

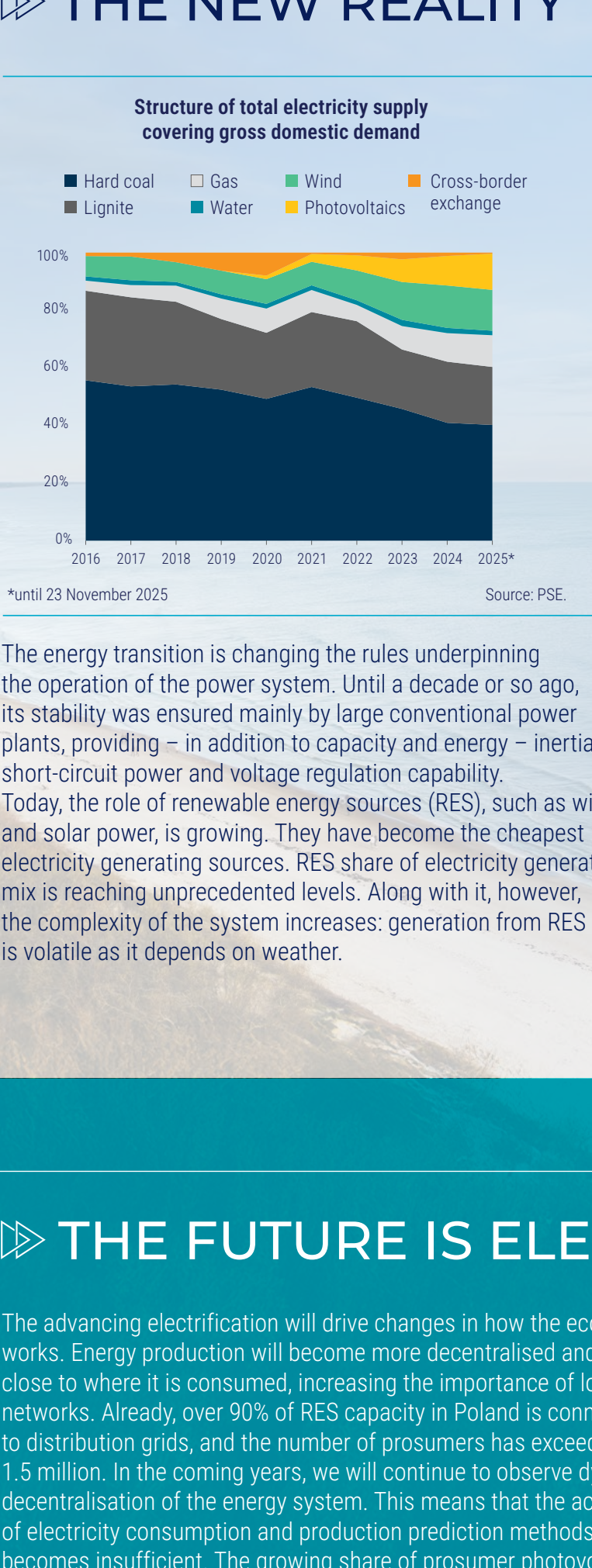


GUARDIAN AND ARCHITECT

PSE's Strategy to 2040

PSE Polskie Sieci Elektroenergetyczne

THE NEW REALITY



The energy transition is changing the rules underpinning the operation of the power system. Until a decade or so ago, its stability was ensured mainly by large conventional power plants, providing – in addition to capacity and energy – inertia, short-circuit power and voltage regulation capability. Today, the role of renewable energy sources (RES), such as wind and solar power, is growing. They have become the cheapest electricity generating sources. RES share of electricity generation mix is reaching unprecedented levels. Along with it, however, the complexity of the system increases: generation from RES is volatile as it depends on weather.

Electricity is the foundation of the modern economy. It is electrons, not fossil fuels, that will power businesses, heat our homes and drive our means of transport. Access to affordable, clean energy will determine the competitiveness of the Polish economy and its development in the coming decades.

Polskie Sieci Elektroenergetyczne has a key role to play in this process. We are a transmission system operator that ensures the security of electricity supply and the development of the necessary transmission infrastructure. We are at the centre of changes that will redefine the way we produce, transmit, store and use electricity. The accelerating expansion of renewable energy sources, the dynamic development of artificial intelligence, as well as new hybrid and cyber threats create challenges that we must respond to.

The new reality requires a new strategy to effectively ensure the secure operation of the power system, balance the energy transition and create a future in which everyone has access to reliable, affordable and clean

approx. **PLN 40 BN**
estimated cost of a one-day blackout for the Polish economy

Source: Energy Regulatory Office

THE FUTURE IS ELECTRIC

The advancing electrification will drive changes in how the economy works. Energy production will become more decentralised and located close to where it is consumed, increasing the importance of local networks. Already over 90% of RES capacity in Poland is connected to distribution grids, and the number of prosumers has exceeded 1.5 million. In the coming years, we will continue to observe dynamic decarbonisation of the energy system. This means that the accuracy of electricity consumption and production prediction methods becomes insufficient. The growing share of prosumer photovoltaics means that the level of electricity injected into the grid by local generation facilities is becoming increasingly difficult to predict.

In order to maintain the secure operation of the Polish Power System (PPS) in the future, we must have reliable information about the predicted production and consumption of energy in all installations connected to the grid. This becomes particularly important in situations when the potential generation of renewable sources exceeds the current demand of consumers. In this context, it is crucial to deepen cooperation with distribution system operators (DSOs) to gain better insight into the behaviour of consumers, including prosumers and energy storage users.

THE ENERGY SECTOR OF TODAY



THE ENERGY SECTOR OF TOMORROW



OUR ROLE IN THE NEW REALITY

As the complexity of the system increases, so do the expectations towards PSE as a transmission system operator. In order to address the challenges of the energy transition, we need to become an organisation that is more agile, courageous and open. We need to respond more quickly to changes in the environment, cooperate more effectively with market participants and better understand the needs of consumers.



MISSION

We are building the **power system** of the future to ensure Poland's **security, competitiveness and development on the path to climate neutrality.**

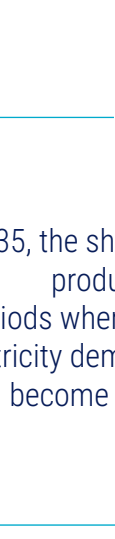
Security of energy supply, competitive prices and a stable investment environment are essential for the development of modern industry, enabling electrification and driving innovation. The key is to develop a transparent, competitive and well-functioning electricity market. The price should serve as a carrier of information – reflecting the current situation of the power system and indicating to market participants the signals for action, when to increase production, when to reduce consumption, and when to make a long-term investment in flexibility. We are aware that market will not solve all problems, for example, not all consumers will be able to purchase energy at the current market price. It is therefore necessary to create mechanisms to protect vulnerable consumers in order to ensure a fair energy transition.



VISION

We are a **guardian** of energy security, an **architect** of the energy system and markets' development, and a **leader** of a sustainable energy transition in Poland and Europe. We are building a future in which everyone has access to **reliable, affordable and clean energy.**

Today, the role of PSE goes beyond technical grid operation. We are becoming an active participant of the energy transition, an initiator of dialogue, a partner for public administration, and an entity that helps create conditions for investment in new technologies, flexibility for the full electrification of the economy.



VALUES

We are creating an organisation that is:

- **responsible and efficient**, ensuring secure and stable operation of the Polish Power System and low cost of electricity for consumers,
- **credible and courageous**, recognising and understanding the complexity of the energy transition and being able to clearly identify the opportunities and challenges involved,
- **self-reliant and competent**, ready to act independently, placing its employees at the centre and caring for their development,
- **unbiased and open**, creating space for innovation, ready for dialogue, knowledge sharing, and learning from others.

MAIN GOAL

Our mission is to build the power system that will ensure Poland's security, competitiveness and development on the path to climate neutrality. We must be ready to ensure stable operation of the system in all possible energy mix development scenarios. It is our duty to create conditions for the safe integration of all types of sources into the system, while minimising the costs of managing it and maintaining its stability.

Therefore, the main goal of our strategy is:



Reaching, by 2035, the Polish Power System's ability to operate safely and steadily in a zero-emission energy mix.

WHY DID WE SET THIS GOAL?



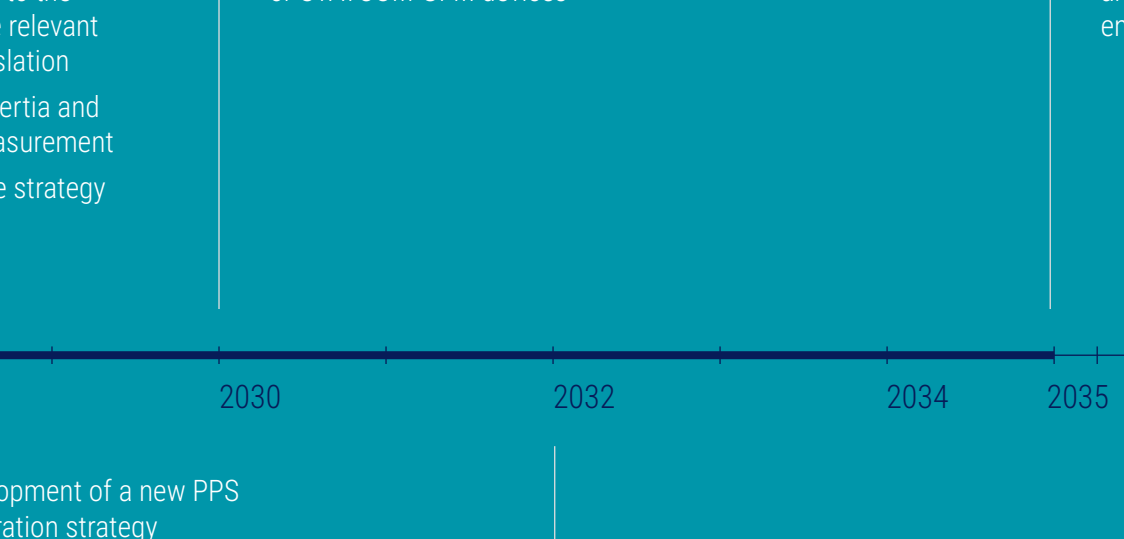
In 2035, the share of RES in Poland's electricity production will exceed 60%. The periods when the vast majority of the country's electricity demand will be covered by RES will become more frequent and longer.



In the coming decade, we must meet the challenge of preparing the PPS to operate most of the time without forcing the operation of conventional sources.



Conventional sources will still be present in the system. Coal and gas power plants will be used to balance the PPS, but the stability of the grid will not rely on them.



*Horizon of PSE's Transmission Grid Development Plan. Source: PSE.

HOW DO WE WANT TO ACHIEVE THIS GOAL?



The PPS requires the implementation of technologies that will maintain the level of security we currently have with conventional (synchronous) power sources. In the future, renewables and energy storage will support the PPS by operating in grid-forming mode, that is, actively shaping the operational parameters of the grid.



Before grid forming becomes widespread, we will be gradually introducing synchronous condensers by building such installations ourselves as integrated grid elements or by purchasing system services for parameters such as inertia, short-circuit power or flexibility.



Such system services could be provided by using components of decommissioned conventional units. In this way, we will ensure the stable and secure operation of the PPS regardless of investors' decisions on the type of sources used.



GRID FORMING

GRID FORMING is an inverter capability that enables initiating and stabilising the operation of a power system even in the absence of an external, stable voltage and frequency reference signal to which other devices in the grid could synchronise. A grid-forming inverter sets the voltage and frequency itself, acting as a virtual synchronous generator.



INERTIA

INERTIA is the system's ability to absorb disturbances in the power balance. In the case of synchronous machines, it is provided by the kinetic energy of rotating masses, which damps sudden frequency changes resulting from the abrupt loss of a generating unit or a major load. The higher the level of system inertia, the more slowly the frequency changes – the system becomes more stable – giving the operator time to activate power reserves and restore balance.



SHORT-CIRCUIT POWER

SHORT-CIRCUIT POWER is essential for maintaining voltage stability and ensuring proper performance of grid protection systems. Sources with high short-circuit power enable rapid damping of disturbances, ensure selective protection operation, and reduce the risk of fault propagation across the system.

WHAT IS OUR PLAN?

A SECURE AND STABLE ELECTRICITY SYSTEM – KEY ACTIONS

- development of technical requirements for the grid-forming functionalities in converter installations and providing support to the administration in implementing the relevant requirements into the national legislation
- definition of the required level of inertia and implementation of tools for its measurement
- development of a new PPS defence strategy
- deployment of PSE's first synchronous condensers or STATCOM-GFM devices
- ensuring full observability and adequate controllability of every resource connected to the PPS
- reaching the Polish Power System's ability to operate safely and steadily in a zero-emission energy mix



Details regarding the system's needs in terms of new market products will be presented in the report "Electricity Market Roadmap" to be published in 2026.

STRATEGIC GOALS



EXTERNALLY ORIENTED GOALS

- SECURE AND STABLE POWER SYSTEM TRANSMISSION**
 - TRANSMISSION INFRASTRUCTURE READY FOR THE ENERGY TRANSITION
- TRANSITION-SUPPORTING ENERGY MARKETS**
 - COOPERATION WITH OTHER OPERATORS
- SMART DIGITALISATION**
 - ACTIVE ADVISER

➤ The power grid is the backbone of a modern economy. We want to develop it efficiently, making maximum use of the existing infrastructure, through, among others, the deployment of high-temperature power lines, dynamic line loading or solutions similar to cable pooling.

➤ We want to move beyond reactive strategies of grid development. Therefore, we will support the public administration in preparing a comprehensive reform of the grid connections process that will eliminate projects that have no chance of being implemented and will reduce the time investors have to wait for grid connection. By 2034, we will be ready to securely integrate over 80 GW of new RES capacity, 15 GW of energy storage and nearly 14 GW of dispatchable capacity, including nuclear power plants.

➤ Security and an adequate level of flexible and dispatchable capacity in the PPS will remain our priority. Therefore, we will continue to support the administration in implementing new capacity mechanisms and the anti-blackout package to be able to increase the observability and controllability of PPS-connected resources at all voltage levels.

➤ We will support strengthening incentives for reliable balancing of buying and selling portfolios and improving electricity pricing mechanisms in the balancing market, so that the price provides the right signals to keep the system balanced.

➤ Development of the electricity market will not be possible without constant and constructive dialogue with its participants. Therefore, we will establish the Balancing Market Consultative Council – a platform for cooperation with stakeholders to support the process of improving market mechanisms. We will also periodically publish the "Electricity Market Roadmap", a document periodically updating our proposals for the development of the electricity market and system services over the coming years.

➤ 90% of RES in Poland are already connected to distribution grids, which is why we will be deepening our cooperation with DSOs; among others, in order to increase the observability and controllability of RES. We will also support the creation of Local Balancing Areas (LBAs) through cooperation in the development of an appropriate technical and regulatory framework, as well as the integration of LBAs' resources into the national market for system services.

INTERNALLY ORIENTED GOALS

- THREAT-RESILIENT INFRASTRUCTURE**
 - SECURITY
- EFFICIENT ORGANISATION**
 - COST EFFICIENCY
 - EFFICIENCY

➤ We will consistently strengthen the resilience of critical energy infrastructure to threats. For this purpose, we will expand a multi-layered security system that will maintain the continuity of the organisation's operations and the stable functioning of the PPS.

➤ In order to prepare for new threats and ensure the best possible cooperation with institutions responsible for national security, we will establish Internal Security Service – our own rapid response team for incidents affecting PSE's critical infrastructure.

➤ In the light of growing cyber threats and dependence on ICT and OT technologies, cyber security is crucial for the continuity of the energy sector. Therefore, we are ready to serve as a Computer Security Incident Response Team (CSIRT) for the national energy sector.

➤ We will actively strive to achieve operational excellence through systematic optimisation of processes within the organisation. Among other things, we want to maintain the availability rate of transmission equipment at a minimum of 99.7% and streamline and increase transparency of the connection process by introducing a digital system for connection process support.

➤ We will improve cost rationalisation mechanisms. This will enable effective planning, monitoring and control of expenditure and improve operational excellence while maintaining high levels of efficiency across the entire organisation. We want to minimise the cost gap between PSE's financial plan and the approved transmission tariff for fixed operations costs. This will maintain a balance between PSE's needs and the expectations of the regulator and consumers.

➤ We want to maintain high timeliness and efficiency in project delivery through systematic rationalisation of resources, technical, operational and investment outcomes – in financial, technical, operational and strategic terms. To achieve this goal, we will develop a comprehensive investment monitoring and evaluation system covering the entire investment life-cycle – from planning and design, through implementation, to analysis of the final results.

WHAT DO WE STRIVE FOR?

- 2035**
 - PPS ready for secure and stable operation in conditions of a zero-emission energy mix
- 2040**
 - PPS ready for the accelerating electrification of the economy
 - Safe integration of 110 GW of RES, 24 GW of energy storage facilities, 5.3 GW of nuclear power plants
- 2050**
 - Poland ready for climate neutrality with an electrified economy