Innovation Forum – Renewable Energies
German-Polish cooperation for Innovations and sustainable development
Poznań, POLEKO, 25 November 2009,

Status and perspectives of development of renewable power engineering in Poland, research priorities and possibilities of financing

Grzegorz Wiśniewski

Institute for Renewable Energy

gwisniewski@ieo.pl

Potential and possibilities of using renewable energy sources in Poland until 2020

Renewable energy resources:

Point of departure for plan of actions for RES until 2020 and further…

Real economical potential of renewable energy resources and state of its use for the year 2006

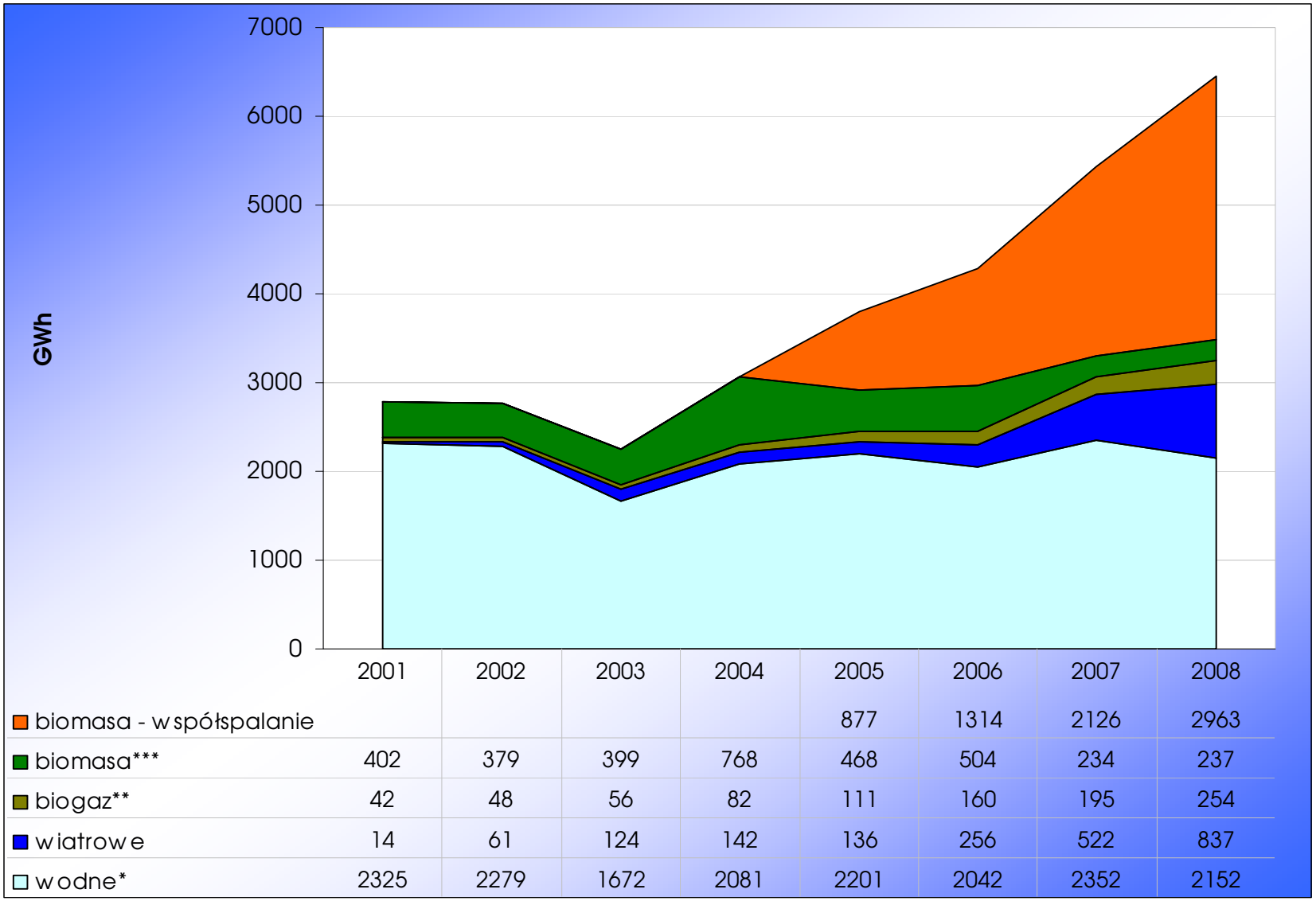
Potential of renewable energy resources	Real economical potential – final energy	State of using the economical potential for the year 2006	
Types of renewable energy resources	(TJ)	(TJ)	(%)
Solar power industry including:	**83 312,2**	**149,8**	**0,18%**
thermal, including:	83 152,9	149,6	0,18%
hot water preparation	36 491,9	149,6	0,41%
central heating	46 661,0	0,0	0,00%
photovoltaic	159,3	0,2	0,11%
Geothermal energy, including:	**12 367,0**	**1 535,0**	**12,4%**
deep	4 200,0	535,0	12,7%
shallow	8 167,0	1 000,0	12,2%
Biomass, including:	**600 167,8**	**192 097,0**	**32,0%**
solid dry waste	165 930,8	160 976,2	97,0%
biogas wet waste)	123 066,3	2 613,0	2,12%
fuel wood (forests)	24 451,8	24 451,8	100,0%
energy farming, including:	286 718,9	4 056,0	1,41%
cellulose	145 600,0	0,0	0,00%
sugar-starch-bioethanol	21 501,0	2 558,0	11,90%
rape-biodiesel	37 980,0	1 498,0	3,94%
corn silage-biogas	81 637,9	0,0	0,00%
Water power engineering	**17 974,4**	**7 351,2**	**40,90%**
Wind power engineering, inclufding:	**444 647,6**	**921,6**	**0,21%**
land	377 242,5	921,6	0,24%
sea	67 405,0	0,0	0,00%
Total:	**1 158 469**	**202 055**	**17,4%**

What have we achieved in the present decade until *2010*,

and what are the challenges for 2020?

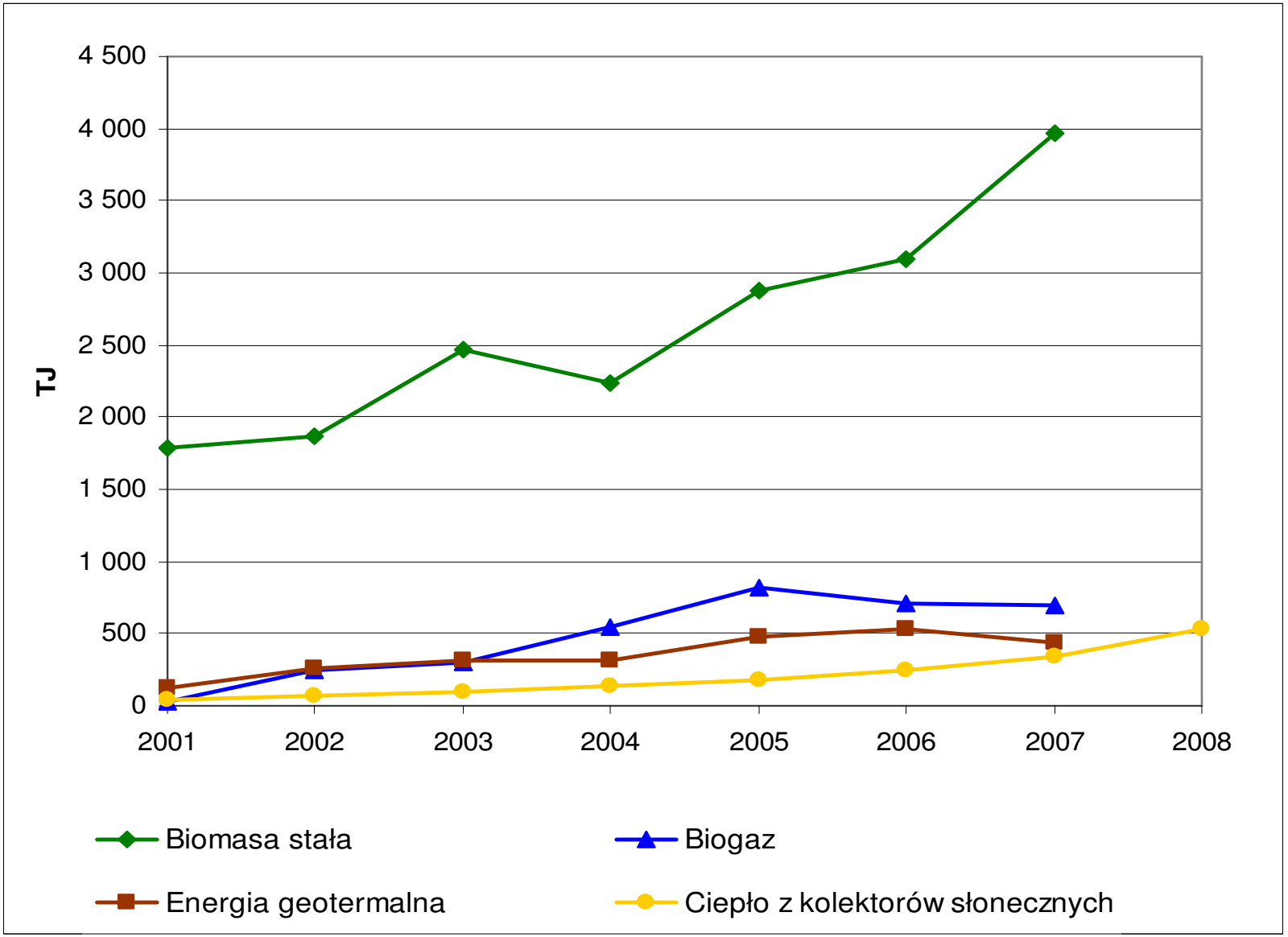
Development of green electric energy production in Poland

Source: GUS and ARE, IEO study

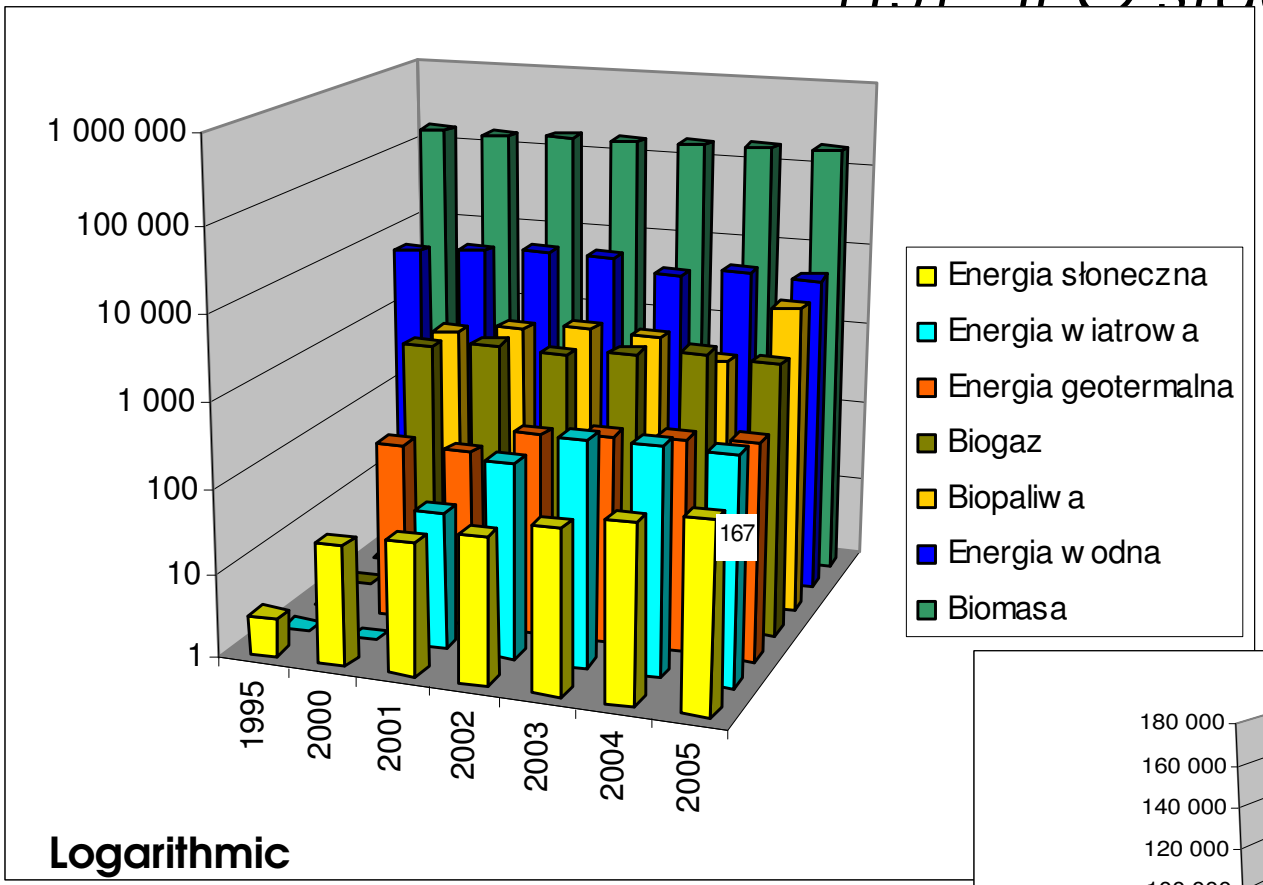


	2001	2002	2003	2004	2005	2006	2007	2008
biomasa - współspalanie					877	1314	2126	2963
biomasa***	402	379	399	768	468	504	234	237
biogaz**	42	48	56	82	111	160	195	254
wiatrowe	14	61	124	142	136	256	522	837
wodne*	2325	2279	1672	2081	2201	2042	2352	2152

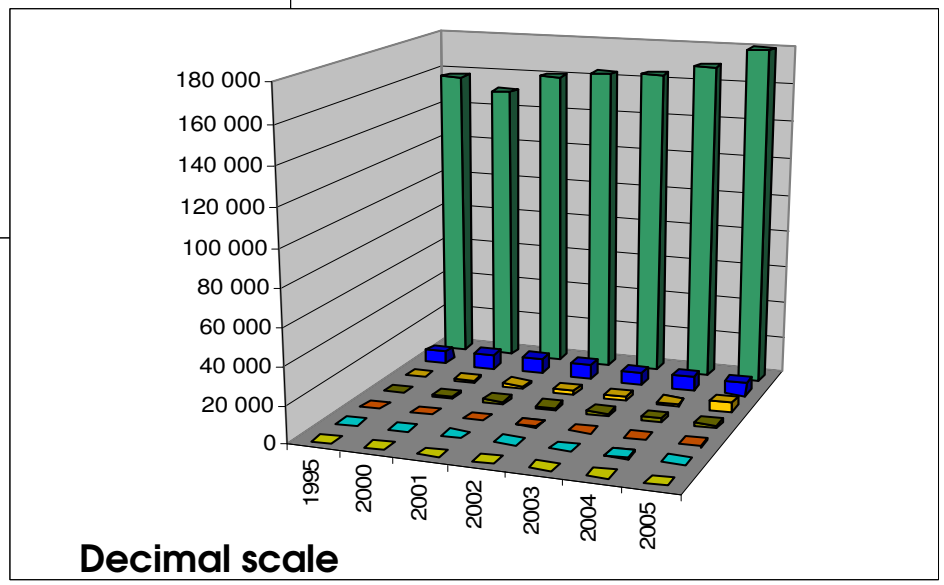
Development of green heat production acc. to GUS and IEO (solar energy)



Production of energy from renewable resources in Poland in the years1995-2005, *(T.I) - IEO study*



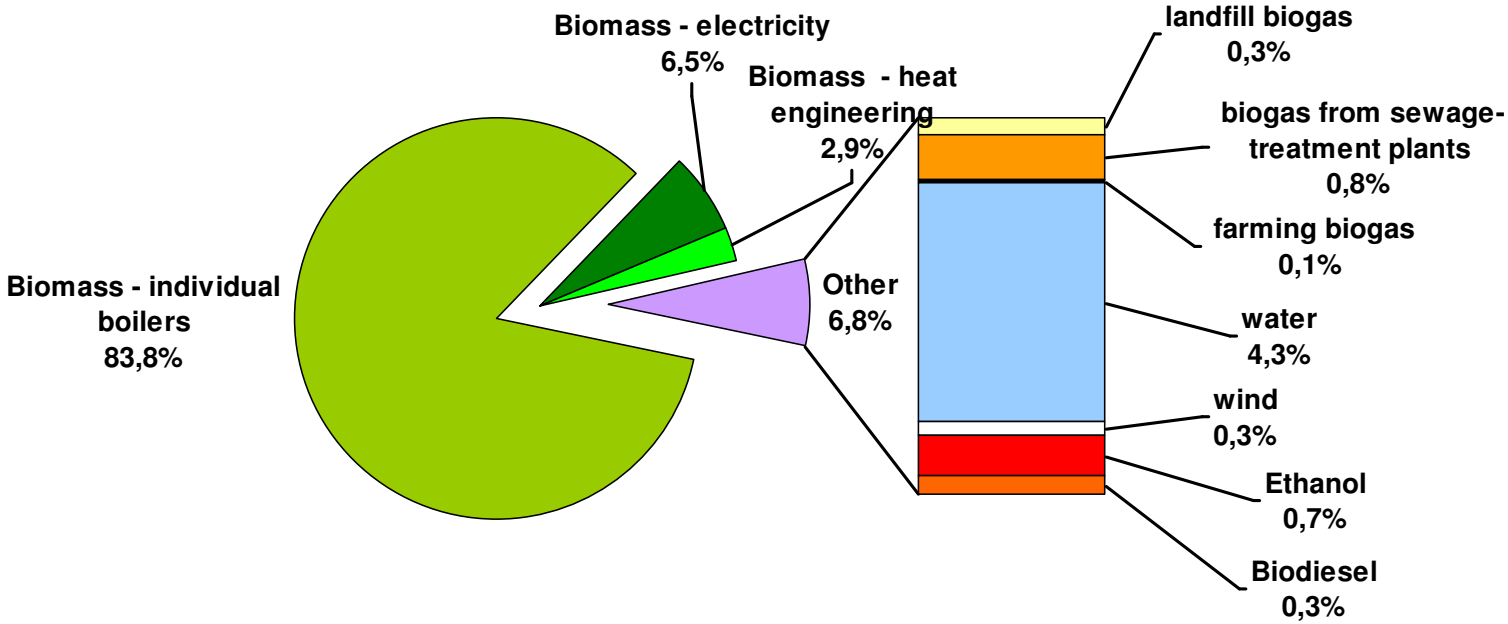
Logarithmic scale



Decimal scale

Share of biomass: over 90%

Energy carriers supplied to the market from renewable energy sources in2005



Consumption of RES energy (176 PJ) constituted **7,2%** of the total final energy used and it was dominated by biomass (94%) and heat (90%)

In other UE countries, share of the biomass is much lower and on average it comes to about 60% (below 50% in Germany)

RES energy carrier 2005	*TJ*	*%*
Electric energy	15 111	**8,6**
biofuels	1 937	**1,1**
green heat	159 467	**90,9**
Total RES	**176 515**	**100,0**

Selected elements of the 2009/28/EC directive on promotion of using renewable energy sources

1. For the first time in history, each UE member state was given its target amount for the year 2020, (**UE-20% PL-15%),** which is a mandatory goal (legally binding under pain of punitive sanction)
2. Until 2010-06-30, the governments must prepare **national action plans (NAP) for RES,** demonstrating in detail how do they intend to meet their goals;
3. Two or more UE countries can complete **joint projects** (also infrastructural, particularly in the case of trading energy with other countries from outside EU) and make an agreement regarding distribution of the „green" energy. The European Commission will create a website, on which the member states will be able to offer joint projects and so-called „**statistical transfers**" of RES energy surpluses or deficiencies in comparison to the national target values.
4. **Priority of RES access to electrical power networks,** enhancing current regulations, e.g. the 2001/77/EC directive, including: in justified cases – fill costs of network development on account of operators, promoting intelligent networks, energy storing, and financial support for development of electric power networks (including heat distribution and gas network – important for promotion of biogas)
5. Active **participation of local governments** in creation and implemetnation of RES is provided for

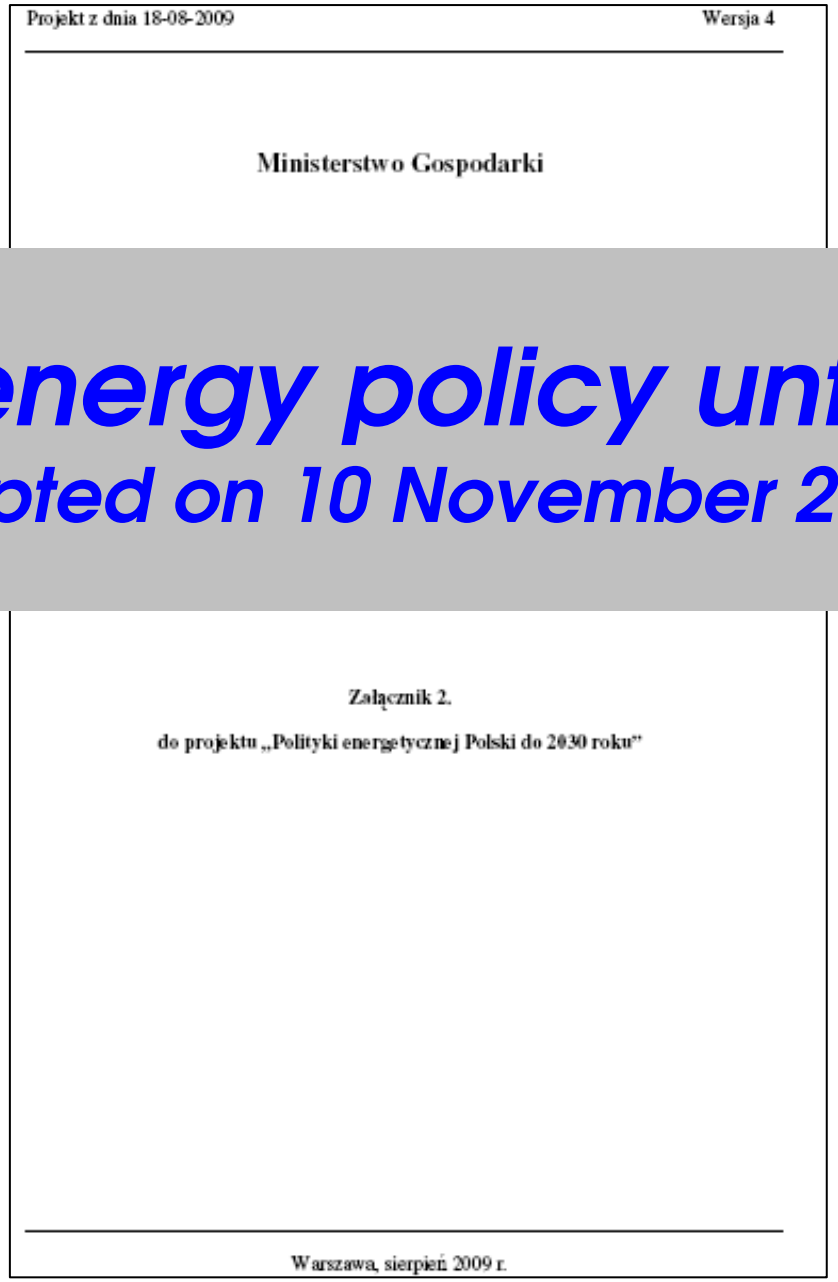
How will the achievement of „15% for 2020” goal for Poland be calculated

*acc. to **2009/28/EC** directive on promotion of using power from Renewable Energy S...s*

$$15\% = \frac{OZE_C + OZE_E + OZE_B + OZE_{ZWW}}{FZE + PW + S}$$

*The package favours **effectiveness** in the whole power industry*

- ➲OZEC -consumption (~production) of green heat (TJ)
- ➲OZEE -consumption (~production) of green electric energy (T
- ➲OZEB -consumption (~production) of biofuels (TJ)
- ➲OZE_{ZWW} - consumption of biomass for the needs of renewable energy sources and secondary energy – derivative energy (e.g. heating charges in biogas-works with heat recovered from biogas engine) (TJ)
- ➲FZE -final energy consumption (TJ)
- ➲PW -consumption of energy for the needs of the power engineering sector (TJ)
- ➲S -losses of fuel and energy during transfer and distribution (TJ)


Projekt z dnia 18-08-2009 Wersja 4

Ministerstwo Gospodarki

Załącznik 2.

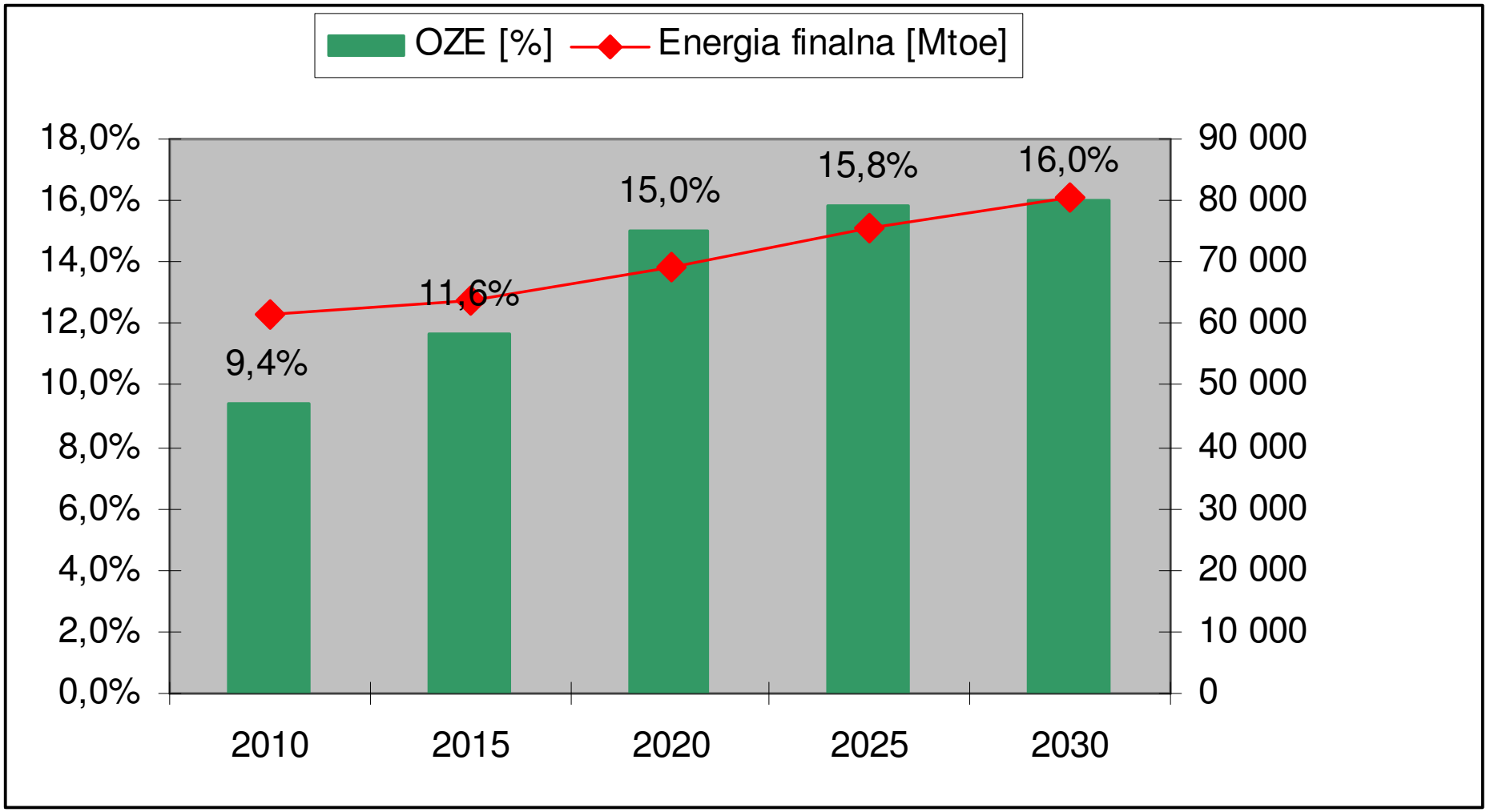
do projektu „Polityki energetycznej Polski do 2030 roku"

Warszawa, sierpień 2009 r.

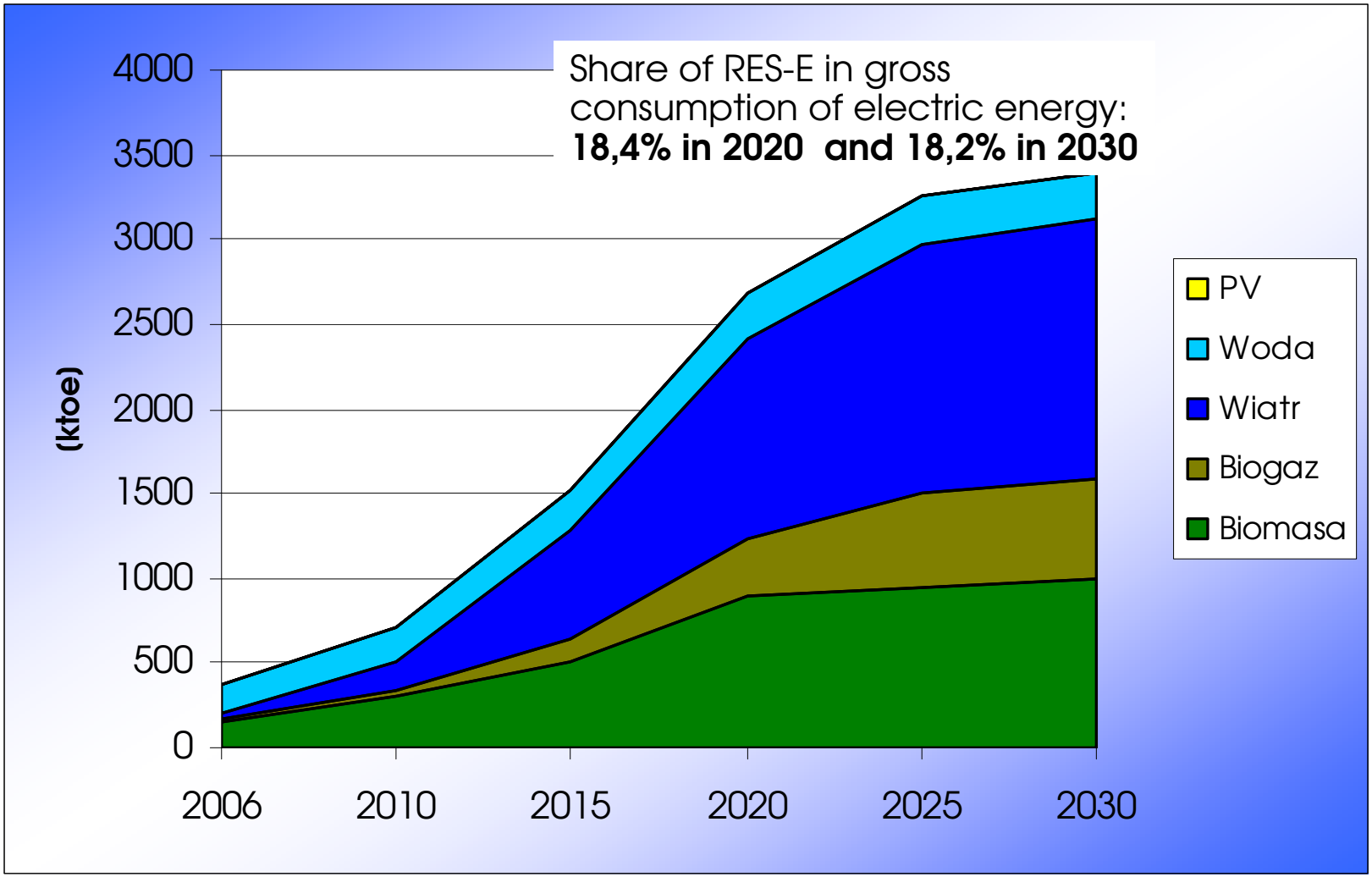
Polish energy policy until 2030

adopted on 10 November 2009

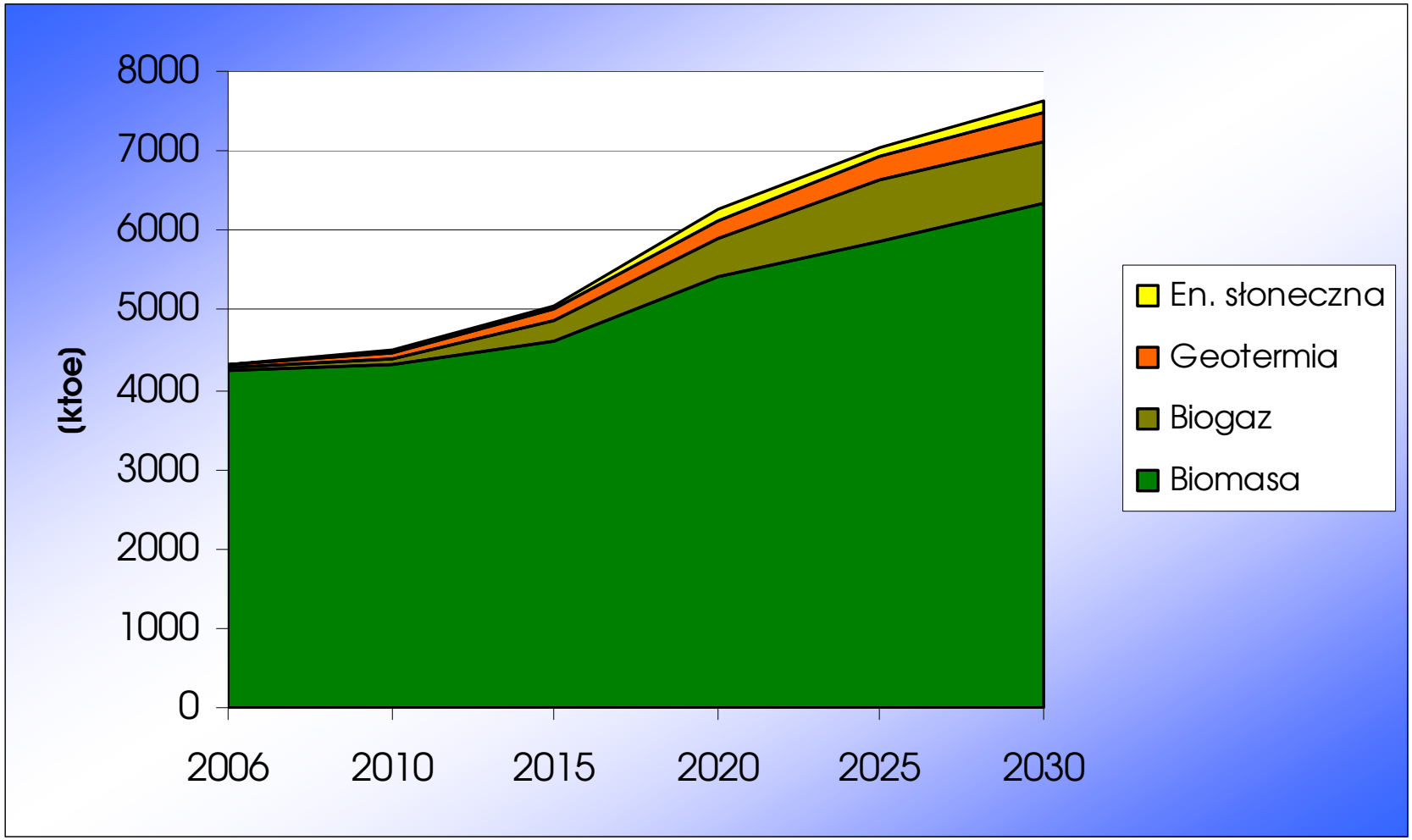
Share of RES acc. to the „Polish energy policy until 2030" (PEP `2030)



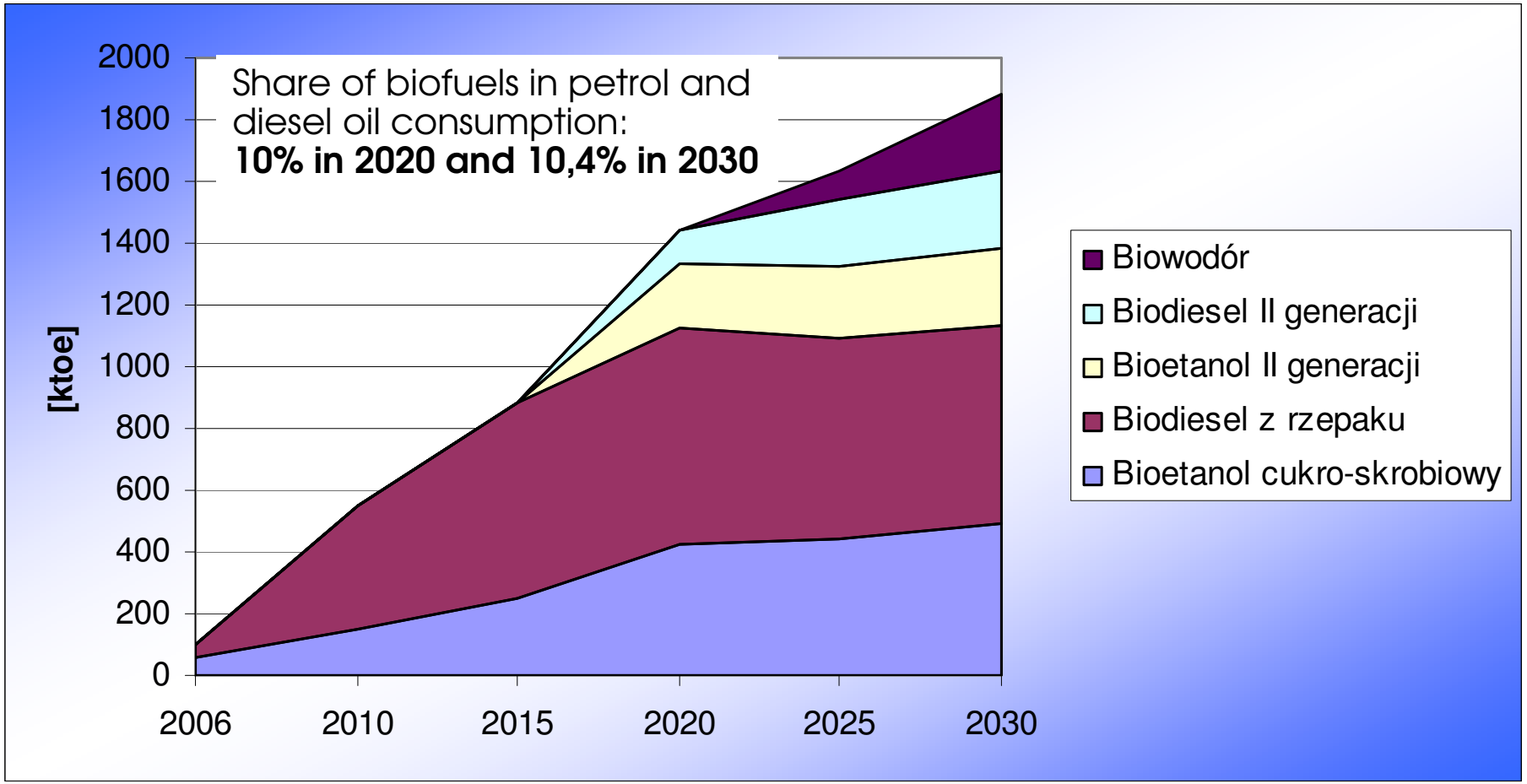
PEP'2030: prognosis for green electric energy



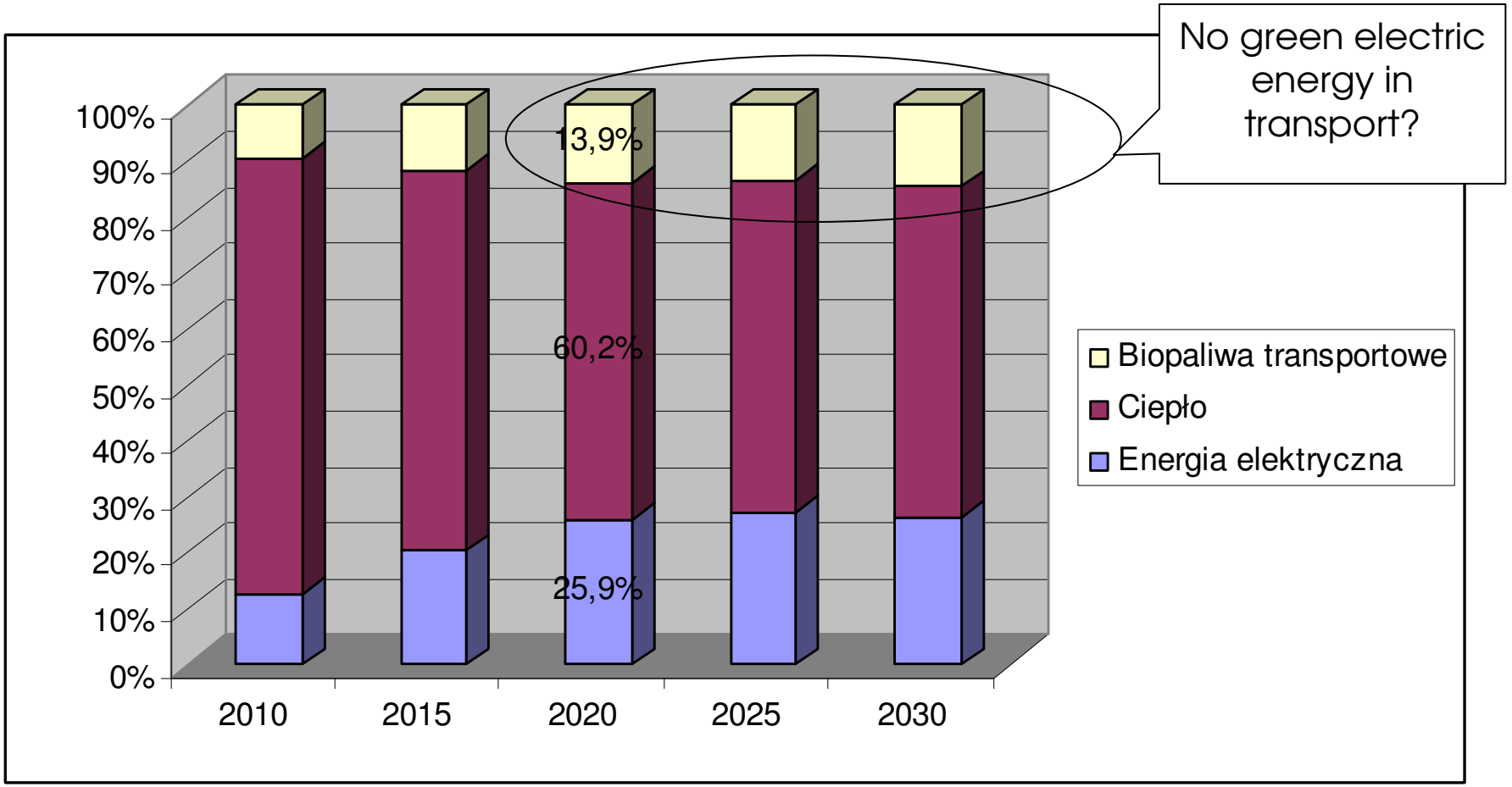
PEP'2030:
prognosis for green heat



PEP'2030: prognosis for biofuels



Final share of RES carriers acc. to the „Polish energy policy until 2030”



Gross demand for final energy from RES acc. to PEP'2030 (ktoe) and for lands (tys. ha)

using analyses of Prof. A. Fabera, IUNG

Energy types	2006	2020	Required land surface '2020, thousands of hectares
Electric energy	370,6	2686,6	
Solid biomass	159,2	**892,3**	**351-587**
Biogas	13,8	**344,5**	**38-76**
wind	22	1178,4	
water	175,6	271,4	
Heat	4312,7	6255,9	
solid biomass	4249,8	**5405,9**	**<2076**
biogas	27,1	**503,1**	**55-110**
geothermal	32,2	221,5	
solar	3,6	125,4	
Transport biofuels	96,9	1444,1	
sugar-starch bioethanol	61,1	**425,2**	**605**
biodiesel from rape	35,8	**696,8**	**774**
second generation bioethanol	0	**210**	**61-94**
second generation biodiesel	0	**112,1**	**18-28**
Total final energy RES/cultivation surface	**4780,2**	**10386,6**	**1903 - 4350**
Share of renewable source energy / share of			

Share of biomass in completion of the 15% goal for 2020 is to reach **83%.**

What does the 2009/28/EC directive say about sustainability of biomass consumption?

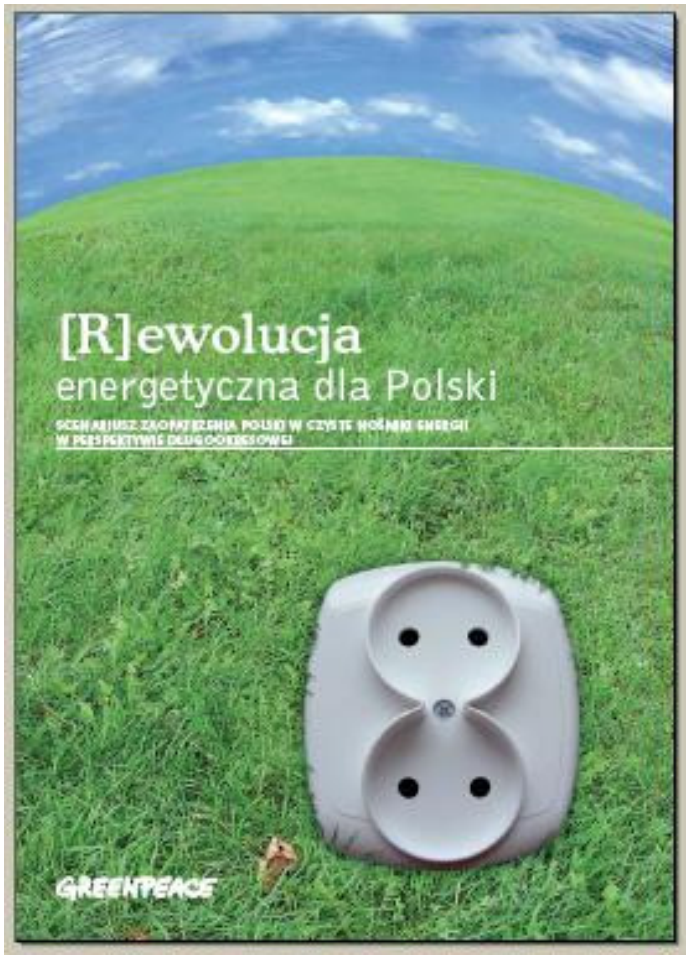
Production of farming raw materials and their conversion into liquid biofuels and energy meets the criteria of sustainable production.

- For liquid and gas biofuels, the criterion is an obligation to prove, using the **LCA** method (Life Cycle Analysis) that liquid fuels will reduce emission of greenhouse gases in the whole production chain by 35% in 2013, by 50% in 2017, and by 60% in 2018 (currently, bioethanol produced from grains and biodiesel made from rape do not meet the requirement of greenhouse gas emission reduction by *2017)*
- Use of green electric energy in transport is promoted *(the multiplier for achieving the directive goal by using green electric drives is 2.5 times higher than for use of biofuels)*
- Due to their biodiversity and various forms of protection, some areas are excluded from production of biomass for the power engineering purposes
- In the case of biomass, the member states promote conversion technologies the energy conversion effectiveness of which is at least 85 % for residential and commercial applications, and at least 70 % for industrial applications (in practice this excludes co-combustion of biomass in coal power plants)

Bold and environmentally sustainable vision of plan of actions in favour of RES until 2020, with a perspective until 2050

Modelling renewable power engineering development scenarios until 2050 – September 2008

Energy (R)evolution = time to change … thinking in and about power industry?



Using the MASEP/Markal model to simulate the RES development scenarios until 2050, considering 2020

„**Scenario of providing Poland with clean energy carriers in a long—term perspective**"

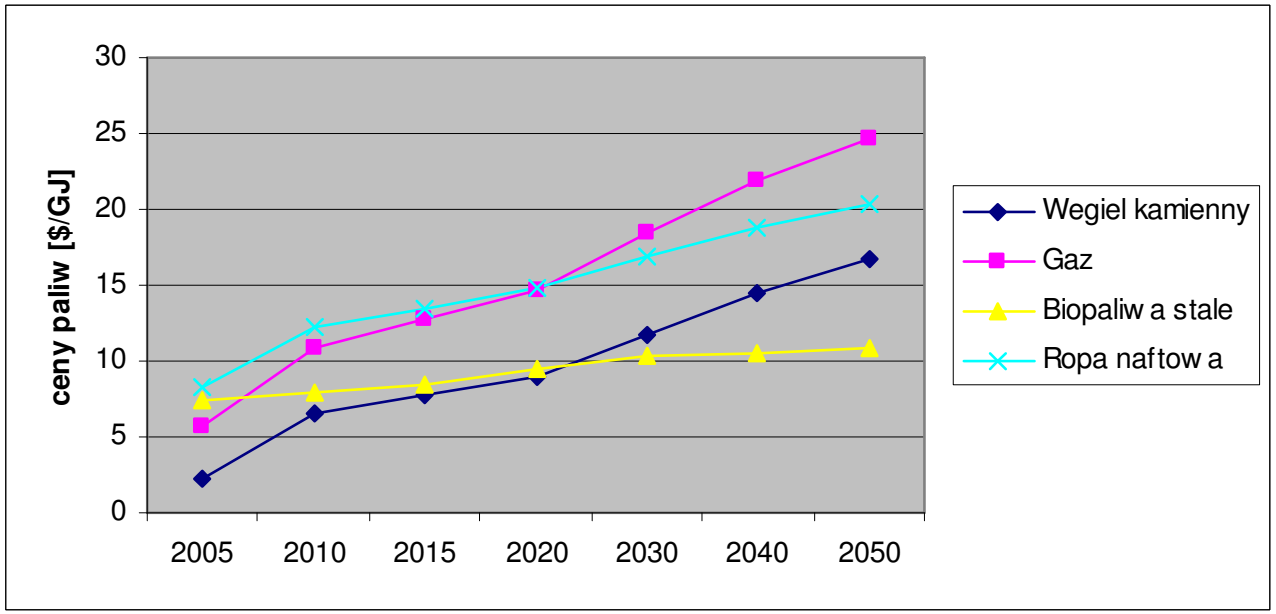
EC BREC Institute for Renewable Energy
DLR Space Research and Technical Thermodynamics Institute in Stuttgart

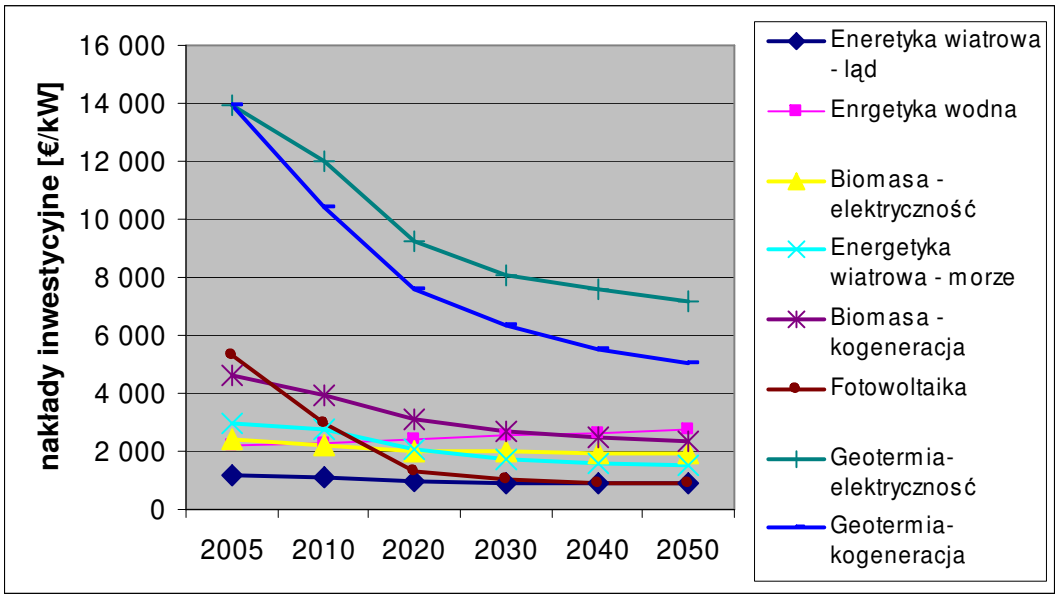
Published by **Greenpeace Poland**, October '2008

http://www.greenpeace.org/raw/content/poland/press-centre/dokumenty-i-raporty/rewolucja-energetyczna-polska.pdf

Assumptions for scenarios -II

Comparison of increase in mineral fuel prices in USD – until 2050 (with constant prices from 2005).

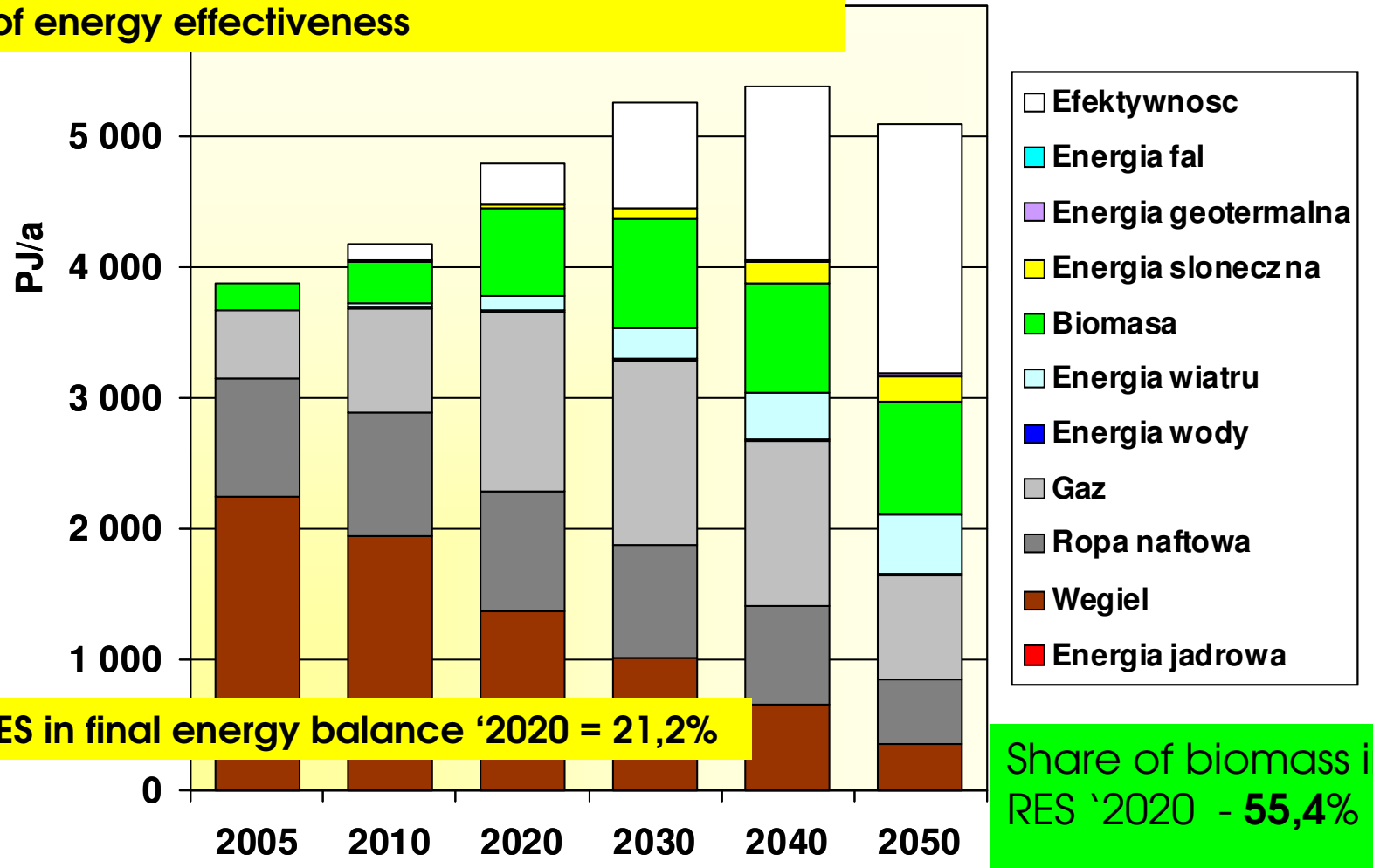




Decrease in amount of individual investment expenditures for renewable technologies which produce electric energy, with constant prices in Euro from 2005

Prognosis of domestic demand for primary energy –Energy (R)evolution

- Share of RES in primary energy balance 2020 = 18,4%
- Key role of energy effectiveness

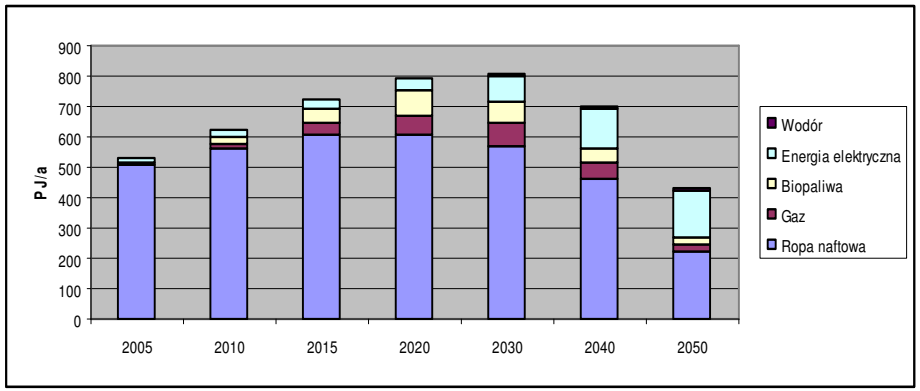


Share of RES in final energy balance '2020 = 21,2%

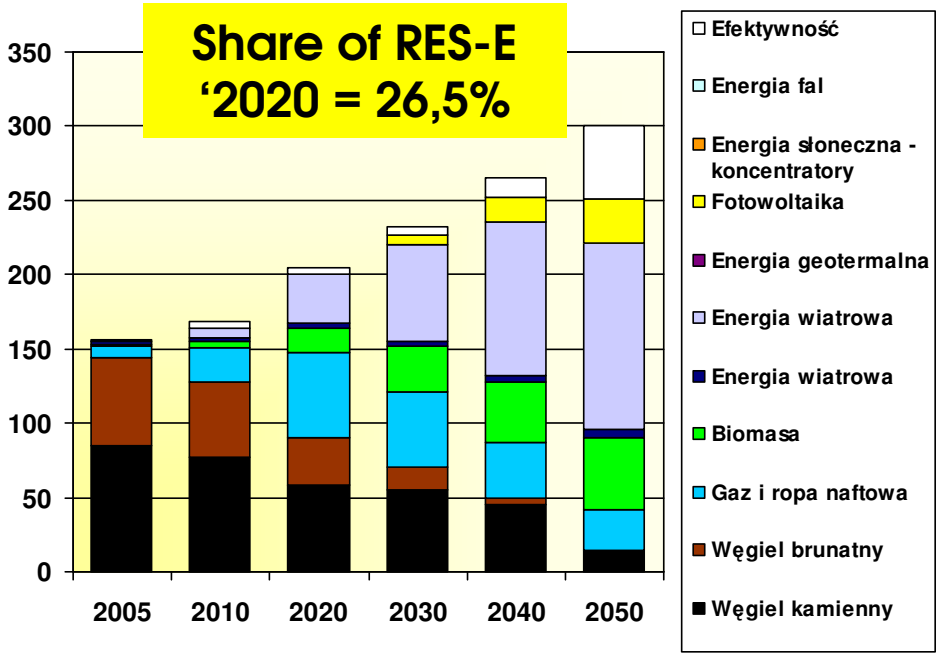
Share of biomass in RES '2020 - **55,4%** (final energy)

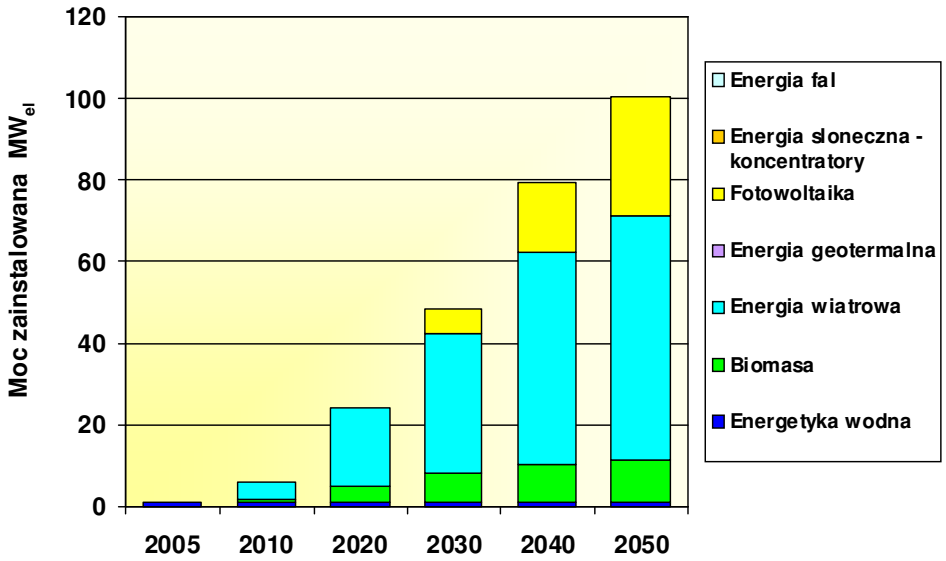
Electric energy in TWh/year in the *Energy [R]evolution scenario*

Electricity also in transport

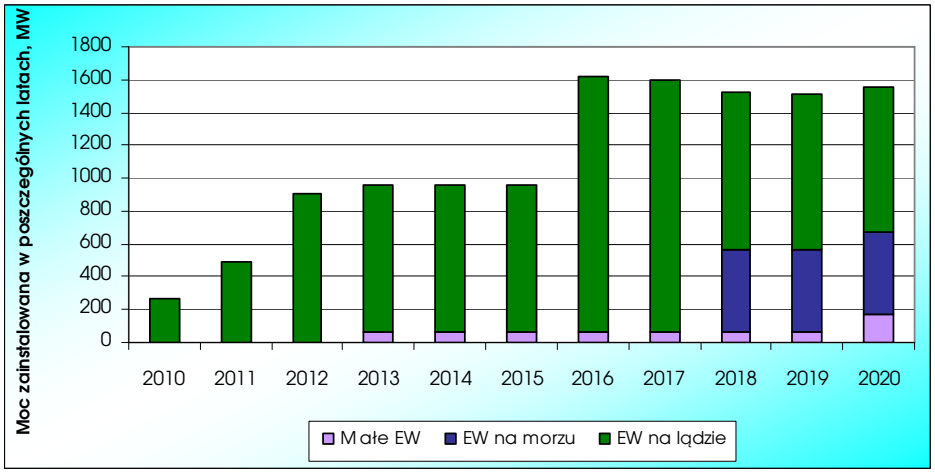


Share of RES-E '2020 = 26,5%



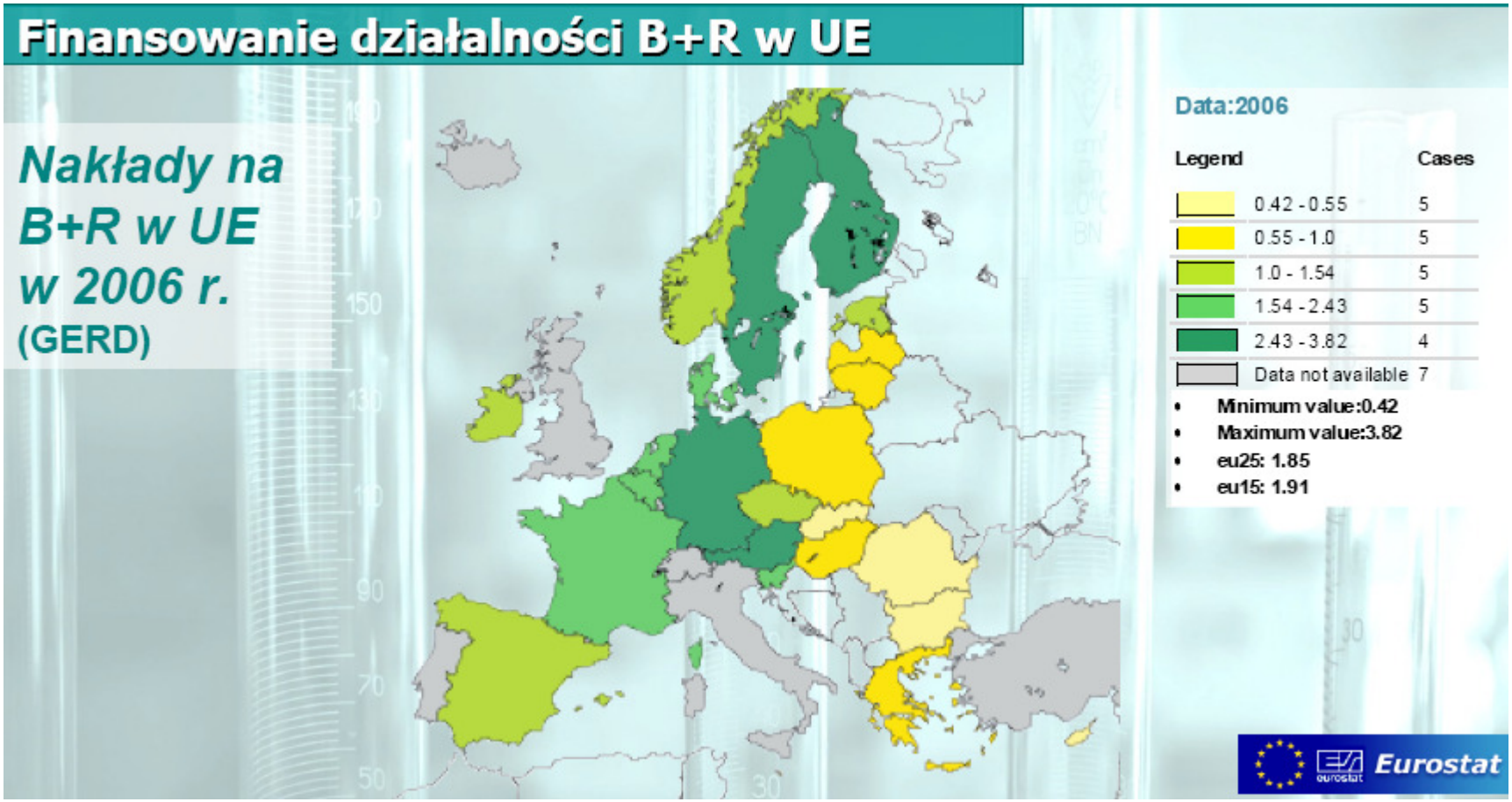


Great significance of wind power industry

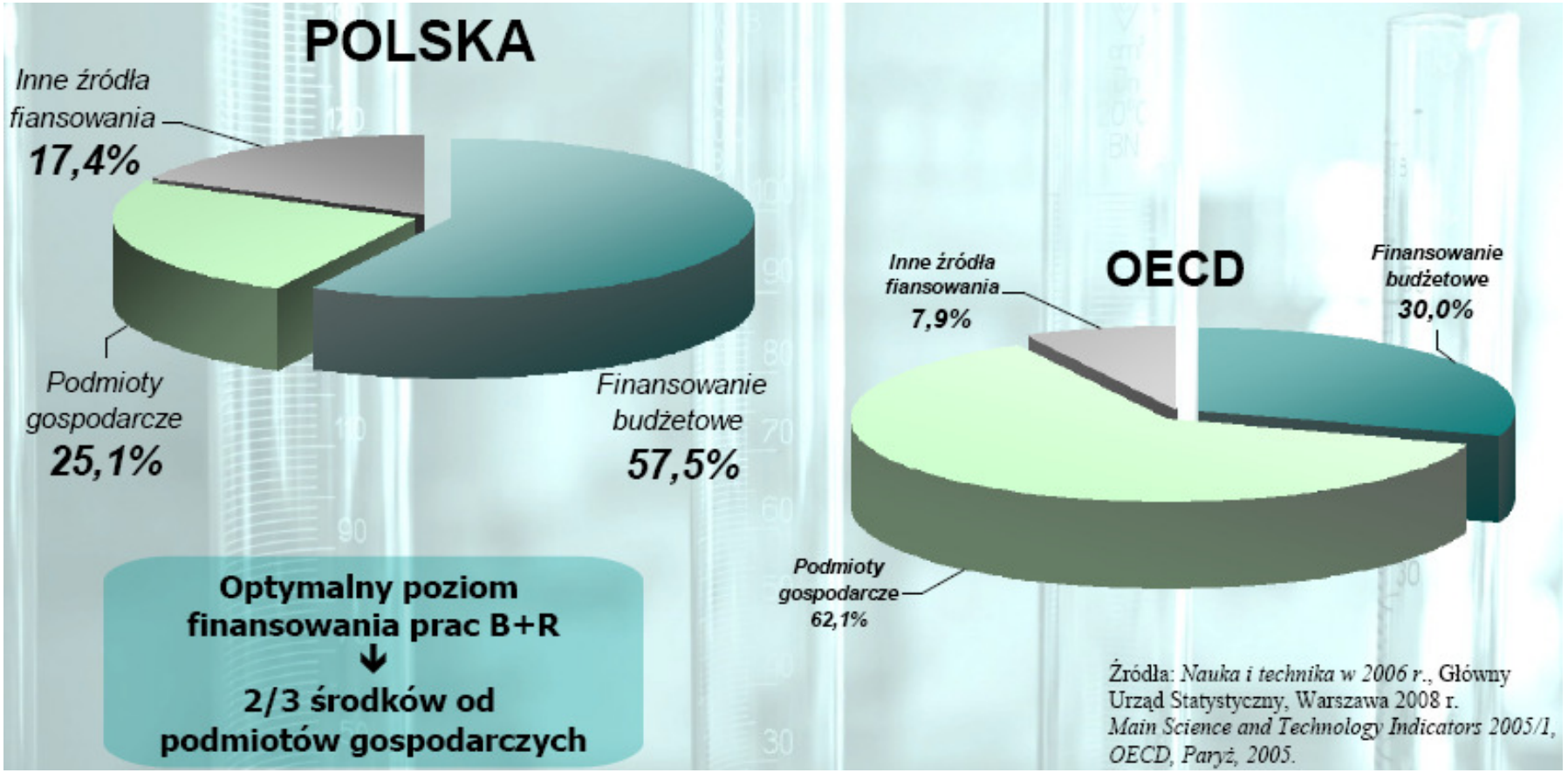


Scientific research and innovations in renewable power industry and financing them

Financing of B+R activity in EU

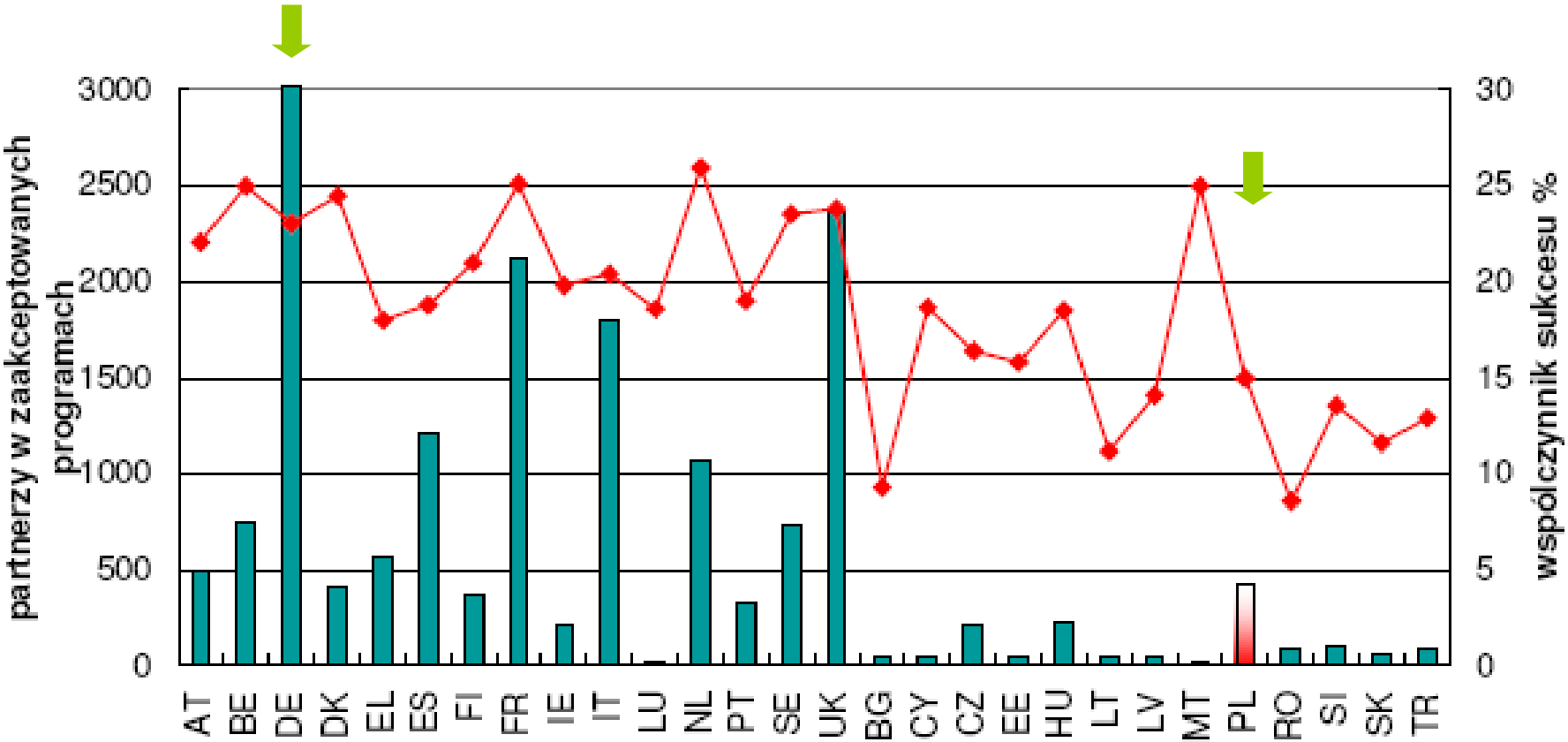


Structure of expenditure on B+R



Large share of financing from the budget, small share of financing by business entities, great significance of EU funds („other sources of financing" on the chart)

Number of programs approved for completion divided into countries (partners) and global success rate in 6 PR EU



Source: „Polityka MNiI w odniesieniu do udziału polskich zespołów Naukowych w Programach Ramowych UE", Warszawa 2006

Great significance of EU structural and cohesion funds EU 2007-2012

Operational Programme Innovative Economy

Action 1.4 Support for research and special purpose projects in favour of companies – 390 million euro (for research),

Action 4.2 support for implementation of B+R programs – 390 million Euro (for investments)

Operational Programme Infrastructure and Environment

Action 10.3 Development of industry for renewable energy sources – allocation of 91 million Euro (including EU contribution of 27 million Euro)

Principles of subsidizing in EU and national programmes for innovations

	Subsidizing level	Minimal value of qualified expenses	Deadline for applications	Implementing institution
10.3 Development of industry for RES, OPI&E	up tp 70%	20 million	III/IV quarter 2009	IPiEO
1.4-4.1Support for research and development and implementation of works results, OPIE	30-70% depending on status and region	400 thousand	01.11-30.11 2009	PARP
4.3 Technological credit, OPIE	40-70% - technological bonus	-	Permanent	BGK
4.4 New investments of high innovative potential, OPIE	40-70% depending on the region	8 million	28.09-30.10.2009	PARP
Special purpose projects NOT	50-80%	-	Cyclically every 6 months	NOT
IniTech	100%- research stage, 50%- industrial research. 25%	-	Announced cyclically	NCBiR

Current financing of power industry programmes by Ministry of Science

Source: *Jerzy Tokarski – NCBiR*

Projects	Start	End	Total subsidizing	Completed projects
Research	2002-2007	2006-2010	**21 400 000**	**4 300 000**
Special purpose	2000-2008	2001-2010	**12 100 000** 47 900 000	**1 800 000** 2 600 000
Commissioned Research *	2007	2010	**32 9000 000**	**32 9000 000**
Development	2006-2007	2008-2010	**18 200 000**	**15 800 000**
			84 600 000	**54 800 000**

** In the years 2007-2010, one research project, ordered from the RES scope entitled „Modern technologies for power industry application of biomass and bio-degradable waste – conversion into energy gas fuels" is financed. Coordinator: Institute of Power Engineering*

National Scientific Research and Development Works Programme (KPBNiPR)

Decision of Minister of Science and Higher Education on establishing a National Scientific Research and Development Works Programme of **2008-10-30**
and on implementation of the Programme by the National Centre for Research and Development (NCBR)

Priority research areas:

1. Research area- „Society under conditions of safe, fast and sustainable social-economic development"
2. Research area - „Health„
3. **Research area - „Energy and infrastructure„**
4. Research area - „Modern technologies for economy"
5. Research area - „Environment and agriculture"

Research area no. 3 in (KPBNiPR): Energy and infrastructure

3.3. DEVELOPMENT OF ALTERNATIVE ENERGY SOURCES – RENEWABLE NUCLEAER, BASED ON HYDROGEN, AND OF NEW TECHNOLOGIES LEADING TO INCREASE IN RELIABILITY, EFFECTIVENESS OF PRODUCTION, PROCESSING, STORAGE AND TRANSFER OF ENERGY

3.3.1 Development of safe and ecological technologies of production and storage of energy from renewable sources (combustion and gasification of biomass, integrated systems – steam and gas micro power plants, bio-refineries and biogas-works, using wind, geothermal and water sourc solar power engineering, fuel cells).

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Strategic programme „Advanced technologies of acquiring energy"

Carried out on behalf of MNilSW by NCBiR

„The is mostly oriented at results of those scientific research which have the highest chances of being applied and fully implemented. It exposes Polish scientific and technological specialities, basing on the main fuel raw material which is, and continues to be, coal, as well as aon alternative energy sources."

GOALS:

The goal of the strategic program is to carry out the *3x20 Strategy,* included in the European Commission announcement of 2007-01-10, which assumes that until 2020, in the total EU balance, in comparison to 1990, it is necessary to:

1. Improve energy effectiveness by 20%,
2. Increase share of renewable energy up to 20%.
3. Reduce CO2 emission by 20%.

Basic research tasks in the programme *Advanced technologies of acquiring energy*

The programme budget is PLN 300 million.

1. Technologies which increase effectiveness of electric power production

2. Technologies of oxy-combustion of coal for effective and low-emission production of electric energy

3. Technology of coal gasification for highly-effective production of energy and fuels

4. **Technologies of renewable power engineering, including alternative**

The first announced research task in the scope of renewable power engineering: „**Development of integrated technologies of producing fuels and energy from biomass, farming waste and other waste**"

Summary

1. The domestic potential of renewable energy sources makes it possible for the share of energy from renewable sources in the balance of final energy consumption oin Poland to reach over 21% in 2020, and almost 60% in 2050.
2. The 2009/28/EC directive on promotion of RES is a good solution for Poland – it is an ambitious challenge, but absolutely possible to achieve by 2020.
3. Although Poland is not among the EU leaders in respect of innovativeness and resources for B+R, demonstrates one of the highest dynamics of increase in financing of science and innovative potential
4. Power engineering, including renewable power engineering, is becoming gradually more important in research programmes
5. There is a lot of potential for international cooperation in renewable power engineering (e.g. biogas, wind and solar power engineering) and regarding innovations in this

Thank you for your attention

Questions/contact:
gwisniewski@ieo.pl

Additional documents and discussion:

- www.ieo.pl (news)
- www.odnawialny.blogspot.com)