GAS INFRASTRUCTURE DEVELOPMENT STRATEGIES IN THE CEE REGION TO IMPLEMENT THE EU ENERGY AND CLIMATE OBJECTIVES

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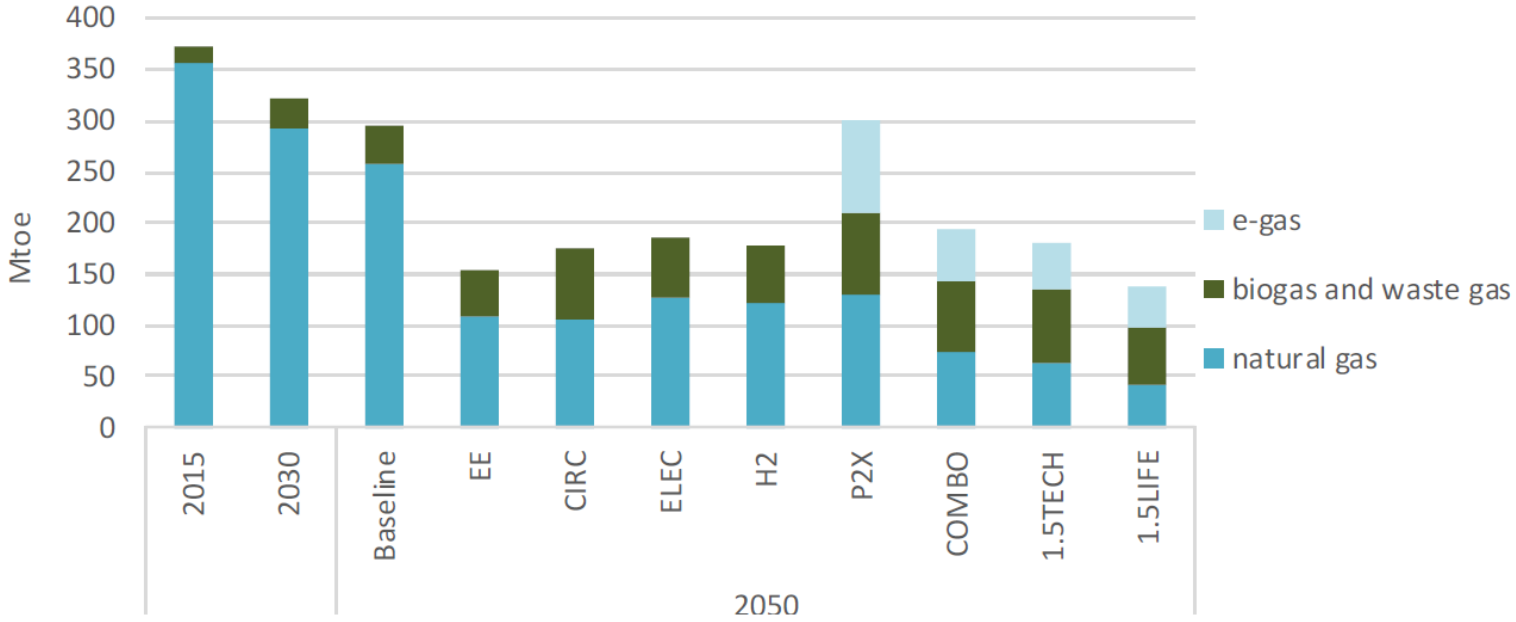
EU LONG-TERM CLIMATE STRATEGY

- Enhanced focus of the EU on decarbonisation of the energy sector due to the Paris Agreement
- Commission Communication on a long-term vision for a prosperous, modern, competitive economy identified the following scenarios towards 2050:
  - **Electrification** in all sectors
  - **Hydrogen** in industry, transport and buildings
  - **Power-to-X**: e-fuels in industry, transport and buildings
  - Deep **energy efficiency**
  - **Circular Economy** (CIRC): resource and material efficiency
  - **Combination** (COMBO): cost-efficient combination of options from the above scenarios to decrease emissions by 90%
  - **1.5°C scenarios** to ensure 100% reduction of GHG: even bigger changes assuming among others change of lifestyle
- All scenarios foresee strong penetration of RES and almost complete decarbonisation of the power sector

EU LONG-TERM CLIMATE STRATEGY – IMPLICATIONS FOR GAS

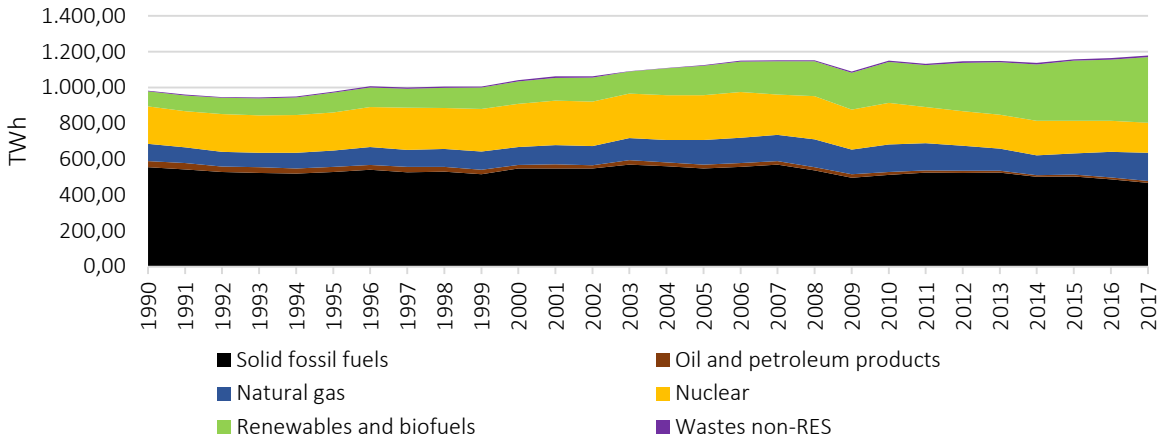
- Current gas consumption in the EU at the level of approx. 490 bcm/y
- Projected decrease of gas consumption under the Commission scenarios:
  - 2030: 303 bcm/y
  - 2050 (under 80% reduction scenarios): approx. 96 – 121 bcm/y
  - 2050 (under 90/100% reduction scenarios): below approx. 60 bcm/y
- Growing importance of renewable gases, in particular under Power-to-X and Hydrogen scenarios



CASE STUDY: CENTRAL-EASTERN EUROPE

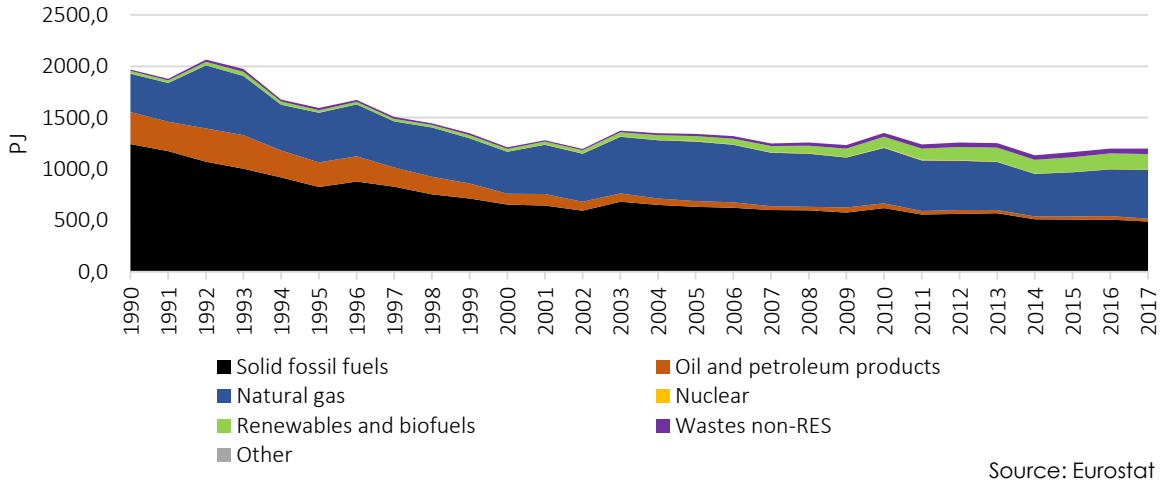
- CEE region: DE, PL, CZ, SK, AT, HU, SI, CR, RO, BG
- High share of solid fuels in the energy mix in CEE countries
- Dependency on coal and lignite mostly visible in the electricity and heat generation
- 40% of electricity produced from solid fuels in CEE. Limited but increasing role of natural gas (13%). Dynamic development of RES (31%)
- Solid fuels generate 41% of the heat in CEE. Natural gas with significant share of 39%. RES and biofuels slowly advancing (13%)

Evolution of gross electricity generation in the CEE region



Source: Eurostat

Evolution of gross heat generation in the CEE region



Source: Eurostat

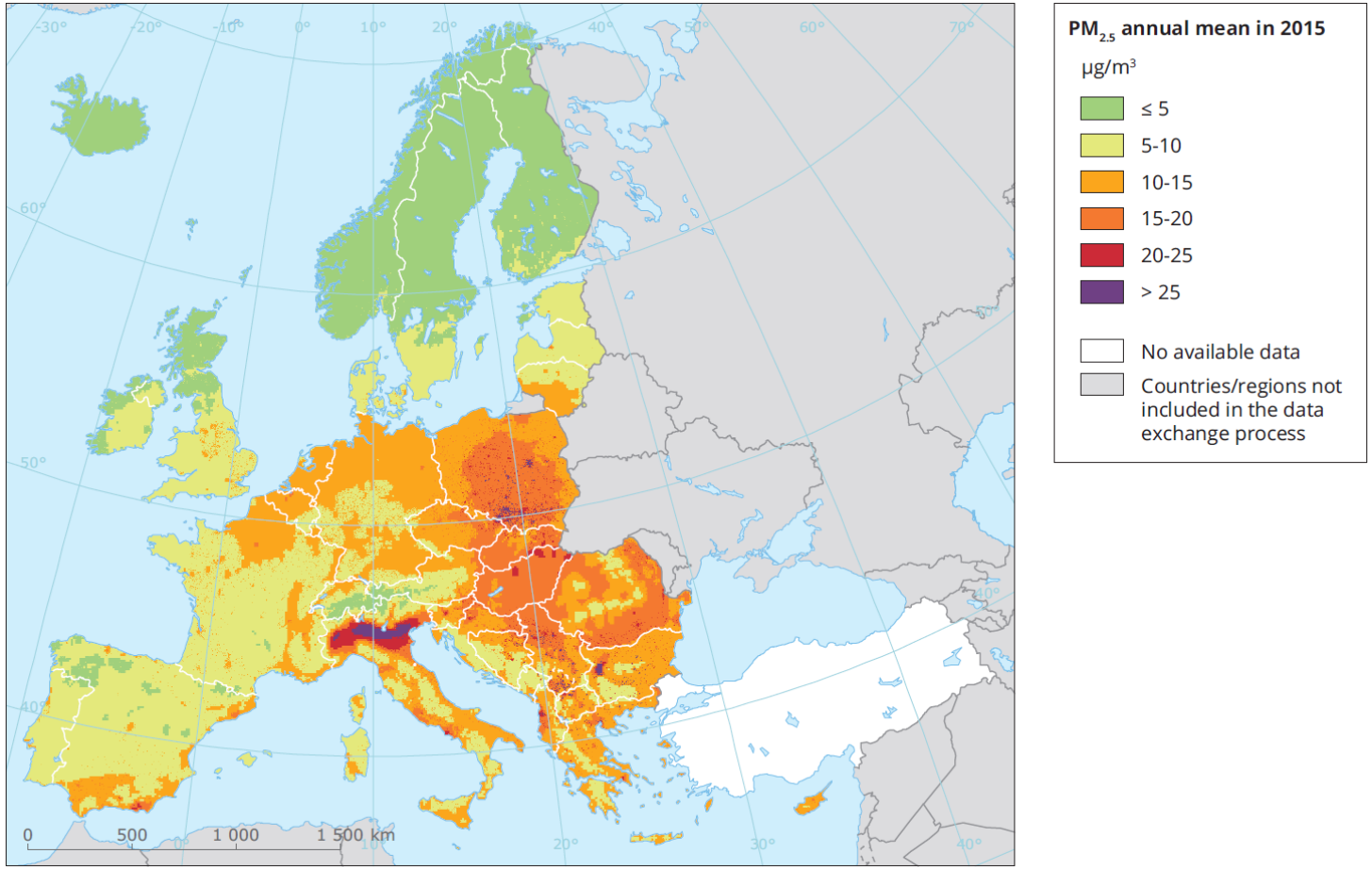
AIR QUALITY IN EUROPE

European Environment Agency's report on the air quality

- Concentrations of air pollutant emissions continues to exceed the EU limit values in large parts of Europe
- Air pollution continues to have significant impacts on the health of the European population, particularly in urban areas
- Considerable economic impacts, cutting lives short, increasing medical costs and reducing productivity through working days lost across the economy

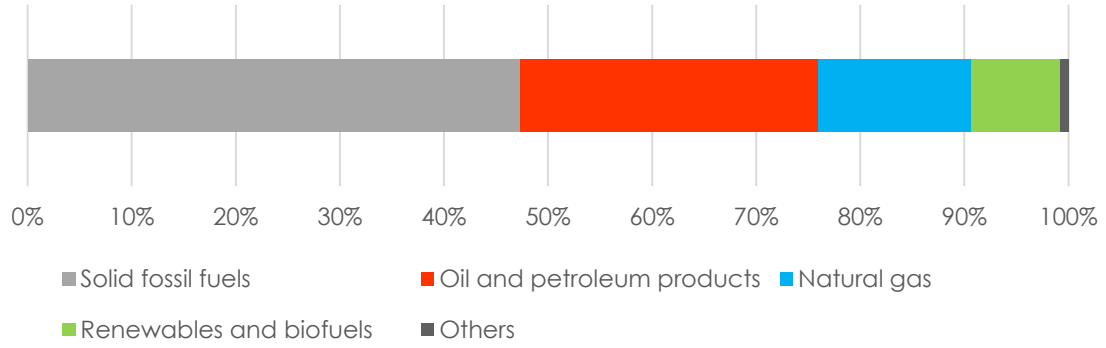
Air quality in Poland and the CEE region

- Air pollution resulting from burning high emission and low-quality fuels, especially in the winter period
- 33 out of 50 most polluted cities in the EU, are located in Poland
- Mitigation of air pollution with a wider use of natural gas in households, the heating and the power generation sectors
- Natural gas as an affordable, time- and cost efficient solution

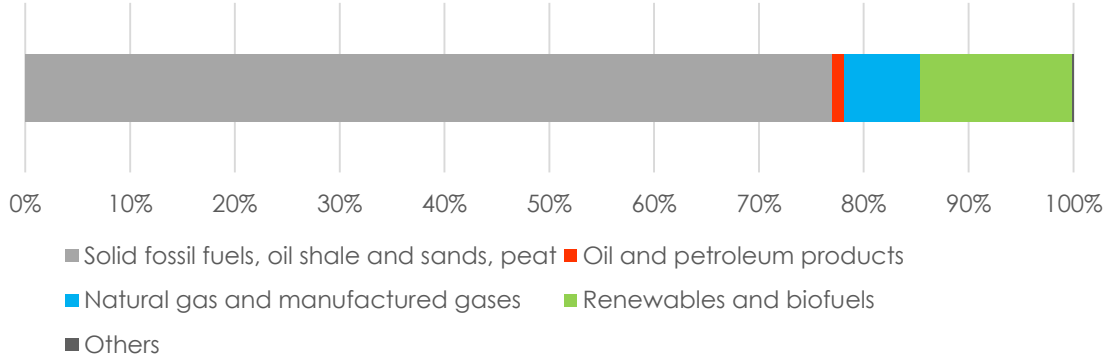


ENERGY SECTOR IN POLAND – CURRENT OUTLOOK

Gross inland consumption in Poland by product - %



Gross electricity generation in Poland by source - %



Gross inland consumption

- The structure of energy consumption closely linked with significant resources of raw materials (coal and lignite) that are located in Poland
- The bulk of input provided by solid fuels (47.4%) and oil/petroleum products (28.6%)
- Increasing butstill limited share of natural gas (14.7%)

Electricity generation

- Overwhelming majority of electricity produced from solid fuels (77%)
- Dynamic development of renewables in Poland in the last decade (3.8% in 2007, 14.4% in 2017)
- Limited but increasing share of gas-fired generation (7.2%)
- Structure of installed capacities (major sources): solid fuels – 29.6 GW, RES – 6.3 GW, natural gas – 2.3 GW, hydropower – 2.3 GW

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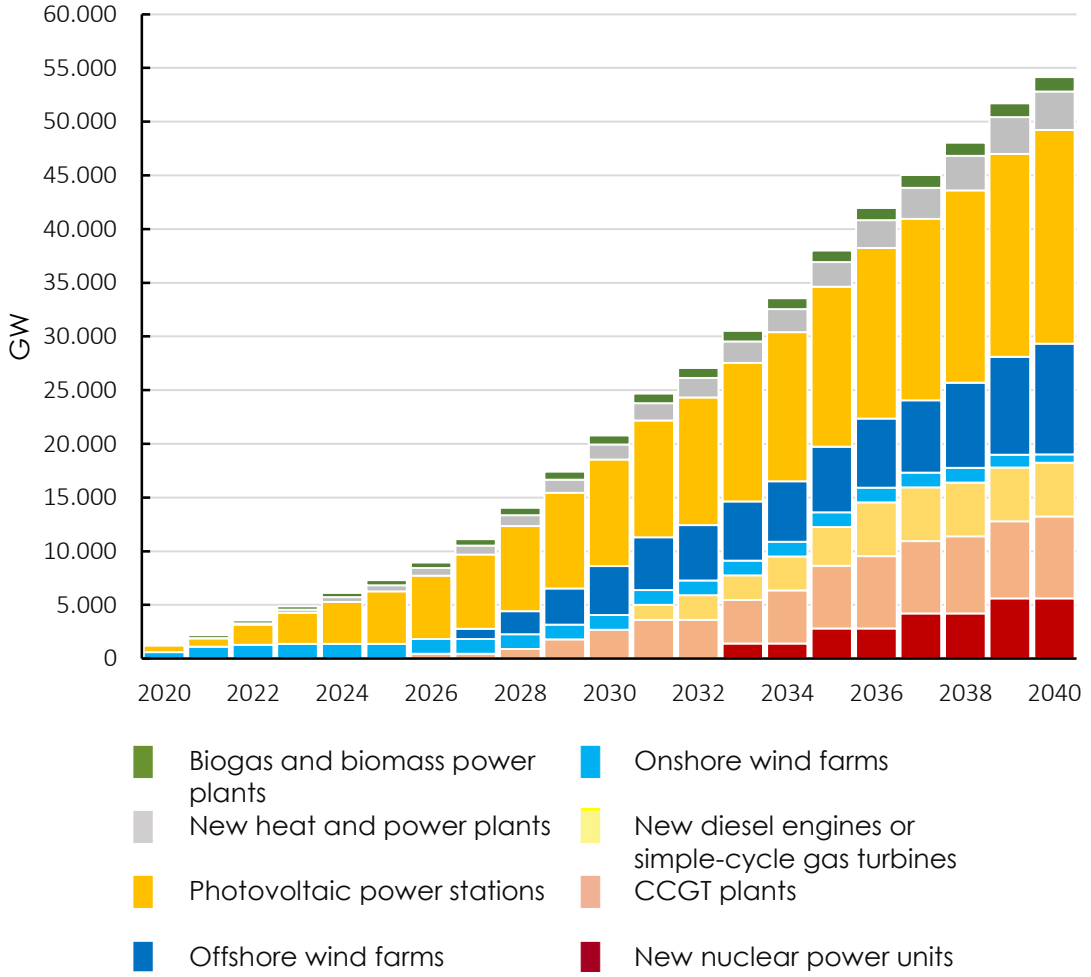
TRANSFORMATION OF THE ELECTRICITY GENERATION IN POLAND

- Ensuring stable supplies of electricity (e.g. via the capacity market)
- Reduction of pollutant emissions from the electricity generation sector with:
  - modernisation of existing units
  - decommissioning of old, inefficient plants (below 35% efficiency)
  - promotion of RES and low-emission sources
- Impact on gradual reduction of the role played by solid fuels in the electricity generation sector
- New units to be mostly based on:
  - renewables (offshore wind and solar PV)
  - nuclear power plants
  - gas-fired power plants

New installed capacity in the perspective of 2040



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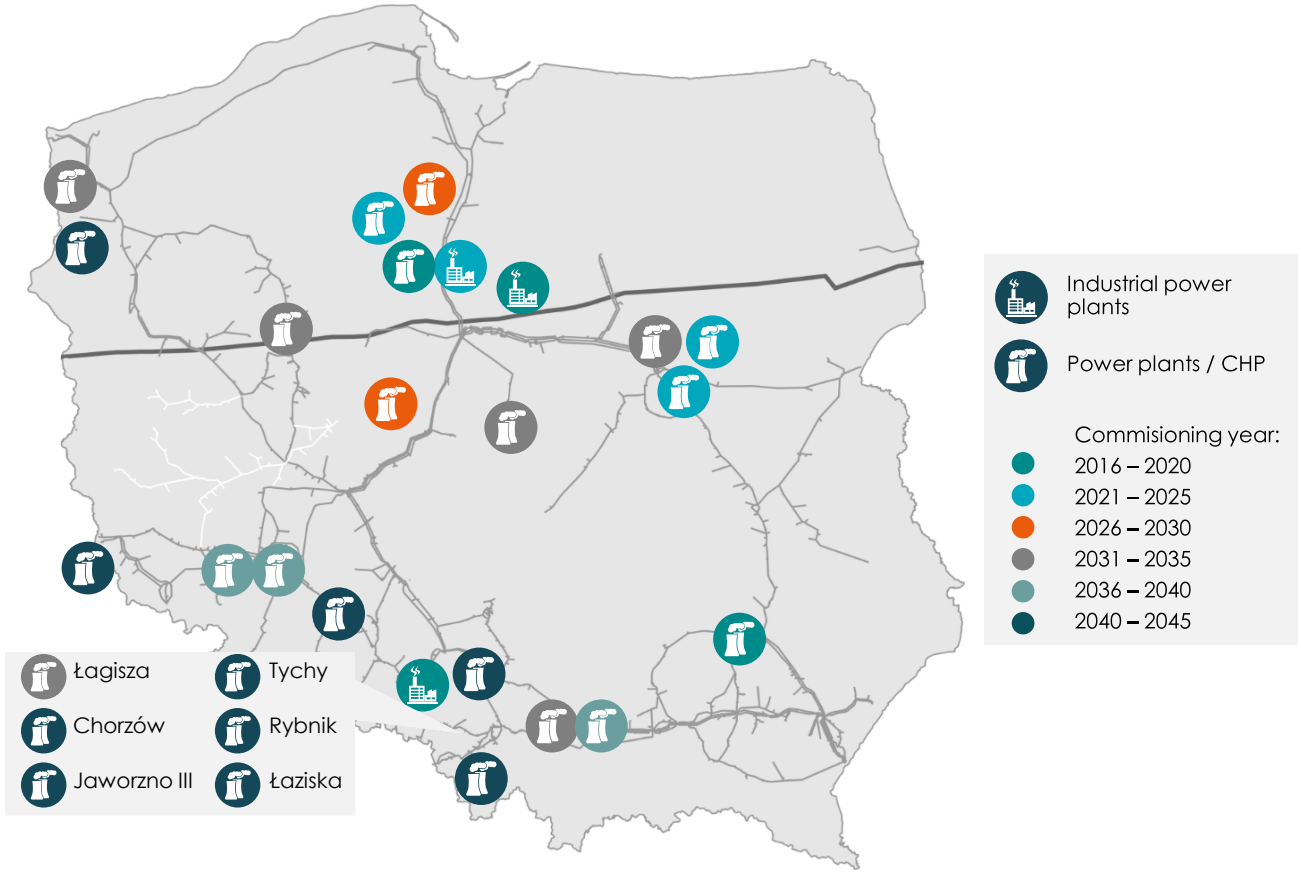
IMPACT OF GAZ-SYSTEM INVESTMENT PROJECTS ON PROTECTION OF THE ENVIRONMENT AND MITIGATION OF CLIMATE CHANGE

- E&Y prepared a report for GAZ-SYSTEM to analyse the impact of GAZ-SYSTEM investment projects on protection of environment and mitigation of climate change
- The gas infrastructure is considered as physical enabler to:
  - ensure security of gas supply
  - improve competition of natural gas as a fuel in the energy market
  - enhance availability of natural gas as a low emission source of energy and to allow for the switch from high- to low-emission sources of energy
  - support an increasing uptake of renewables
- Pre-conditions for business decisions of investors engaged in natural gas projects
- The focus in the report is put on quantification of results

INCREASE IN DEMAND FOR NATURAL GAS IN THE ENERGY SECTOR

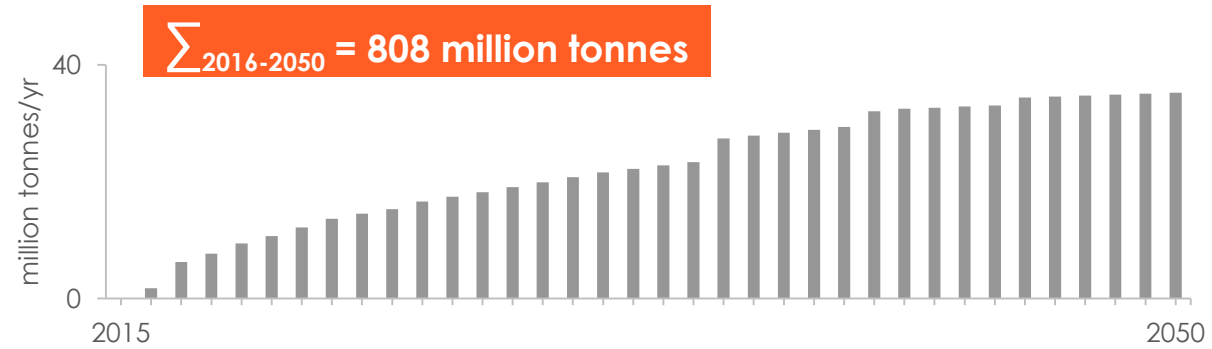
- The energy sector as the most important demand growth factor in Poland
- Power plants and combined heat and power plants with a total capacity higher than 50 MW to influence demand growth
- In total, 29 units considered in the study based on the following information:
  - convenient location near the transmission network
  - prospective investment projects (planned or under implementation)
  - age of generation assets based on coal/lignite (above 40 years)

Prospective gas power plants in Poland



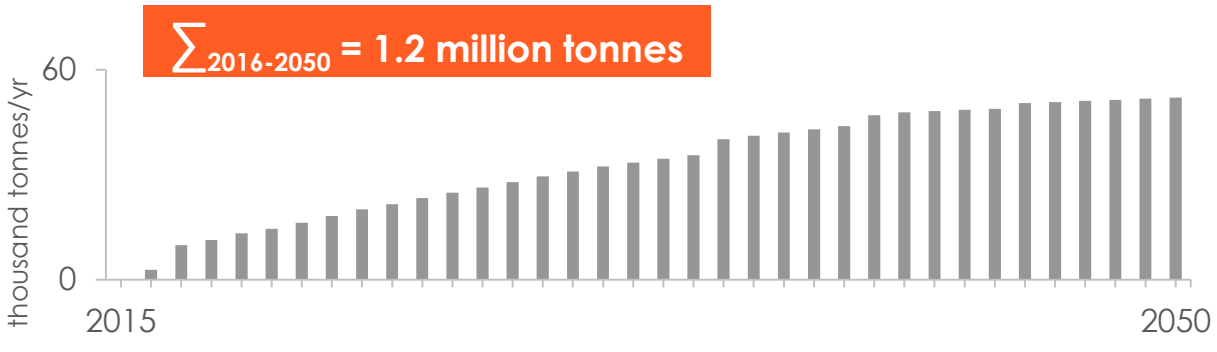
ESTIMATED REDUCTION OF EMISSIONS

CO2 emission reduction – moderate growth scenario



equals 3 times of national CO2 emissions in 2016

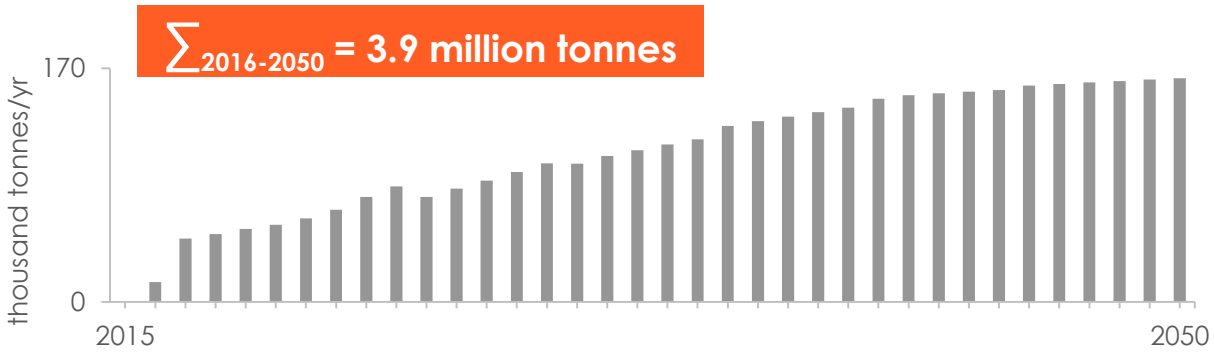
NOx emission reduction – moderate growth scenario



equals 2 times of national NOx emissions in 2016

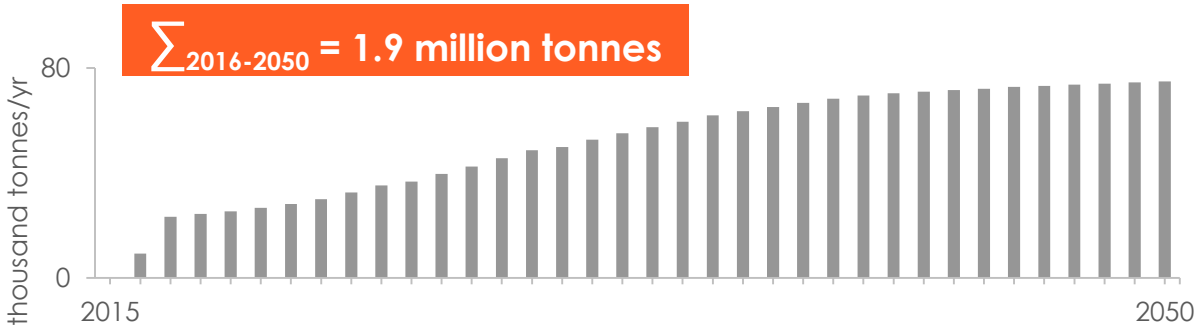
ESTIMATED REDUCTION OF EMISSIONS

SOx emission reduction – moderate growth scenario



equals 7 times of national SOx emissions in 2016

Particulate matter emission reductions – moderate growth scenario



equals 5 times of national particulate matter in 2016

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CASE STUDY: POLAND – CONCLUSIONS

- Consumption of natural gas is not completely climate neutral but due to its low emission coefficients compared to solid fuels, gas should be considered in the Polish and Central-European circumstances as a fuel that can contribute to a significant reduction of greenhouse gas emissions in the medium and long-term perspective
- **Natural gas as a low emission source of energy:**
  - Due to a high share of solid fuels natural gas will play a key role in the transition from high-emission sources to low-emission (electricity generation of segments of industry)
  - Decommissioning of old and inefficient coal and lignite power plants (lack of economic viability of modernisation)
  - Urgent need for modern, stable and low-emission generating units which mainly include gas-fired power plants
- **Natural gas supporting an uptake of renewables:**
  - Accelerated development of renewable energy
  - Risks for stability and security of the electricity system
  - The energy system to be supplemented with highly flexible energy sources such as natural gas
- **The use of gas infrastructure for the development of renewable gases and the storage of electricity produced from RES**

THANK YOU

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