

GAZ-SYSTEM STRATEGY VERSUS DEVELOPMENT OF GAS-FIRED POWER GENERATION

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Development Department,
Gas Market Development Division

GAZ-SYSTEM FORUM
Warsaw, 30.09.2020





1 Market

2 Information

3 Strategy

Gas market
today?

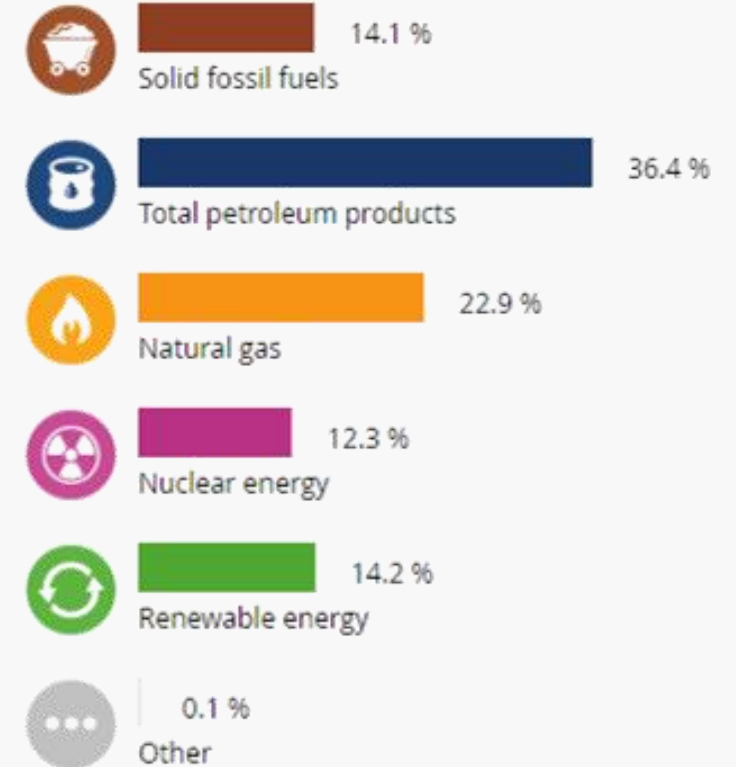
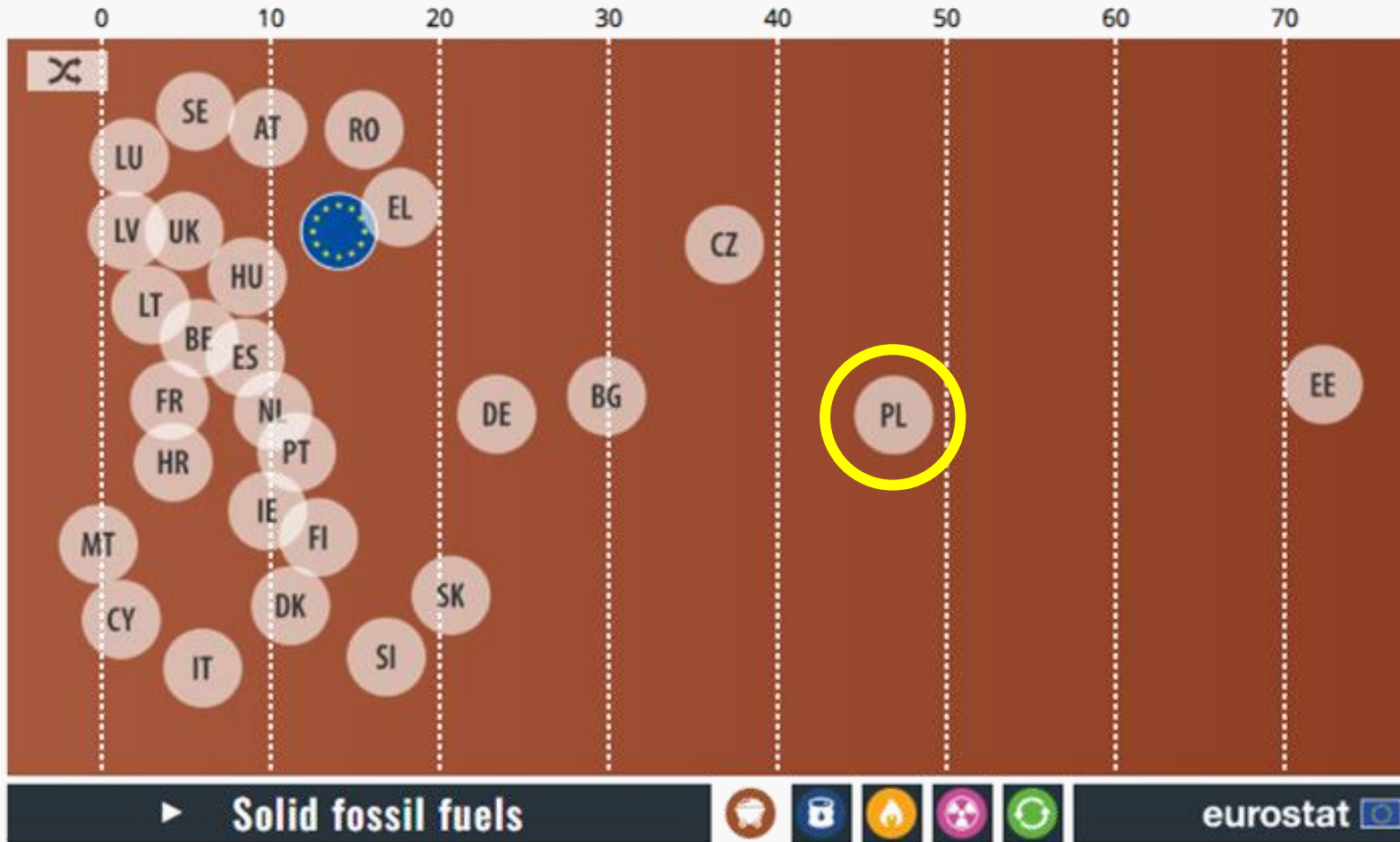


SHARE OF FOSSIL FUELS IN EU ENERGY PRODUCTION (PL)

Share of energy products in total energy available (gross inland consumption), in %, 2018



Energy mix for EU (28 countries)

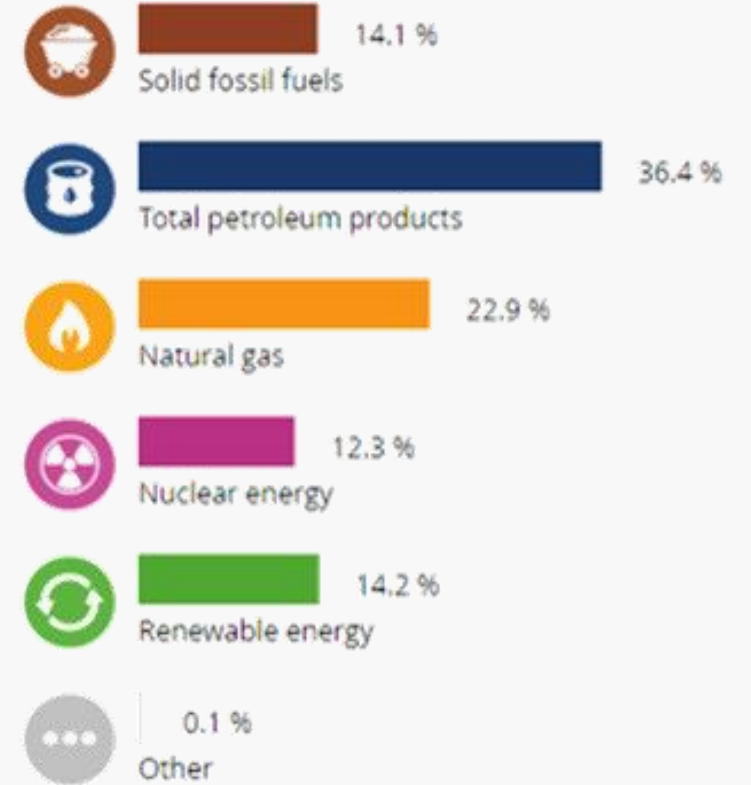
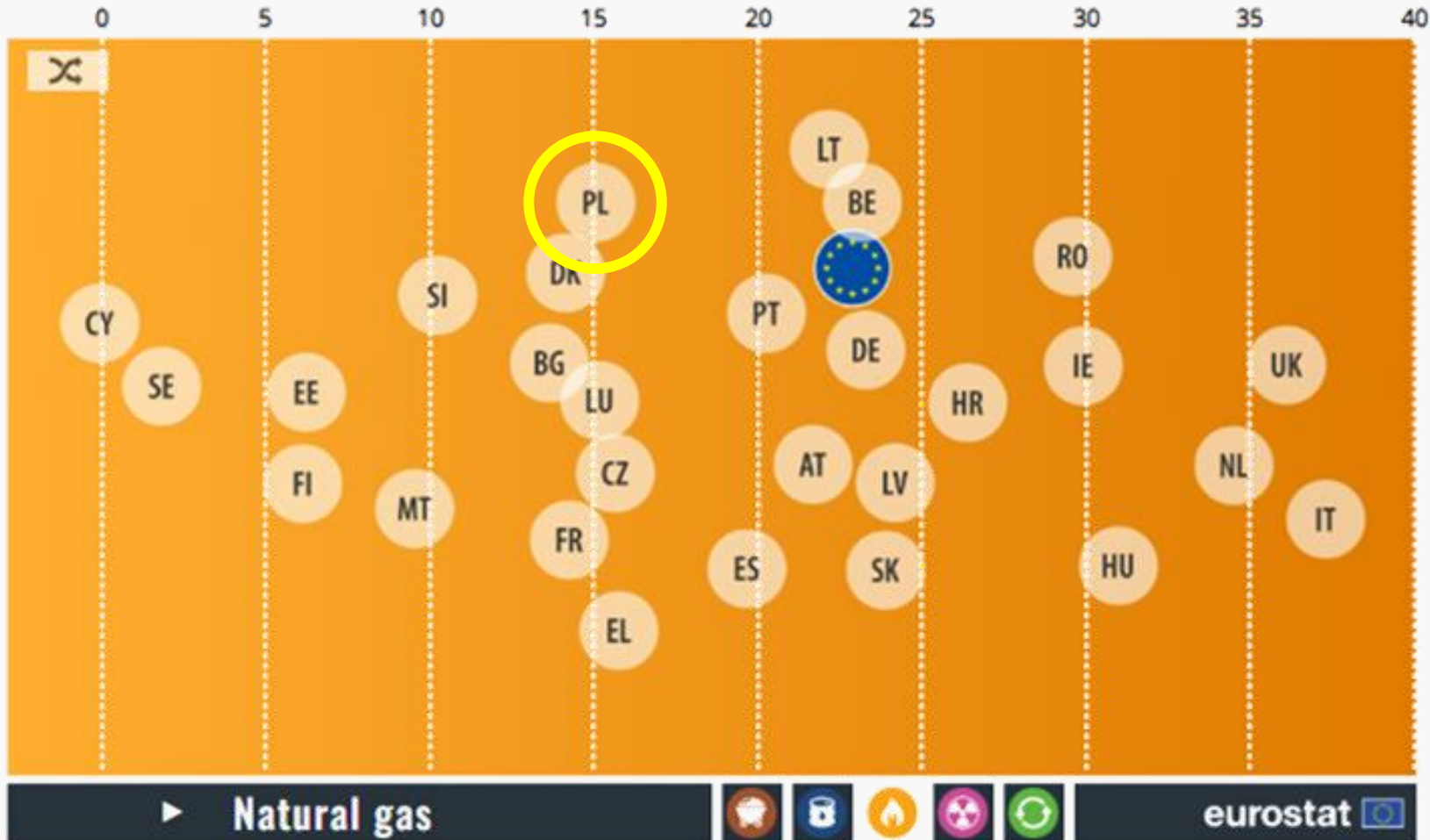


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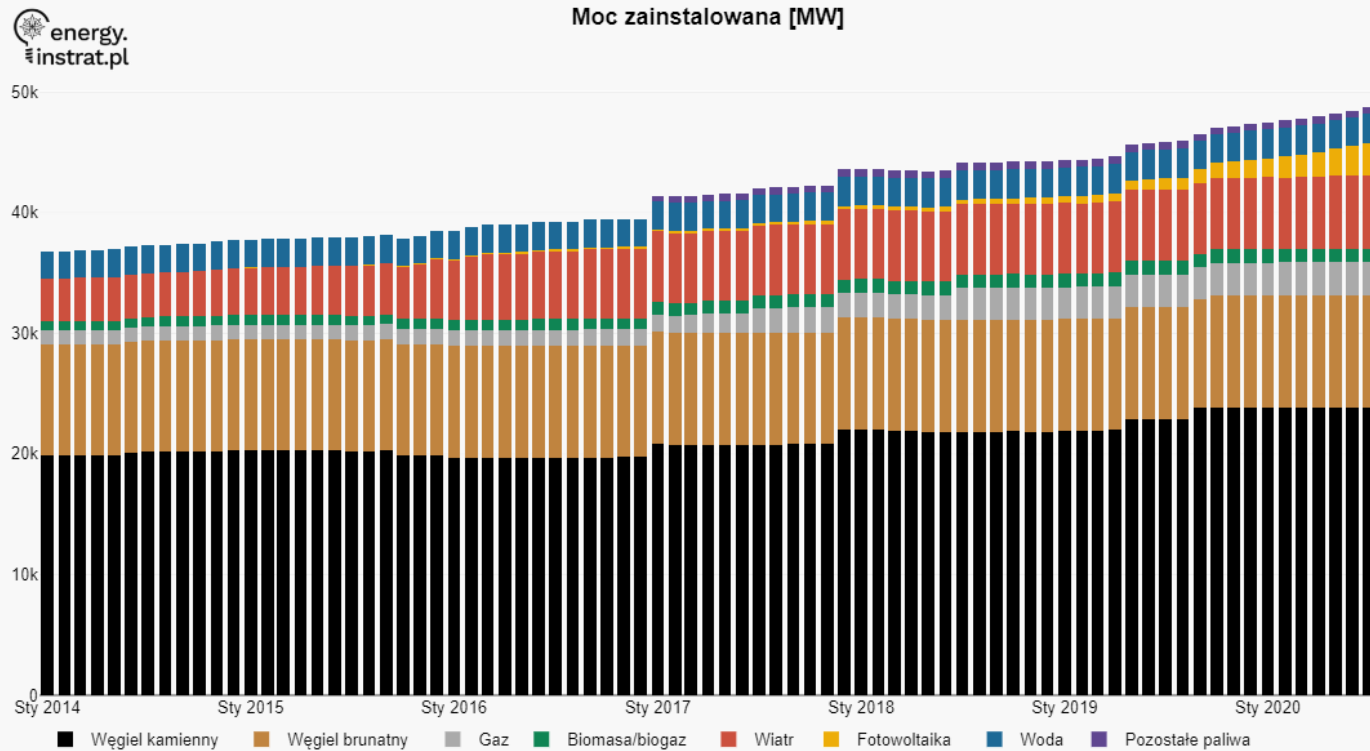
► Natural gas



eurostat

Source: Eurostat, <https://ec.europa.eu/eurostat/data/database>

NPS - INSTALLED CAPACITIES

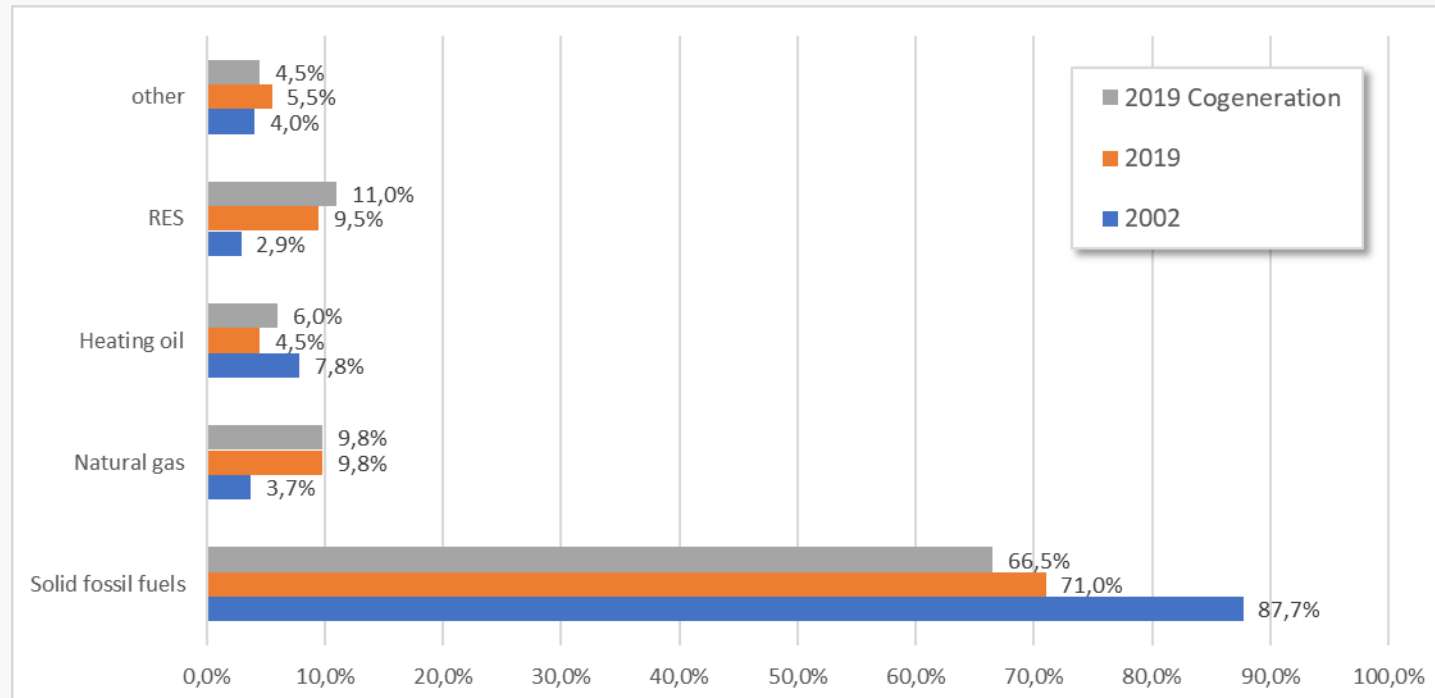


Today the structure of production capacity is being slowly shifted, primarily as a result of erecting photovoltaic installations which feature support systems. However, this largely applies to "prosumer" projects - projects by individual customers.

The increasing demand for energy "supports" to a large extent the current production resources based on fossil fuels. However, gas-based "capacities" can be seen to systematically increase the NPS production base.

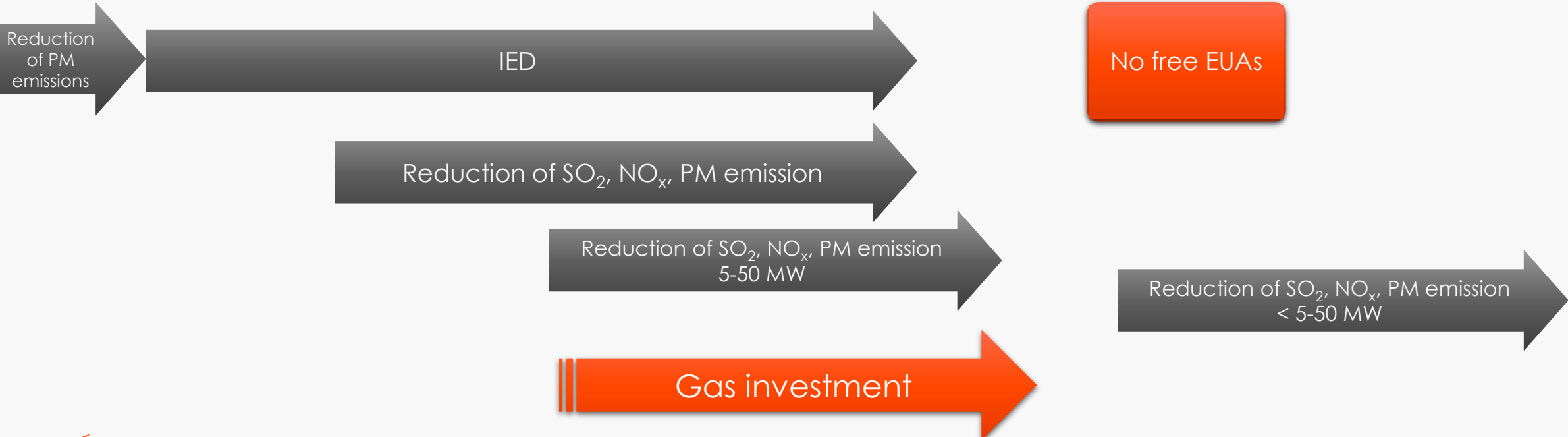
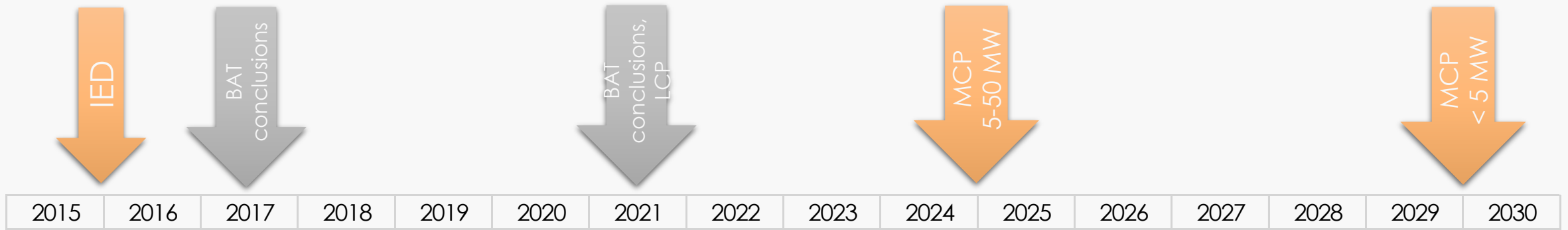
Źródło: wykres energy.instrat.pl, dane z entsoe & ARE

FUELS - STRUCTURE OF FUELS USED FOR HEAT GENERATION IN 2002 AND IN 2019



ERO (Heat Power Engineering) - in 2002-2019, or following eighteen years of research by licensed district heating companies, it can be concluded that the diversification of fuels used for heat generation is progressing very slowly. Coal fuels are definitely dominant, with a 71% share in fuels consumed in heat sources in 2019 (versus 72.5% in 2018). Since 2002 the share of coal fuels has decreased by 10.7 percentage points, while share of gaseous fuels and renewable energy sources has increased - by almost 5.8 percentage points and 6.6 percentage points respectively.

REQUIREMENTS AND DECISIONS



WHAT AFFECTS BUSINESS

European Emission Allowance price chart for DEC-19 and DEC-20



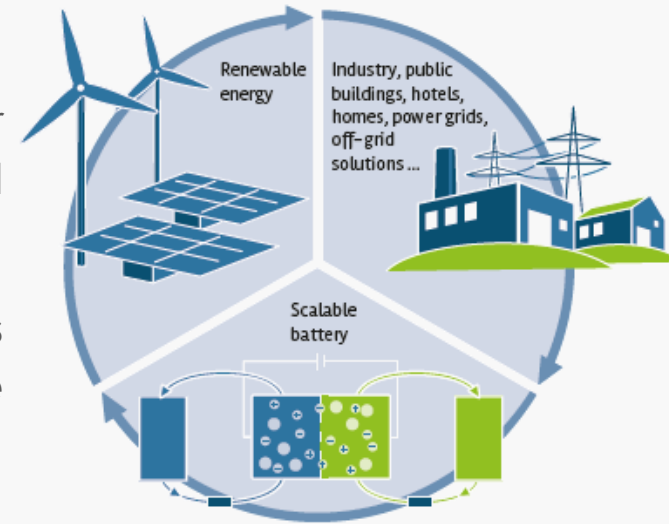
Closing prices for key European market-related prices December 2019 / 2020

Contract	Closing price	Change
EUA DEC-21	€ 24.65 per t	169.1%
Annual contract for electricity (DE)	€ 42.1 per MWh	-20.94%
Annual contract for electricity (EN)	PLN 184.80 per MWh	65,4%
Brent oil barrel	\$53.80 per bbl	-19.5%
Gas contract (POLPX)	PLN 120 per MWh	6.2%
Gas contract (TTF)	€ 19.75 per MWh	5.33%
Annual contract for coal (ARA)	\$83.70 per t	-1.9%

RES, ENERGY STORAGE FACILITIES, GAS

THE CHALLENGE

- ▶ Gas turbines and renewable energy sources are starting to solve their problems themselves. Turbines have long played a major role in helping to meet demand spikes, but also in balancing the lack of energy produced from renewable energy sources.
- ▶ The current increase in renewable sources, which is a promise of a reduction in our carbon footprint, poses a threat to network operators as their volatility and unpredictability make balancing and planning complicated.
- ▶ **A highly desirable solution is a gas turbine system with a battery, in which storage is a kind of back-up to be activated to smooth out and optimise operation of the network.**
- ▶ Moreover, energy generated by wind, which isn't used to balance market demand, can be used to produce hydrogen, which then may be introduced into the gas network.



Future of the gas market?

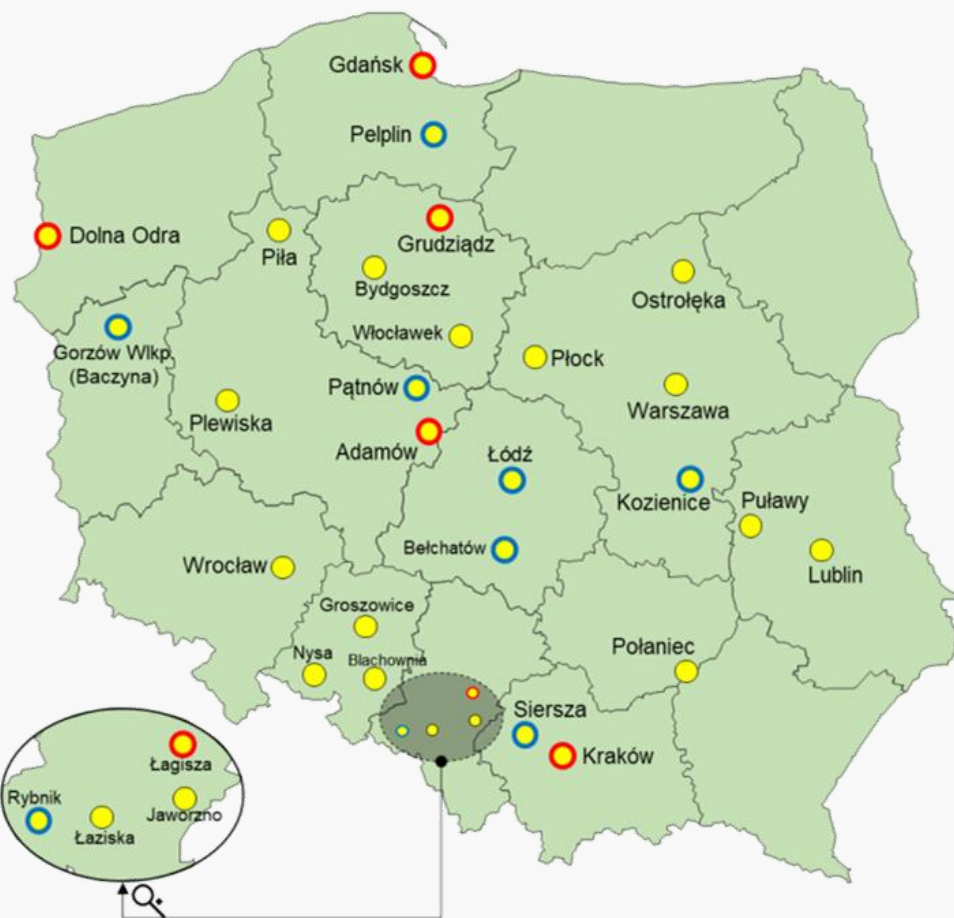


PSE - DEVELOPMENT PLAN

PSE Polish Power Grid Company

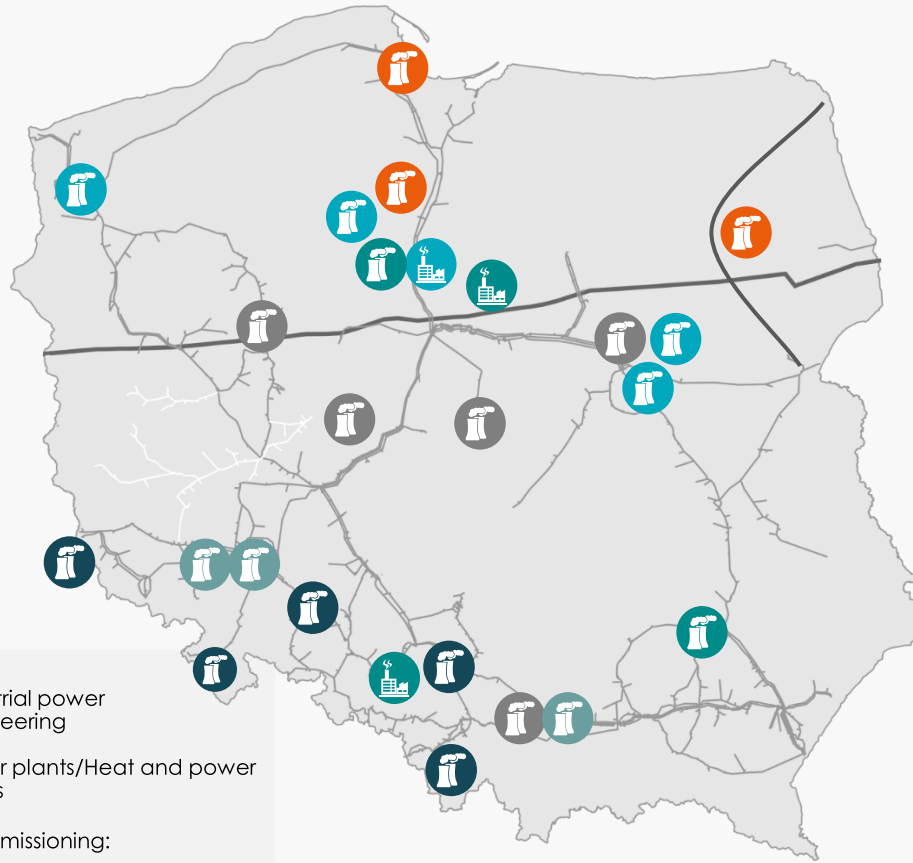
With reference to meeting the current and future electricity demand for 2021-2030

- ▶ The results of analysis aimed at determining the future structure of electricity generation carried out for the purpose of TSDP update **proved a possible significant increase in the number of gas units in NPS.**
- ▶ Given that, **a list was drafted of potential locations for large 500-700 MWe class units,** where connection, as per the current state of knowledge, is possible in terms of the power transmission grid.





- Potencjalne lokalizacje w okresie 2030-2040
- Lokalizacje dla roku 2030 pokrywające się z potencjalnymi lokalizacjami będącymi w obszarze analiz GAZ-System S.A.
- Lokalizacje dla roku 2040 pokrywające się z potencjalnymi lokalizacjami będącymi w obszarze analiz GAZ-System S.A.

GAS - GROWING DEMAND...








- ▶ The power generation sector is the one with the highest increase in the demand for gas.
- ▶ More than 29 facilities are at the stage of evaluation or investment processes based on:
 - ▶ Location
 - ▶ Development potential
 - ▶ Service life of carbon-based equipment

 Industrial power engineering

 Power plants/Heat and power plants

Commissioning:

-  2021 – 2025
-  2026 – 2030
-  2031 – 2035
-  2036 – 2040
-  2040 – 2045

INFRASTRUCTURE AND ITS DEVELOPMENT

Demand for transmission service

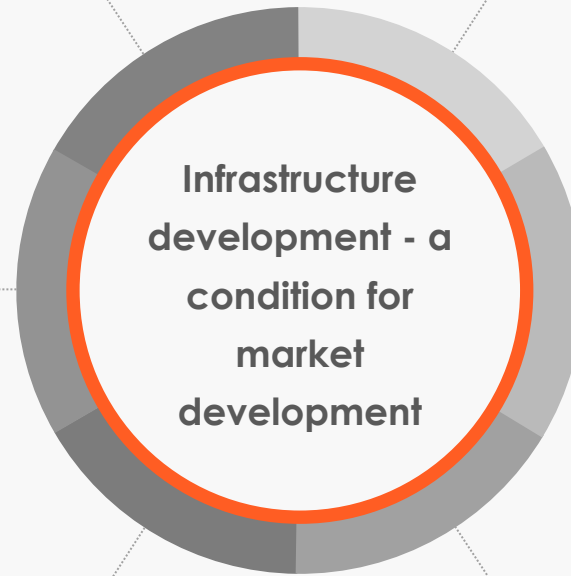
Electrical Power Engineering
Industry
Residents/trade/services

Import/Export needs

Optimisation of assets
Expansion of interconnections
Expansion of connections to TGPS

Domestic sources

Conventional sources
Non-conventional sources



Transmission security

SoS Regulation
Diversification of supply sources and directions
Expansion of interconnections

The role of gas

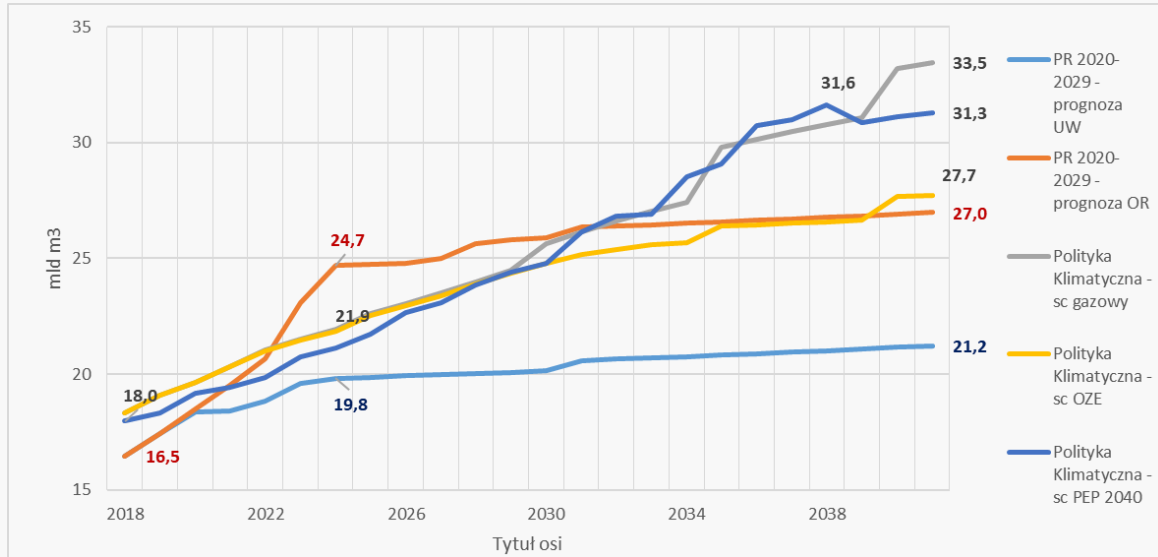
Gas in the economy
New technologies in the gas industry
Development of services for LNG and RE gases
Environment protection

Market integration

Infrastructure: BEMIP, corridor N-S
Cooperation platforms / Network Codes
Increased competitiveness

DEVELOPMENT FORECASTS 2020-2029

Forecast of domestic demand for transmission service

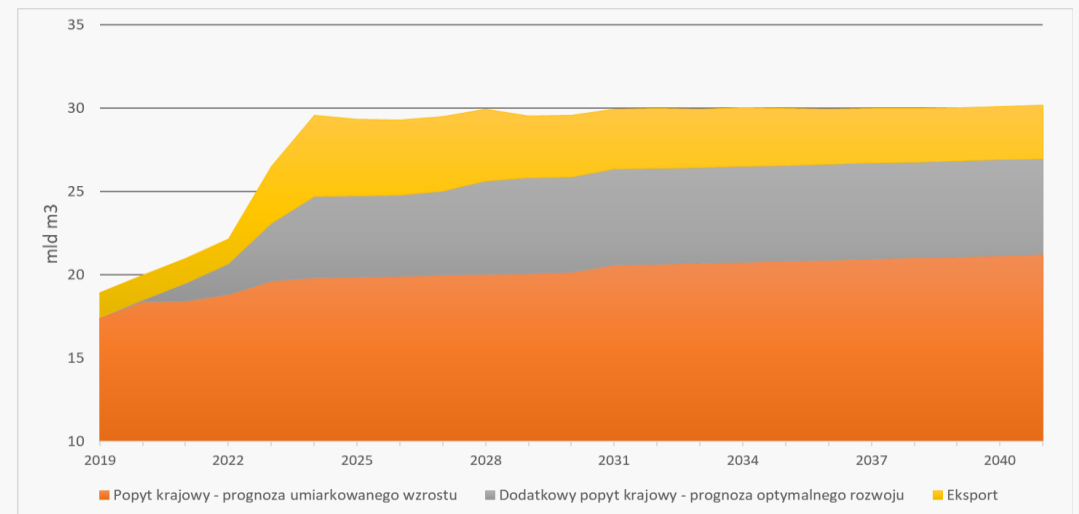


- ▶ The investments that are currently planned will secure firm transmission of **up to approx. 5 billion m³** in the coming years
- ▶ Increased transmission / export will require the gas sources to expand

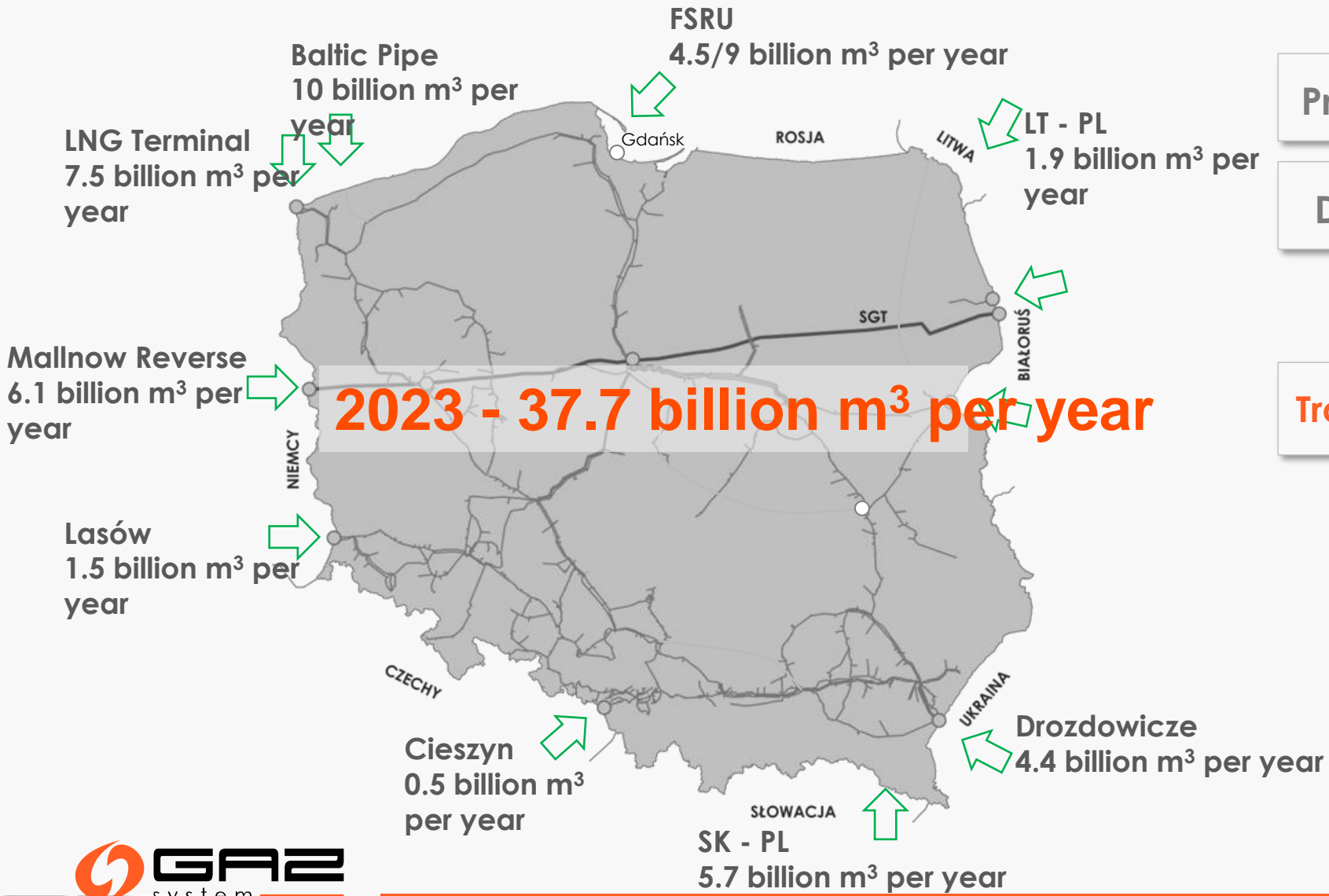
Forecasts include:

- ▶ Capacity allocation
- ▶ Issued conditions for connection
- ▶ Concluded connection agreements
- ▶ Statistics
- ▶ Market research and analysis
- ▶ Reporting data

Demand for transmission service including export



DIVERSIFICATION

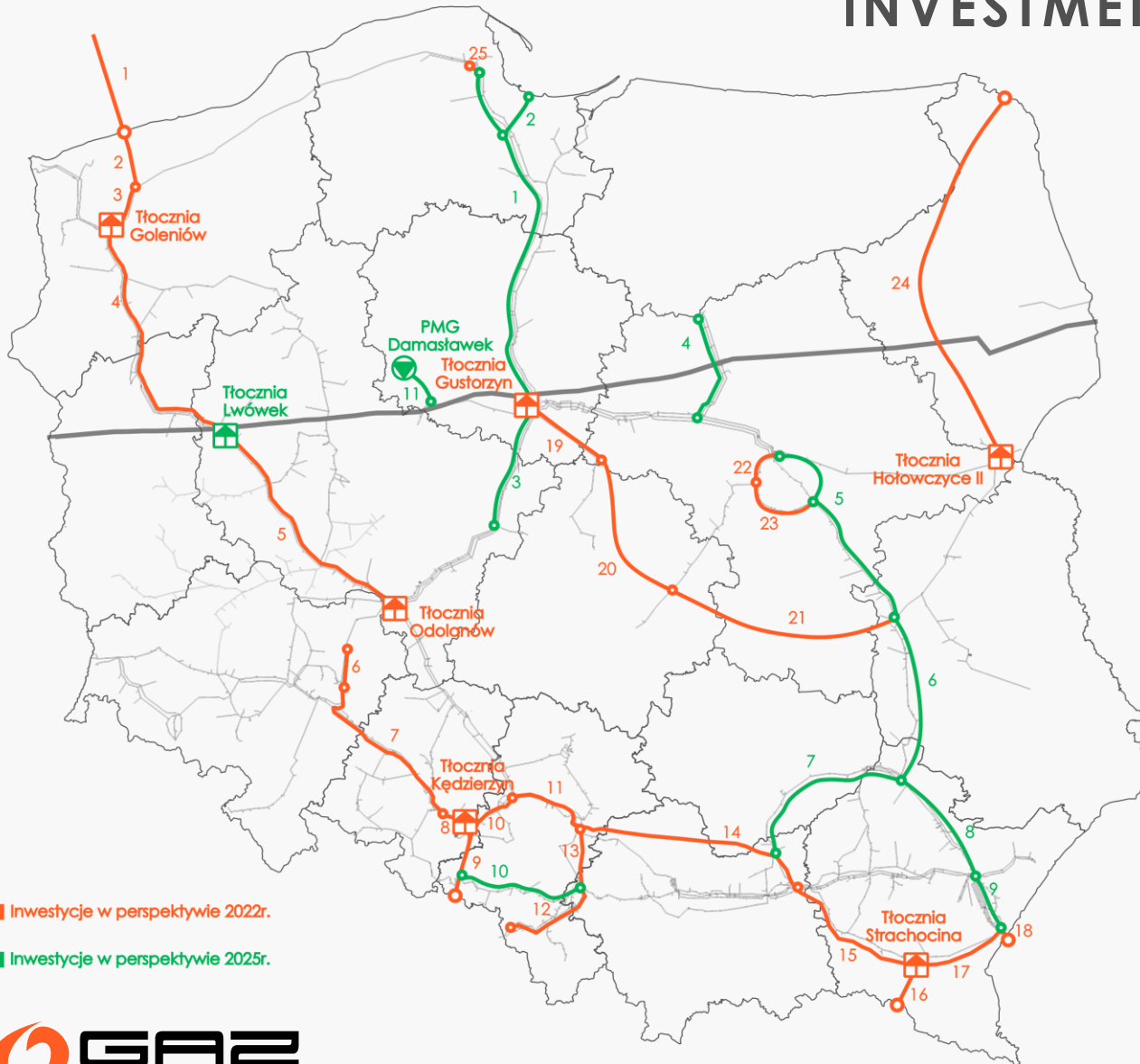


Production - 3.8 billion m³ per year

Demand - 17.7 billion m³ per year

Transmission - 21.6 billion m³ per year

INVESTMENTS



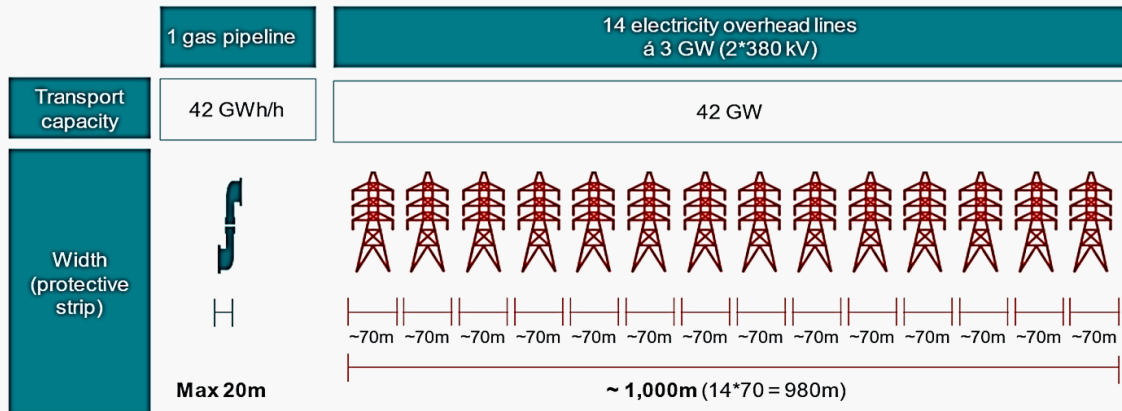
Gazociągi w perspektywie 2022r.

1	Baltic Pipe
2	Niechorze - Płoty
3	Płoty - Goleniów
4	Goleniów - Lwówek
5	Lwówek - Odolanów
6	Czeszów - Kietczów
7	Wrocław - Zdieszowice
8	Zdieszowice - Kędzierzyn-Koźle
9	Kędzierzyn Koźle - Granica RP
10	Kędzierzyn Koźle - Tworóg
11	Tworóg - Tworzeń
12	Skoczów - Komorowice - Oświęcim
13	Oświęcim - Tworzeń
14	Pogórska Wola - Tworzeń
15	Strachocina - Pogórska Wola
16	Strachocina - Granica RP
17	Strachocina - Hermanowice
18	Hermanowice - Granica RP
19	Gustorzyn - Leśniewice
20	Leśniewice - Rawa Mazowiecka
21	Rawa Mazowiecka - Wronów
22	Warszawa Północ - Mory
23	Mory - Wola Karczewska
24	Hołowczyce - Granica RP
25	Reszki - Wiczlino

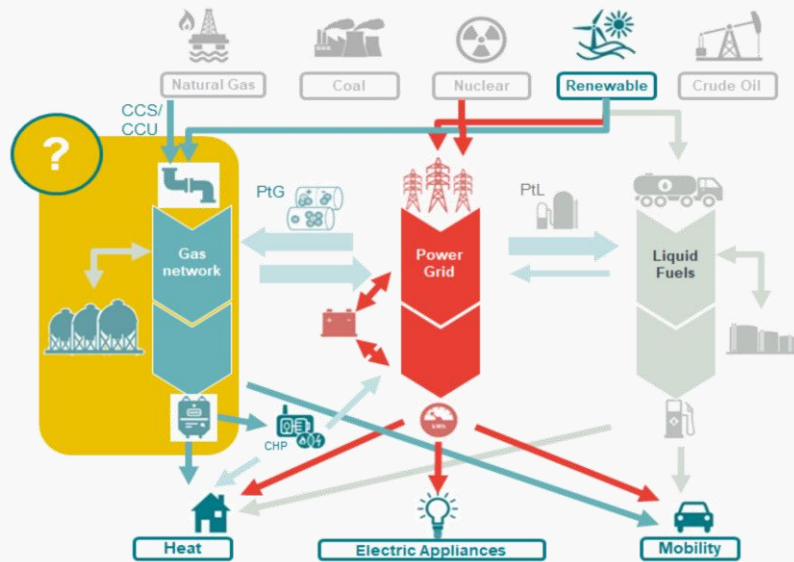
Gazociągi w perspektywie 2025r.

1	Reszki - Gustorzyn
2	Gdańsk - KSP (Kolnik)
3	Wieniec - Adamów
4	Uniszki Zawadzkie - Płońsk
5	Warszawa Północ - Wronów
6	Wronów - Rozwadów
7	Swarzów - Rozwadów
8	Rozwadów - Jarostaw
9	Jarostaw - Hermanowice
10	Racibórz - Oświęcim
11	Damasławek - Mogilno

ANTICIPATING THE FUTURE

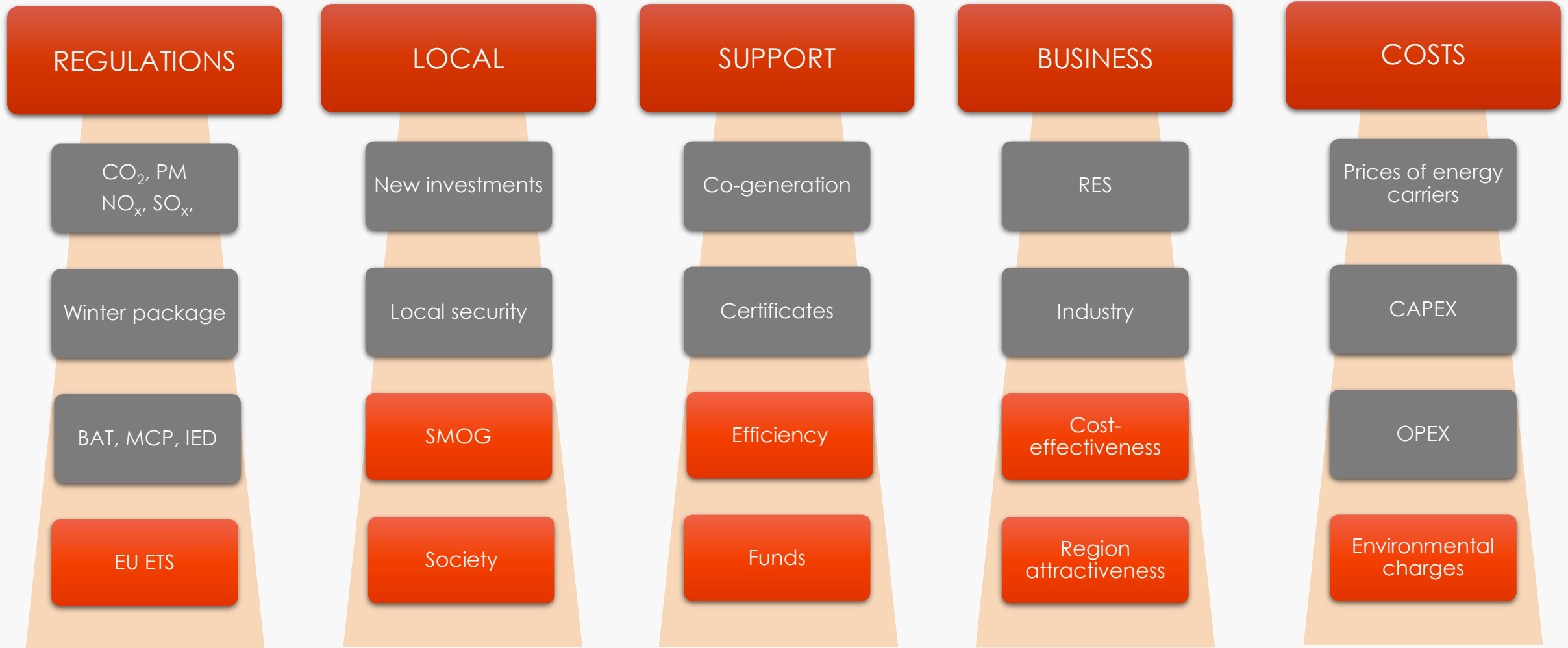


Predicting and designing the construction of "adequate" electricity infrastructure and gas infrastructure so that they are capable of maintaining sufficiently high levels of synergy between depends on a number of factors, particularly when striving to maintain low or decreasing level of emissions.



- ▶ Heat
- ▶ Energy storage facilities
- ▶ Power market
- ▶ Transport

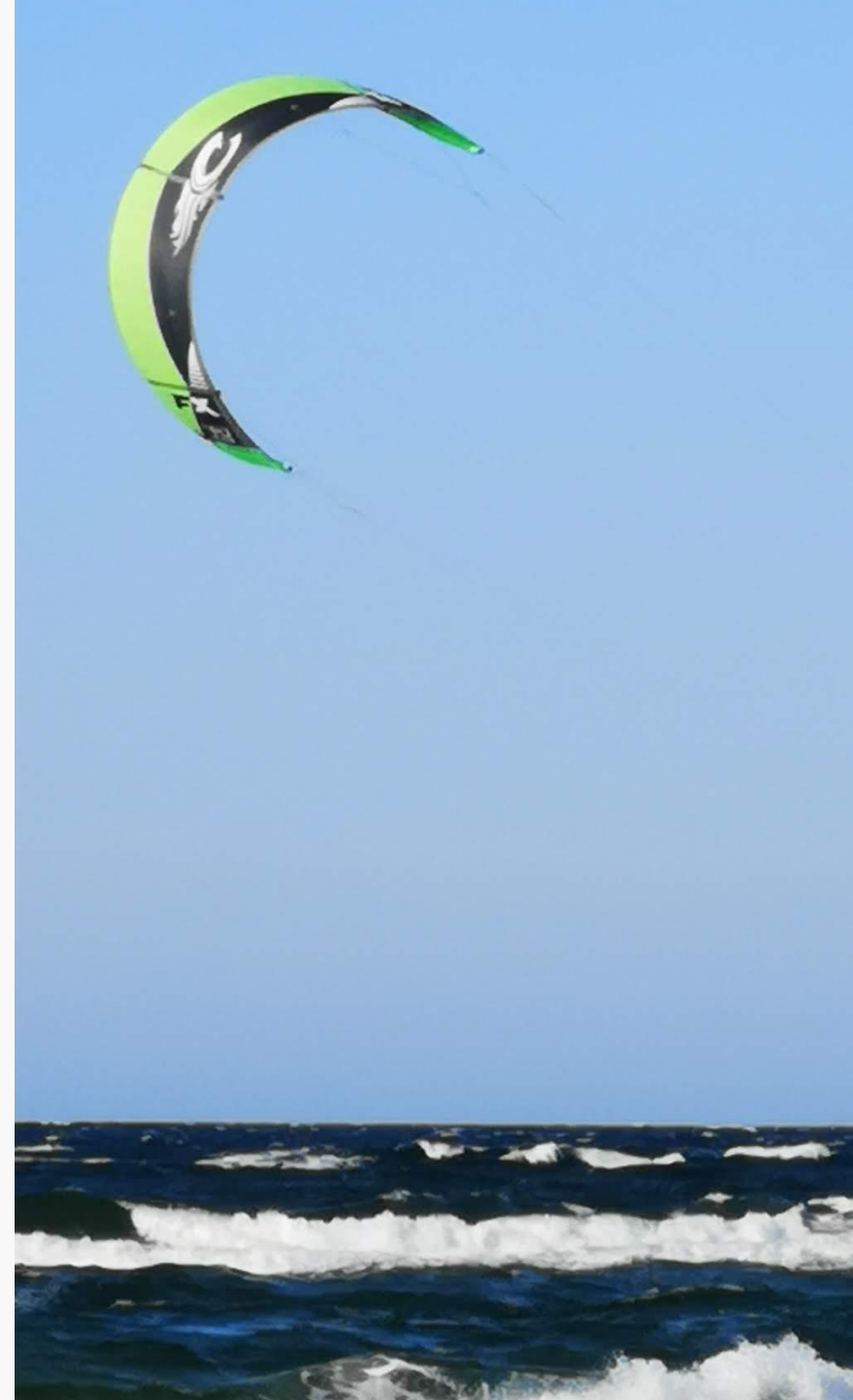
THE FUTURE - MANY VARIABLES



DEVELOPMENT OF THE GAS TRANSMISSION NETWORK



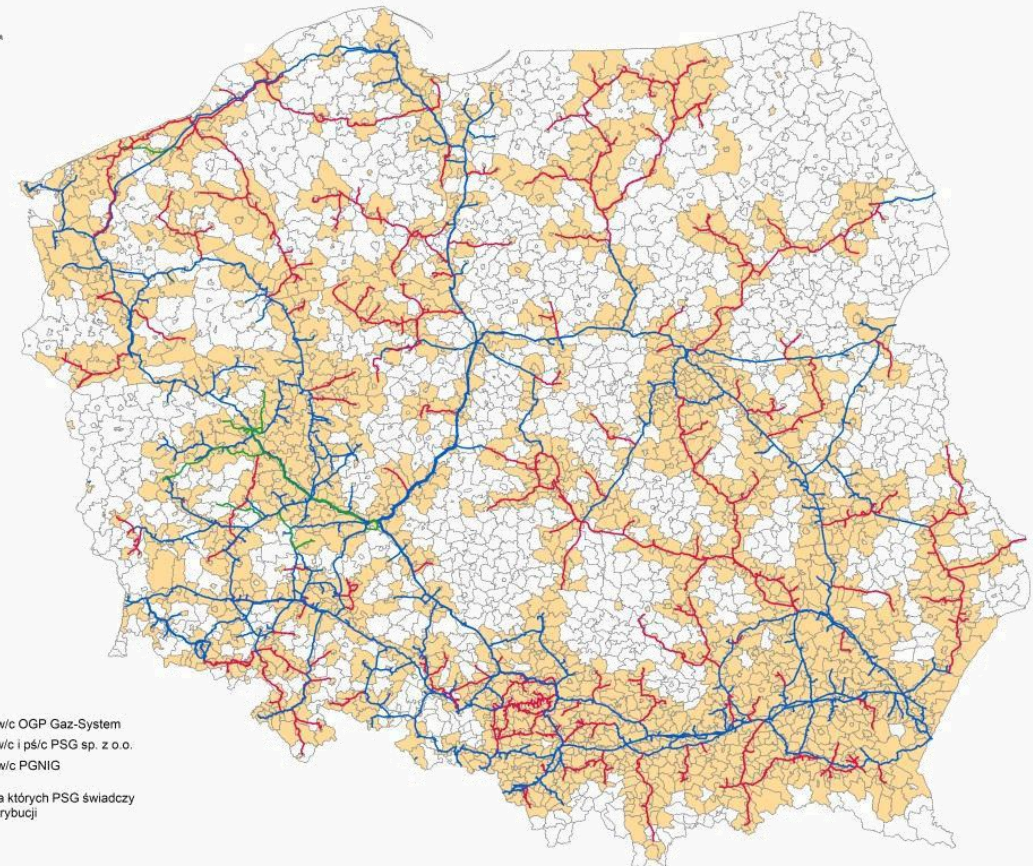
**ONE NEEDS COURAGE
TO BE OPEN
FOR FEEDBACK**



POLAND - GASIFICATION



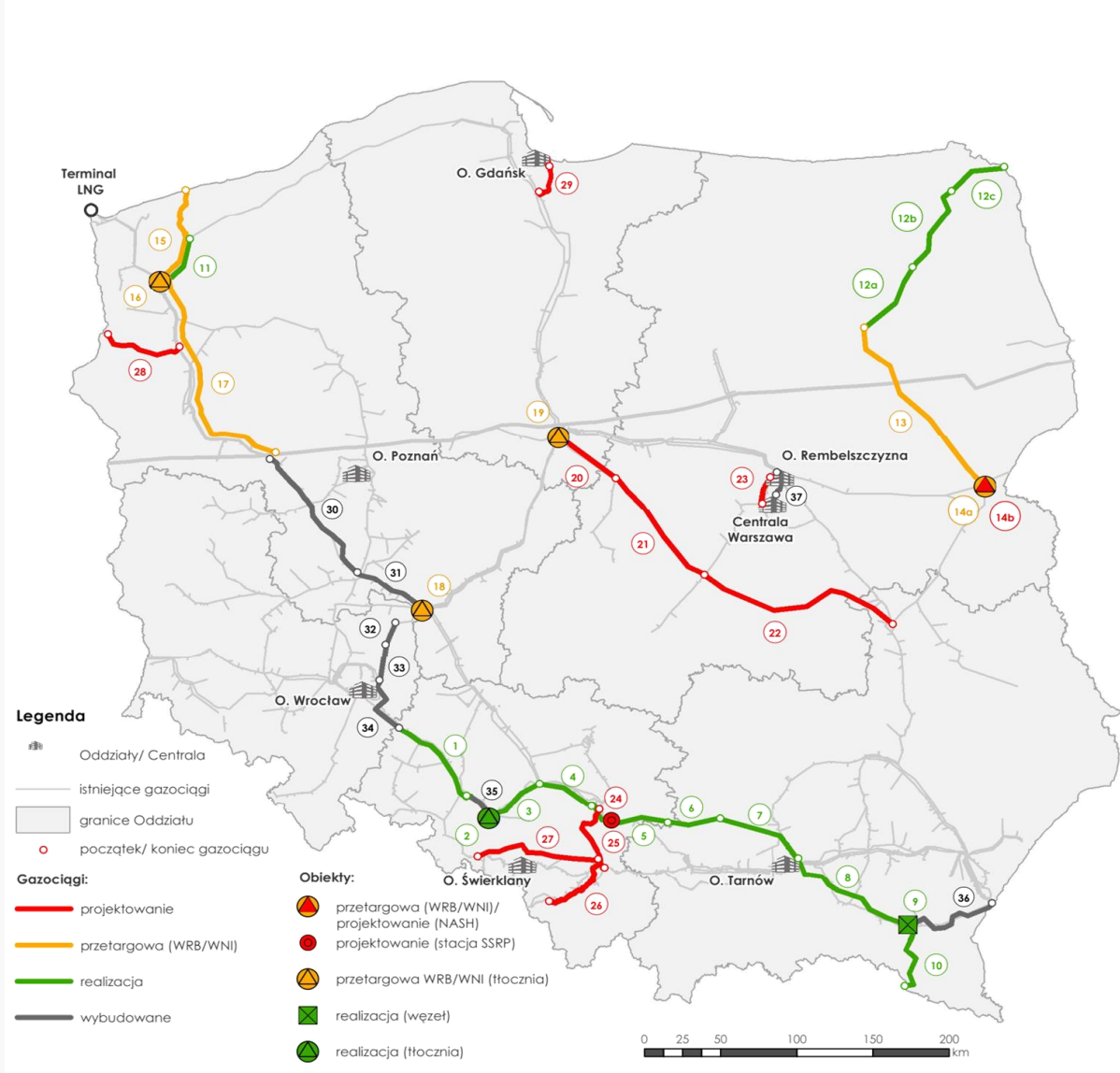
Obszar działania Polskiej Spółki Gazownictwa



Legenda

- Gazociągi w/c OGP Gaz-System
- Gazociągi w/c p/c PSG sp. z o.o.
- Gazociągi w/c PGNiG
- Obszary, na których PSG świadczy usługę dystrybucji

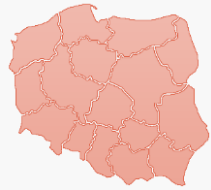
UPDATE OF THE INVESTMENT STRATEGY





**MARKET
STRATEGY
QUESTIONNAIRE**

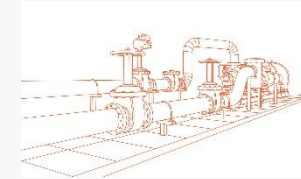
TEN-YEAR NATIONAL DEVELOPMENT PLAN



NATIONAL

10

TEN-YEAR



PLAN

The obligation to prepare a development plan with regard to meeting the current and future demand for gaseous fuels arises from the provisions of Article 16 (1) of the Energy Law

The Plan is based on:

- ▶ Documents related to the Energy Policy
- ▶ The concept of spatial development of the country
- ▶ Gas demand forecast
- ▶ GAZ-SYSTEM Investment Plan for 2019-2021
- ▶ Assessments, concepts and current data on the company's business



Modele finansowe


- Model węgiel-gaz prosty
- Ankieta
- Rejestracja



REGISTRATION



Rejestracja

Imię	<input type="text"/>	<input type="checkbox"/> Zgoda 1
Nazwisko	<input type="text"/>	<input type="checkbox"/> Zgoda 2
Nazwa organizacji	<input type="text"/>	<input type="checkbox"/> Zgoda 3
Miejscowość	<input type="text"/>	
Poczta	<input type="text"/>	Przepisz symbole: <input type="text"/>
Kod pocztowy	<input type="text"/>	<input type="button" value="Zarejestruj"/>
Ulica	<input type="text"/>	<input type="button" value="Rezygnuj"/>
Numer	<input type="text"/>	
Nr telefonu	<input type="text"/>	
NIP	<input type="text"/>	
REGON	<input type="text"/>	
Adres e-mail	<input type="text"/>	
Gaz do produkcji	<input type="text" value="Ciepło CO/CWU"/>	

- ▶ Register your organisation
- ▶ Enter the necessary contact information
- ▶ Confirm the necessary approvals
- ▶ Answer the e-mail / Confirm your participation

ANALIZY.GAZ-SYSTEM.PL

Dodaj źródło (przedsiębiorstwa energetyczne) lub zakład produkcyjny (przemysł)

Eksport xls

Organizacja

GAZ-SYSTEM

Edytuj źródło

Dodaj układ wytwórczy lub instalację przem. w podanym źródle

Usuń źródło

Źródło: Nowe CCGT

Miejscowość: WARSZAWA
Pocztą: WARSZAWA
Kod pocztowy: 00-370
Ulica: Mszczonowska
Numer: 1

Edytuj układ wytwórczy

Usuń układ wytwórczy

Układ wytwórczy: CCGT 200MW

Miejscowość: WARSZAWA
Pocztą: WARSZAWA
Kod pocztowy: 00-370

- ▶ Upon signing in, you will see your organization
- ▶ Create a source enter the necessary technical information
- ▶ Create a generation system operating in the source

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Układ wytwórczy w źródle: Nowe CCGT

Źródło	Nowe CCGT	
Nazwa układu wytwórczego	CCGT 200MW	
Miejscowość	WARSZAWA	
Poczta	WARSZAWA	
Kod pocztowy	00-370	
Ulica	Mszczonowska	
Numer	1	
Jaką funkcję pełni dany układ wytwórczy/instalacja	Produkcja ciepła i energii el. w kogeneracji	
Moc zainstalowana MW _e	200	
Moc zainstalowana MW _t	150	
Produkcja energii elektrycznej [PJ] w roku:	2020	40 000
Produkcja energii elektrycznej [PJ] w roku:	2021	40 000
Produkcja energii elektrycznej [PJ] w roku:	2022	40 000
Produkcja energii cieplnej [PJ] w roku:	2020	20 000
Produkcja energii cieplnej [PJ] w roku:	2021	20 000
Produkcja energii cieplnej [PJ] w roku:	2022	20 000
Czy układ wytwórczy jest zasilany gazem ziemnym	Tak	

- ▶ Capacities
- ▶ Generation of heat and/or electricity
- ▶ Type of fuel used

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Rok	Roczne zużycie gazu [kWh]	Roczna prognoza zużycia gazu Moc zamówiona [kWh]
2020	0	0
2021	0	0
2022	0	0
2023	0	0
2024	0	0
2025	0	0
2026	0	0
2027	0	0
2028	0	0
2029	0	0

Zapisz ↻ Rezygnuj ↻

- ▶ Gas consumption forecasts
- ▶ Ordered capacity

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Dane do modelu podstawowego

Moc cieplna w podstawie	<input type="text" value="20,00"/>	MWt
Odległość od gazociągu	<input type="text" value="10,00"/>	km
Opis	<input type="text"/>	

Założenia do obliczeń

	Wartość założona	Wartość nadpisana	
Dyspozycyjność źródeł w ciągu roku	7 500	<input type="text"/>	h
Wartość opałow gazu ziemnego	50,00	<input type="text"/>	MJ/kg
Cena gazu ziemnego	30,00	<input type="text"/>	PLN/GJ
Wartość opałow węgla kamiennego	25,93	<input type="text"/>	MJ/kg
Cena węgla kamiennego	10,41	<input type="text"/>	PLN/GJ
Zawartość popiołu w węglu	0,16	<input type="text"/>	kg/kg
Nakłady na inwestycje dostosowujące źródło węglowe do wymagań środowiskowych	15 000 000	<input type="text"/>	PLN
Koszt energii elektrycznej	225,00	<input type="text"/>	PLN/MWh

Wyniki dla modelu podstawowego

3 nowe silniki gazowe na gaz ziemny

Istniejący kocioł węglowy

Cena ciepła	25,045	31,384	PLN/GJ
Jednostkowa emisja CO2	0,142	0,116	Mg/GJ
Jednostkowy koszt CO2	15,262	12,465	PLN/GJ
Wyprodukowana energia elektryczna	188 697		MWh/rok
Przychód ze sprzedaży energii elektrycznej	42,46		min PLN/rok



**CUSTOMER
QUESTIONNAIRE
STRATEGY**

Thank you for your attention



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marek.elert@gaz-system.pl

tel: 885890553



THANK YOU FOR YOUR ATTENTION

