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ENERGY POLAND

The uncertain road to carrying out Poland's ambitious energy strategy

Poland's draft update of its National Energy and Climate Plan for 2030-2040 has been designed by the book. Its main goals include improving energy efficiency, green energy, and investing in electrification. In theory, the financing of the energy transformation should be manageable but how exactly could it play out in practice?



Solar panels lining a pedestrian path along the Vistula river in Warsaw, Poland

A long-awaited update to Poland's National and Climate Plan (NECP)

In mid-October, Poland's Ministry of Climate and Environment published a draft NECP for public consultations until mid-November. The document will be completed, approved by the government and then submitted to the European Commission as part of the consultative governance process of the EU's energy union. The former NECP was submitted in 2019 and is totally outdated, overtaken by events like the Covid-19 pandemic, war in Ukraine, further declines in prices of clean energy technology and the materialisation of the EU's high carbon prices scenario.

The NECP reading is very demanding, totalling over 600 pages altogether. Navigation through the document and the attachments requires a lot of time and attention in order to get a full

picture of the comprehensive strategy. Poland's commitments can be extracted from the modelling results, prepared based on a suite of engineering and economic modelling tools (bottom-up energy system and top-down macroeconomic models).

As required by Brussels, the modelling exercise was conducted for two scenarios: WEM, with existing measures (close to a baseline path), and a more ambitious WAM scenario with additional measures. The less ambitious WEM scenario actually reflects a huge scale of energy transformation. This is because the scenario includes key elements of the EU's climate policy, including high carbon prices in the EU ETS, the introduction of the ETS2 from 2027-28 (covering transport, buildings, and small industries), EU-wide renewable energy and energy efficiency targets. In this note, the plans refer to the more ambitious WAM scenario unless otherwise stated.

Energy efficiency, green energy and electrification

Key elements of a textbook energy strategy

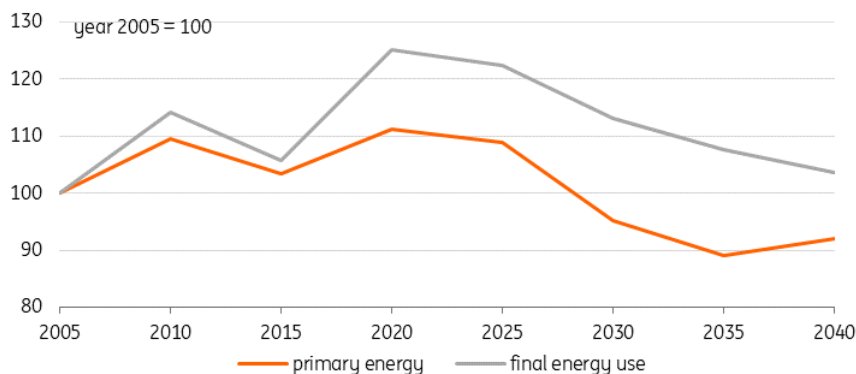
The draft NECP is designed according to the textbook – it includes key elements leading to a modernised, low-carbon energy system. This stands in line with the EU's ambitious 'Fit for 55' commitment (a reduction of carbon emissions in the EU by 55% in 2030 compared to 1990 levels) as well as the EU's 2050 net zero goal. Poland plans to reduce its use of primary energy (and to a smaller extent, the final use of energy) and accelerate the decarbonisation of the power system, also enabling electrification in energy demand sectors such as transport, industry, agriculture, and services.

Substantial energy efficiency improvements through to 2040

Poland is set to reduce its primary energy consumption by around 10% through 2040 compared to 2005, and keep the final use of its energy broadly flat in the same period. In the last two decades, these aggregates increased by around 10% and more than 20% respectively.

Nonetheless, it was a huge achievement, given that in the same period Poland's real GDP more than doubled – and usually, higher output growth is accompanied by a roughly similar increase of energy use. Provided that Poland's real GDP continues growing faster than the EU's average (albeit at a slower pace than in the past two decades), further improvements in energy efficiency will be impressive.

Primary energy and final energy use in Poland, 2005=100



Source: Poland's draft NECP, October 2024.

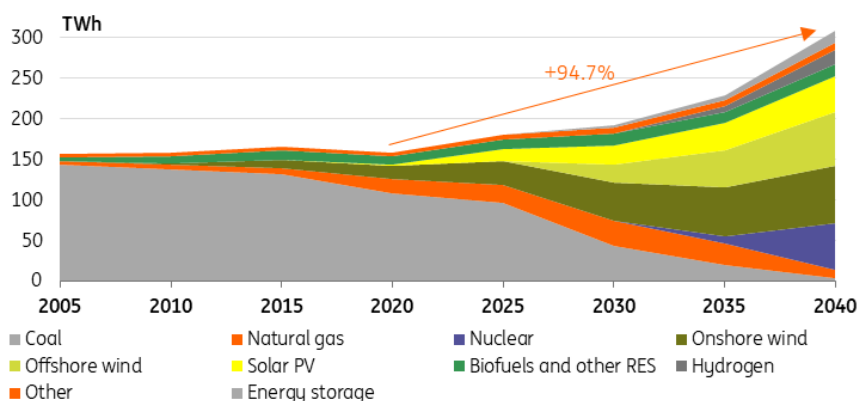
Going for a green power system

While energy use is going to be contained, electricity production is going to double in the next two decades. What's more important is that electricity is largely set to be generated from renewable energy – largely onshore and offshore wind, solar, and biomass – from the mid-2030s, supplemented by nuclear power. Poland is to transform its non-famous, coal-dominated (60% of the electricity mix in 2023) power system, and reduce the share of coal in its electricity generation to 22.5% in 2030, 8.5% in 2035, and close to 1.3% in 2040. Old, carbon-intensive technology is going to be phased out.

Economic reasons are the main driver of this change, in particular the high carbon prices of European Union Allowances (EUAs). As per the EC's recommendation, all NECPs need to assume a rising EUA price to €100 per ton of CO₂ equivalent in 2030 and €250 in 2040, all in 2020's euro-constant prices. In such circumstances, operational costs (OPEX) of electricity generation in coal-fired power plants are higher than total costs (both operational and capital costs – OPEX and CAPEX) in the renewable energy sources (RES), such as wind or solar.

However, the critical issue is managing the intermittency of RES, and assure stability of the power system when the sun does not shine and wind does not blow sufficiently. Energy engineers struggle with serious problems such as the duck curve (large electricity supply-demand imbalance throughout the day) or Dunkelflaute (periods throughout the year when there is little wind and sunlight). A full solution for a RES-based electricity is not yet there. Energy storage should provide a partial solution. In the NECP, energy storage is to play a significant role in Poland from the 2030s, when prices of these technologies should go down.

Annual electricity production in Poland, in TWh



Source: Poland's draft NECP, October 2024.

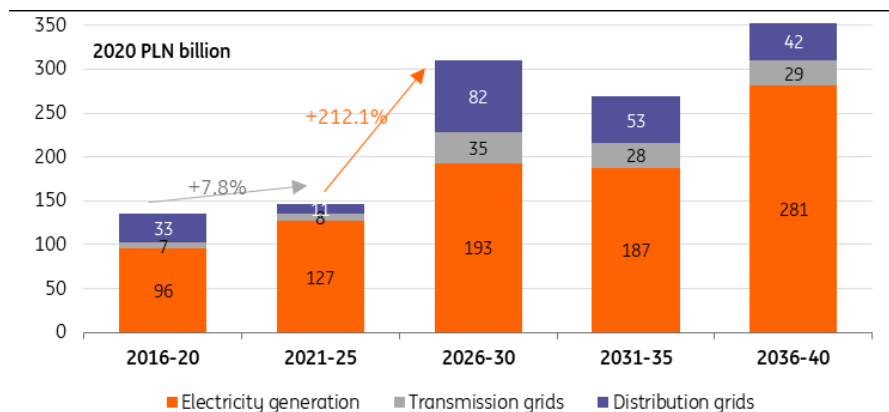
Understandably, the Ministry of Climate and Environment made the 56% share of RES-generated electricity a headline commitment. This will elevate Poland's overall RES target – making it consistent with the EC's recommendations – to 32.6%. Even though the national RES targets are not binding, they are coordinated at the EU level. The overperformance on RES-electricity should compensate for underperformance on RES-transport, and the slower-than-planned deployment of biofuels.

Meeting the 56% RES-electricity target would require increasing the solar PV capacity from 18GW (as of mid-2024) to 29GW by 2030, and a further expansion to 46GW in 2040. As per onshore wind capacity, this will rise from 10GW (as of mid-2024) to 19GW by 2030, and further to 26GW by 2040. By 2030, Poland is set to have 6GW capacity in offshore wind in the Baltic Sea, and expand it to 18GW by 2040. The latter is a nascent technology in the Polish context as the projects are under construction, and the first one is expected to be completed in 2026.

Expansion of green power requires significant investment in electricity grids

Growth of solar PV installations in Poland has been unprecedented in recent years. In 2023 alone, the capacity was increased by nearly 5GW. However, its further growth has been already slowed down by grid constraint. The underinvestment in electricity grids – in particular distribution networks, which allow for the connection of low-voltage PVs – is visible in investment figures (around PLN20bn estimated in 2021-25 compared to PLN40bn in 2016-20), and feedback from businesses (see last year's [energy study](#)).

Investments in electricity generation and grids by 2040, by 5-year periods, in 2020 PLN billion



Source: Poland's Energy Policy 2040 (2021) and draft NECP, October 2024.

The grid capacity determines the scope of RES integration into the power system. It radically changes the feasibility of RES projects as it enables energy trading when self-consumption is exceeded. And in turn, the plan to increase grid investments by a factor of six (to nearly PLN120bn projected in 2026-30 from around PLN20bn in 2020-25) appears challenging.

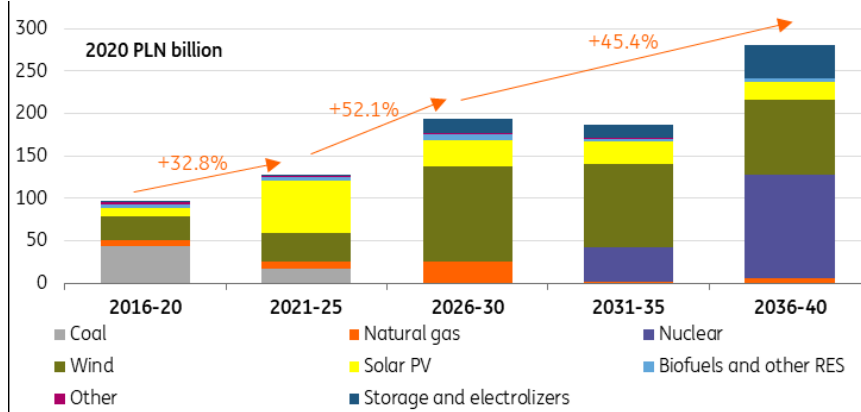
The NECP envisages that the grid investment in the WAM scenario (PLN billion) is set to be twice as high than under the WEM scenario – but is not precise enough in explaining the feasibility of this plan. Investments in grids is not merely an economic or engineering issue; it also requires social consensus, access to land, etc. Nevertheless, the modernisation and huge expansion of electricity grids stands as the number one goal of the NECP, unprecedented in its scale and coverage in Poland.

The composition of zero-carbon investments will evolve in time

Solar and wind investments are to dominate in this decade, aided by storage – but nuclear energy is to be the largest ticket in the next decade. Investments into energy storage and electrolysers will also constitute a significant part of the investment programme. Overall power generation investment should increase by around 33% in 2021-25 compared to the previous five years, mainly driven by solar PV.

In the second part of this decade, investments in wind energy, especially offshore, and gas-fired power plants are to be major drivers of the 52% investment growth. Wind investments are set to remain at an elevated level throughout the 2030s, and the implementation of the nuclear programme will prove to be a major investment driver in the same period.

Investments in electricity generation by 2040, by 5-year periods, in 2020 PLN billion



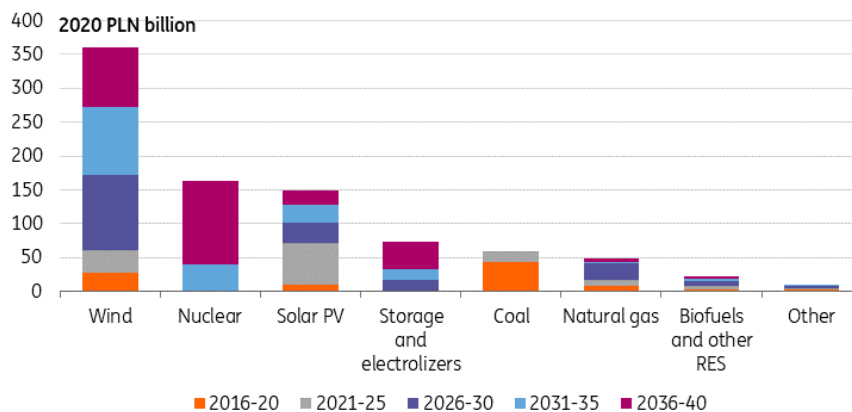
Source: Poland's Energy Policy 2040 (2021) and draft NECP, October 2024.

Electrification based on cleaner power set to enable decarbonisation in other sectors

Including transport, buildings and industry

In the 20-year projection period, wind investments – both onshore and offshore – are going to be the largest investment programme, followed by nuclear, solar PV, and energy storage and electrolisers. As already mentioned, the wind and solar investments are set to be frontloaded, while nuclear spending will materialise in the 2030s.

Investments in electricity generation by 2040 by overall investment programme, in 2020 PLN billion



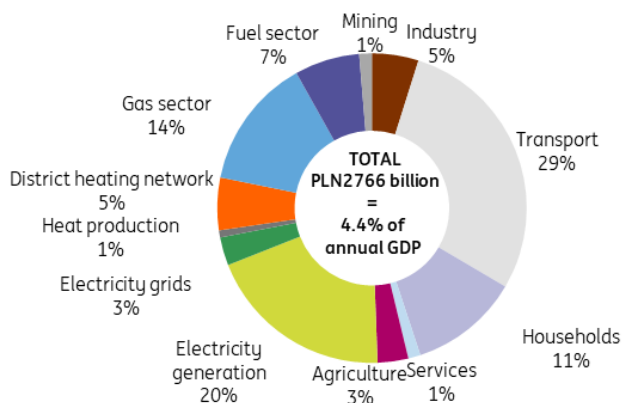
Source: Poland's draft NECP, October 2024.

The decarbonisation of other sectors hinges upon a success story in transforming power

generation and implementing sizeable investments in grids. This is because electrification is a large, if not critical, lever in decarbonising energy use in demand sectors.

This can be achieved through the deployment of electric vehicles (in transport), electrical equipment such as heat pumps (in buildings) or switching to various electric devices (in industry). In the modelling results, investments in clean power and electricity grids precede energy-related investments in transport, households, agriculture or services. According to Eurostat data, electricity constituted only around 10% of Poland's total final energy consumption in 2022. Given that final energy use is set to remain broadly flat while electricity production is to double by 2040, this share is going to grow.

Energy-related investments in the entire economy in 2021-2040, supply and demand side, % of total



Source: Poland's draft NECP, October 2024.

In the entire projection horizon, supply-side investments – including power, grids, district heating, gas and fuel sectors – are to account for about one-half of required investment needs in 2021-2040. The other half consists of demand-side sectors, in particular transport, households (buildings), and industry.

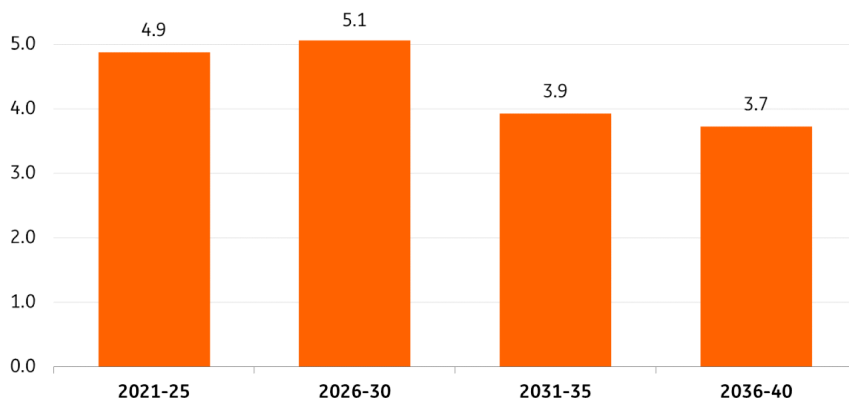
Tackling the large energy investment programme

Total energy investment needs, both supply and demand side, are estimated at around PLN2.8tr in 2021-2040 cumulatively, which looks like a breathtaking amount. However, if recalculated as an equivalent of projected GDP, it amounts to 4.4% of annual GDP.

Given that Poland's overall investment rate was around 18% of GDP based on 2003 data, this means that around one quarter of total investment in Poland in this decade and the next is set to be energy related. The required investment effort of this scale appears manageable, especially if well-coordinated and implemented in a step-by-step manner rather than cumulated over a short period of time. Desmond Tutu once said that "there is only one way to

eat an elephant: one bite at a time." We think that sentiment holds true here.

Energy-related investments in the entire economy in 2021-2040, % of annual GDP



Source: ING estimates based on Poland's draft NECP, October 2024.

Why the lion's share of energy spending investment will be private

An important driver in accelerating this process in Poland this decade will be the availability of various EU funds for the energy transformation. Here, the carrot motivates a prompt implementation of this huge clean investment programme; the window of opportunity, however, is time constraints – projects from the grant component of the Recovery and Resilience Facility (RRF) will be implemented through mid-2026. In addition, the EUA's high carbon prices act as the stick in phasing out coal-fired power plants. They are largely sustained financially by the capacity market regulations (a form of public subsidy), but they are about to expire in the next few years. According to the EC's guidelines on NECPs, if the EUA prices were to materialise (€100 per ton of CO₂ equivalent in 2030, and €250 in 2040), delaying the coal exit in electricity generation would be very costly.

The draft NECP provides a long list of 61 financing possibilities of the required investments, offered by the public sector, including from EU funds. The available EU financing for the energy transformation in the 2021-2027 period is estimated at PLN260bn, including from the cohesion policy, RRF, Modernisation Fund, Just Transition Fund and others. This covers less 20% of the required investments in 2021-2030 of over PLN1400bn in total. The remaining amount is to be mobilised from firms and households' own resources as well as debt instruments, including bank loans.

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