THE ROLE OF BIOGAS AND BIOMETHANE PLANTS IN BIO-WASTE MANAGEMENT IN POLAND - BARRIERS TO THE DEVELOPMENT OF THE SECTOR

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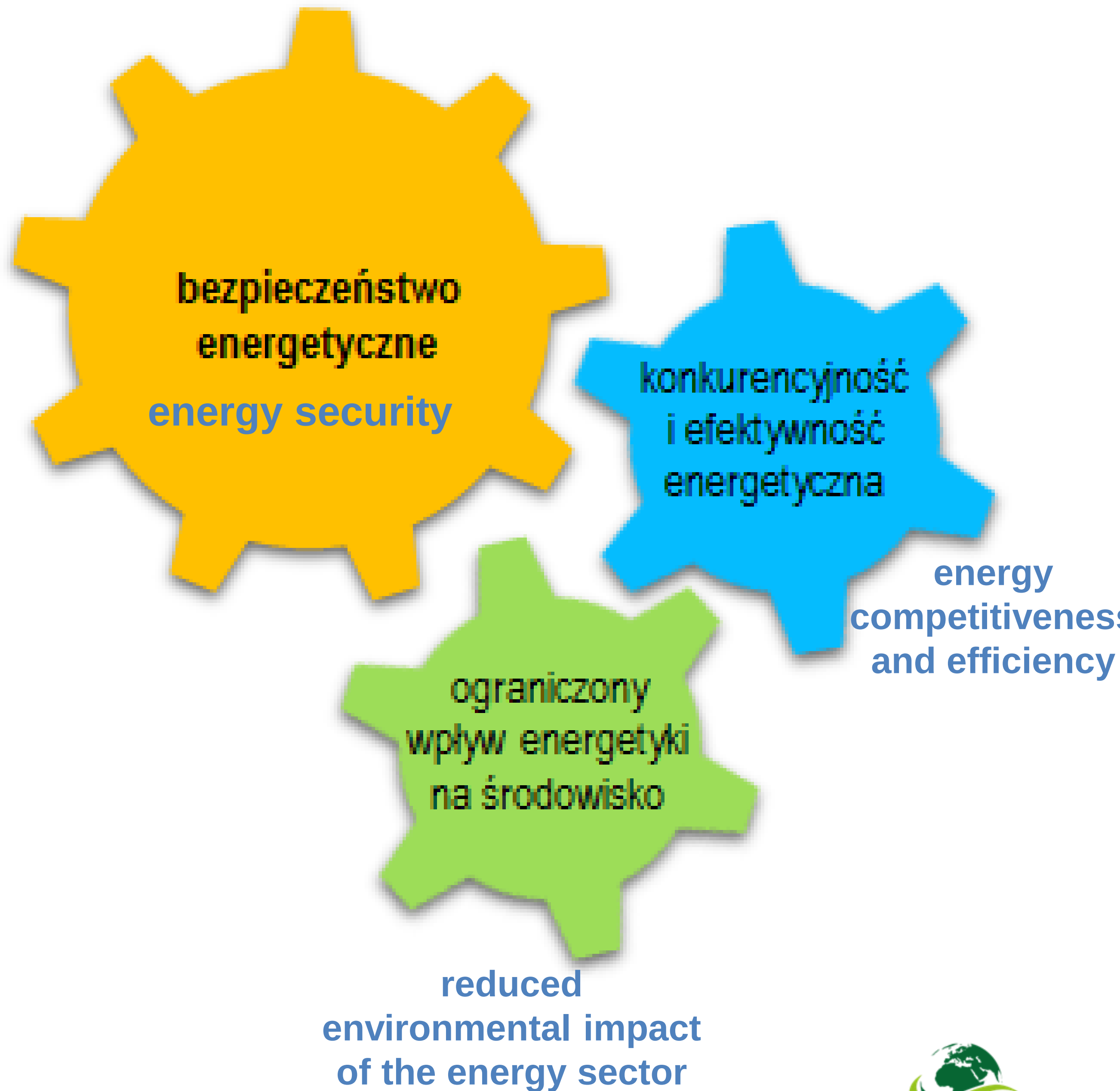
State energy policy objectives*

The objective of the state energy policy is
energy security,
while ensuring **competitiveness of the economy,** energy efficiency and **reducing the environmental impact of the energy sector**,
with the optimum use of own energy resources.



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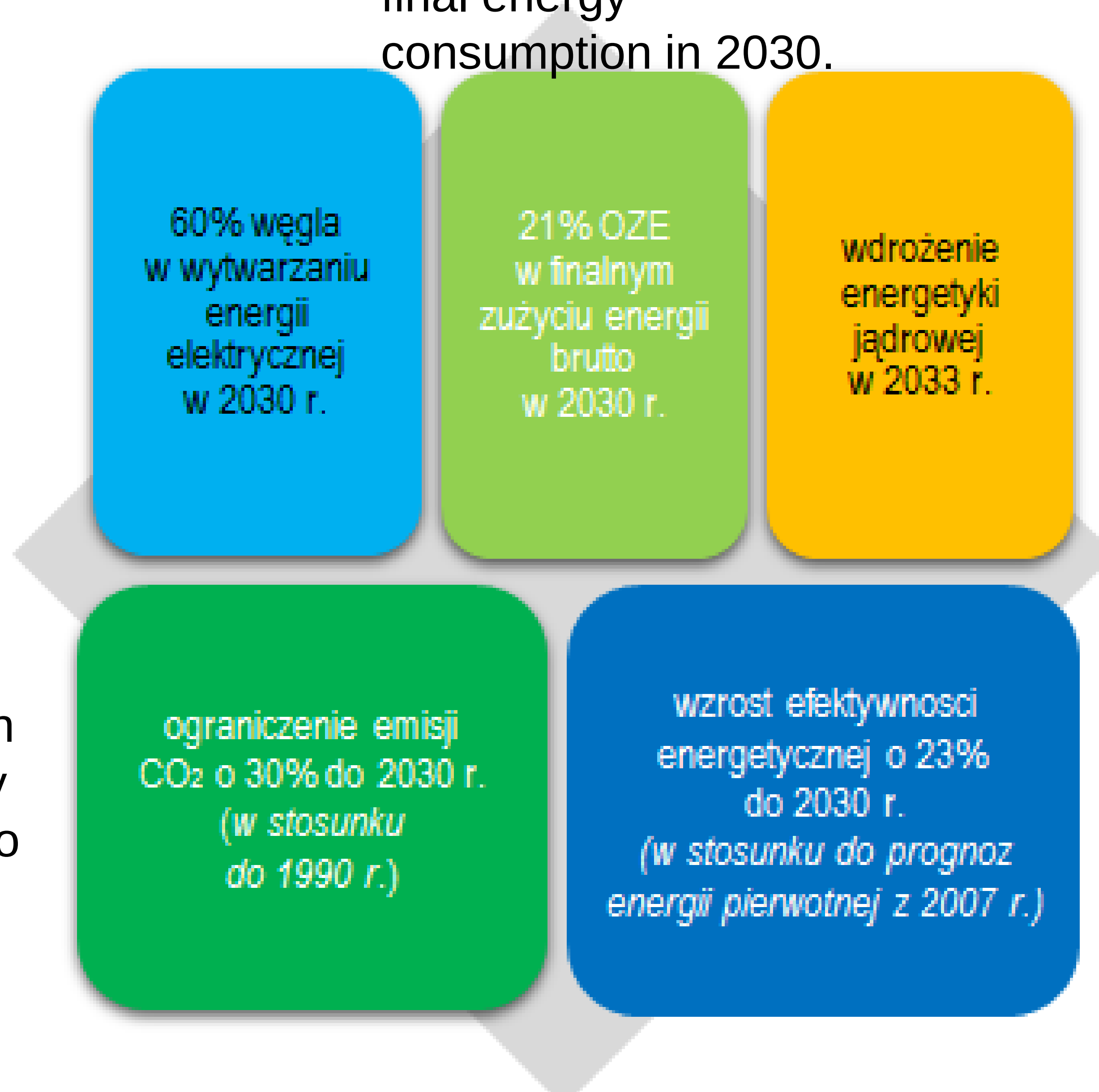
*Source: PEP2040 Project v.1.2

INDICATORS FOR ACHIEVING THE PEP TARGET*

21% RES in gross final energy consumption in 2030.

60% coal in electricity generation in 2030.

implementation of nuclear power in 2033.



a 30% reduction in CO_2 emissions by 2030 (compared to 1990)

a 23% increase in energy efficiency by 2030 (relative to 2007 primary energy projections)

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*Source: PEP2040 Project v.1.2

THE POTENTIAL OF BIO-WASTE IN POLAND

According to the amount of available biomass and organic waste available to biogas plants are:

- approx. **90 million t** of manure, slurry and poultry manure
- **8 million t** of straw, cereals and rapeseed (out of 30 million t)
- **4 million t** of maize straw;
- waste plant biomass (e.g. from protected areas, nature reserves, etc.);
- **waste from food processing, sugar factories, abattoirs, slaughterhouses, dairies, distilleries, etc;**
- **refood**, i.e. out-of-date and spoiled food.

At the Ecotechnology IIB Laboratory of the Poznan University of Technology, the production potential calculated on the above basis is 13.5 bcm of biogas (7.8 bcm of biomethane), - 3640 MW of electrical power (more than 30.5 TWh of electrical energy per year), - 3185 MW of thermal power (over 96 000 TJ of heat annually).

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THE POTENTIAL OF BIO-WASTE IN POLAND

MUNICIPAL WASTE

In the volume of approx. **15 million tonnes of municipal waste** we generate annually in Poland, over **30%** is bio-waste - is a mass of **5 million tonnes** (where **4 million tonnes** is **mixed waste**! and only 1 million tonnes is **bio-degradable waste**)

RAW MATERIAL USE IN POLAND AGRICULTURAL BIOGAS

LP.	Type of raw material	Amount (in tonnes)
1	Distillery	920 995,247
2	Slurry	759 773,954
3	Fruit and vegetable residues	706 944,922
4	Corn silage	491 869,598
5	Food processing waste	344 329,140
6	Technological sludge from the agri-food industry	227 148,226
7	Beet pulp	209 815,865
8	Waste from the dairy industry	132 910,511
9	Expired food	117 184,169
10	Manure	91 681,445
11	Slaughterhouse waste	85 776,821
12	Fruits and vegetables	45 925,628
13	Green fodder	43 691,158
14	Waste plant mass	42 247,298
15	Bird litter	27 531,751
16	Grass and grain silage	26 708,233
17	Fats	25 580,422
18	Sludge from the processing of plant products	21 089,638
19	Feedstuff	20 066,290
20	Cereal, grain waste	18 970,565
21	Waste from vegetable oil production	12 231,831
22	Stomach contents	11 347,706
23	Straw	7 752,650
24	Vegetable oils	3 891,139
25	Fat deposits	3 461,990
26	Protein and fat waste	3 035,680
27	Ferment	1 600,000
28	Catering waste	1 528,372
29	Washings	1 214,550
30	Liquid wheat scraps	1 100,569
31	Protein and fat sludge	802,760
32	Glycerine	414,590
33	Fusel oils	247,840
34	A mixture of lecithin and soaps	181,160
35	Coffee	3,180
	SUM :	4 409 054,898

Source: KOWR

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PEP2040 DIRECTIONS: OPTIMAL USE OF OWN ENERGY RESOURCES

- *Demand for natural gas will increase due to its ability to be used in regulating power plants and its lower carbon footprint compared to other fossil fuels. Domestic natural gas production covers about 25% of the demand of almost 17 bcm. (...) In addition to traditional natural gas extraction, the development of unconventional extraction methods is expected.*
- ***It is crucial for the energy sector to use those biomass fractions that have no use in other sectors of the economy, i.e. mainly waste and residues from forestry and the agro-food industry. This is to eliminate the competition of raw materials between the energy sector and the agriculture, agri-food and processing industries (...). Biomass should be used at the shortest possible distance from generation so that its transport does not adversely affect the environmental effect.***
- *The energy use of non-agricultural waste should be increased. The greatest potential is in sewage sludge, industrial waste defined by law as hazardous (including hospital waste) and municipal waste. (...) Waste should be used as close to its origin as possible.*

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Source: PEP2040 Project v.1.2

PEP2040 DIRECTIONS: DIVERSIFICATION OF FUEL SUPPLY AND DEVELOPMENT OF GRID INFRASTRUCTURE

- *Currently, Poland is **58% gasified**; the goal for 2022 is to provide access to gas in 61% of municipalities. Particular emphasis has been placed on eliminating so-called 'white spots' - places without access to the resource. In the longer term, the distribution network will be expanded and upgraded in line with market needs. (...) Local access to gas makes it possible to use it as a reserve for renewable energy sources, while at the same time the use of gas and/or renewable energy sources - as low-emission heat sources - provides an alternative to individual boilers using low-quality solid fuels where access to the district heating network is not possible.*
- *Independence from single-direction supply can also be achieved by not increasing demand for this fuel, which will be influenced by the development of the market for alternative fuels, i.e. **increasing the use of natural gas in the form of LNG, LPG, CNG** (compressed natural gas), hydrogen, synthetic fuels or electricity in transport. Biofuels can also serve a certain area of the market.*

BIOMETHANE??

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Source: PEP2040 Project v.1.2

PEP2040 DIRECTIONS: DEVELOPMENT OF RENEWABLE ENERGY SOURCES

- *The share of RES in heating and cooling will increase by about 1-1.3 percentage points per year. The use of RES in this subsector will contribute to RES generation:*
  - *biogas energy - the use of biogas will be particularly useful in the cogeneration of electricity and heat. An advantage is the possibility to store energy in biogas, which can be used for regulation purposes. From an economy-wide perspective, the use of biogas offers additional added value, as it makes it possible to manage particularly troublesome waste (e.g. animal waste, landfill gas)*
- *The use of RES in electricity generation will contribute to an increase in the share of:*
  - ***biomass and biogas energy - their potential will be used primarily for heating, but part of the resources will also be directed to electricity generation, especially in cogeneration. The advantage of biogas is that it can be used for regulation purposes, which is particularly important for the flexibility of NPS operation***

BIOMETHANE??

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Source: PEP2040 Project v.1.2

FORECAST STRUCTURE OF NET INSTALLED CAPACITY BY TECHNOLOGY TO 2040. [MW]

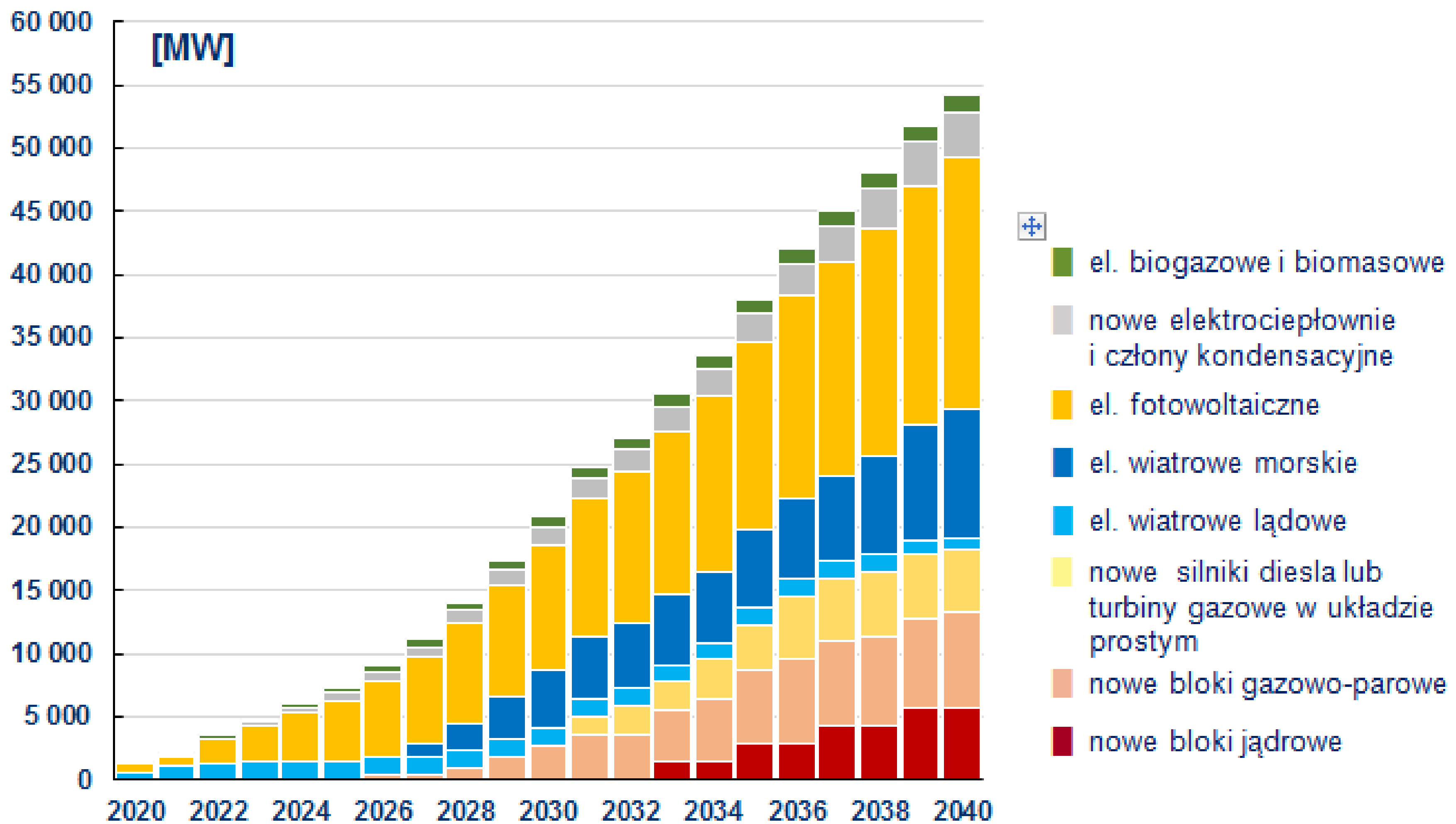
	2020	2025	2030	2035	2040
lignite power plants	7 400	7 600	7 600	3 800	1 500
hard coal power plants – existing	12 700	11 100	9 300	5 400	3 100
hard coal power plants – planned and under construction	2 500	3 400	3 400	3 400	3 400
hard coal thermal power stations	5 450	5 210	5 130	5 010	5 485
nuclear power plants	0	0	0	2 800	5 600
natural gas power plants	1 500	2 000	4 700	7 900	9 700
combined heat and power plants fired with natural gas	1 350	1 520	2 200	2 330	2 745
photovoltaic power plants	900	5 200	10 200	15 200	20 200
onshore wind farms	6 400	7 000	6 000	2 100	800
offshore wind farms	0	0	4 600	6 100	10 300
other RES power plants (biomass, biogas, hydroelectric)	**3 400**	**3 800**	**4 100**	**4 300**	**4 300**
other thermal power plants	400	470	470	460	470
backup power plants (OCGT*/diesel)	0	0	0	3 600	5 000
Total	42 000	47 300	57 700	62 400	72 600

* OCGT – *open cycle gas turbines*

BIOMETHANE ???

Source: PEP2040 Project v.1.2

FORECAST INCREASE IN INSTALLED CAPACITY BY 2040 BY TECHNOLOGY [MW]



- biogas and biomass power plants
- new combined heat and power plants and condensing units
- photovoltaic power plants
- offshore wind power plants
- onshore wind power plants
- new diesel or straight gas turbine engines
- new gas/steam units
- new nuclear units

DESPITE 100 MILLION TONNES OF BIO-WASTE PER YEAR PEP2040 DOES NOT FORESEE THE DEVELOPMENT OF BIOGAS/BIOMETHANE

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Source: PEP2040 Project v.1.2

DIRECTIVE RED II

- On 24 December 2018, the DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL (EU) 2018/2001 of 11 December 2018 on the promotion of the use of energy from renewable sources, commonly referred to as the RED II Directive, entered into force.
- The implementation of RED II aims to meet the new EU target of increasing the share of renewable energy sources in the EU energy mix to at least 32% by 2030. **The 32% target will only be binding at the level of the entire European Union. Unlike the 2020 target under the first RES directive, it will not be made up of mandatory national targets. However, the adopted energy union governance rules are intended to ensure that individual countries gradually increase the share of renewable energy in their energy mixes**.
- Among other things, the new regulations will prevent retroactive changes to the support rules for renewable energy producers and reduce administrative barriers. Member States will have to ensure that citizens can generate their own renewable energy for their own needs, and will also be able to store and sell any surplus. For the smallest RES installations up to 10.8 kW, a simplified start-up procedure for energy production on the basis of a notification is to be applied.
- **The regulations for RES, which are enshrined in the RED II directive, also assume an increased role for second-generation biofuels. By 2030, at least 14% of transport fuels are to come from renewable sources, with first-generation biofuels with a high risk of 'indirect land use change' no longer counting towards the EU's renewable energy targets from 2030. From 2019 onwards, the share of first-generation biofuels in meeting these targets is to gradually decrease until it reaches zero in 2030.**

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DIRECTIVE RED II – SELECTED DEFINITIONS

- *‚biomass' means the biodegradable fraction of products, waste and residues from biological origin from agriculture, including vegetal and animal substances, from forestry and related industries, including fisheries and aquaculture, as well as the biodegradable fraction of waste, including industrial and municipal waste of biological origin;*
- *‚biogas' means gaseous fuels produced from biomass;*
- *‚biofuels' means liquid fuel for transport produced from biomass;*

- ***'advanced biofuels' means biofuels that are produced from the feedstock listed in Part A of Annex IX;***

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Source: Directive RED II

BARRIERS TO DEVELOPMENT - INSTITUTIONAL

Institutional barriers:

- *Lack of dedicated programmes to promote biogas and/or biomethane*
- *Lack of political interest in the potential of biogas and biomethane in the energy (balancing), district heating, transport system*
- *Bureaucratic approach, complicated and lengthy administrative procedures, unclear rules for interpretation of legislation*
- *Unstable and often unclear legal environment, many unpredictable factors (lack of stable rules also at the level of utilisation of EU regulations)*
- *Lack of inter-ministerial cooperation: climate, agriculture, energy, environment, waste management sectors in the development of biogas and biomethane use*
- *Lack of private sector participation and poor coordination of cooperation between public and private sectors (niche business)*

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BARRIERS TO DEVELOPMENT - TECHNICAL

Infrastructure problems:

- Limited access to the gas grid (seasonality, high connection costs, high parameters for feeding biomethane into the grid)
- Limited access to electricity grid connection, which conditions the installation.
- Underdeveloped market for NGVs and vehicle charging infrastructure,
- Lack of heat utilisation from biogas plants
- Lack of biomethane utilisation in the transport sector (no clear support in the implementation of NDC for bioCNG, bioLNG
- Lack of availability of technology supply in Poland (long delivery times for installations)
- Lack of servicing industry for installations and storage of spare parts (long time to remove failures)

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BARRIERS TO DEVELOPMENT - ADMINISTRATIVE, ENVIRONMENTAL

Environmental problems:

- Lengthy and cumbersome administrative procedures related to the implementation of the project
- Lack of adequate preparation and approach of officials to the specifics of installations, technologies and processes,
- Use of incorrect and non-uniform nomenclature
- Resistance and unwillingness of local communities expressed in protests against the construction of installations as part of issuing administrative decisions
- Lack of proper education and preparation of officials, lack of awareness among the local community, worn-out stereotypes about the nuisance of biogas installations
- Lack of inclusion of biogas and biomethane facilities in MPZP (Act on planning and spatial development (lack of consideration of biogas and biomethane plants in planning))

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BARRIERS TO DEVELOPMENT - ECONOMIC

Economic problems:

- High investment costs for biogas and biomethane plants,
- High costs for connection to the gas grid with the necessary infrastructure for gas analysis
- Lack of a support system for biomethane, OPEX and CAPEX
- Lack of preferential bank loans and lack of interest of banks in providing investment loans
- Long process of biomethane plant project preparation.
- Long time to wait for conditions for connection to the gas and electricity grid
- Long procedure for obtaining permits for the application of digestate to fields.
- Major problems in insuring the installation.
- Lack of a biomethane guarantee of origin system in Poland

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BARRIERS TO DEVELOPMENT – SUBSTRATE

Substrate problems:

- Lack of uniform regulations for the use of certain substrates in non-agricultural biogas plants - For biogas plants using substrates other than those intended for agricultural biogas plants, problems are indicated regarding the use of the biodegradable fraction of municipal waste
- Unclear interpretation of waste regulations and waste groups - Regulation of waste catalogue
- Difficult use of post-ferment as a fertiliser/soil improver - Procedures for the use of post-ferment as a soil improver are difficult, costly and time consuming.

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