BIOMASS COMBUSTION AND CO-FIRING AS A PATH TO ZERO-EMISSION POWER PRODUCTION AND SUSTAINABLE DEVELOPMENT

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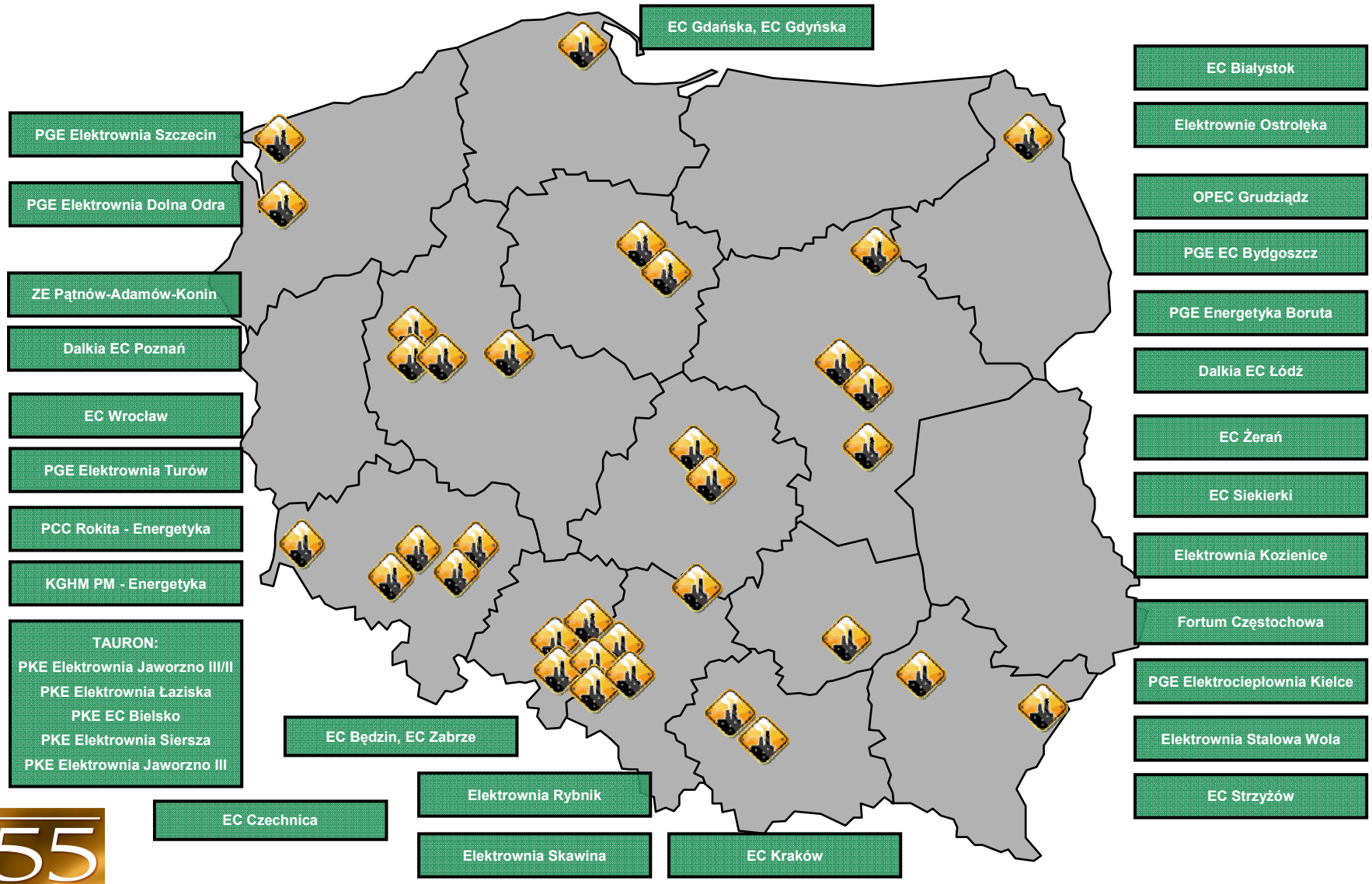
Large biomass utilities and CHP plants in Poland

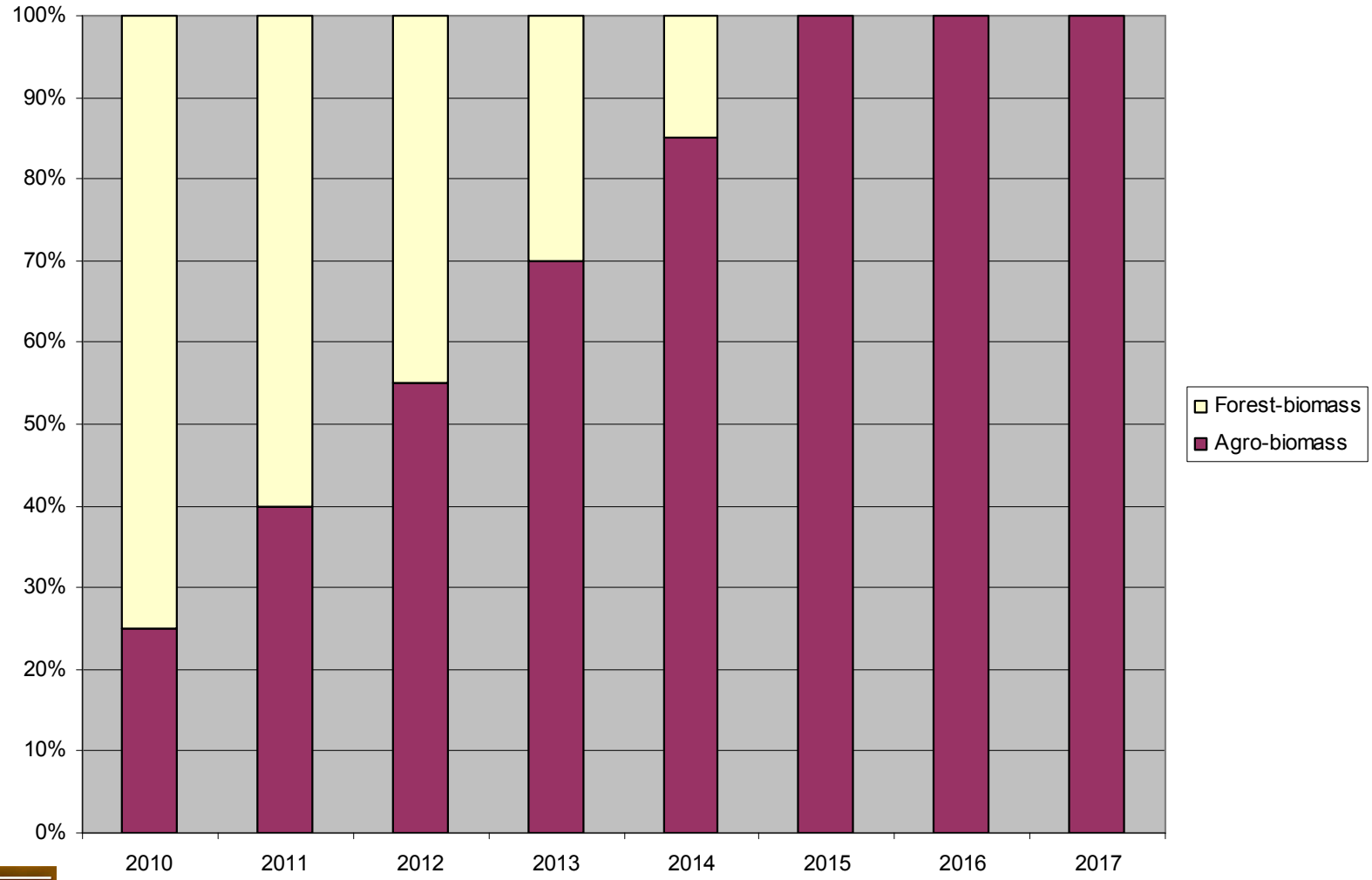


Issued guarantees of origin for RES based electricity in Poland

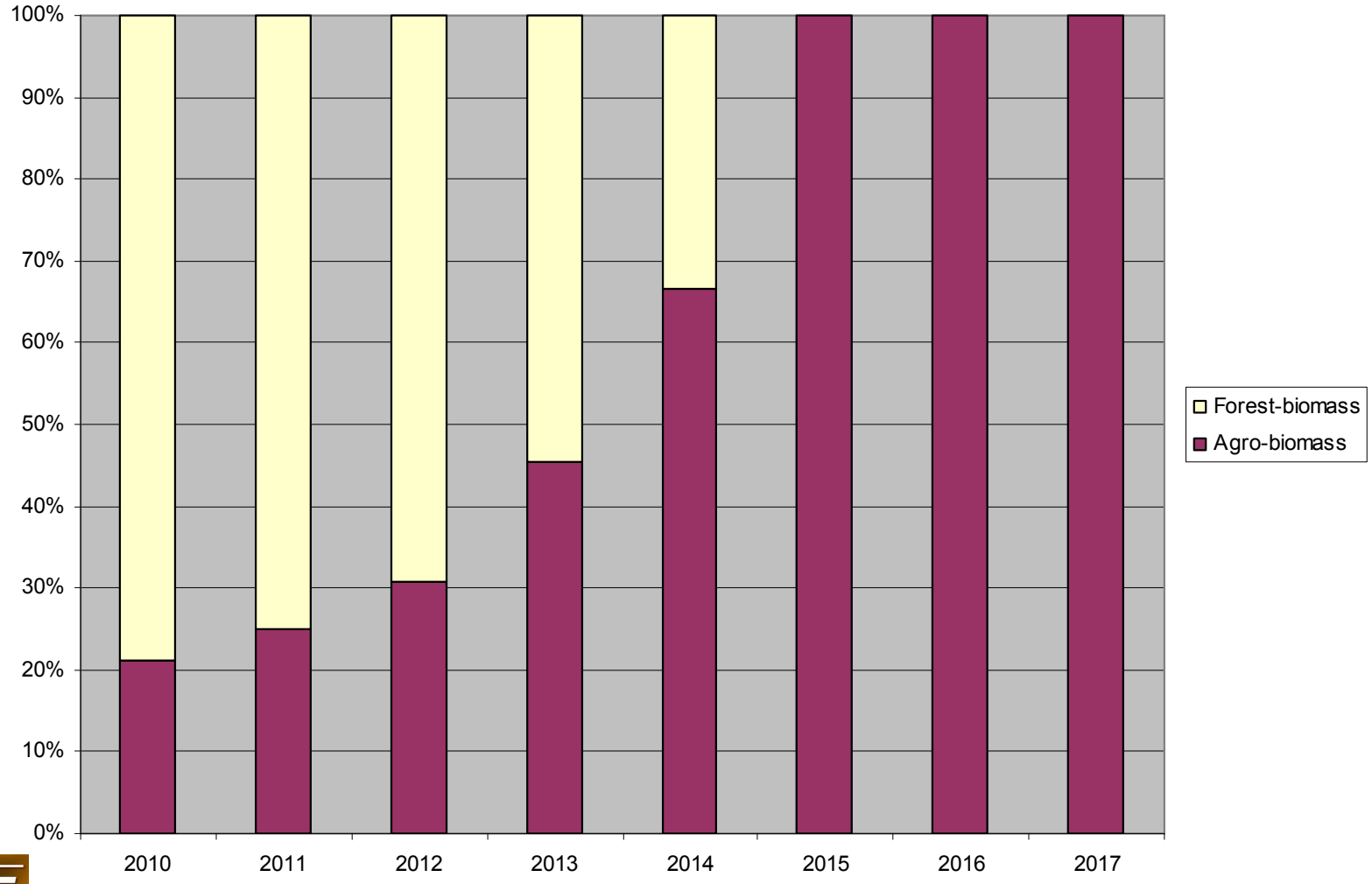
Item	Renewable energy			Electricity [MWh]
(1)	*(2)*			*(3)*
1.	Biogas plants	Sewage sludge biogas	BGO	73 821,602
		Manure and farm litter biogas	BGR	7 981,494
		Landfill biogas	bgs	139 079,828
2.	Biomass plants	Forest residues and agriculture biomass	bmg	1 774,432
		Mixed biomass	BMM	5 825,124
		Pulp and paper industry residues and wood-processing industry residues biomass plants	BMP	507 444,764
3.	Wind [illegible]	[illegible] Onshore	WIL	[illegible]
4.	Hydro [illegible]	River hydropower (< 1 MWel)	WO[illegible]	[illegible]
		River hydropower (< 1 MWel)	WOB	152 455,211
		River hydropower (< 5 MWel)	WOC	390 917,081
		River hydropower (< 10 MWel)	WOD	168 604,340
		River hydropower (> 10MW)	WOE	1 010 529,364
		Dam hydropower or river hydropower with pumping section	WOF	247 281,200
5.	Biomass co-firing	Fossil fuels and solid biomass	WSB	2 536 041,002
		Fossil fuels and biogas	WSG	2 705,822
	TOTAL			6 218 824,904

49% electricity from biomass combustion

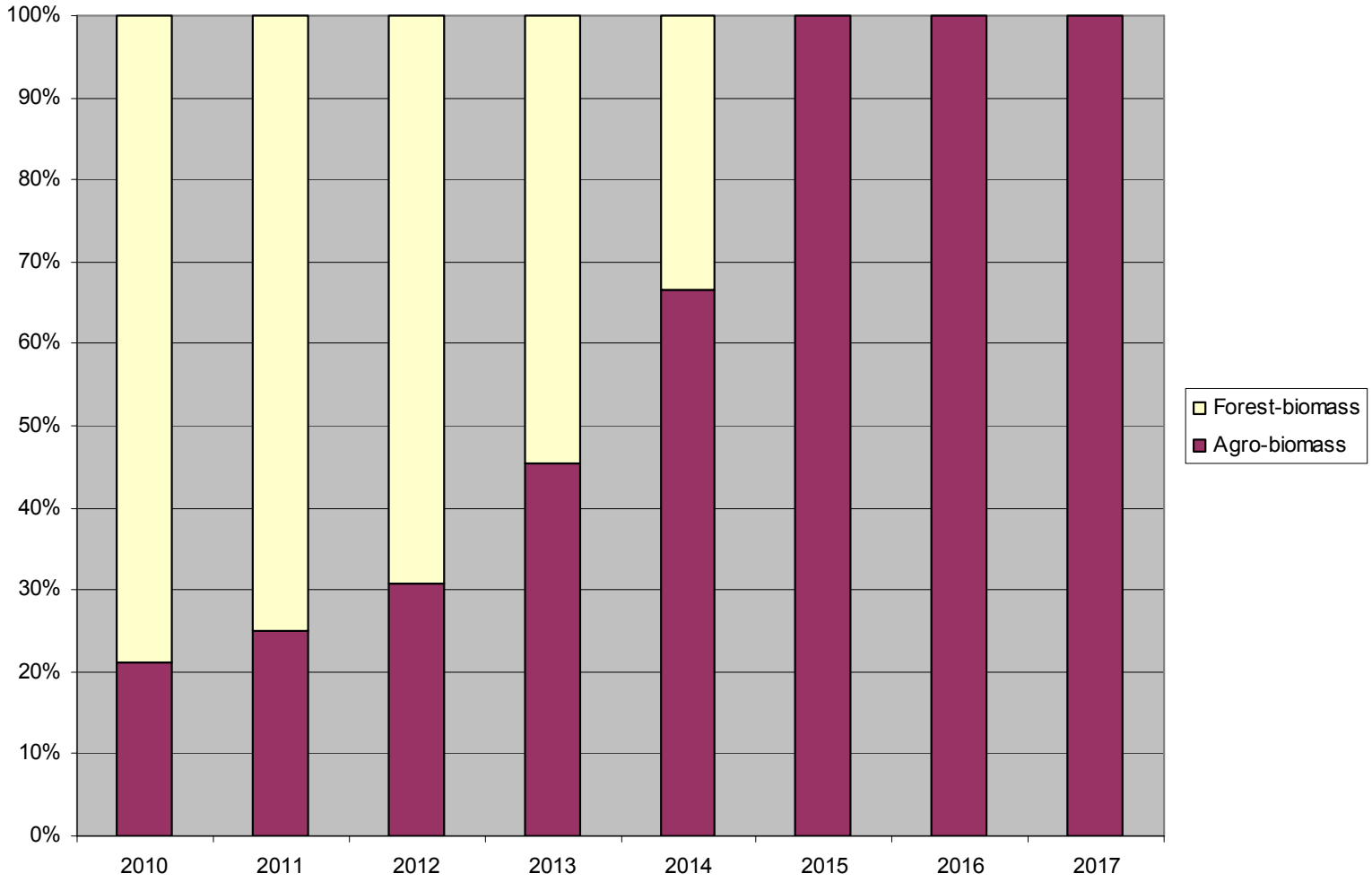
Mandatory biomass consumption structure – biomass co-firing



Mandatory biomass consumption structure – hybrid biomass



Mandatory biomass consumption structure – 100% biomass



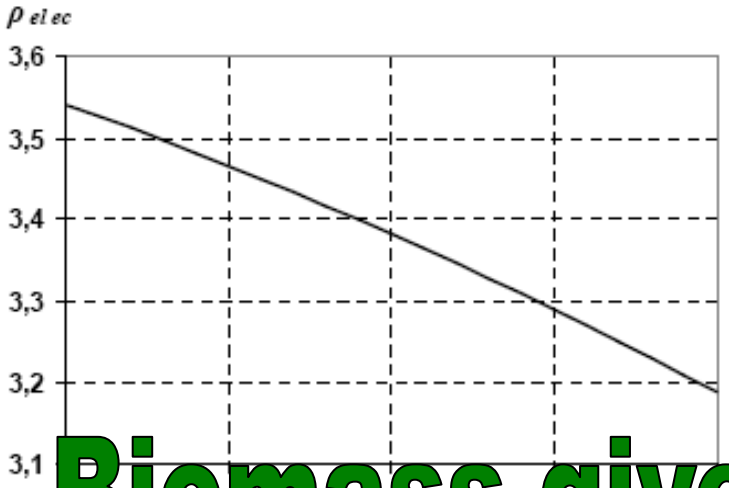
Status quo

- Biomass is used now in over 30 utilities and CHP plants in Poland.
- Domination of „simple" co-firing with fossil fuels is observed. Average biomass energy share in the fuel blend for such installations doesn't exceed 5-7%.
- 100% coal to 100% biomass boiler retrofit projects are carried out now (Białystok BFB, Wrocław PC, Czechnica CFB, , High share biomass combustion) enabling to combust from 60% biomass (PC boilers, energy share) up to 100% biomass (BFB).
- Biodegradable waste fractions (recycled biomass) co-firing projects are under considerations by some companies.
- Biomass pre-treatment technologies (torrefaction) implementation is foreseen to emerge in the following years

Sustainability measure is needed

- Useful products, including final energy carriers such as electricity and heat are generated as a result of power, technological and transport processes implementation, creating a network of interdependences.
- Thus they should be burdened not only with the direct consumption of chemical energy in the processes of fuel combustion in utility boilers.
- Also up-stream energy consumption in the transmission of final energy carriers, energy consumption in fuels transport and their extraction from the deposit as well as with energy consumption in the manufacture of machines and equipment used in each of the aforementioned stages.

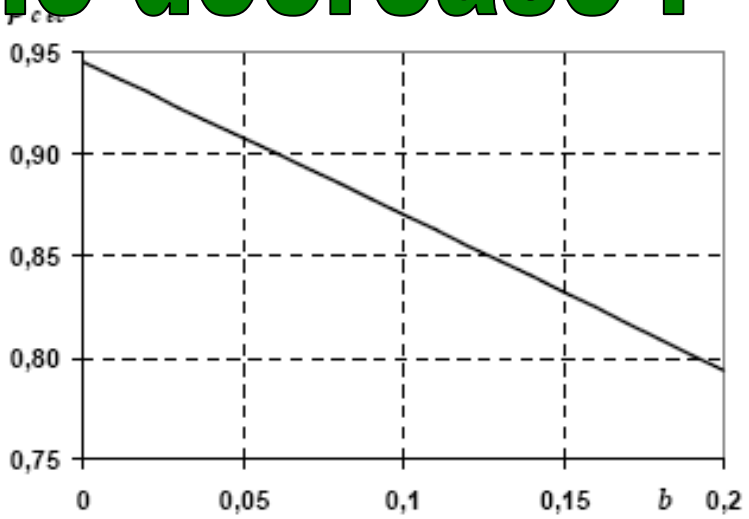
Possible approach - exergy based tools



Thermoecological cost of electricity generated in CHP plant

Biomass gives the decrease !

Thermoecological cost of heat generated in CHP plant



Conclusions

- Biomass co-firing offers an interesting option for renewable energy generation with lowest capital cost, at the same time taking advantage from the high energy efficiencies of coal-fired plants (especially CHP plants).
- Co-combustion in large utilities creates a potential for high electric efficiencies due to high steam parameters and technical measures for efficiency improvement.
- As was concluded by Repetto (Green Fees: How a Tax Shift Can Work for the Environment and the Economy, 1992), the environmental taxes along with the proper tax reforms could influence the individual country's economy.
- Analogically, it can be assumed that the reform of Polish green energy support system could enhance the development biomass and biomass-bound industries.
- Cummulative approach (thermoecological cost, LCA) can be applied applied to analyze the impact of biomass co-firing implementation on environmental burdens.

Thank you for your attention!

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