



# Polish energy sector current state and scenario for 2040

Warsaw 2018.11.29

## About us



### Forum Energii

We are independent think tank, focused on forging the foundation for a clean, innovative, safe and efficient energy sector based on data and analysis.

### Strategic goals

- Reliability of the Polish energy system
- Reduction of the impact of the energy and heating sector on environment
- Energy efficiency and the role of the consumer





Where we are?



# Where we are?

## Resources and technology – main challenges:

- Depletion of lignite deposits – *50 TWh (30% of country production) at risk till 2040*
- Decreasing of domestic hard coal production – *growing import*
- Growing energy price and import of energy – *due to high price (capacity inadequacy, high CO2 emission)*
- Ageing energy production fleet – *increase of LOLE and EENS (Expected energy not supplied) indicators since 2027*

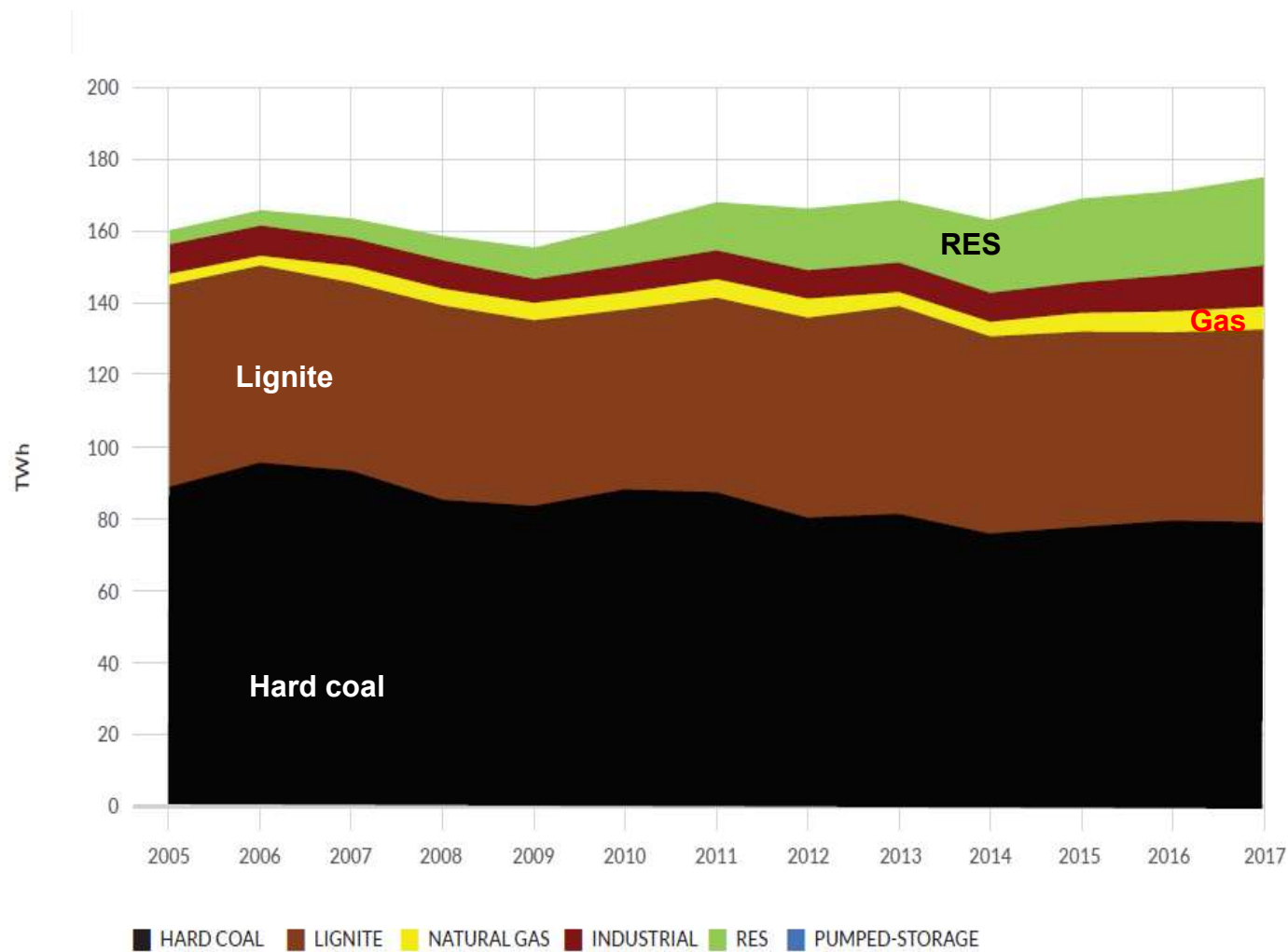
## Opportunities:

- Focus on DH network development – *potential increase of CHP generation up to 3 GWe*
- Lack of summer peak capacity – *2- 3 GWe of PV should alleviate the problem (TSO expectation)*
- Big interest in off shore wind farms – *potential construction of 2 – 3 GWe till 2030*
- Growing demand for flexibility of energy system – *application of all related solutions*
- Energy market reform – *Balancing Market price limits increase, Locational pricing....*

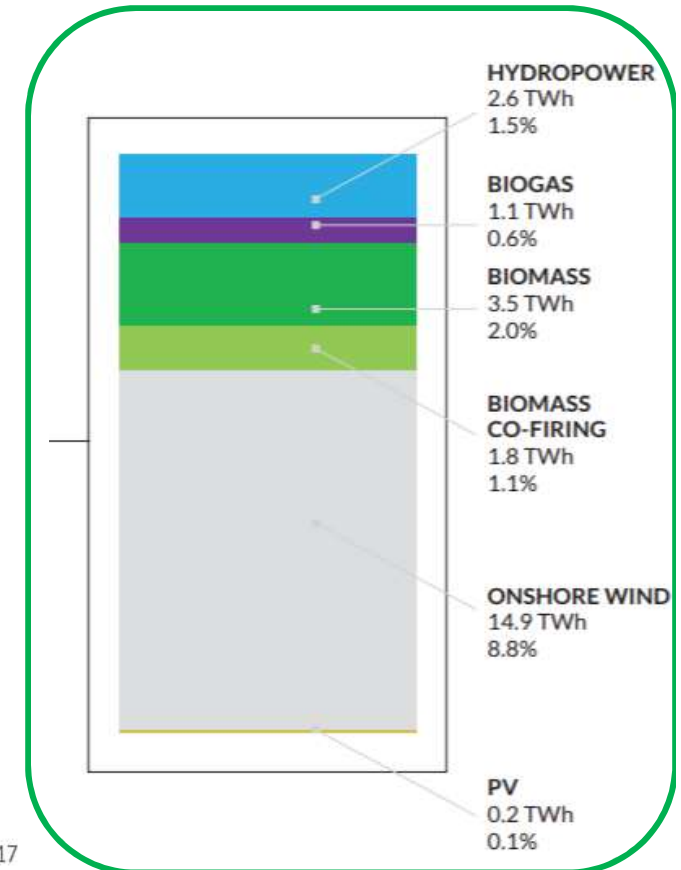


Polish energy sector 2005 – 2017 - 2040

# Energy production mix

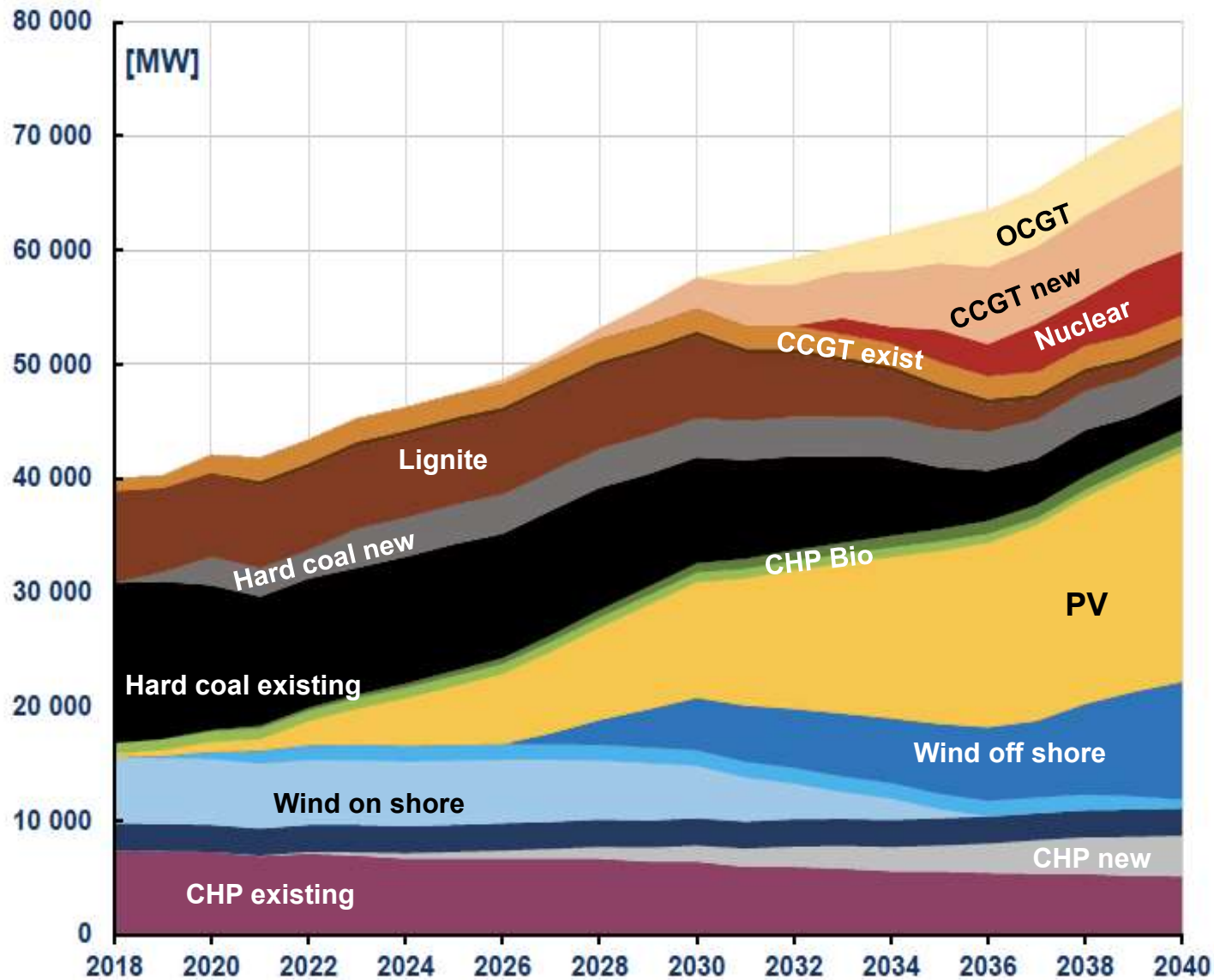


## RES 2017

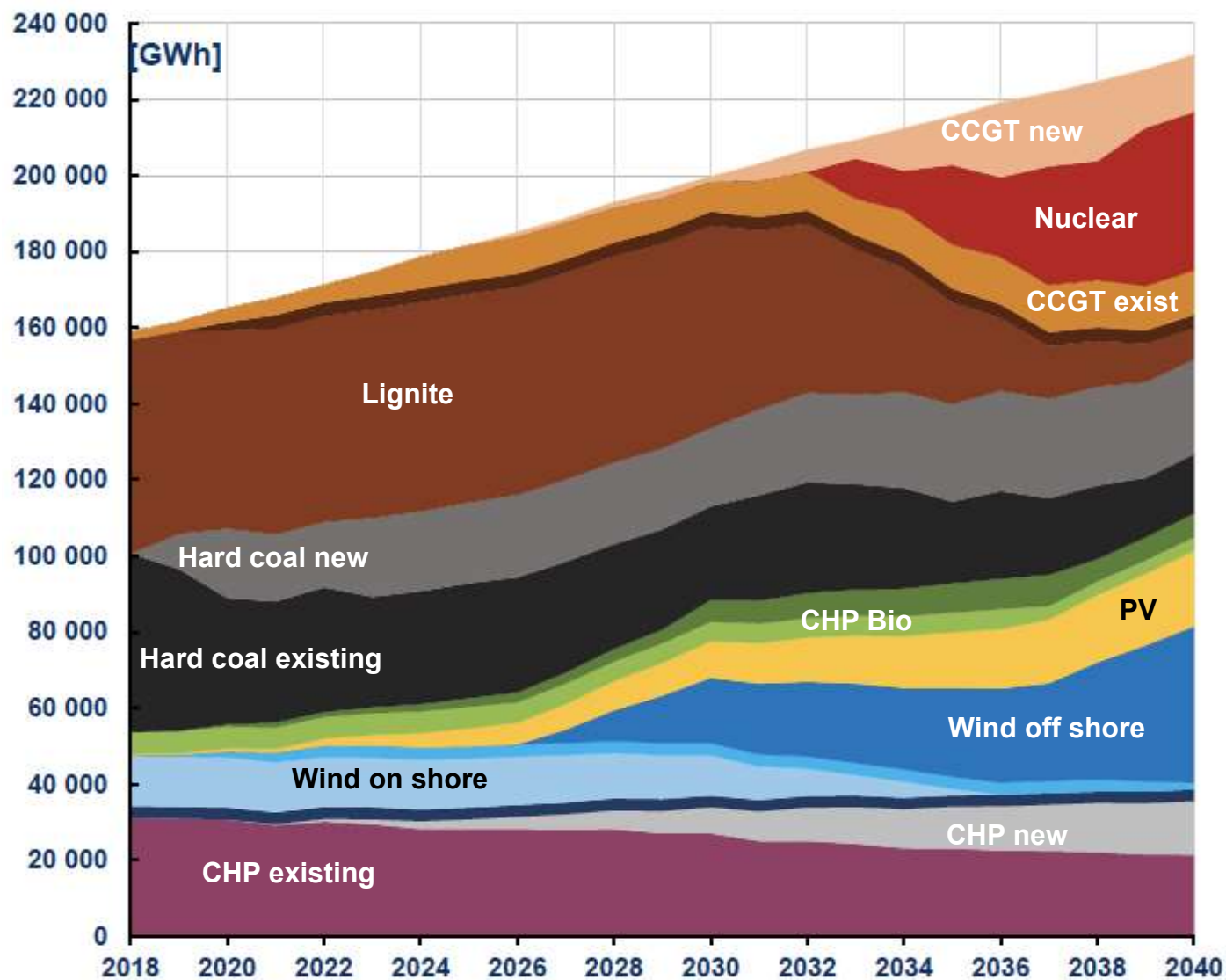




# Capacity Mix



# Energy generation



- nowe silniki diesla lub turbiny gazowe w układzie prostym
- nowe bloki gazowo-parowe
- nowe bloki jądrowe
- bloki gazowo-parowe: Płock, Żerań, Stalowa Wola, Włocławek
- el. na węgiel brunatny – w budowie (Turów)
- el. na węgiel brunatny – istniejące
- el. na węgiel kamienny – plan i w budowie (Jaworzno, Opole, Ostrołęka)
- el. na węgiel kamienny – istniejące
- el. biogazowe
- el. biomasowe
- el. fotowoltaiczne
- el. wiatrowe morskie
- nowe el. wiatrowe – w ramach aukcji OZE w 2018 r.
- el. wiatrowe lądowe – istniejące
- el. wodne
- nowe elektrociepłownie i człony kondensacyjne
- elektrociepłownie





# Summary

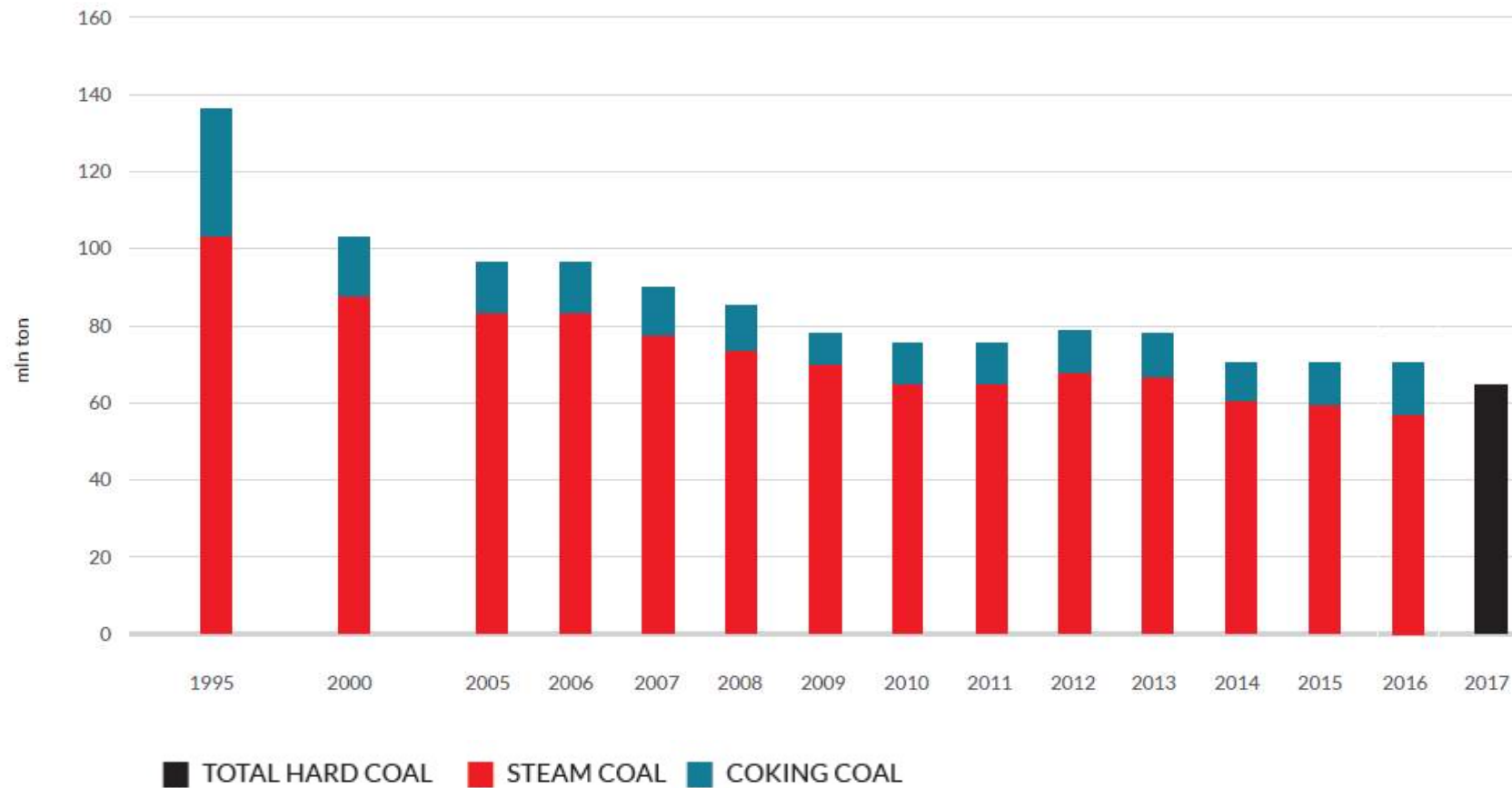
1. Polish energy sector diversification is the only way to energy security and affordable energy
2. Flexibility of the power system is the no regret option
3. Growing perspectives for renewables
4. Ongoing electricity market reform

# Thank you

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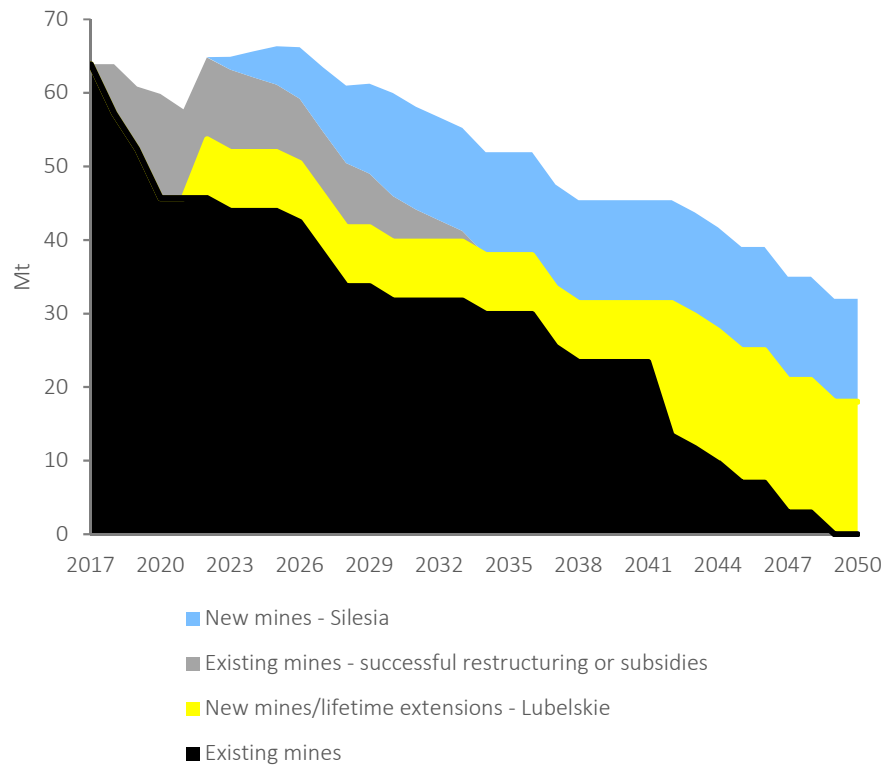
# Coal extraction 1995 - 2017





# Projected hard coal production

Hard coal production  
In coal-based scenario

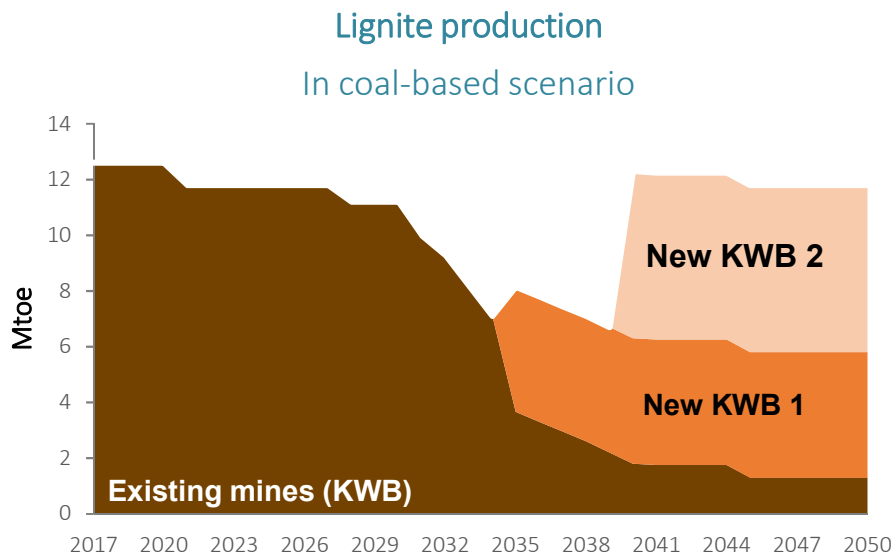


Source: WiseEuropa

## Domestic hard coal supply:

- Decrease of supply due to geological conditions and high extraction costs
- Public resistance
- Lack of staff
- Competition with imported fuel

# Lignite production



Source: WiseEuropa

## Lignite supply risks:

- Depleting lignite deposits
- After 2030 required construction of two new mines and power plants to keep production on existing level
- Public resistance against new mining sites
- High cost of lignite mine and power plant
- Long construction time means start-up in time of unprofitability of coal units (after 2030)
- Base load operation necessity to gain return on invested capital – impossible !

# How the future power mix can look like?

Outcome of the Forum Energii project  
4 scenarios of the power mix until 2050





# Assumptions



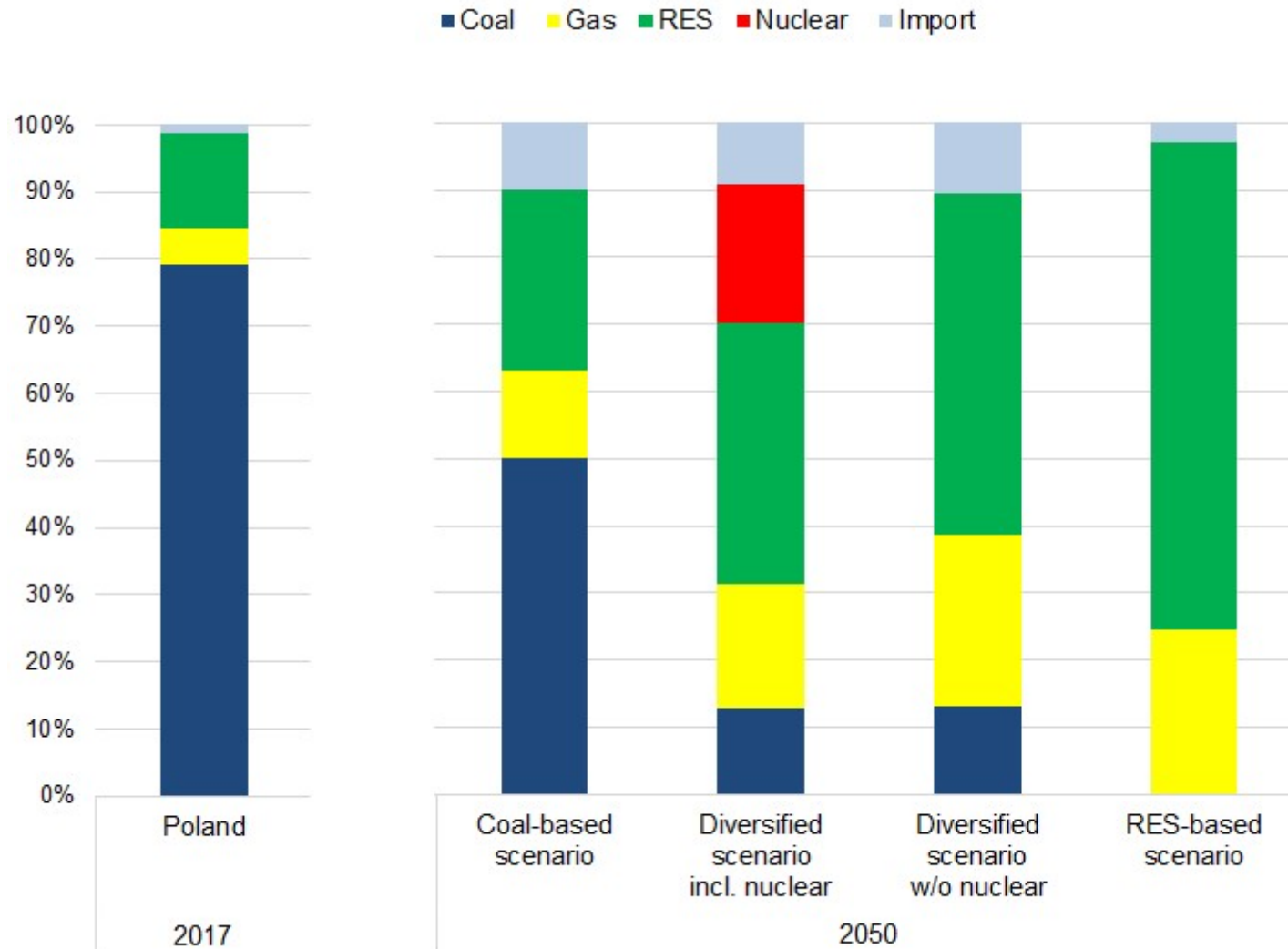
## Demand in 2050

Increase by 1.4% annually up to 220 TWh

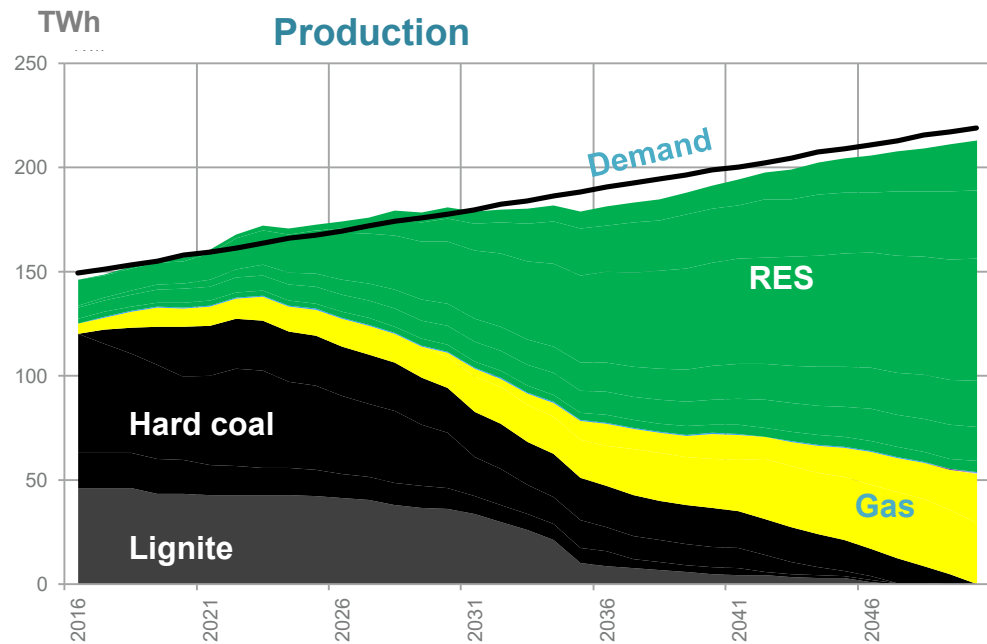
## Power reserve 9 %

Prices forecast of fuels and CO<sub>2</sub> – IEA reference scenario and futures

# 4 scenarios of the Polish power mix until 2050



# RES scenario – production and capacity



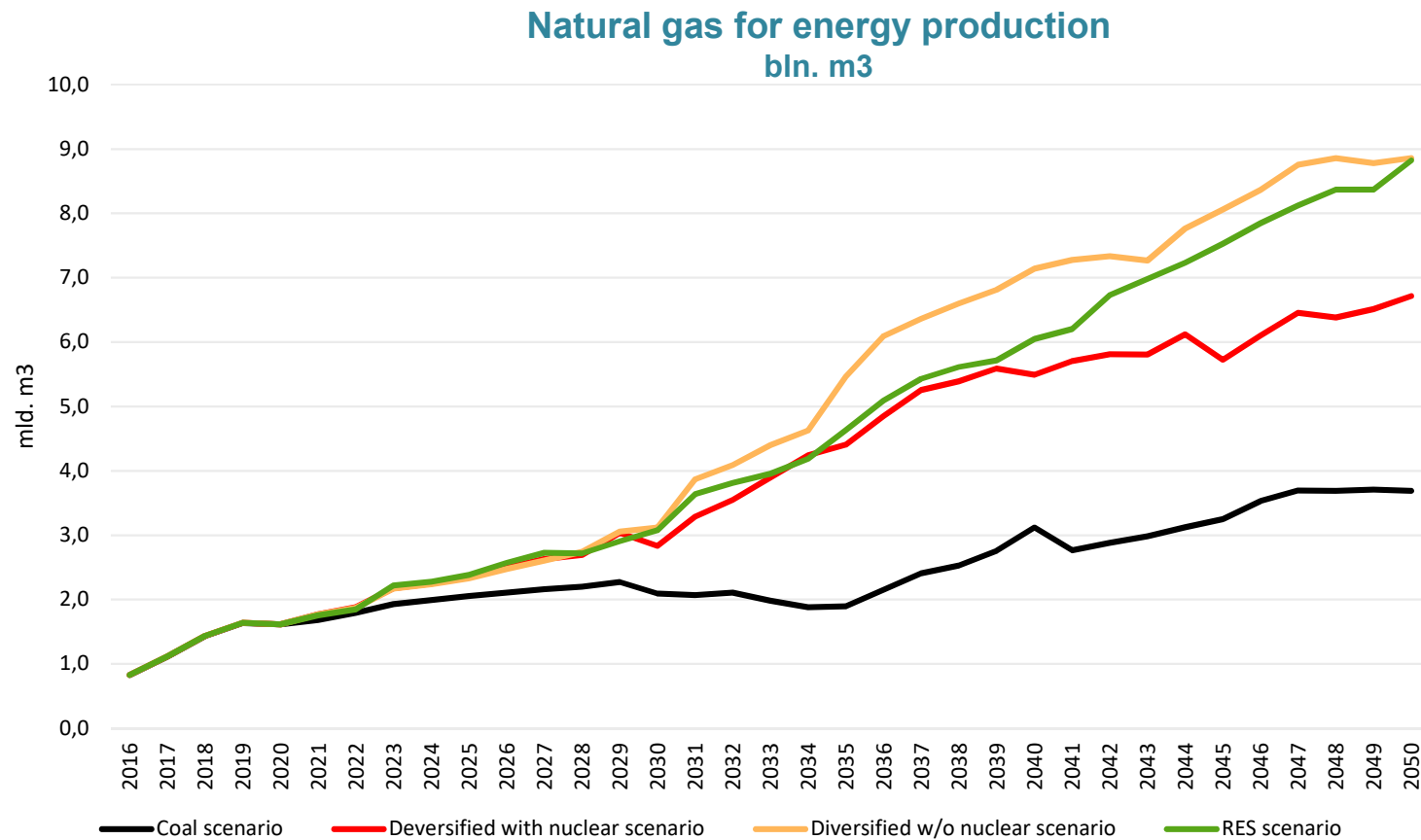
Źródło : enervis Energy Advisors

## RES capacity and production in 2050

Type	2050 r.
Wind on shore	25 GW
Wind off shore	9 GW
PV	24 GW
Hydro power plants	2 GW
Biogas	4 GW
Biomass and waste	3 GW
<b>RES production</b>	<b>160 TWh</b>
<b>RES share</b>	<b>73 %</b>



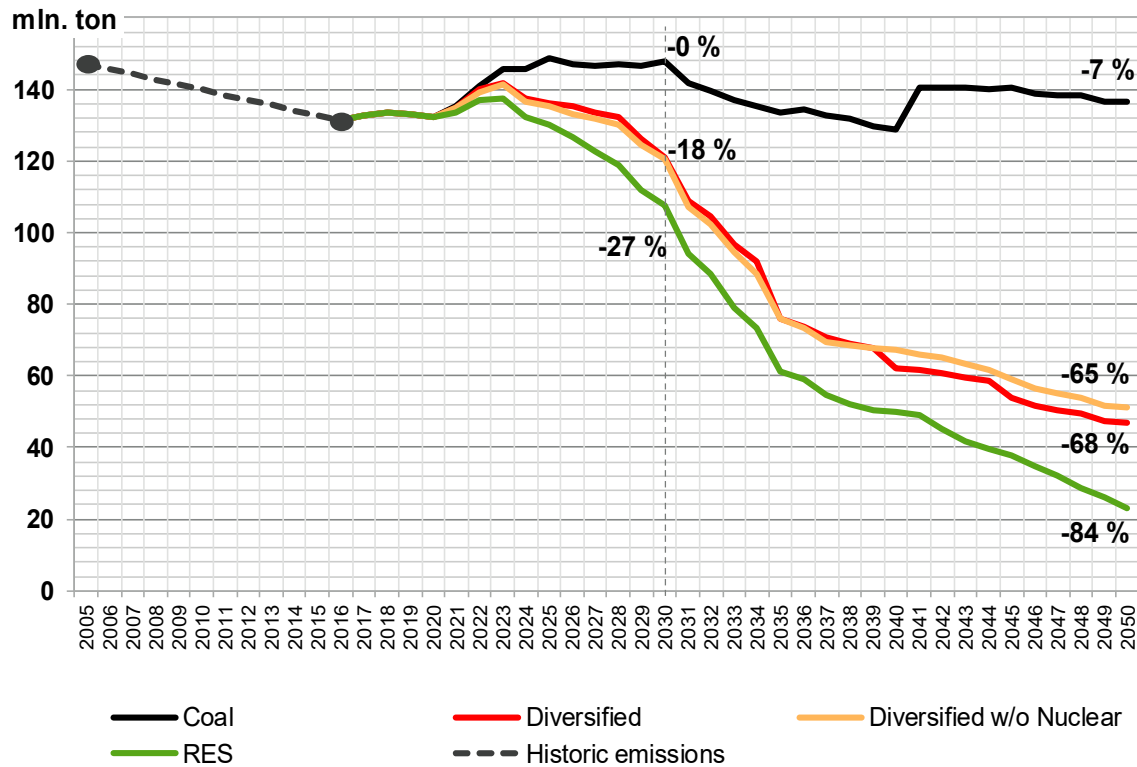
# Natural gas consumption in 4 scenarios



Source: Forum Energii 2017, enervis Energy Advisors

# CO2 emissions of domestic power sector

**CO2 Emission**  
(% reduction vs 2005)

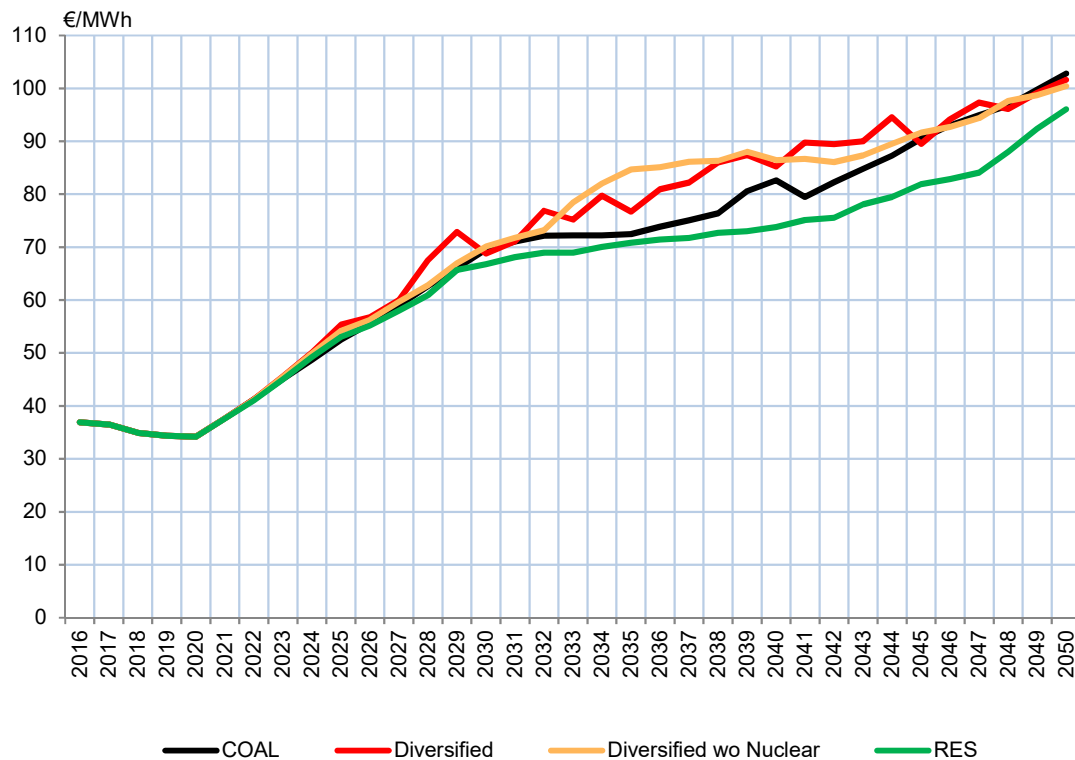


Source: enervis Energy Advisors

- RES scenario introduce CO2 emission limitation up to **84%** in 2050, coal-based only by **7%**
- Diversified and RES scenario allow to keep to 2030 targets.

# Wholesale electricity price in 4 scenarios

## Wholesale electricity price



Wholesale prices will increase due to:

- increasing cost of fuels
- increasing cost of CO2 allowances

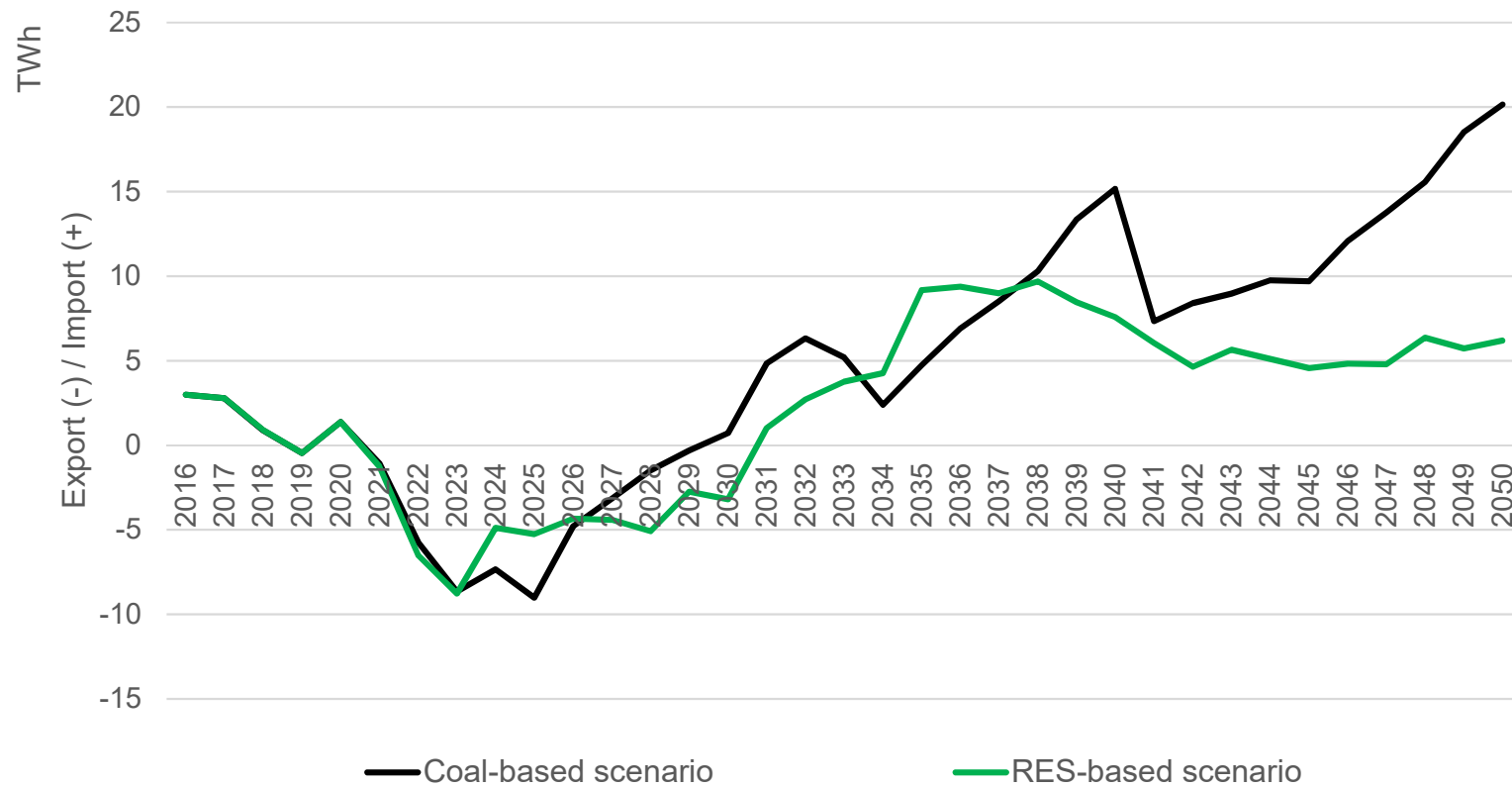
Possible limitation of prices and costs for the consumer:

- greater share of low-emission technologies
- lesser share of units reliant on high-cost fuels
- better use of interconnections with external energy systems
- efficient energy use

# Future electricity import



Nett electricity import expected for each scenario



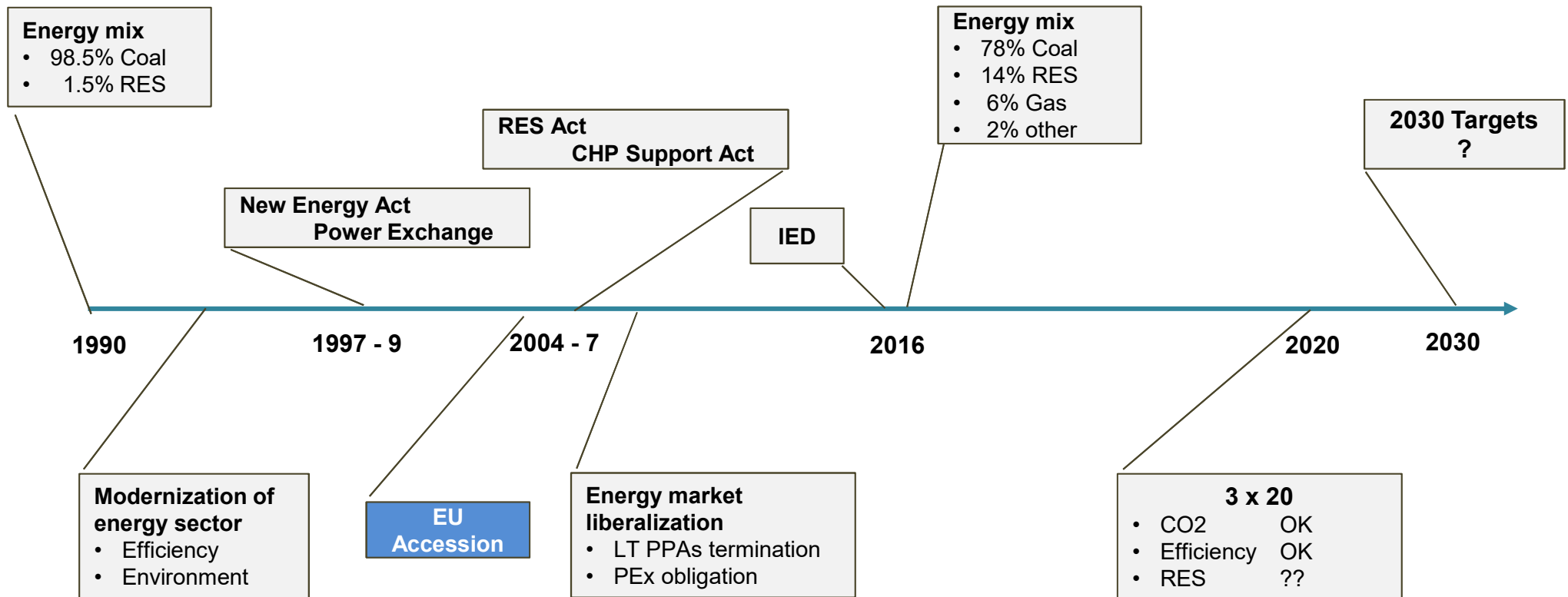
Source: Forum Energii 2017, enervis Energy Advisors



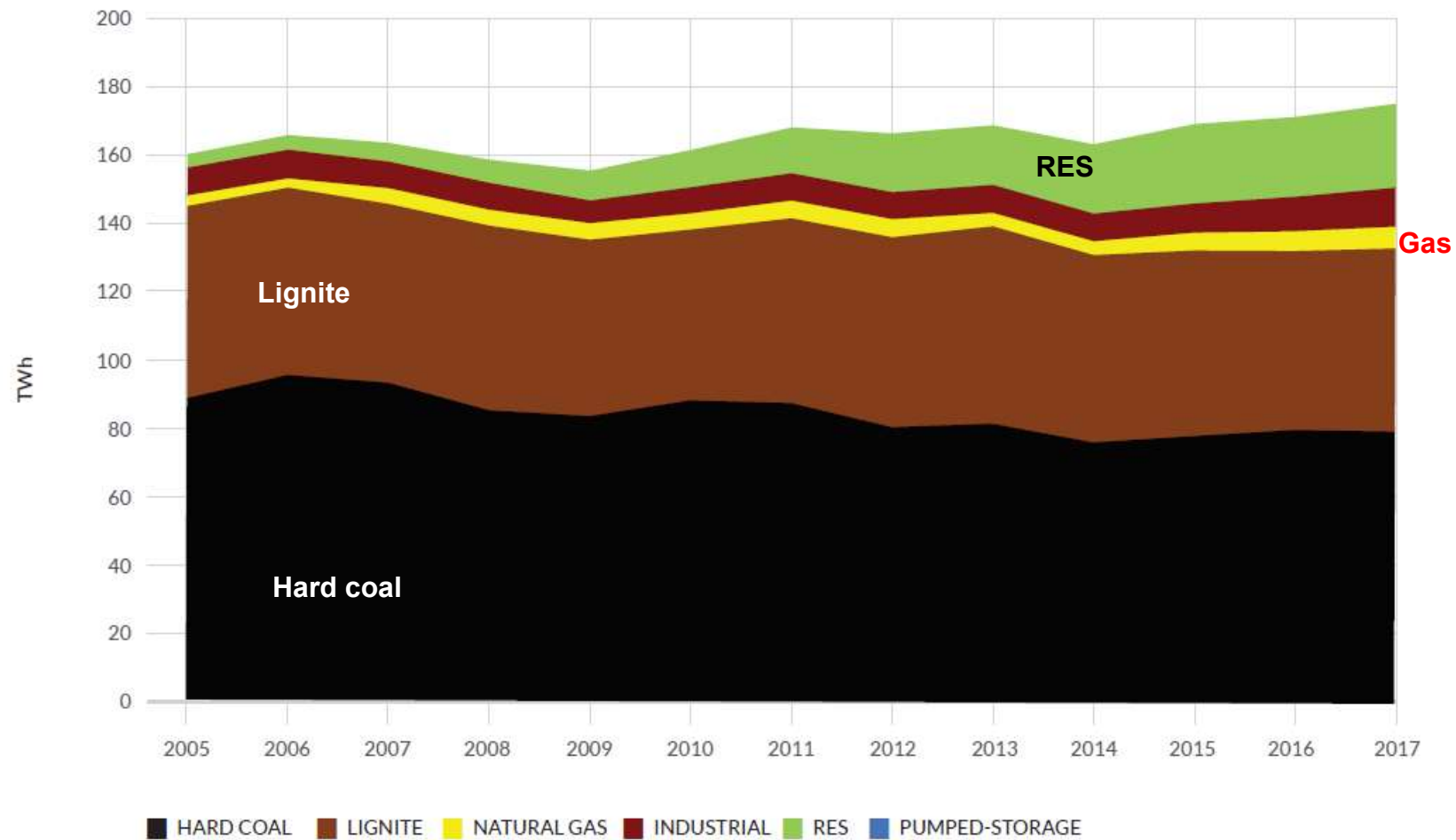
# Polish energy sector 2040



# Polish energy transition in the nutshell

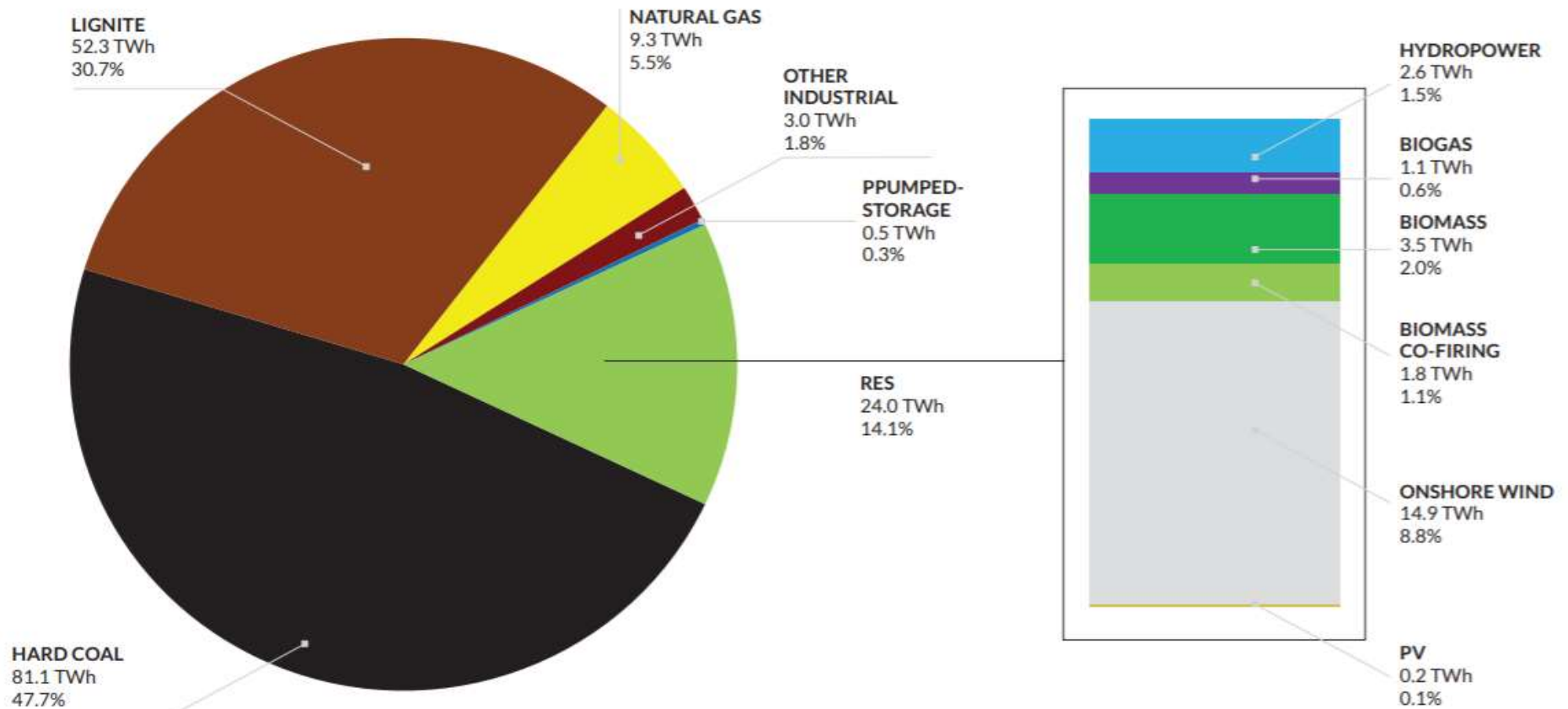


# Changes in electricity production 2005 - 2017

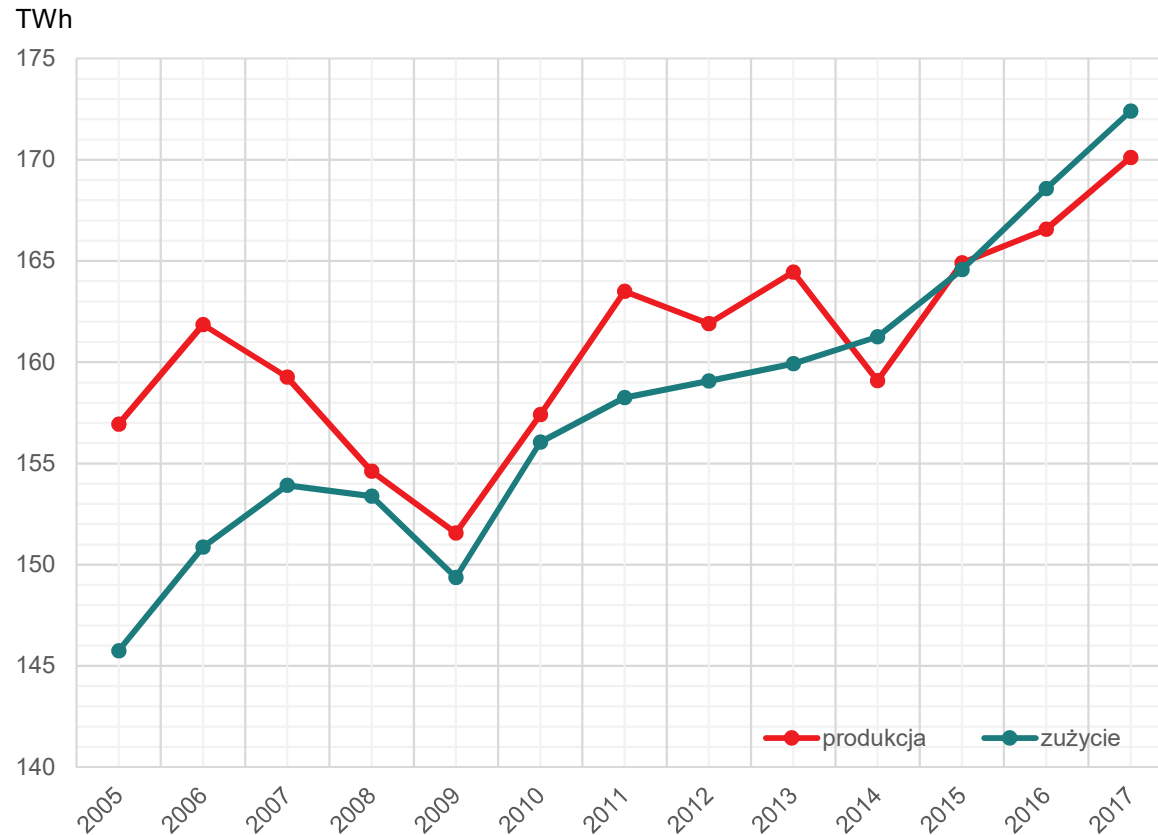


Source: own analysis, based on data from ARE.

# Energy production mix 2017



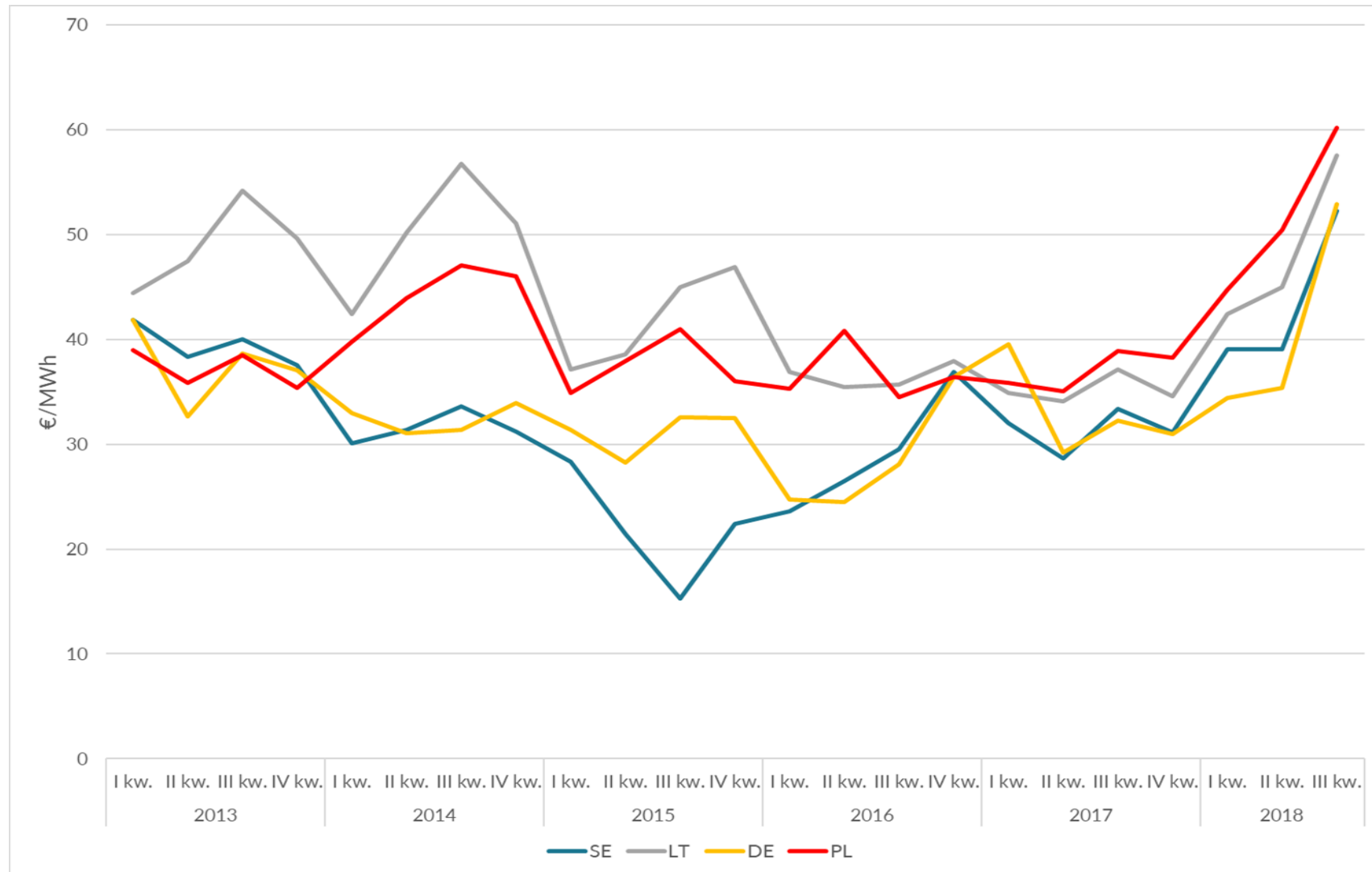
# Electricity demand is growing



Average growth  
**1.2%** a year

Since 10 years we cover  
growing demand with RES,  
gas and import

# SPOT electricity prices





# Where we are?



## Legislation – governmental toolbox:

- Polish Energy Policy 2050 – *under preparation till the end of 2018*
- RES Act – *potential incentive for RES development, effective tool if properly utilised – in force.*
- Off shore Wind Farms Act – *dedicated support mechanism – in force H2. 2019*
- CHP support Act – *incentive for small CHP supplying DH networks (+4 GWe) – in force since Jan. 2019*
- Capacity Remuneration Act – *petrification of coal technologies, potential incentive for coal CHP – in force*
- Nuclear Energy Legislation – *under preparation – decision is not clear*