Polskie Sieci Elektroenergetyczne

Introduction to the electricity markets in Poland. Current status and the transitions ahead.

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Agenda

- 01 - Current state of Poland’s power system
- 02 - System challenges under changing generation and demand conditions
- 03 - Electricity market structure and pricing mechanisms
- 04 - District heating in PSE strategic context

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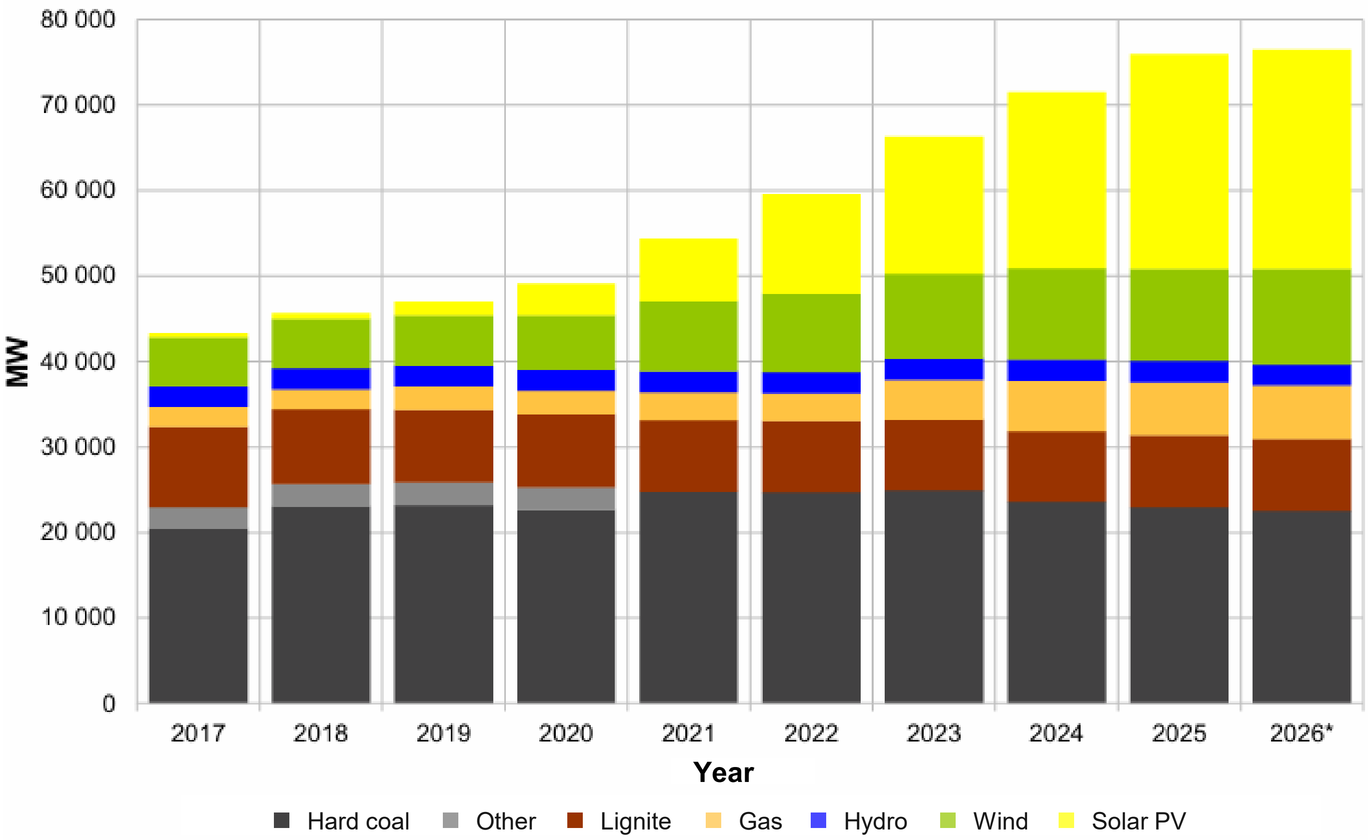
01

Current state of Poland’s power system

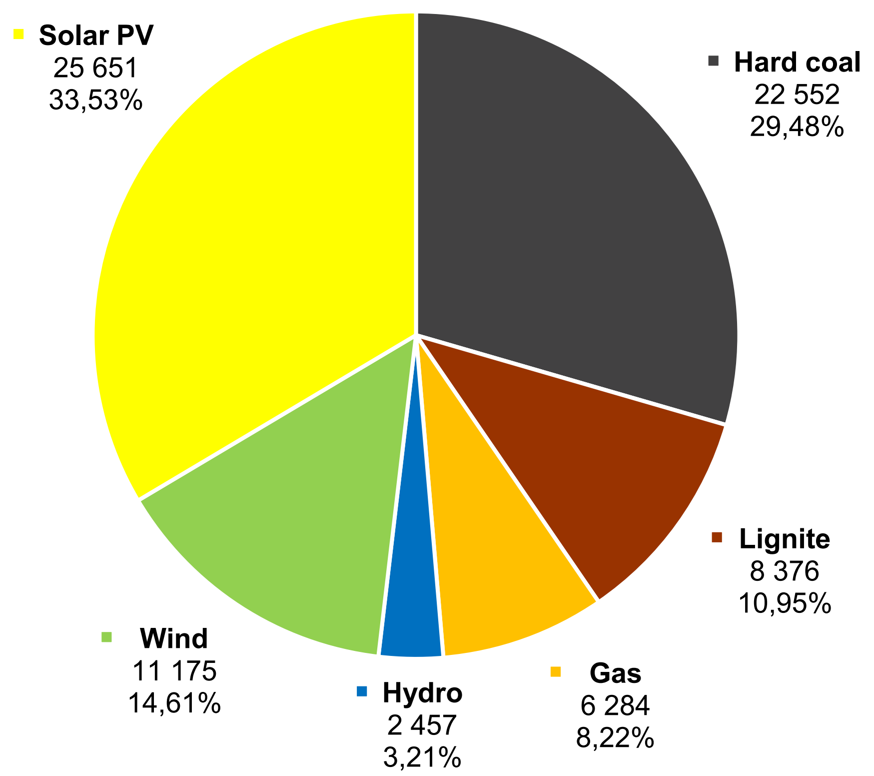
Poland's generation capacity structure is undergoing rapid transformation

Poland's installed generation capacity has grown from about 43 GW in 2017 to nearly 78 GW in 2026, driven almost entirely by the rapid expansion of renewable sources. Solar PV and wind now account for nearly half of total available capacity, fundamentally reshaping the generation mix.

Available capacity of generating sources [MW]



Generation capacity mix [MW]



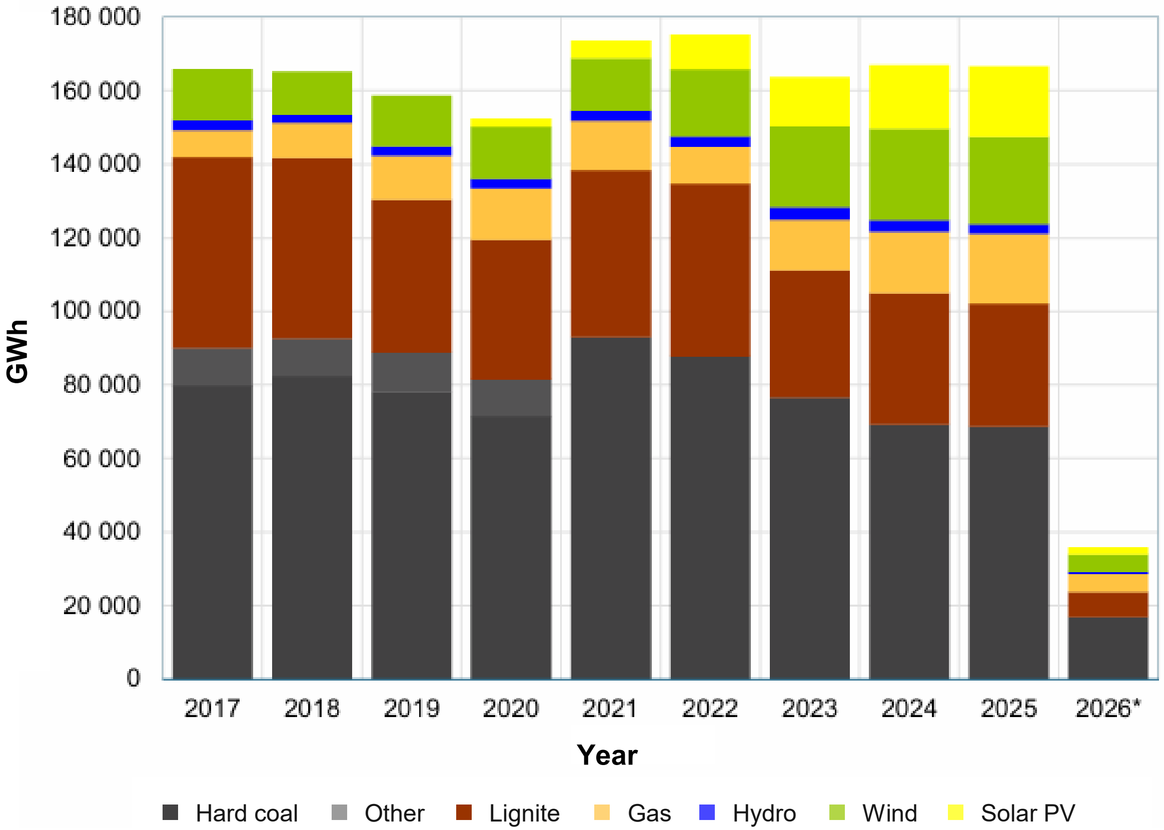
* as of 8 March 2026

The installed capacity increase in RES (Solar PV and Wind) amounted to over 4.2 GW in the past year (03'25/03'26)

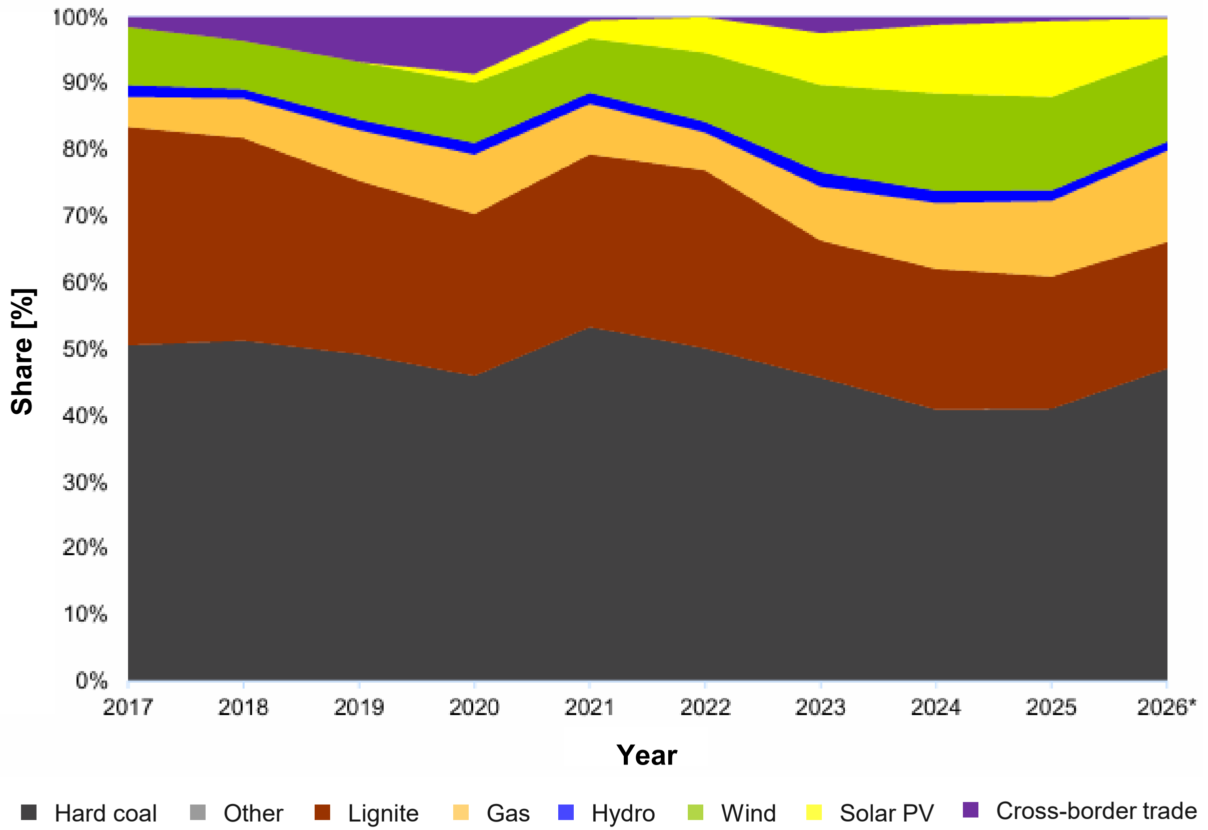
Renewables are transforming Poland's generation mix and reducing reliance on coal-based supply

Hard coal and lignite, once responsible for the vast majority of domestic supply, have been steadily displaced by wind and solar PV over the past decade. The trend is accelerating with renewables visibly reshaping both the generation stack and the structure of domestic demand coverage.

Gross electricity generation by source [GWh]



Share in domestic demand coverage [%]

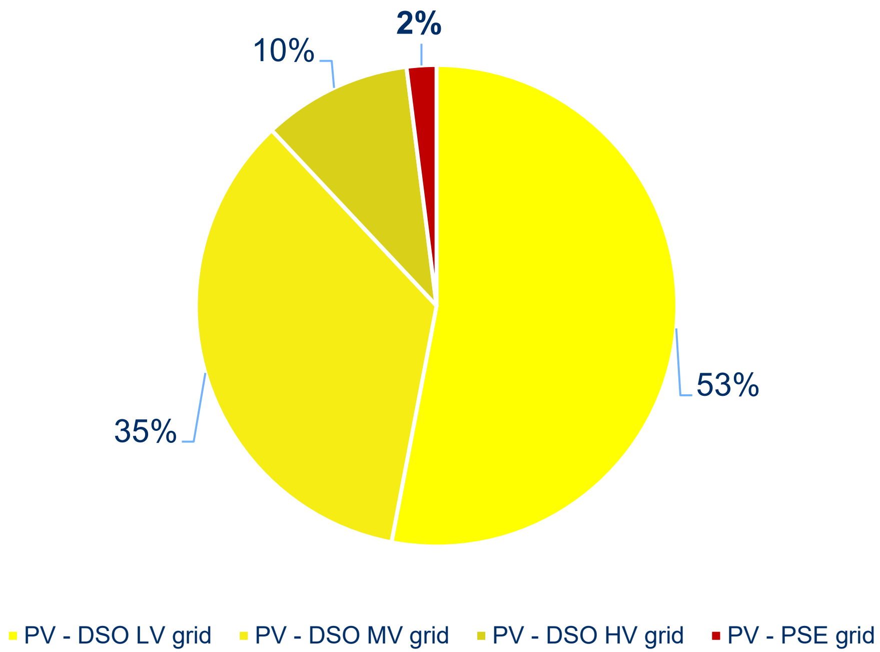


* as of 8 March 2026

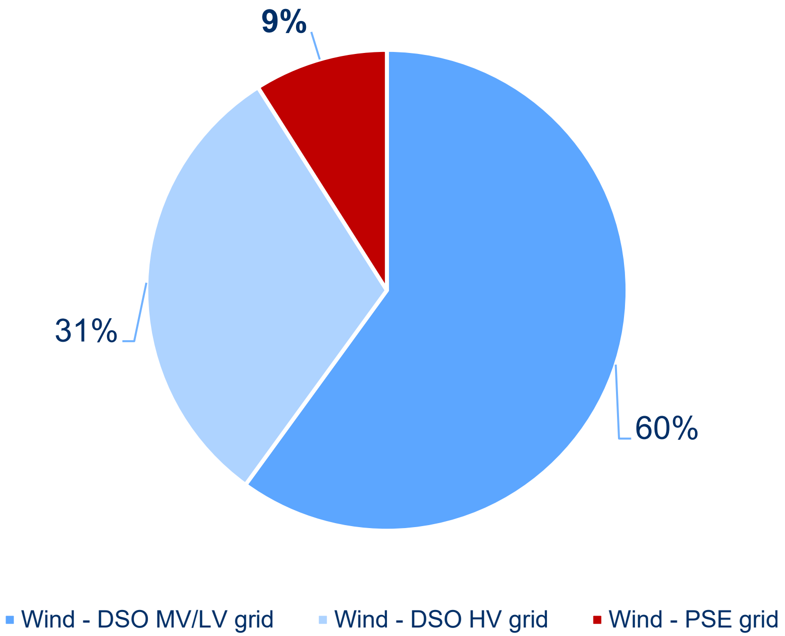
Shift in “supply” paradigm

The system supply paradigm is shifting from centrally connected generation towards increasingly distributed resources. Today, **96% of RES capacity from photovoltaics and wind is connected to distribution system operator grids**, highlighting the growing role of distribution networks in system operation and flexibility.

Installed PV capacity – 25.65 GW



Installed wind capacity – 11.17 GW



More than half of PV capacity is connected at low voltage (>1 kV)

RES and energy storage capacity growth potential

PSE estimates as of 28.02.2026, based on issued (TSO) and agreed (DSO) connection conditions to the grid

	Existing (as of end of December 2025)	Planned: CC + CA (excl. microinstallations)	Total capacity
Onshore wind	11,2 GW	33,7 GW	44,9 GW
Offshore wind* *including preliminary connection conditions	0 GW	17,2* GW	17,2 GW
Solar PV	25,6 GW	61,9 GW	87,5 GW
Total wind + PV	**36,8 GW**	**112,8 GW**	**149,6 GW**
Potential annual electricity generation:			**> 293 TWh**
Electrical energy storage (BESS connected to medium voltage as of 31.12.2025)	**0,5* GW**	**102,3 GW**	**102,8 GW**

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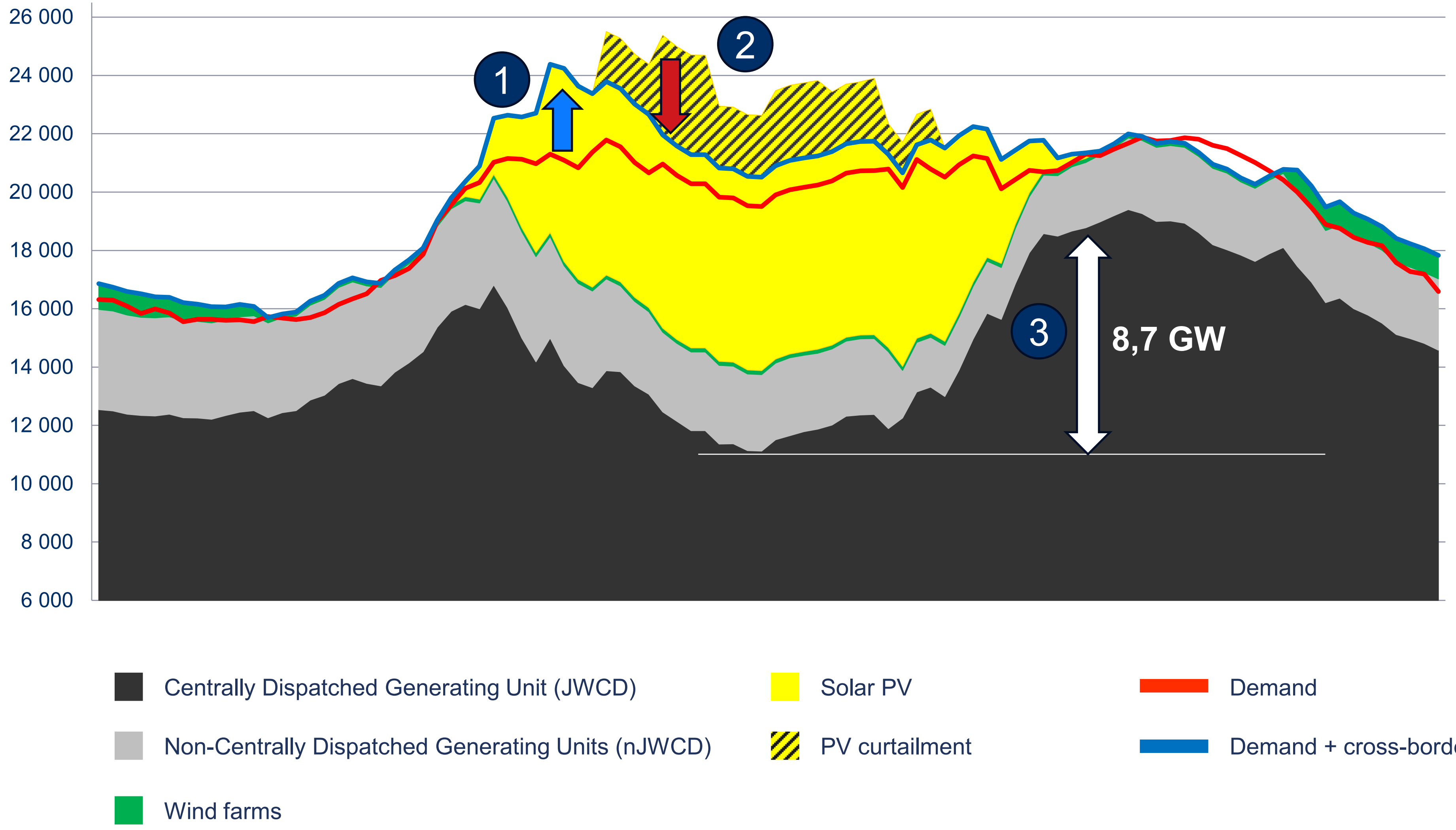
02

System challenges under changing generation and demand conditions

System operation dynamics are increasing

RES generation surpluses at midday (RES curtailments) followed by the need for rapid ramp-up of conventional generation in the evening.

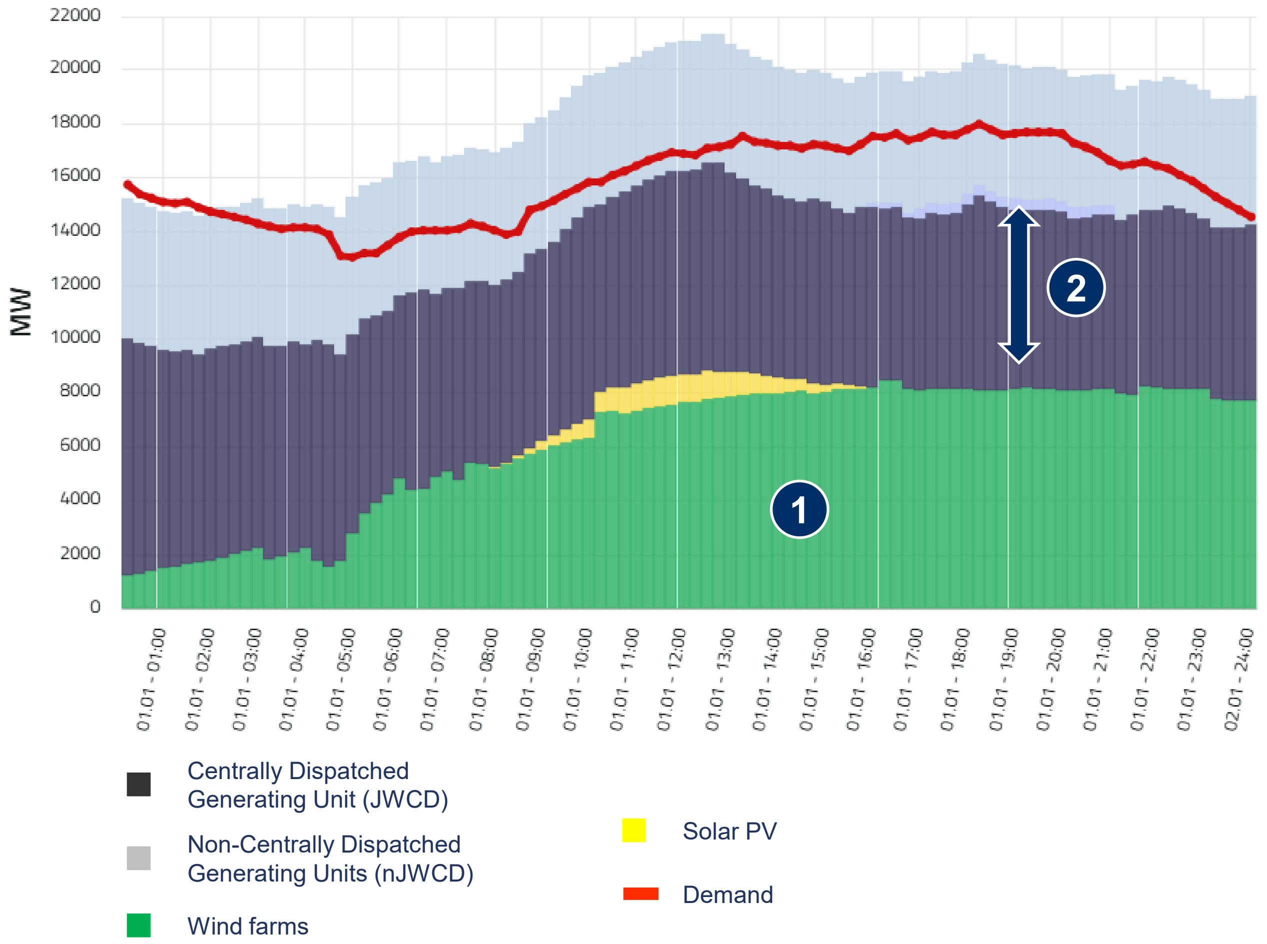


Observations

1. Exports during PV generation hours
2. Need for deep RES curtailments
3. Required rapid ramp-up of conventional generation - the duck curve effect

Selected challenges for the transmission system operator 1/3

Periods of high wind generation and low electricity demand



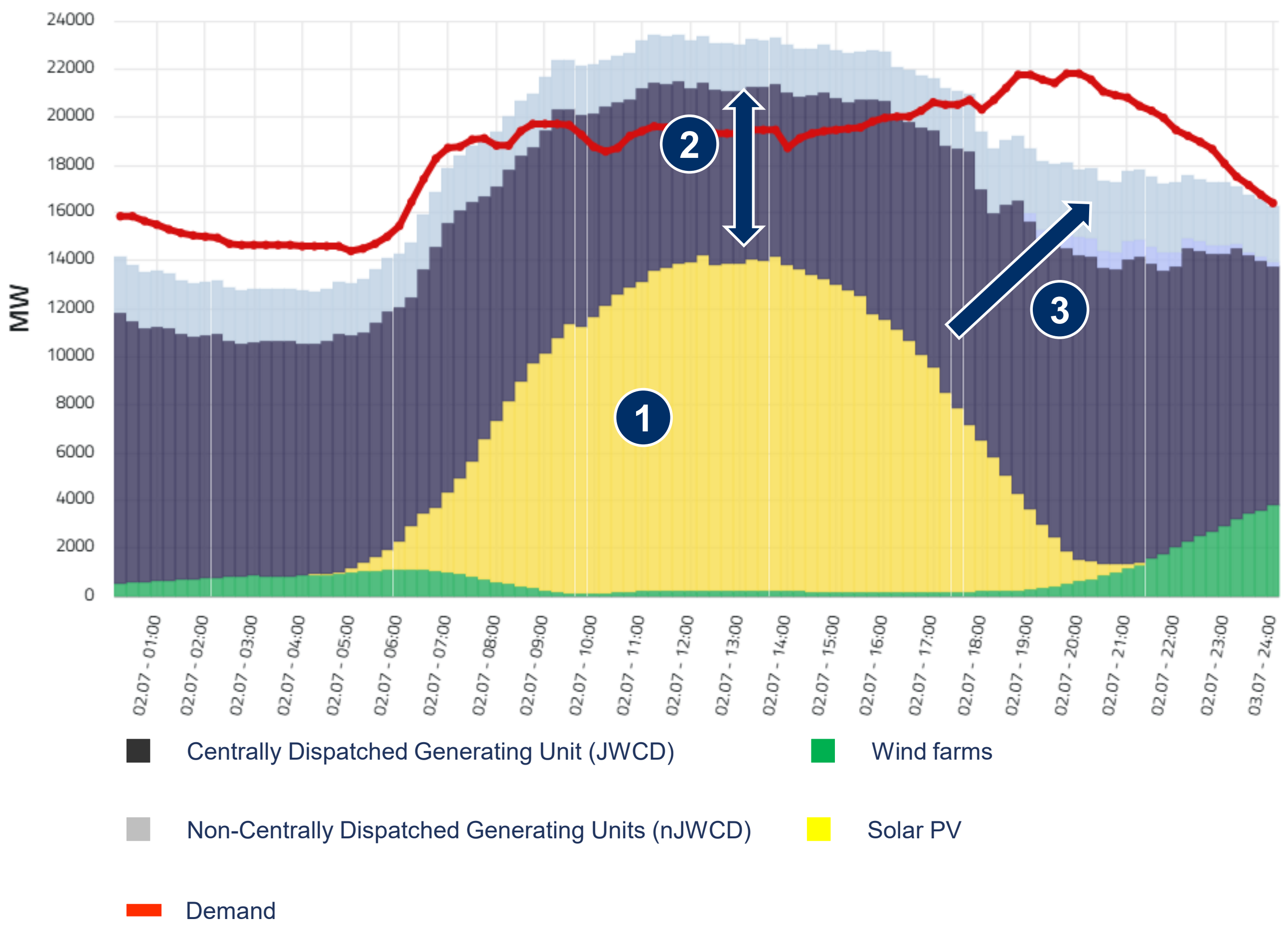
Observations

1. High wind generation during periods of low demand increases the need to activate balancing energy and maintain reserves to manage deviations related to wind variability.

2. Low electricity prices reduce the economic incentive for conventional units to operate. At the same time, they must remain online due to the limited capability of distributed energy sources to provide system services.

Selected challenges for the transmission system operator 2/3

Periods of high solar generation and increased system flexibility needs

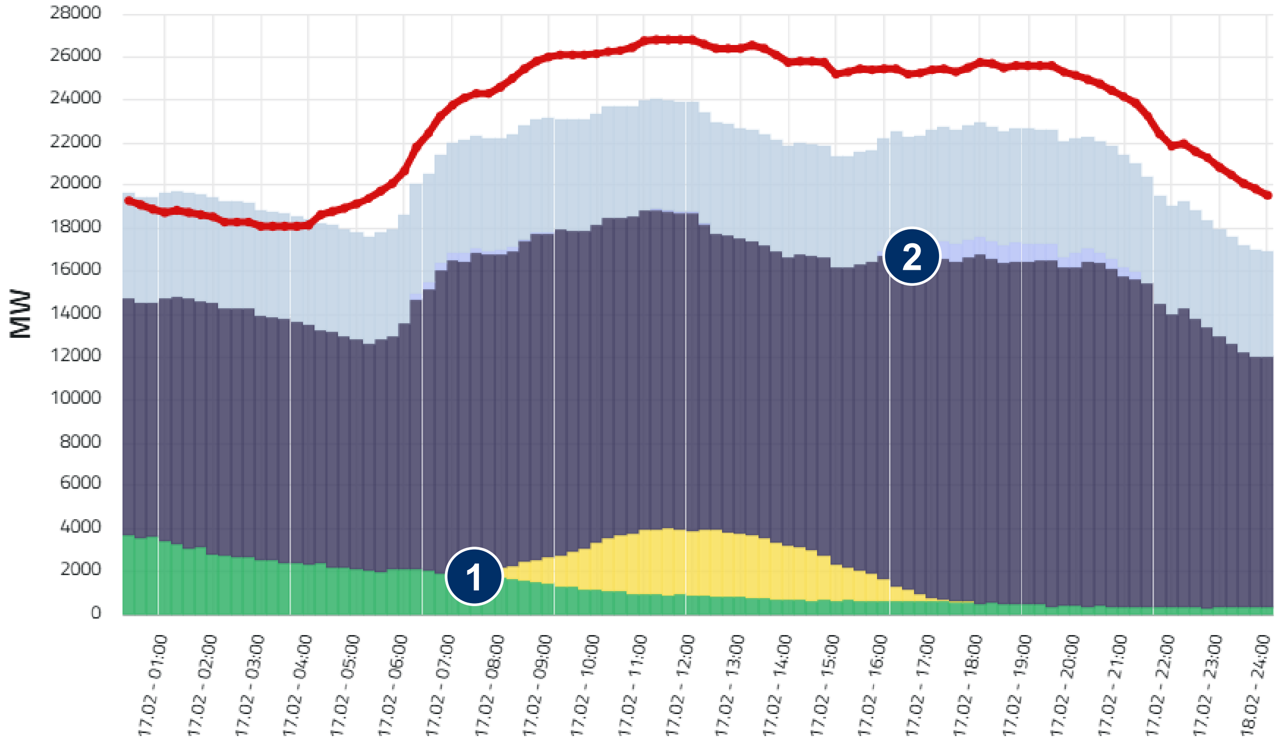


Observations

1. High photovoltaic generation requires the operator to maintain reserves to manage sudden weather changes, such as cloud cover.
2. The limited capability of distributed energy sources to provide system services necessitates keeping conventional units online to ensure inertia and voltage control.
3. A rapid decline in PV generation requires the system to have the capability to quickly ramp up output from conventional sources.

Selected challenges for the transmission system operator 3/3

Insufficient renewable generation



Centrally Dispatched Generating Unit (JWCD)

Wind farms

Non-Centrally Dispatched Generating Units (nJWCD)

Solar PV

Demand

Observations

1. During periods of low renewable generation, electricity demand is met by conventional units.

2. The system requires maintaining adequate capacity in dispatchable units, which must remain available and ready to operate.

03

Electricity market structure and pricing mechanisms

Overview of electricity market structure and pricing mechanisms 1/6

	Market participants decisions				TSO led dispatch
	Forward	**Day-Ahead (D-1)**	**Intraday**	**Gate closure** *no further schedule updates*	**Real time**
Energy Markets	EXCHANGE-TRADED **TGE RTT** Y, Q, M, W – base / peak OTC **Bilateral forwards**	**Fixing I** hourly, domestic, by 10:30 **Fixing II** 15 min, SDAC, by 13:30	**IDM – SIDC** continous, EU-wide (XBID)		
Market Participants (BRPs)	*Portfolio hedging and position management*	**DGS submission*** D-1 by 14:30	**DGS updates** via IDM trading		*Execute dispatch intructions*
PSE (TSO)		**Balancing capacity procurement** FCR, FRR, mFRR, RR tenders **System planning** daily schedule	*Monitoring balance of the system*		**Balancing Market** dispatch, imbalance settlement

*Daily generation schedule

Overview of electricity market structure and pricing mechanisms 2/6

SPOT MARKET

	TRADING HOURS	
Day-Ahead Market DAM/RDN	TRADING HOURS **Mon-Sun** **8:00 – 13:30** Pay-as-cleared	AUCTIONS **Fixing I** - hourly contracts, domestic published by 10:30 **Fixing II** - 15-min contracts, SDAC simultaneous EU action – published by 13:30 CONTINUOUS **Continuous quotations** 10:31 – 11:00 - domestic
Intraday Trading SIDC (XBID)	TRADING HOURS **Mon-Sun** **24h** Pay-as-bid	CONTINUOUS **Continous quotations SIDC** EU-wide continuous trading platform

Overview of electricity market structure and pricing mechanisms 3/6

FORWARD MARKET

Exchange-traded
TGE Forward Market / RTT

TRADING HOURS

Mon-Fri
8:00 – 14:00

Pay-as-bid

Continuous order book

CONTRACT TYPES

Base / Peak / Off-peak
load profiles

W, Y, Q, M
Delivery periods – e.g. BASE-Y2027

DELIVERY

Specified future date or period

OTC contracts

Negotiated prices

- Bilateral contracts concluded directly between counterparties, outside the exchange

PPAs

Negotiated prices

- A type of OTC contract - long-term bilateral agreement, typically linked to a specific RES installation
- May include physical or financial settlement

OTC and PPAs are **forms of trading**, not separate market segments - both operate within the forward market alongside exchange-based RTT.

The **retail market** sits downstream of wholesale trading. Suppliers purchase energy on the wholesale market (exchange or OTC) and resell it to end customers - households, commercial, and industrial consumers - under bilateral supply agreements. Retail prices are shaped by wholesale costs, network tariffs, and regulatory obligations set by the President of Energy Regulatory Office.

Overview of electricity market structure and pricing mechanisms 4/6

BALANCING MARKET

Balancing Energy

PRICING

Pay-as-cleared

TRIGGER

PSE dispatch

PURPOSE

- Technical market operated by PSE to settle imbalances in real time - activated by dispatch instructions to BSPs
- Imbalance settlement: BRPs (POBs) pay/receive based on deviation from contracted position

single imbalance price

Balancing Capacity

PRICING

Pay-as-cleared

PROCUREMENT

PSE tenders daily/weekly/annual

RESERVE PRODUCTS

- FCR — frequency containment
- aFRR — frequency restoration
- mFRR — frequency restoration
- RR — replacement reserve

ANCILLARY SERVICES MARKET

Ancillary Services

PRICING

Negotiated prices

PROCUREMENT

PSE bilateral or tender

SERVICES

- Demand-side response (DSR)
- Reactive power regulation
- Black start
- …

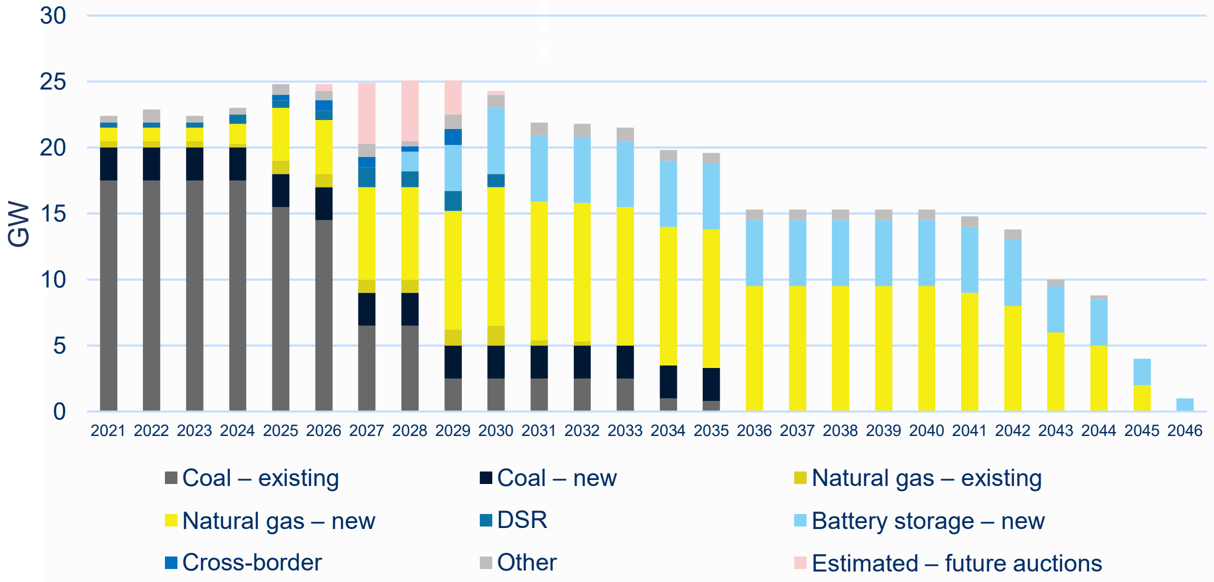
Overview of electricity market structure and pricing mechanisms 5/6

CAPACITY MARKET

PRICING

Reverse auction

closing auction price
+ annual CPI indexation



AUCTION TYPES

- Main auction
  - Held 5 years before delivery year · largest volume · basis for remaining auctions
- Additional auction
  - Year before delivery · quarterly contracts · corrects seasonal gaps
- Supplementary auction
  - Coal derogation - high-emission units allowed until end of 2028
- Tiebreaker auction
  - Triggered if main auction results are insufficient · targets new capacity

CONTRACT LENGHTS

- 1 year
  - existing units, DSR, foreign capacity
- 5 / 7 years
  - modernised units and DSR (7y if <450 g CO_2/kWh)
- 15 / 17 years
  - new generation units (17y if <450 g CO_2/kWh)

Overview of electricity market structure and pricing mechanisms 6/6

FLEXIBILITY SERVICES MARKET

DSO Flexibility
Local constraints

PRICING

Negotiated prices

PROCUREMENT

DSO
Enea/ Energa/ Tauron

LEGAL BASIS

Energy Law Act

amendment Jul 2023

PRODUCTS

IDC - Interventional Active Power Delivery
Active power injection to relieve local overloads

IRB - Interventional Reactive Power Regulation
Reactive power regulation to manage local voltage

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04

District heating in PSE strategic context

District heating in PSE strategic documents

Electrification of district heating and its impact on balancing the Polish Power System (KSE) have been identified as one of the key areas of the energy transition - both in the Transmission Network Development Plan for 2027-2036 and in the PSE Strategy to 2040.

PSE Strategy to 2040

- The objective of PSE is to **increase the role of district heating in KSE balancing processes.**
- PSE and National Centre for Energy Analysis (NCAE) are preparing a **roadmap for the integration of the power system with district heating**, which will define, among others, the necessary regulatory changes enabling the use of district heating potential in system balancing.
- The roadmap will be preceded by a **pilot project with a district heating entity**, the results of which will form the basis for designing market and regulatory mechanisms enabling broader involvement of district heating in actively supporting KSE stability.

*Tactical objective: “**Deepening synergies between the power sector and other sectors**”*

Key actions:

- *Launch, together with NCAE, a **pilot project between PSE and a district heating entity** - by the end of 2026.*
- *Prepare, together with NCAE, a **roadmap for the integration of the power system with district heating** - by the end of 2027.*

Transmission Network Development Plan (PRSP) 2027-2036

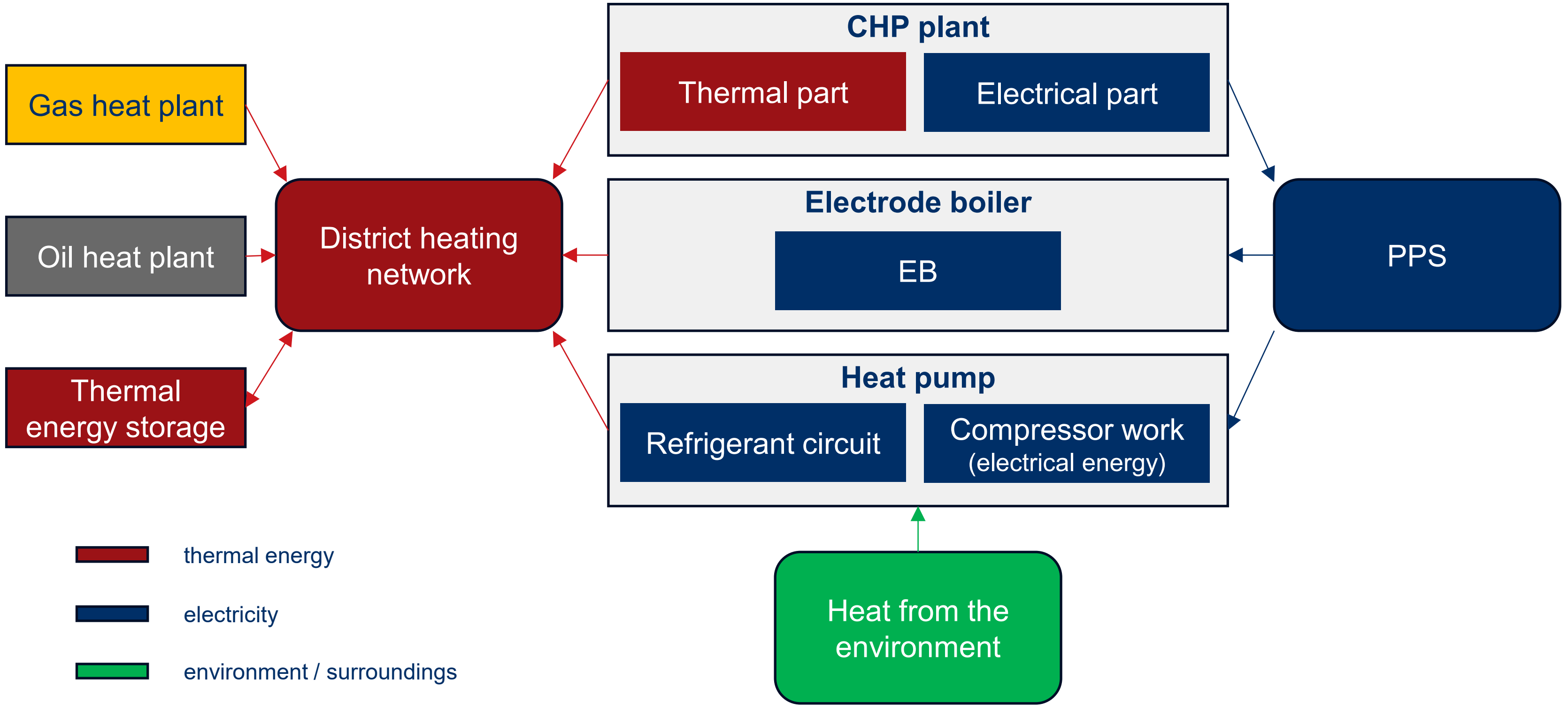
- A **dedicated section on district heating electrification**, including the impact of power-to-heat technologies on electricity demand and energy consumption in the KSE.
- The district heating sector is **modelled as an integral part of the KSE**, including electrode boilers, heat pumps and thermal storage in major urban areas.

*District heating is addressed under the sections “**District heating electrification**” and “**Sector coupling**” - a development direction of the electricity market and the KSE, where the district heating sector (and its progressive electrification) is modelled as an integral part of the system.*

Increasing the district heating sector's share in the Polish Power System balancing processes

The ongoing transformation of district heating - driven by growing power-to-heat technology in the heat generation mix - has a significant and direct impact on electricity demand in the country. Declarations from the generation sector regarding the phase-out of coal-fired sources in combined heat and power plants are increasingly supplemented by plans to install electrode boilers and industrial heat pumps to cover thermal demand in urban agglomerations.

Simplified diagram of PPS interaction with an example heat market



District heating in PPS

- The district heating sector **is modelled in TNDP as an integral element of PPS**, taking into account the full spectrum of heat generation and storage technologies.
- The use of cogeneration, electrode boilers, heat pumps, and heat storage can enable **flexible control of power demand and time-shifting of consumption**, thereby contributing to a reduction in daily peak demand.

Thank you for the attention

DK-PL Webinar | 12 May 2026

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