SAMORZĄD
WOJEWÓDZTWA POMORSKIEGO

SELF-GOVERNMENT
OF POMORSKIE VOIVODESHIP

Pomorskie

Energy sector report and services in Pomorskie Voivodeship with development of technology perspectives

WHERE WE ARE, WHERE WE ARE GOING TO, HOW WE COULD IMPROVE OUR EFFECTIVENESS

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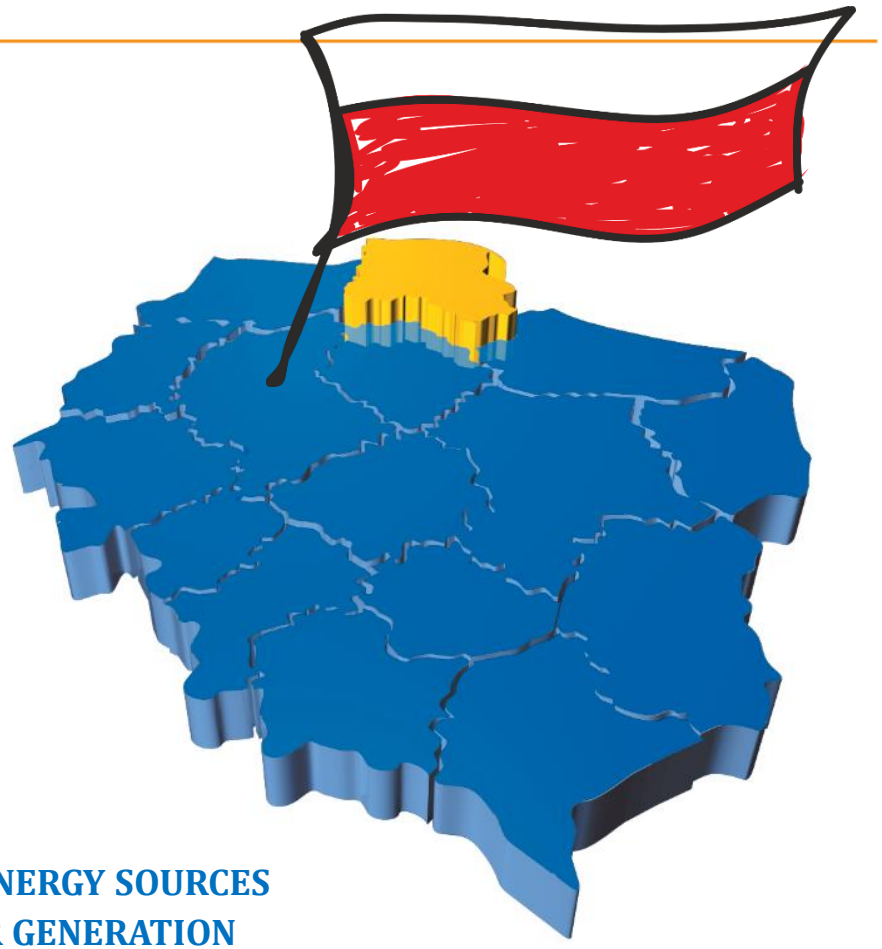
- ✓ Region with high importance for Poland mainly because of access to the Baltic Sea, reloading infrastructure and ports. Very significant potenctial as the tourist region as well renewable energy sources point of view.
- ✓ Energy projects should be base on long term activities. Pomorskie Voivodeship has clearly defined direction of development in energy sector.



ENERGY SECTOR IS STRICTLY CONNECTED WITH ECONOMIC DEVELOPMENT. WE UNDERSTAND NECESSITY OF CARRYING ABOUT ENVIRONMENT AND DECREASE OF USE THE NATURAL ENERGY RESOURCES. THE EUROPEAN STRATEGY BASED ON RENEWABLE ENERGY SOURCES ARE THE MOST REASONABLE.

ENERGY GOALS

DECREASE OF USE THE NATURAL ENERGY SOURCES

INCREASE THE „GREEN" POWER GENERATION

INCREASE USE THE RENEWABLE ENERGY SOURCES – POTENTIAL FOR POLAND !!!

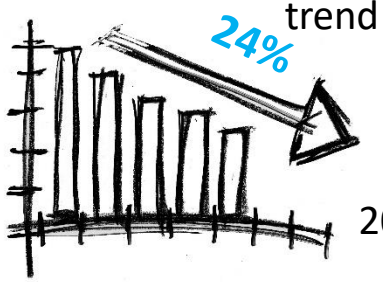
DEVELOPMENT OF DISTRICT HEATING

THERMO RECONSTRUCTION OF BUILDINGS

Bloomberg New Energy Finance (BNEF) presented the avarage costs of energy production for renewable energy sources.

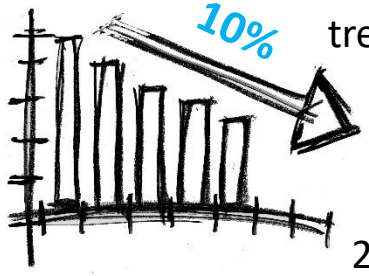
Wind Energy Offshore

trend of avarage energy production cost



2018 2019 (100 USD/MWh)

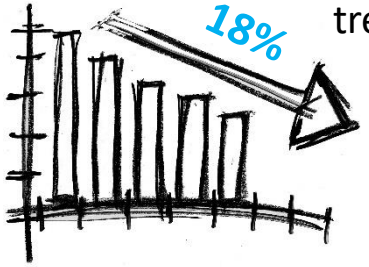
Wind Energy Onshore



trend of avarage energy production cost

2018 2019 r. (50 USD/MWh)

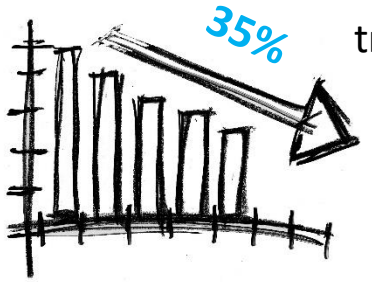
PV



trend of avarage energy production cost

2018 2019 (57 USD/MWh)

Energy storage

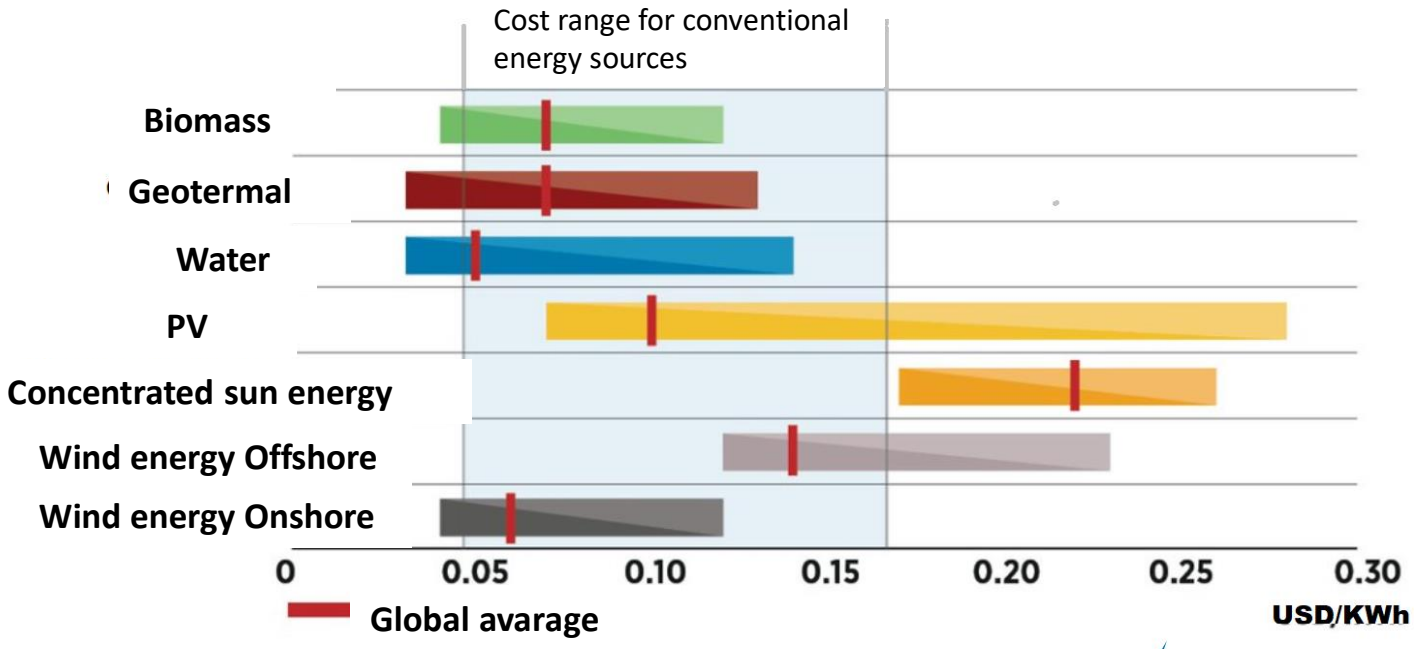


trend of avarage energy production cost

2018 2019 (187 USD/MWh)

„Green" Hydrogen production

Avarage cost of „green" and „black" electrical energy



IRENA
International Renewable Energy Agency

wysokienapiecie.pl

The more of renewable energy the cheaper

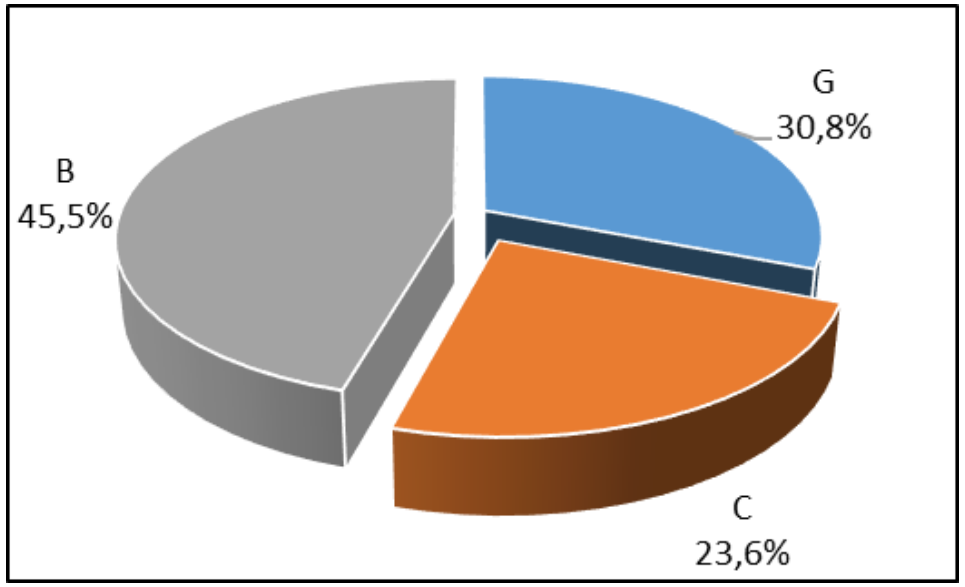
According International Renewable Energy Agency (IRENA), in 2010-2020 every doubling of installed renewable power decrease the energy production cost:

- ✓ 14 % in case of wind energy offshore,
- ✓ 21 % - wind energy onshore,
- ✓ 35 % - PV.

Coal will be not cheaper

In perpective of 3 years renewable energy could produce cheaper energy than coal power plants.

- ✓ The consumption of electrical energy in pomorskie voivodeship in 2017 was 8,75 TWh
- ✓ Every year demand for electrical energy increase by 2%
- ✓ Only households in cities are the area where demand decrease (in 2017 about 4% in comparison to the previous year)
- ✓ Pomorskie voivodeship is not self-sufficient in production of electrical energy – produce only 52% of the own demand - are going to increase of electrical energy production
- ✓ **53% of electrical energy is generate from renewables energy sources** – primarily the wind energy



Our strenght points are very good conditions for development of renewable energy sources and distributed generation of power

Weaknesses includes high level of share the conventional energy sources based on coal and to slow improvement of energy effectiveness.

G - households
C – smal and middle businesses
B – large companies

Electrical energy consumption (2017) - ENERGA-Operator and ENEA-Operator data.

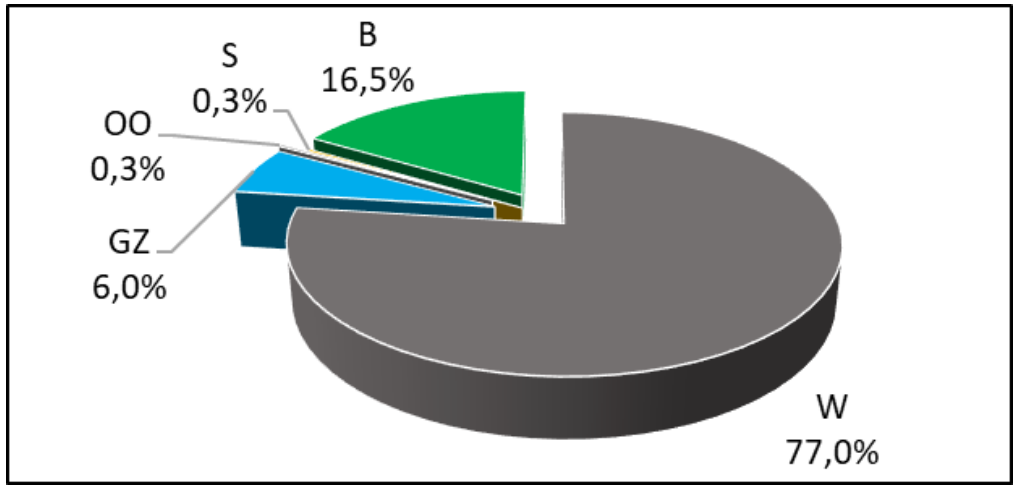
Conventional energy sources

Conventional heat and power plants:

- ✓ PGE Energia Ciepła S.A. Oddział Wybrzeże EC II w Gdańsku
- ✓ PGE Energia Ciepła S.A. Oddział Wybrzeże EC III w Gdyni
- ✓ LOTOS w Gdańsku
- ✓ Energobaltic we Władysławowie (gas from oil rig)
- ✓ Nanice w Wejherowie (kogeneracja gazowa)
- ✓ Starogard w Starogardzie Gdańskim

Heat and power plants based on renewable energy sources:

- ✓ International Paper w Kwidzynie (based in 60% on renewable)
- ✓ MPEC Lębork
- ✓ Malteurope w Gdańsku (Organic Rankine Cycle heat and power plant based on wooden chips)



Share of fuel in electrical energy generation i heat and power plants of pomorskie voivodeship

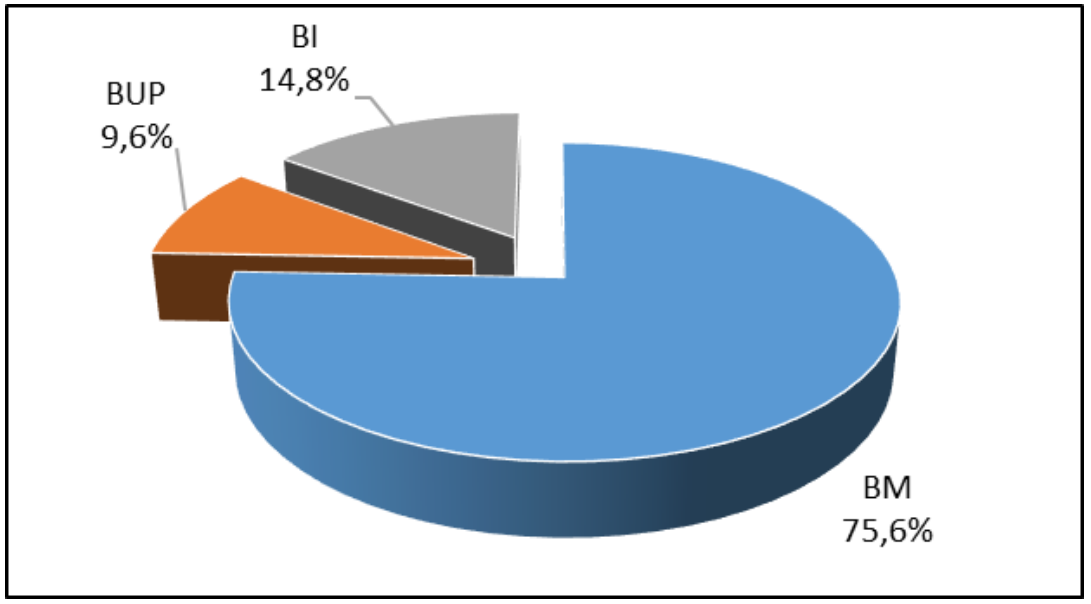
W - coal, GZ – natural gas, OO – heating oil, OOL - heating oil (light), OOC – heating oil (heavy), LPG – liquid gas, B – biomass

Pumped hydroelectric energy storage Żarnowiec in Czymanowo (716 MW of generation) – is connected to power system.

The main reason of high level of coal in power generation are heat and power plants in Tricity.

DEMAND FOR THERMAL POWER IN POMORSKIE VOIVODESHIP

- ✓ Total demand for thermal power equals more that 8 000 MWt (households)
- ✓ More than 61% of thermal power is generated from coal, 15% from natural gas and 13% from biomass
- ✓ 50% of inhabitants (71% from cities) use natural gas – increasing of new connections 3% every year
- ✓ There are visible results the thermo reconstruction of buildings – decreasing demand for thermal power and the same time increasing the quantity of new connections to the district heating systems
- ✓ District heating is fulfilling the needs for thermal power in about 40%.

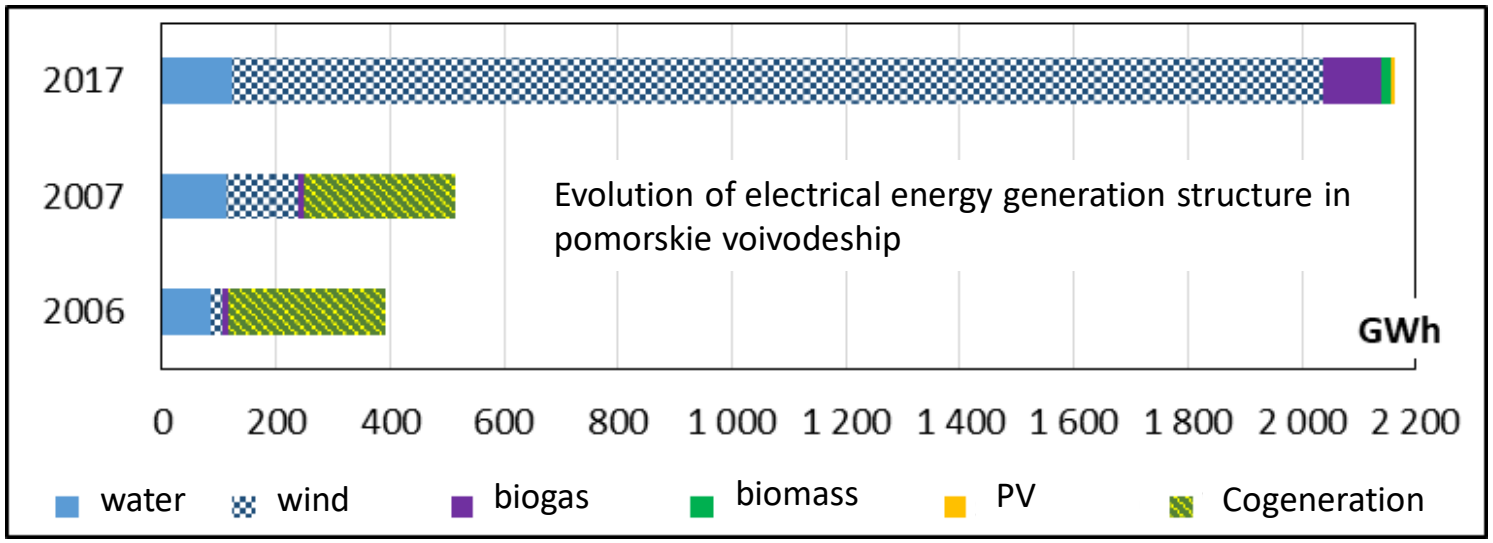


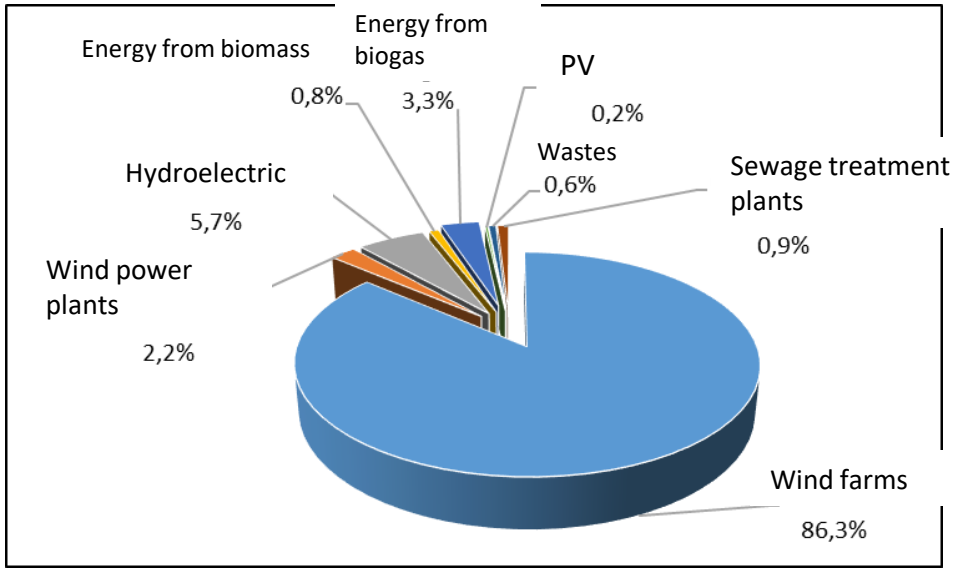
Production of thermal power in cities and towns is based on burning of the coal and this is the main source of smog – the change of it will be our challange.

Demand for thermal power
Source: BAPE

BUP – public buildings
BM – house buildings
BI – others (trade, services, industry)

ELECTRICAL ENERGY STRUCTURE OF PRODUCTION– RENEWABLE ENERGY SOURCES





Renewable electrical energy sources in 2017

Production of electrical energy from renewable energy sources in pomorskie voivodeship:

- ✓ **41 wind farms and 36 of separate wind turbines with total power** about 815 MW (increase about 655 MW from 2009)
- ✓ **87 hydro-electric power stations with total power about** 32 MW (includes about 31 power stations connected to the national grid)
- ✓ **9 biogas plants** (10 MWe)
- ✓ **10 biogas plants based on sewage treatment plants and waste storages (5,3 MWe)**
- ✓ **Photovoltaic farms** (2 MW), included the biggest one on the border of Gdańsk and Przejazdowo with total power 1,64 MW
- ✓ Many micro (mostly) PV plants with total power about 10 MW

The most increase and the main source of electrical energy in pomorskie voivodeship is wind energy. There is also stable role of hydroelectric power sources and increase power generation from biogas.

There are special and very good conditions for install the wind power plants in pomorskie voivodeship. Productivity in the best locations is reaching 30%. It is very good result.

Lp.	Place of connection	Power	Connection time according to agreement
	Onshore	MW	
1	Słupsk Wierzbięcin	240,00	31.01.16
2	Żarnowiec	90,00	30.03.16
3	Słupsk Wierzbięcin	100,00	31.10.16
4	Pelplin	107,43	30.01.16
5	Słupsk Wierzbięcin	319,75	31.12.19
6	Słupsk Wierzbięcin	239,50	31.03.19
7	Żarnowiec	111,00	31.12.19
8	Żarnowiec	145,00	03.07.23
9	Gdańsk Błonia	132,00	03.05.19
	Total	1 484,68	
	Offshore		
1	Słupsk Wierzbięcin	1 200,00	27.09.26
2	Żarnowiec	1 045,50	31.12.26
	Total	2 245,50	

Wind farms with valid connection agreement (31st July 2018)

Productivity = 2 800 MWh/MW (approx. 30%)

Installed wind power on-shore (2017): 815,9 MW

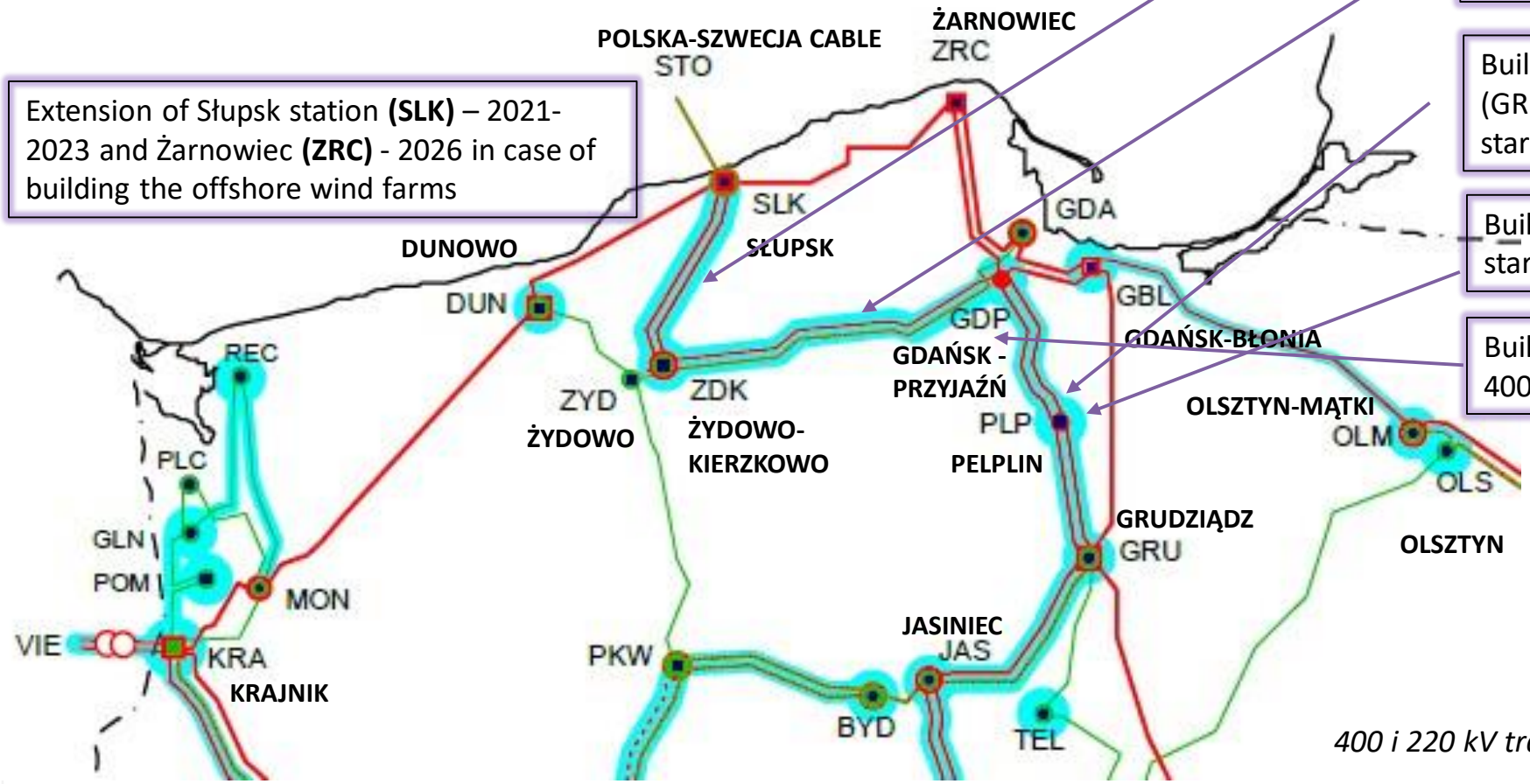
Potencial on-shore: 1 485 MW (connection agreements)
Potencial off-shore : 2 245 MW (planning)

Development of wind energy in pomorskie voivodeship effectively stopped new law („anti-wind”) from 2016 .

Investment projects for years 2018-2027 - Polskie Sieci Elektroenergetyczne SA

- ✓ Improvement of technical conditions for electrical energy transmission between pomorskie voivodeship and southern Poland.
- ✓ Preparing for dustribution of energy from offshore wind farms

Extension of Słupsk station **(SLK)** – 2021-2023 and Żarnowiec **(ZRC)** - 2026 in case of building the offshore wind farms



Building of 400 kV line – Żydowo-Kierzkowo (ZDK) – Słupsk (SLK) – start-up 2019

Building of 400 kV line – Gdańsk-Przyjaźń (GDP) – Żydowo-Kierzkowo (ZDK) – start-up 2019

Building of 400 kV line – Grudziądz Węgrowo (GRU)-Pelplin (PLP) – Gdańsk-Przyjaźń (GDP) – start-up 2019

Building of Pelplin station (PLP) 220/110 kV - - start-up 2019

Building of Gdańsk-Przyjaźń station (GDP) 400/110 kV – start-up 2019

400 i 220 kV transmission lines– investments till 2022

Yearly demand for heat in households equal **65 200 TJ**

BIOMASS – YEARLY TECHNICAL POTENCIAL (42 785 TJ/)

- ✓ firewood from forest – 2 940 TJ/y
- ✓ wood processing wastes – 2 430 TJ/y
- ✓ another wooden wastes - 135 TJ/y
- ✓ straw and hay – 31 000 TJ/y
- ✓ energy plants – 6 280 TJ/y

BIOGASS – YEARLY TECHNICAL POTENCTIAL (3 729 TJ)

- ✓ animal farms – 1 850 TJ/y
- ✓ biodegradable wastes – 1 764 TJ/y
- ✓ stabilized sewage sediment – 115,2 TJ/y

Technical potential of biomass and biogas: 46 514 TJ/yearly

- (71% of demand for households)

There are nine biogas plants in pomorskie voivodeship. The first group is based on liquid manure as the substrate and the second one is based on agricultural mixed substrate. The last one has problem with profitability.

In pomorskie voivodeship are also biogas plants based on biodegradable municipal wastes (4 plants) and based on sewage treatment plant sediment (6 biogas plants)

From 2020 more than 205 000 tons of wastes should be develop in another way like storage. There is necessity to build the installation for thermal transform the municipal wastes. From the beginning of 2016, according to EU regulations storage wastes with thermal value more than 6 MJ/kg is prohibited.

The first installation for thermal transforming (burning) of municipal wastes will be build on the Zakład Utylizacyjny Gdańsk area as the Port of Clean Energy.

160 thousand tons of municipal wastes from 35 pomeranian communes

Electrical energy (18 MWe)

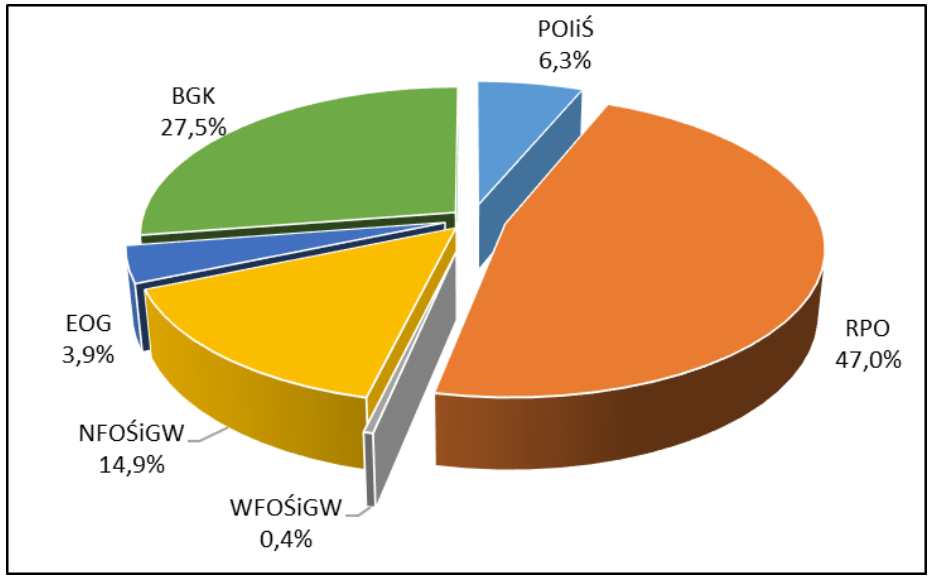
Heat (4 MWt)

Improvement of energy effectiveness is the priority activity in EU

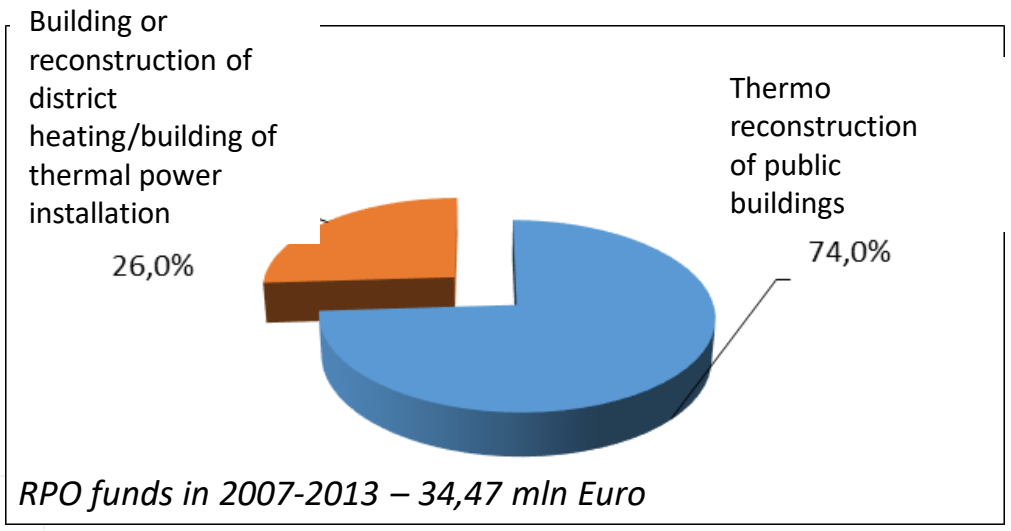
There are new goals in limits (saving) of power consumption :

- ✓ 32,5% till 2023
- ✓ Postpone untill 2030 duty of reaching **new** savings on the level of 1,5% yearly in comparison to yearly sales of energy to consumers.

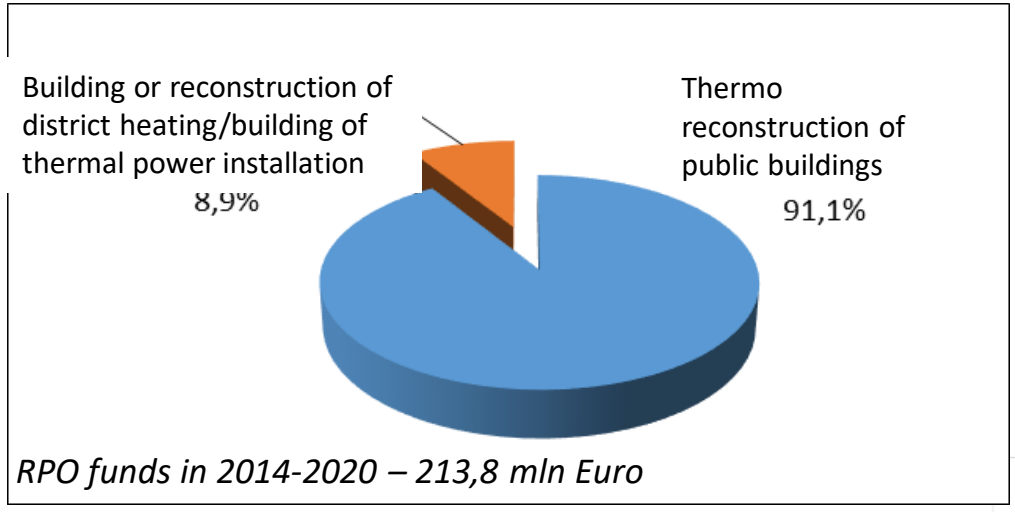
Avarage savings between 5% and 50 % depends on the building conditions as well scope of works.



Savings of energy vs source of funding



RPO funds in 2007-2013 – 34,47 mln Euro



RPO funds in 2014-2020 – 213,8 mln Euro

Thank you for your attention