Can Poland's power grid operator accelerate the energy transition?

In recent years, Polish firms have highlighted the low capacity of power grids as a barrier to investing in renewable energy. The new Polish Power Grid strategy for 2025-34 is a positive shift, even though high-level agreements have been slow to materialise. While the plan is promising, its implementation could face challenges

It's fair to say that the state of electricity grids has not been a political priority in Poland in recent times

In its 10-year development plan, the transmission system operator has outlined specific investments, including a significant expansion of renewable energy and the construction of a nuclear power plant, with a total allocation of more than PLN 64 billion. The plan also highlights the need for urgent investment in dispatchable capacity, mainly gas units.

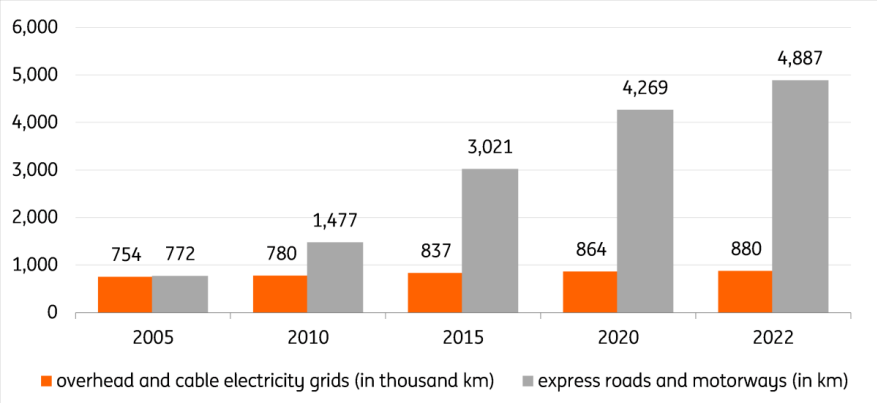
Electricity grids are a bottleneck

In recent years, Polish entrepreneurs have often pointed to the low capacity of power grids as a bottleneck for accelerating investments in renewable energy sources (RES). We have written about this previously here. In our report, we spoke to business owners like Artur Popko, CEO of a leading construction company Budimex, who said we should "focus on solving the problem with power transmission grids". He said: "The issue is that their average age exceeds 35 years, and their

management is fragmented because although we have one key manager, we also have five distribution companies. We, for example, would like to be able to produce 1GW of electricity in our portfolio, but we cannot reach 100MW because we do not have permission for connection capacity."

It's fair to say that the state of electricity grids has not been a political priority in Poland in recent decades, unlike, for example, the construction of the national road and motorway network. While their length has increased from less than 800km to around 5,000km in the last two decades, the length of overhead and cable power lines, measured in thousands of km, has not changed significantly (880,000km compared to 754,000km). Following the expansion of RES, especially photovoltaics (PV), the modernisation and expansion of the grid and related equipment have become necessary to further increase RES in Poland's energy mix.

Length of express roads and motorways (in km) and length of electricity grids in Poland (in thousand km) since 2005

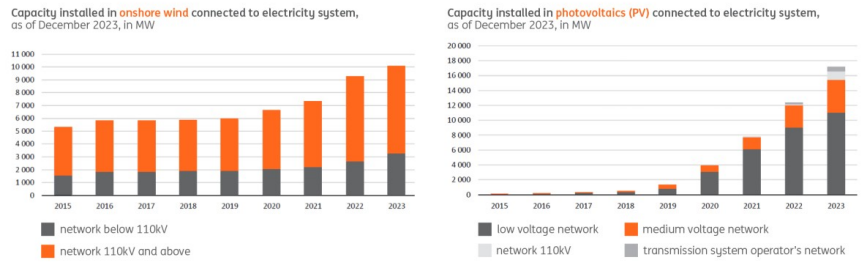


Source: General Directorate for National Roads and Motorways, and Energy Market Agency Inc.

Grid development plan update 2025-34: a runaway success?

Between 2015 and 2023, around 5GW of additional capacity from onshore wind and almost 18GW from photovoltaic sources were connected to the electricity system. For the latter, the grid has become a key bottleneck and further integration of RES requires significant grid investment.

RES capacity installed, connected to the electricity system in 2015-23



Source: Polish Power Grid PSE Inc., Development plan for meeting current and future electricity demand for 2025 - 2034, January 2025.

Published at the beginning of January this year, the development plan of the Polish Power Grid (full name: Development Plan for Meeting Current and Future Demand for Electricity for 2025-34) marks a great opportunity for positive change and updates the last edition of the plan from three years ago (for 2023-32). In the latest document, PSE (the Polish acronym for the Polish Power Grid, which we refer to as operator) states that after the implementation of measures of a total scale of 64.6MW and planned investments over the next 10 years, the power grid will not limit the development of RES anymore. In doing so, the operator reports that, based on data from the end of 2023:

- Transmission grid connection agreements have been concluded (13.8MW in total).
- Conditions for connection to the transmission grid were issued (19.4MW).
- A total capacity of 31.2MW is planned for connection to the distribution network.

These activities are broken down according to the integration of planned capacities: onshore wind farms, PVs, offshore wind farms, electricity storage units, and the distribution system.

Capacity of RES installations and electricity storage planned for connection to the transmission and distribution networks, as of December 2023, in MW

ACTION STAGE		TOTAL PLANNED CAPACITY	ONSHORE WIND	PV	OFFSHORE WIND	ELECTRICITY STORAGE	DISTRIBUTION SYSTEM
Transmission network	Connection agreements were concluded	13 836	1 190	1 761	8 389	1 901	595
	Connection conditions have been issued	19 435	1 070	4681	101	9 787	3 893
Distribution network	Planned for connection to the 110kV network	14 804	3 639	6 987	0	3 606	572
	Planned for connection to the medium voltage network	16 397	1 056	12 451	0	2 890	-
SUM		64 569	6 955	25 880	8 490	18 184	5 060

Source: Polish Power Grid PSE Inc., Development plan for meeting current and future electricity demand for 2025 - 2034, January 2025.

The new government strategy is there, but it's not yet official

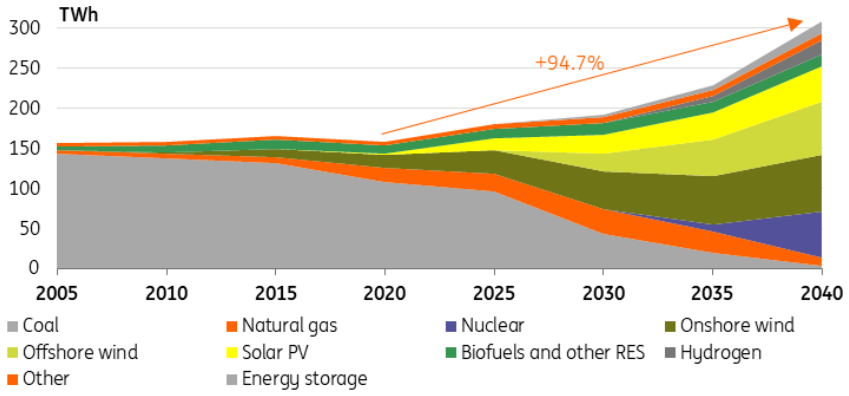
The PSE action plan considers legally binding strategic documents, including the Polish Energy Policy (PEP) until 2040 (February 2021), the Polish Nuclear Power Programme (October 2020), and the National Plan for Energy and Climate (NECP) for 2021-30 (December 2019). However, these documents were adopted by the previous government, and the process of forming strategic energy agreements under the current government, in place since December 2023, is progressing slowly. Although the government submitted an update of its NECP to the European Commission in March 2024, it only included the scenario with existing policies (WEM – with existing measures scenario). The PSE investment plan does not account for this document but indicates that updates to the NECP or PEP will be incorporated into future editions of the plan if adopted.

The more ambitious part of the strategy – the WAM scenario (with additional measures) – was

published last October and was subject to public consultation. The Ministry received 3,000 comments on this draft plan. At the beginning of February this year, there was still no final version, adopted by the government. The transmission operator, however, stands ready to adjust its investment plan once the government strategy is updated.

There seems to be a political consensus that Poland's energy transition will involve increasing the share of RES in the energy mix, including in particular photovoltaics and onshore and offshore wind, building nuclear power, including small modular reactors (SMR), and gradually moving away from coal in the electricity sector. The pace of this transition is still to be determined. The social agreement of 2021 (under the previous government) assumed the completion of the phasing out of thermal coal mines by 2049. In contrast, in the ambitious WAM scenario in the draft NECP, there is virtually no coal in the 2040 energy mix. The Climate Ministry assumes a 56% share of RES in electricity production in 2030, and a rapid transition away from coal by 2040.

Annual electricity production in Poland according to WAM scenario, in TWh



Source: Ministry of Climate and Environment, NECP project, WAM scenario, October 2024.

Transmission system operator plans to unleash network investments

In its latest development plan extending to 2034, the transmission system operator has outlined specific investments aimed at expanding renewable energy sources (RES) and nuclear construction. The plan includes the construction of 4,700km of new 400k Volt lines, 28 new substations, and the modernisation of 110 existing ones. According to PSE, the plan considers trends and sectoral changes in the National Power System, including the increasing electrification of heating and transport. One of the key investment projects is the construction of a High Voltage Direct Current (HVDC) link connecting the north and south of the country.

The implementation of the plan is expected to allow a significant increase in the potential for the construction of new RES sources, including power output from approximately 18 GW of offshore wind farms, around 45 GW of PV sources and over 19 GW of onshore wind farms. According to PSE, together with the potential of other types of RES, this means the possibility to produce around 160 TWh per year of electricity from RES in a 10-year timeframe, which is close to the annual electricity production from all sources in recent years. Finally, the implementation of the plan is expected to allow the connection of a nuclear power plant in Pomerania and small modular

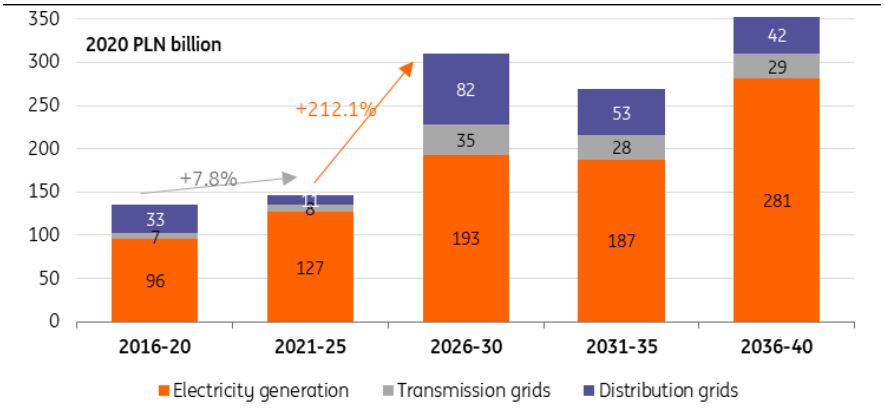
reactors (SMRs), the construction of which has been signalled by investors, although the technology has not yet been commercialised worldwide.

PSE estimates investments in transmission networks at more than PLN 64 billion

Although PSE's 10-year investment plan does not formally include an ambitious version of the NECP, the planned investments in transmission networks are generally consistent with the investments estimated in the NERP. According to PSE's plan, PLN 64 billion (in current prices) is to be allocated to transmission networks in the next 10 years (2025-34), while the NECP envisaged PLN 63 billion for this purpose in 2026-35) in 2020 constant prices. After accounting for projected inflation, the latter estimate would amount to around PLN 80 billion in current prices.

The difference can be seen as a space for PSE to take into account in the next update of the plan after the official adoption of the NECP. The WAM scenario assumes a real doubling of electricity investments, and investments in the networks (transmission and distribution) in the second half of the current decade (PLN 117 billion in 2026-30) are expected to increase sixfold compared to the first half of this decade (just PLN 19 billion). This shows the scale of underinvestment in networks, especially distribution networks, in recent years. The development of distribution networks is mainly the responsibility of four large state-owned enterprises: PGE, Tauron, Enea and Energa.

Planned investments in electricity generation and grids by 2040, by five-year periods, in constant 2020 PLN billion



Source: Ministry of Climate and Environment, NECP project, WAM scenario, October 2024.

Grid operator stresses the need to invest in dispatchable generation sources and energy storage

PSE is responsible for the stability of the electricity system in Poland and, in addition to the planned investments in the grid, it also advocates accelerating investments in generation capacity, particularly gas units. Energy production from RES is dependent on weather conditions. The highest generation occurs between April and September, and power demand falls by about a quarter during this period compared to the autumn-winter period. The power demand profile also changes over the day: as a general rule, the peak hours in winter are 8:00-13:00 and 17:00-18:00, and in summer 8:00-13:00 and 20:00-21:00.

In addition, PSE estimates that, due to the regulations of the power market, in the next few years the generating capacity of conventional units (lignite, hard coal and natural gas) participating in the central balancing mechanism will fall from about 24GW in 2024 to about 17GW in 2028. If the government obtains the relevant three-year derogation from the European Commission, the generating capacity of these units will fall to about 21GW. Nevertheless, under both variants, the decline in power capacity from the conventional units will be sharp from the early 2030s onwards.

According to PSE, maintaining the security of the electricity system requires the construction of new controllable generation sources or electricity storage facilities. Investments by external entities may not be sufficient to offset the rising demand for electricity (e.g. due to the increasing number of heat pumps or electric cars) and to cover the gap, resulting from the withdrawal of coal-fired units. Therefore, PSE is considering the construction of its own 500MW gas or liquid-fuel-fired generating unit.

Investment in controllable sources, mainly gas-fired, is urgent

In the scenario without including capacity from cross-border interconnections, PSE forecasts a systematic increase in the indicators for the duration of potential power capacity deficits and an increase in the expected volume of electricity not supplied due to these deficits. The operator estimates that to stabilise these indicators, the additional available capacity required is 1.4GW in 2025, 4.8GW in 2030, 11.6GW in 2035 and 18GW in 2040. In addition, the risk is skewed towards higher demand due to, among other things, unfavourable climate conditions or uncertainty about the timing of new investments and the rate at which obsolete conventional units are being phased out.

The capacity gap can be filled by new gas-fired capacity (there are projects in the pipeline for a total of more than 3GW), coal-fired units based on a derogation in the capacity market allowing them to be used until the end of 2028, new energy storage facilities and biomass and biogas power plants. In the 2030s, new capacity is expected to be filled by, among other things, nuclear and SMR power plants, as well as hydrogen technologies, alternative fuels and - possibly - energy imports and demand side response (DSR) mitigation. The implementation of new investments, in particular gas-fired, is an urgent task to ensure the stability of the electricity system in the future.

Will the operator accelerate the Polish energy transition?

The document prepared by the transmission network operator represents significant progress in the strategic planning of long-term investments in energy infrastructure in Poland. Nevertheless, while the plan is concrete and in line with the government's strategy, its implementation remains a major challenge, not necessarily in financial terms.

In the context of Poland's tight labour market, which is expected to continue in the coming years, a challenge may be the availability of construction workers and energy specialists, whose shortage is also due to the closure of many vocational and technical schools in the past. The bottleneck may be construction procedures and investment approvals at the local level. General public support for most energy investments often contrasts with NIMBY (Not In My Back Yard) syndrome and community resistance.

Let's keep our fingers crossed for the realisation of the grid investment plan, so important not only for the power industry but also for the long-term development prospects of the Polish economy.

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