coal production facilities across Europe (under the assumption that current climate dominated European policy trends persist and thus these assets will no longer generate positive cash flows in the future) as well as redefined their strategies towards RES, sending a strong signal to their shareholders where they see growth opportunities on the continent.

Once again, Polish market players are different. Even though major domestic utilities are listed entities and their management is aware of what has been happening in the EU, their transformation is far slower. Pushed by the Ministry of Treasury (their controlling shareholder), three biggest Polish utilities (PGE, Tauron, ENEA) launched a considerable investment program and plan to connect 4.2 GW of new coal capacity to the grid between 2017 and 2019. New power plants are necessary as the rapidly ageing production infrastructure has posed a threat to the well-being of the whole electric energy system. They are also needed if the marginalization and ultimate decline of the Polish coal mining industry is supposed to be gradual and smooth.

Plant	Utility	Capacity	Fuel	CAPEX	Launch
Opole	PGE	1800 MW	hard coal	11.5 bn PLN	2018/2019
Kozienice	ENEA	1075 MW	hard coal	6.4 bn PLN	2017
Jaworzno	Tauron	910 MW	hard coal	5.5 bn PLN	2019