Environmental Labelling of Green Electricity with Key Parameter Models

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Problem Setting

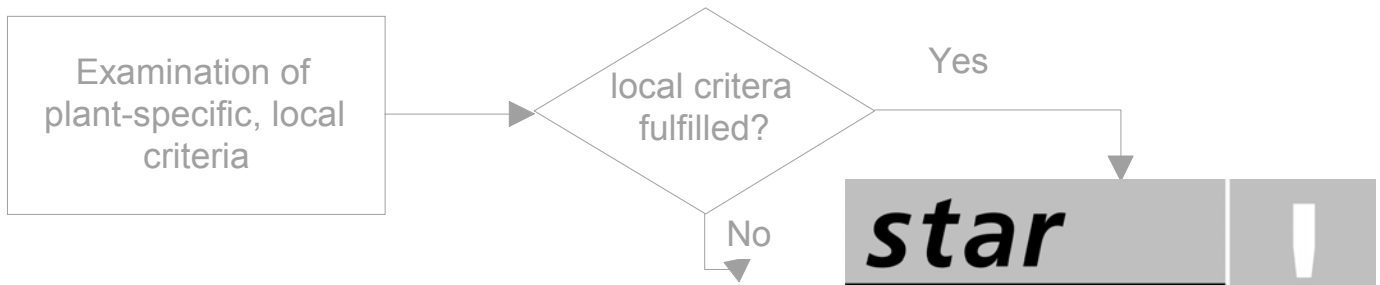
- Opening of electricity markets in Europe
- Consumers want to buy environmentally friendly electricity with good ecological criteria
- How can LCA contribute to this kind of question?

Contents

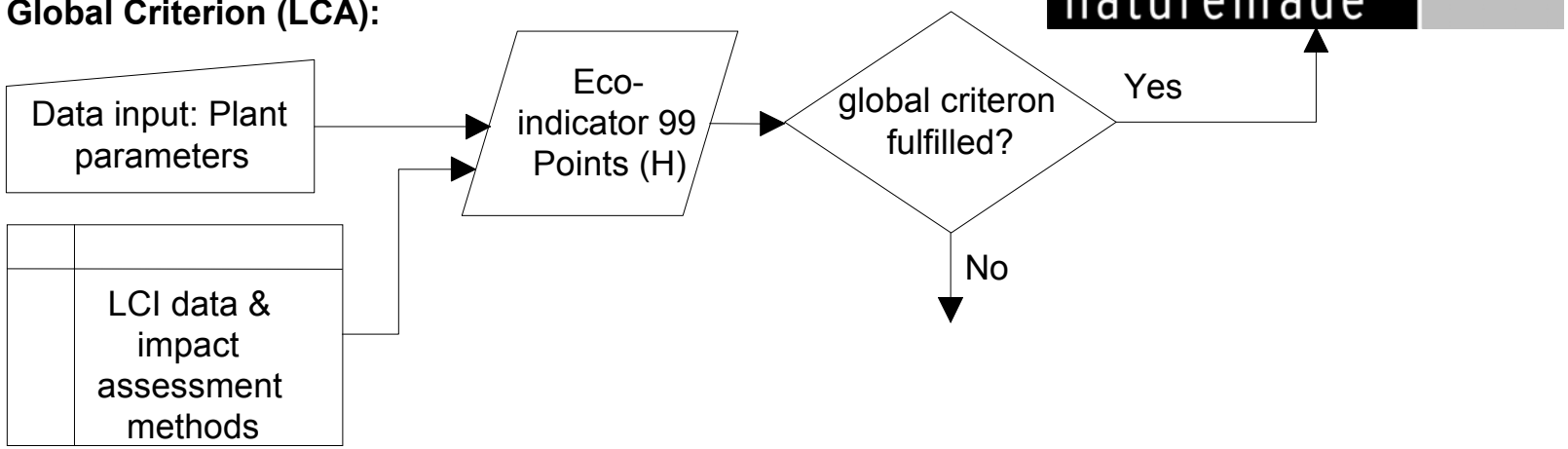
- Labelling scheme for *naturemade star*
- Rule of LCA and an example
- Consistent system boundaries and other challenges
- Conclusions and outlook

Criteria for Ecolabelling

Local Criteria:



Global Criterion (LCA):



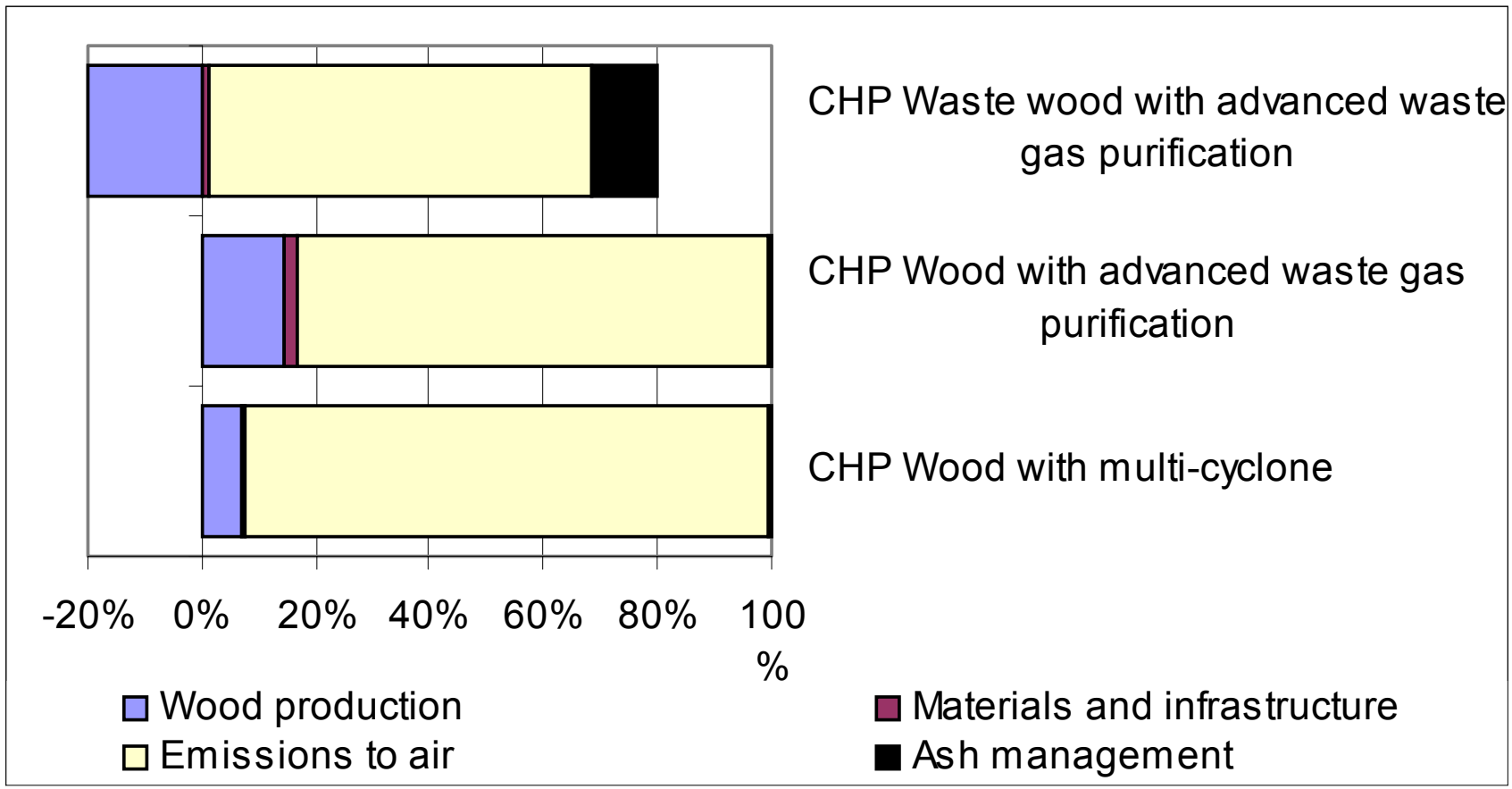
Global Criterion

- One threshold for all renewable energy resources
- Detailed LCA per type of power plant
- Identification of key parameters
- Modelling in Excel for checking the threshold

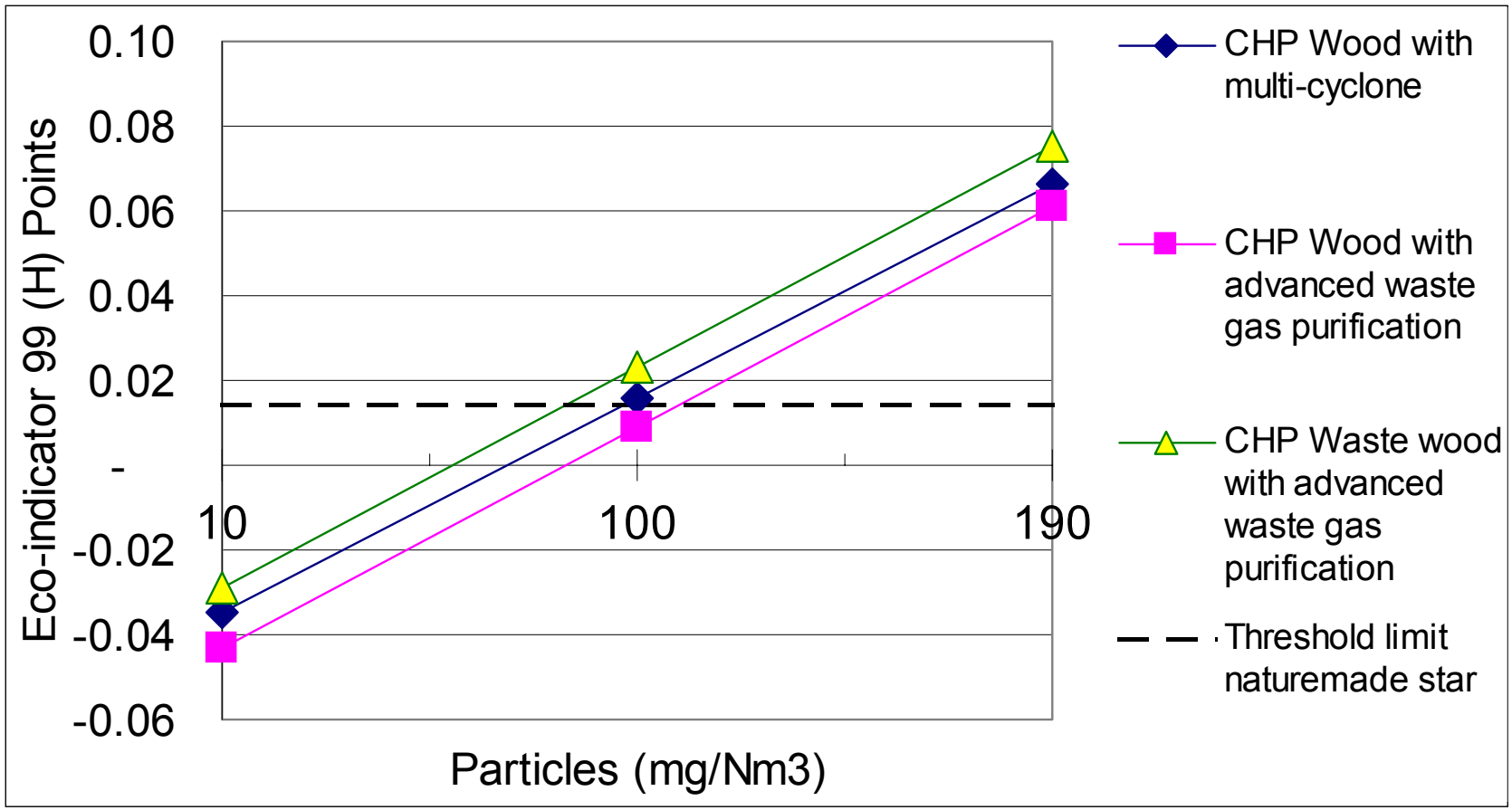
Detailed LCA for Electricity Production from Wood

- Detailed inventory for three Swiss plants
- Cradle to grave
- Assessment with Eco-indicator 99 and other impact assessment methods
- Analysis of most important stages as entries to the inventory

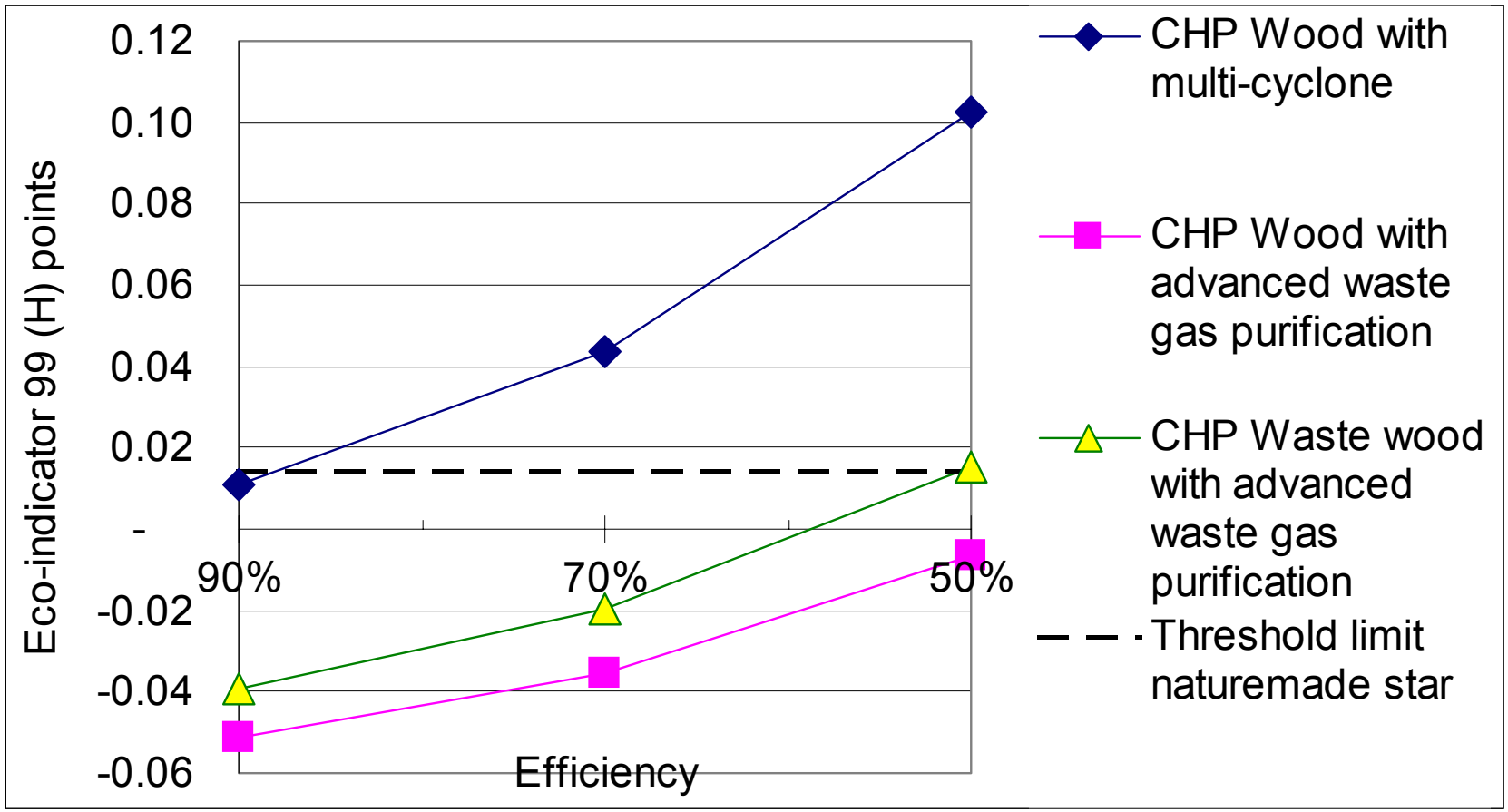
Contribution of different Stages



Variation of Particle Emissions



Variation in Efficiency



Key Parameter Model

Key parameter model for wood

Name of facility		WKK Lengwil	
Impact assessment method		EI'99-aggregated, Hierarchist	
Type of plant		Co-generation wood combustion with multi-cyclone	
Data input			
Wood chips from forest	t/a	25560	
Wood chips from wood processing	t/a	0	
Wood chips from wood wastes	t/a	0	
Transport distance	km	0	
Emissions to air			
Particle	mg/Nm^3	40.0	
NOx as NO2	mg/Nm^3	100.0	
Lead (only for waste wood)	mg/Nm^3	1.0	
Cadmium (only for waste wood)	mg/Nm^3	0.05	
Zinc (only for waste wood)	mg/Nm^3	0.5	
Outputs			
Ash for waste management	t/a	255.6	
Type of waste management		land fill	
Gross electricity production	kWh/a	1.31E+07	
Heat used	kWh/a	9.19E+07	
Results			
		pro kWh	
WKK Lengwil per year	EI-99-points/a	1.74E+05	
WKK Lengwil / kWh	EI-99-points/kWh	1.33E-02	
Threshold Eco electricity Switzerland	EI-99-points/kWh	1.40E-02	95.0%
Eco electricity criterion fulfilled			

Threshold Limit

- Eco-indicator 99 (H) points
- 50% of a gas combined cycle power plant

		Certified Systems for Renewable Energy				Conventional Reference Systems				
Threshold Limit		Hydro Power	Wind Energy	Biogas	Photovoltaic	Gas Combined Cycle - Natural Gas	Nuclear Power	Fuel Oil	Hard Coal	UCPTE-Electricity-Mix
13'950	Min	367	1'160	neg.	6'730	27'900	6'260	61'600	28'000	24'600
	Max	637	9'680	neg.	14'900					

Challenges

- Step by step evaluation of different systems. Start with wind, hydro and solar energy
- Consistent definition of system boundaries for new energy systems has to be ensured

System Boundaries

- Development of guidelines
- Allocation of by-products → Credit with 50% of good conventional technique
- Average situation as reference standard

Impact Assessment

- One score impact assessment is necessary in order to compare result with a threshold
- Shortcomings of Eco-indicator 99 are relevant for some (new) systems, e.g. nutrients from biogas plant
- Local criteria cover specific problems of new systems (e.g. fish-ladders, visual impact of wind power, etc.)

Conclusions

- Key parameter models are a valuable tool for plant specific evaluation and comparison of different technologies
- Local criteria are indispensable to support the labelling

Outlook

- Further case studies are on the way for biogas in agriculture, biogas from effluent treatment plants