



Meeting of the EU Agricultural & Environment Attaches in Poland, German
Embassy, Warsaw 28 March 2007

Bioenergy framework and prospect for Poland

*Presentation based on the policy paper „Bioenergy in Poland”
prepared by
Institute for Renewable Energy & Institute for Sustainable Development
for Bohl Foundation*

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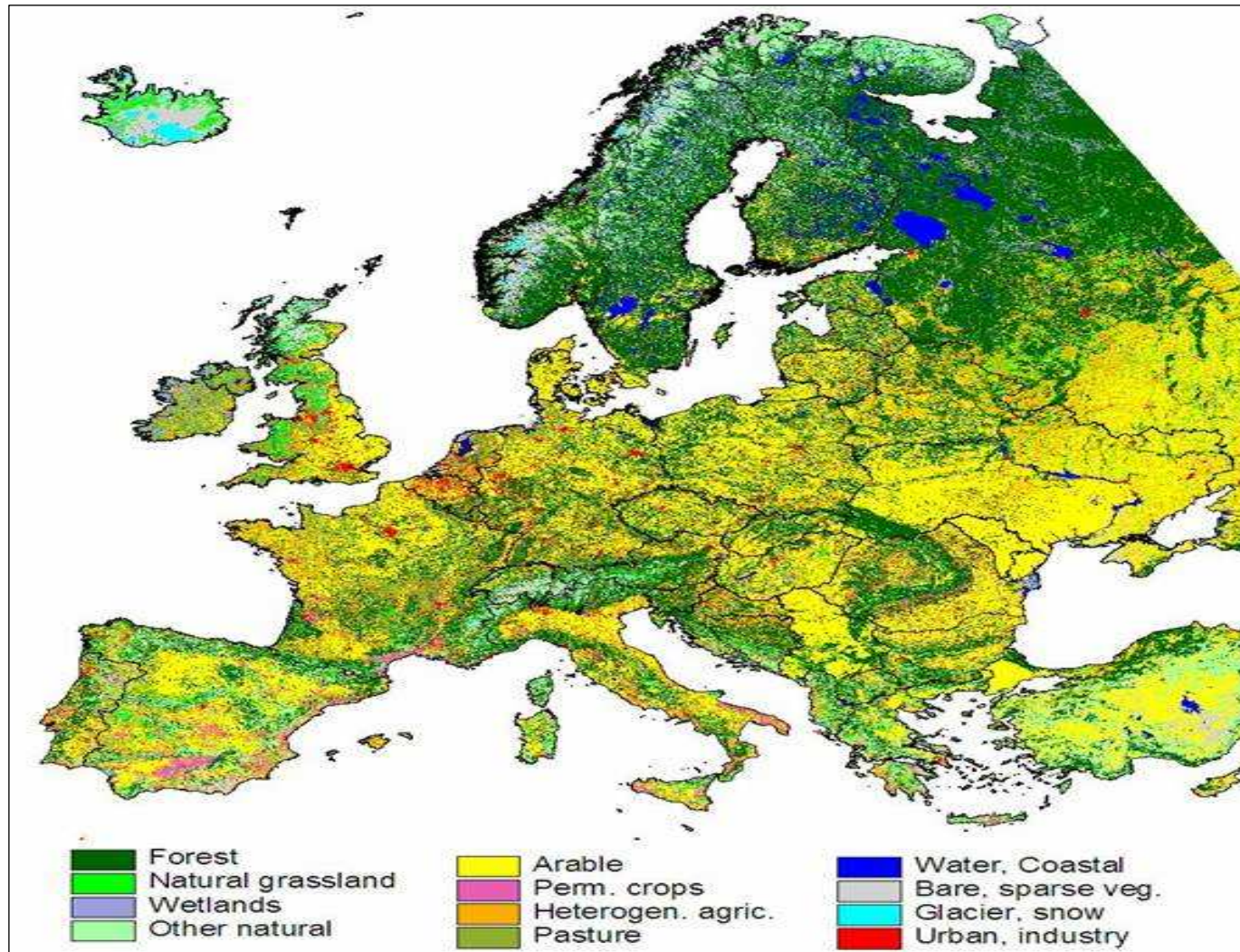
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Content of the presentation

1. Bioenergy resources and potentials in the EU and Poland
2. Biofuels production technologies and their efficiency
3. The role of biomass in the Polish renewable energy strategy – green electricity case
4. Conclusions

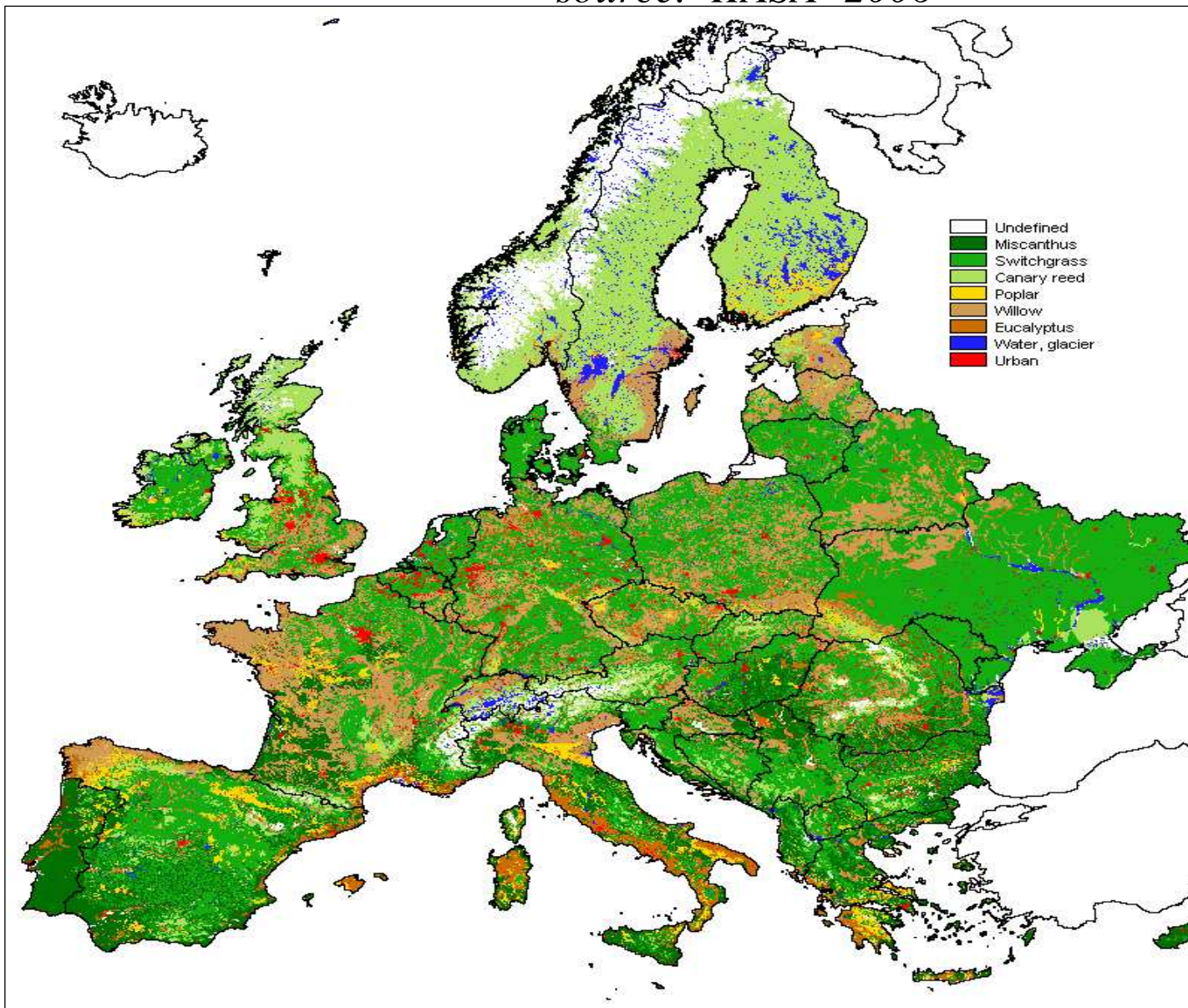
Land use in Europe

*Source: IIASA; data analysed within the REFUEL project –
cofinanced under the EU IEE/Altener programme*



Suitability of various energy crops in European conditions

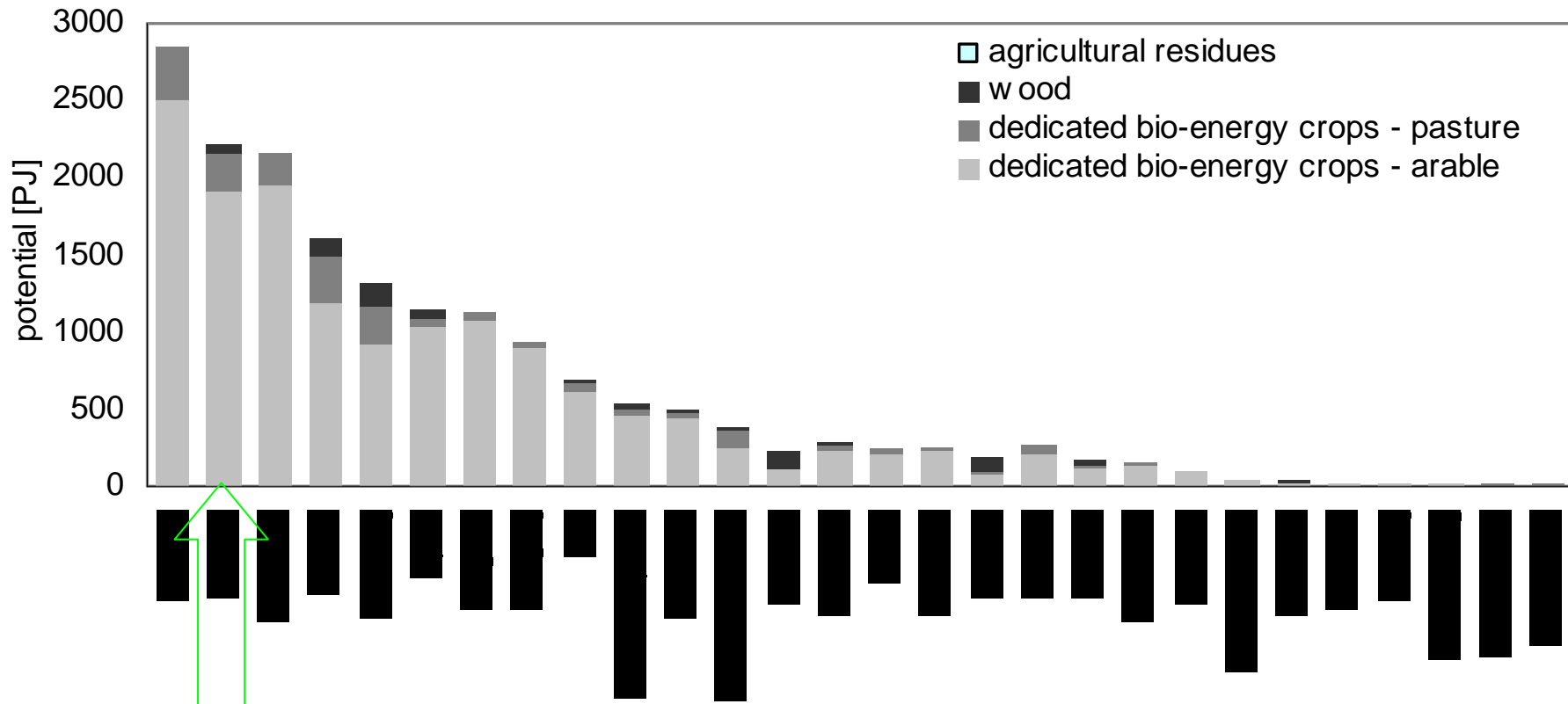
source: IIASA '2006



Assessment of biomass resources in Europe for respective countries & use of agricultural production space

source: De Witt, 2007

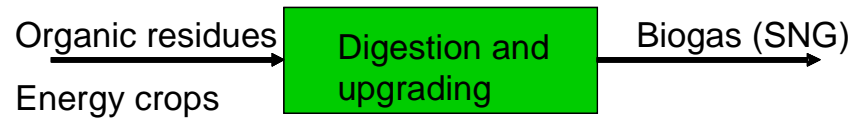
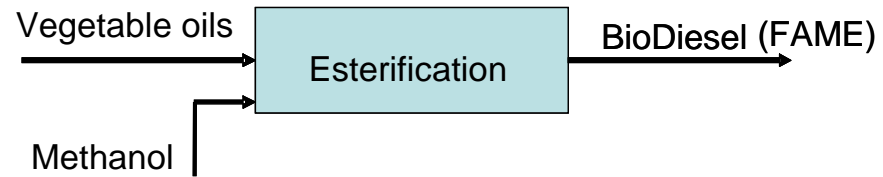
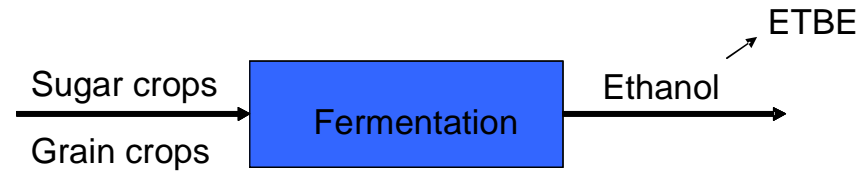
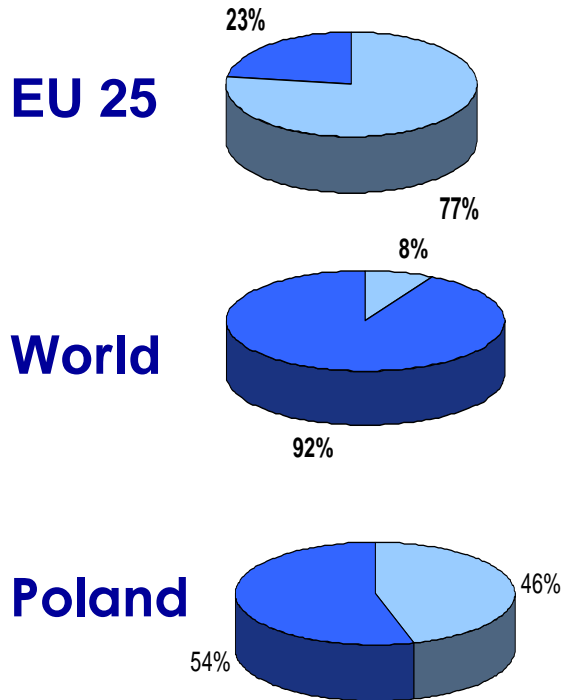
total biomass resource potential - divided by origin



Poland can provide 12% (2200 PJ) of total EU bioenergy potential (17.5 EJ/year)

1st generation biofuels current '2006 share & biomass transformation processes

- bioethanol
- biodiesel



2nd generation of biofuels: feedstock & processes used in their production

(no share on the fuels market yet)

Biofuel type	Specific name	Biomass feedstock	Production process
Bioethanol	Cellulosic bioethanol	Lignocellulosic material	Advanced hydrolysis & fermentation
Synthetic biofuels	Biomass-to-liquids (BTL) Fischer-Tropsch (FT) diesel Synthetic (bio)diesel Biomethanol Heavier (mixed) alcohols Biodimethylether (Bio-DME)	Lignocellulosic material	Gasification & synthesis
Synthetic Biomethane	SNG (Synthetic Natural Gas)	Lignocellulosic material	Gasification & synthesis
Biogas		Lignocellulosic material	Anaerobic fermentation
Biohydrogen		Lignocellulosic material	Gasification & synthesis or Biological process

Environmental and efficiency parameters for using different biomass resources for biofuel production

source: CONCAVE, 2005

Biofuel	Resources	Emission, gCO _{2eq} /km
Biodiesel	Rapeseeds	65
Bioethanol	sugar beet	64
	wheat grain	36
	willow coppices	47
	straw	20
	forestry residues	39
Synthetic diesel (F-T)	willow coppices	17
	forestry residues	12
Syntetic natural gas (SNG)	willow coppices	19
	forestry residues	14
Fossil fuels	Diesel	164
	Gasoline	183
	compressed nat. gas (CNG)	161

Comparison of energy efficiency of various energy crops

source: Harvey Jonathan, Renewable Energy World, January-February 2007, p. 87

Crop	Energy for crop production [MJ/ha]	Energy output [MJ/ha]	Energy output/input ratio
Miscanthus	9 224	300 000	32.5
Willow	6 003	180 000	30.0
Hemp (straw)	13 298	112 500	8.5
Wheat (grain)	21 465	189 338	8.8
Rape (seed)	19 390	72 000	3.8

General economic and sustainability indicators for Poland'2004

as percentage of EU 25 '2003 or factor EU25/PL
(demand for urgent RES market growth in Poland)

	Poland	„EU 25”	% or factor
Population (mln)	38 231	451 864	8,46
GDP (bln €)	202	9 599	2,10
Employment (mln)	13 782	196 772	7,00
Expenditure on research (bln €)	1,2	169	0,70
Energy intensity, (kg of oe/1000€ GDP)/(factor EU25/PL)	650,1	209,9	factor 3,10
Share of green electricity cons. (%) / (factor EU25/PL)	2,0	12,7	factor 6,35
Expected production/share of biofuels '2005 (%) / (factor EU25/PL)	0,5	1,2	factor 2,40

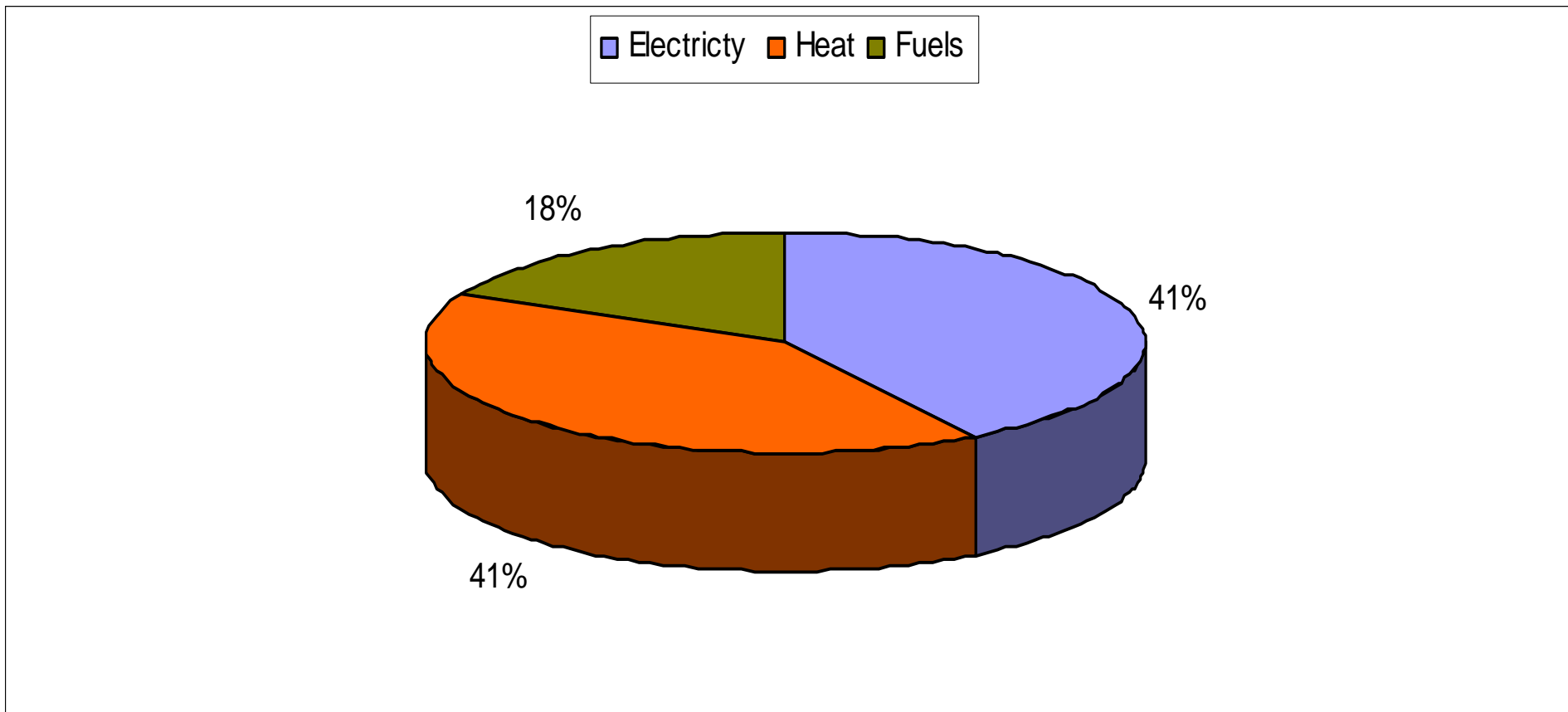
Total production and use of RES in Poland 1999-2004 [ths. toe & %]

Years	Gross production 100%	Geo-thermal 0,22%	Biomass 94,1%	Wind 0,27%	Hydro 4,1	Share in % in:	
						Production	Consumption
1999	3754	2	3541	0,33	185	4,46	4,01
2000	3801	3	3587	0,46	181	4,75	4,22
2001	4076	3	3830	1	200	5,08	4,53
2002	4139	6	3901	5	196	5,16	4,64
2003	4157	7	3929	11	144	5,20	4,46
2004	4315	8	4062	12	179	5,49	4,71

Source: GUS, 2005

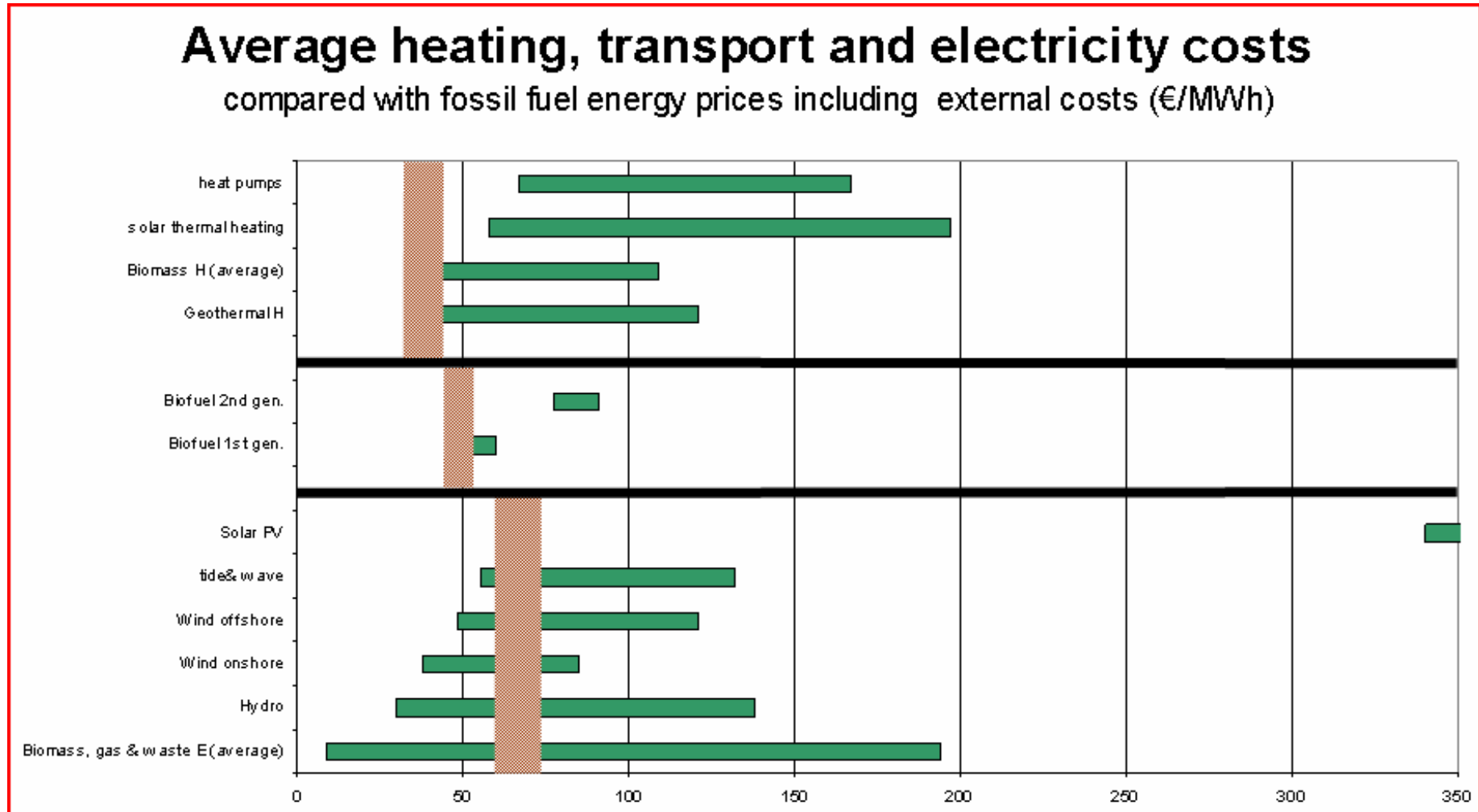
Estimated primarily energy use in Poland '2006 for final consumers

source: author calculations



**? How to use in the best and most efficient way
the national renewable energy resources ?**

Competition in energy sector over renewable energy resources, source EC „RES road map”



National Renewable Energy Strategy '2001

Overall target: 7,5% RES in TPE in 2010

RES TECHNOLOGY	Additional installed capacity 2000-2010, MW	Annual electricity production in 2010, GWh	Annual heat production in 2010, TJ	Annual biofuels production in 2010, ktonnes
Wind energy	600	1200		
Large hydro	0	1510		
Small hydro	200	1420		
PV	2	2		
Biogas plants	590	2480	5570	
Wood-fired CHP plants	1200	9600	24000	
Automatic wood-fired heating plants	4700		47000	
Automatic straw-fired heating plants	2200		22000	
Individual biomass-fired boilers	8900		71200	
Geothermal heating plants	400		2400	
Solar air collectors	100		200	
Solar water collectors	700		2100	
Biodiesel	70			50
Bioethanol				200
Technologies not included in Polish RES Development Strategy, status for 2006				
Biomass co-firing with coal		1130		

**-biofuels: 5%,
-bioelectricity: 18%
-bio-heat: 72%
-Total bioenergy in RES mix -95%**

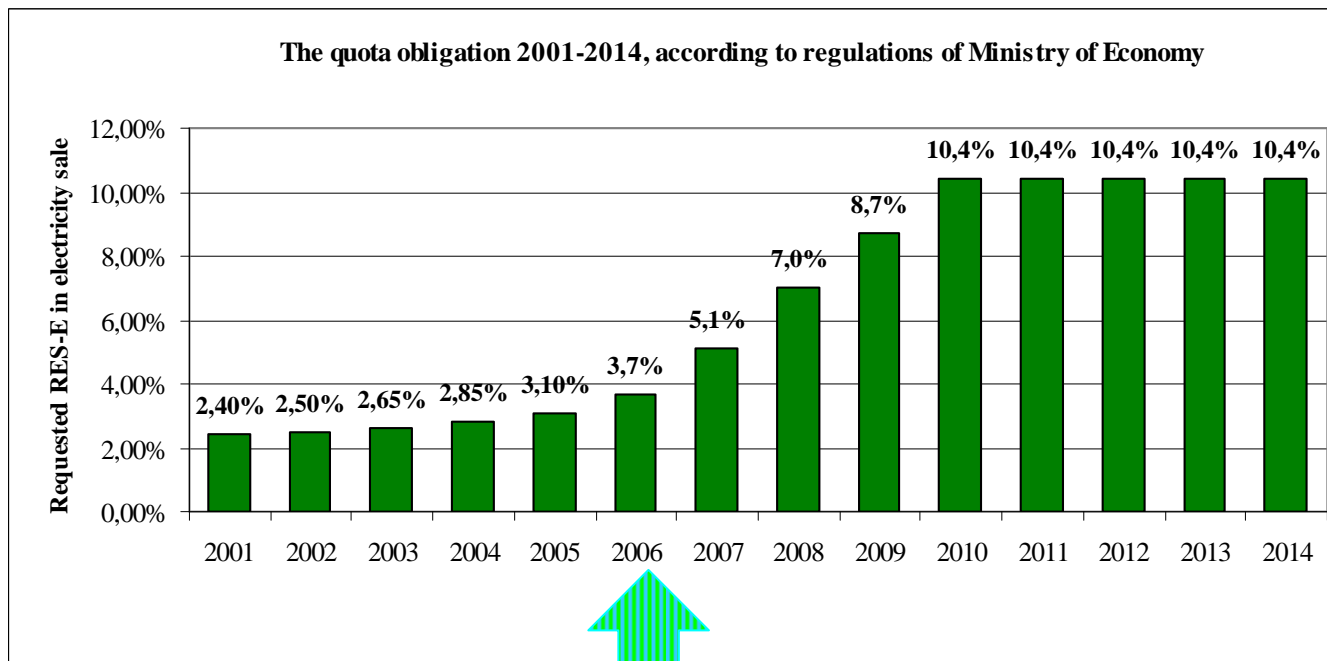
Technical potential of RES in Poland and its utilisation in 2003

Update of potentials approved ('2001) „National renewable energy strategy”, EC BREC '2004 (for RCSS)

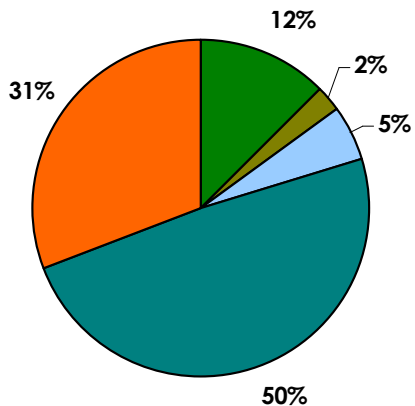
Resources	Technical potential [PJ/year]	Utilisation [%]
Biomass	755	21.0
Hydro	49	16.0
Geothermal	220	0.20
Wind	281	0.08
Solar	445	0.06
Total	1750 <i>(50% of TPEC in PL)</i>	10.0

Polish green electricity quota obligation for electricity suppliers 2010 and after

10,4% of RES-E for Polish suppliers in '2010 is an equivalent of **7,5%** for Poland in '2010



The structure of renewable electricity generation 2006

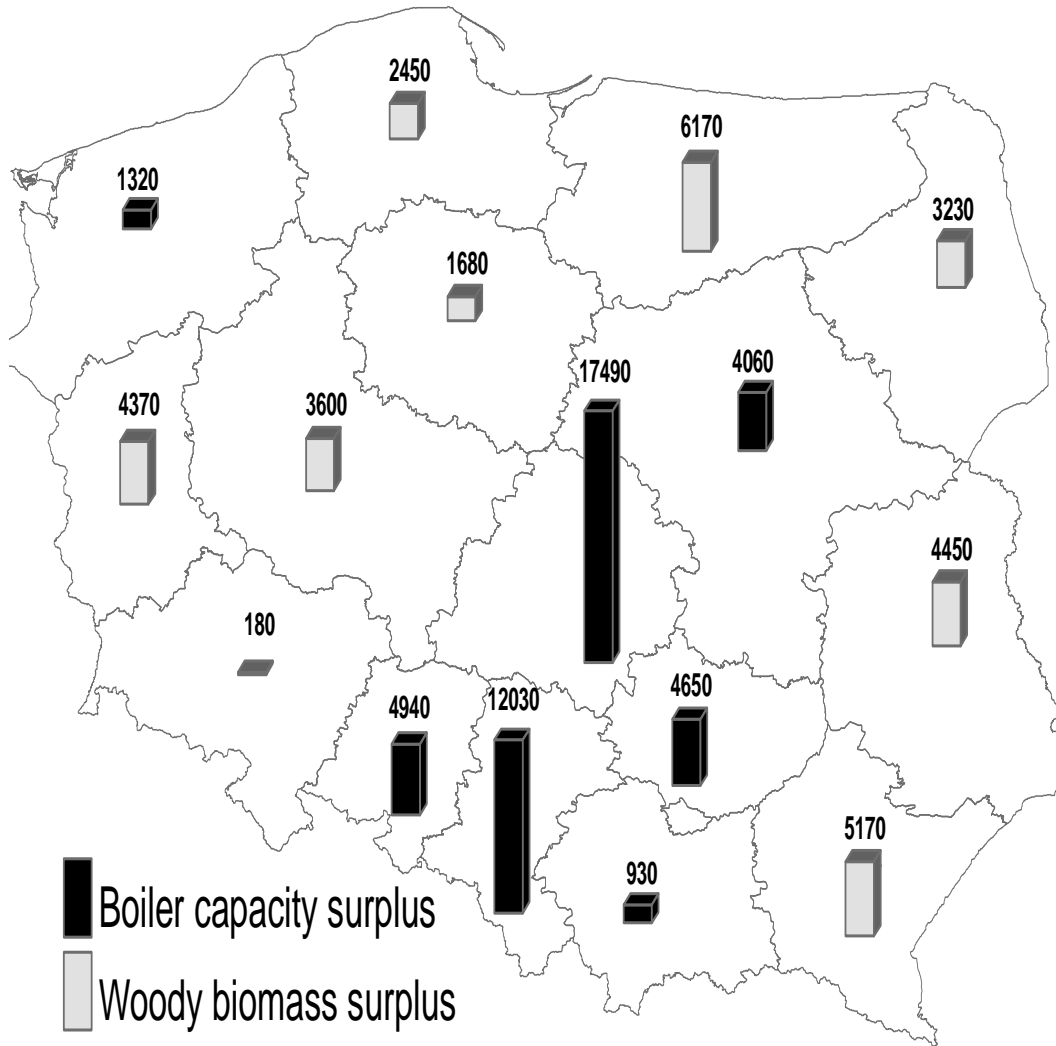


■ Biomass ■ Biogas ■ Wind ■ Hydro ■ Biomass co-firing

Current share of RES-E technologies '2006

Biomass contribution '2006
Biogas + Co-firing
31+12= 43%

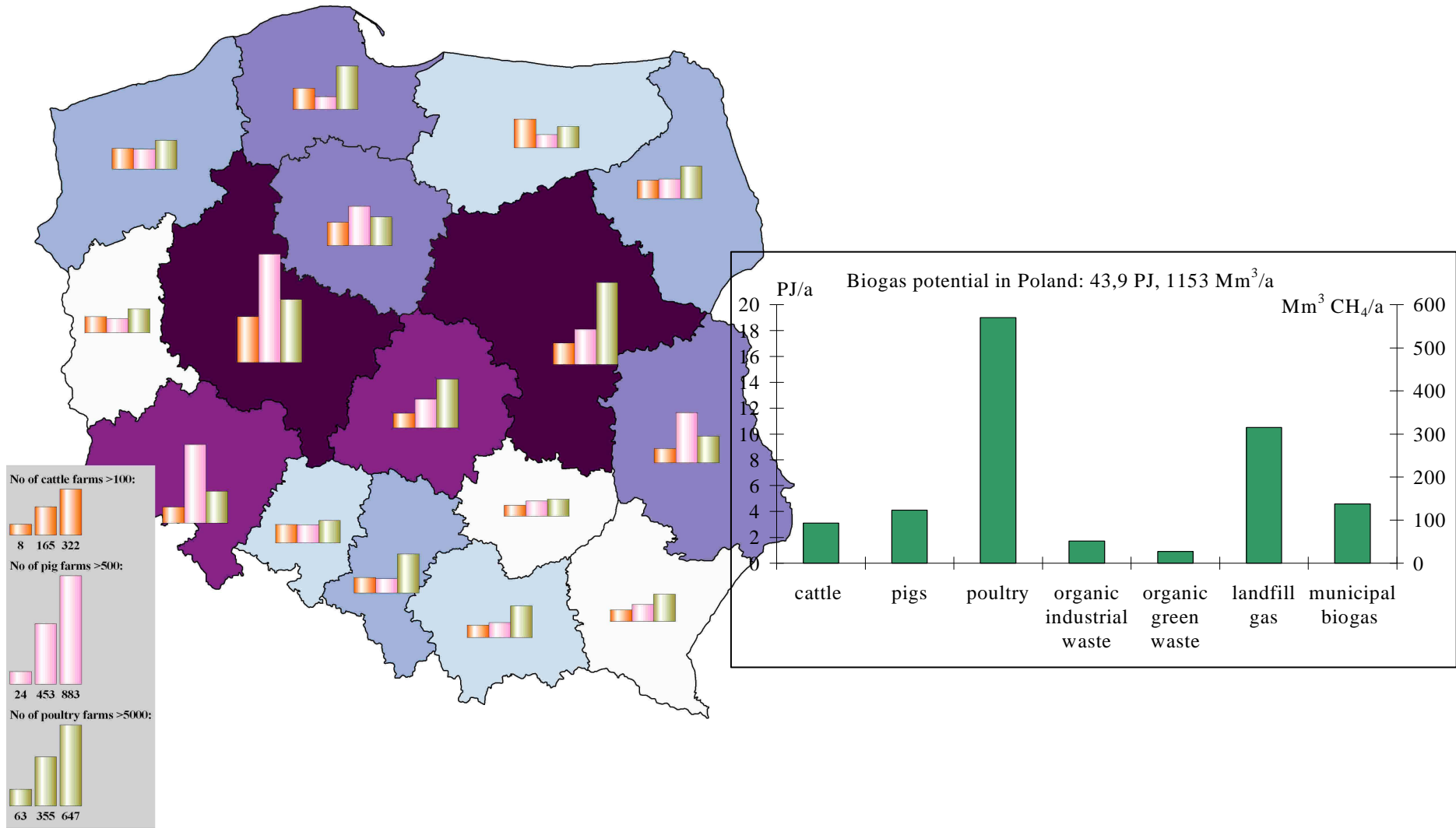
Overestimated role of **biomass co-firing** with coal in Polish power plant [TJ/y@ region]



Results:

- ➔ Average potential of electricity produced from biomass in co-firing in PL: 3,1% (3,4 TWh) in 2010;
- ➔ Cost less than €20 per MWh

Biogas potential- missing potential of agriculture



Current visions for RES-E '2010

	MG '2005*		Updated vision of EC BREC IEO '2007	
• Biomass	4,0%	↓	2,5%	<i>Too slow development of energy plantations and few time remaining to 2010 = doubtful meeting of target</i>
• Hydro	1,2%	↑	1,9%	
• Wind	2,3%	↑	2,5%	
• <u>Biogas</u>	-	↑	<u>0,6%</u>	
Total	7,5%	↔	7,5% (= app. 12TWh)	

* Report of the Ministry of Economy (MG) to the European Commission, 31.08.2005

Conclusions

- **Biomass will continue to enjoy the key role in the 'green' energy policy in Poland.** In the light of the growing demand for biomass, especially for biofuel and electricity production, agriculture, mainly **energy plantations**, will constitute the main source of additional biomass resources.
- **The effectiveness of processing the typical agricultural crops for transport fuels is, very low** (energy input is comparable with final energy output, in 1:1 ratio). **Processing of solid biofuels for heat and electricity offers much greater possibilities in this respect.** Assuming that the processing efficiency for lignocellulosic biomass (such as e.g. miscanthus or even willow) for heat amounts to 70%, the energy input/output ratio is 1:20 (or even more).
- The 'quota' support system for green energy favours the economy of scale and larger players at the electricity and green certificates markets as well as **larger energy biomass producers and suppliers**. At the same time it hinders the development of independent energy producers and small-scale renewable energy technologies for heat, electricity and biogas production.
- Due to the increasing significance and pace of the energy use of biomass in Poland and the growing competitiveness between different economic and energy uses of biomass resources (organic farming, agro-tourism, traditional agriculture etc.), as well as the considerable demands (resulting intensive agriculture, GMO, etc.), the **environmental, economic and social determinants for biomass utilization should constitute a subject for a wide debate in Poland**