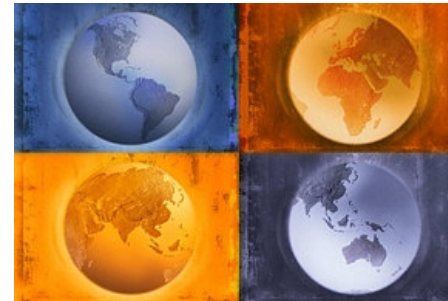


Status of Biofuels: Policies and Technology

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This presentation

PART 1*:

- Review of Biofuels directive (2003/30)

PART 2:

- 1st and 2nd generation of biofuels

** Presentation based upon slides Stakeholder meeting – **Preparation of the review of the fuel quality directive** - Paul Hodson, DG Energy and Transport EC*

PART 1: Biofuel Directive

- I Objectives of the directive
- II Progress
- III Fuel specification issues

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I Objectives



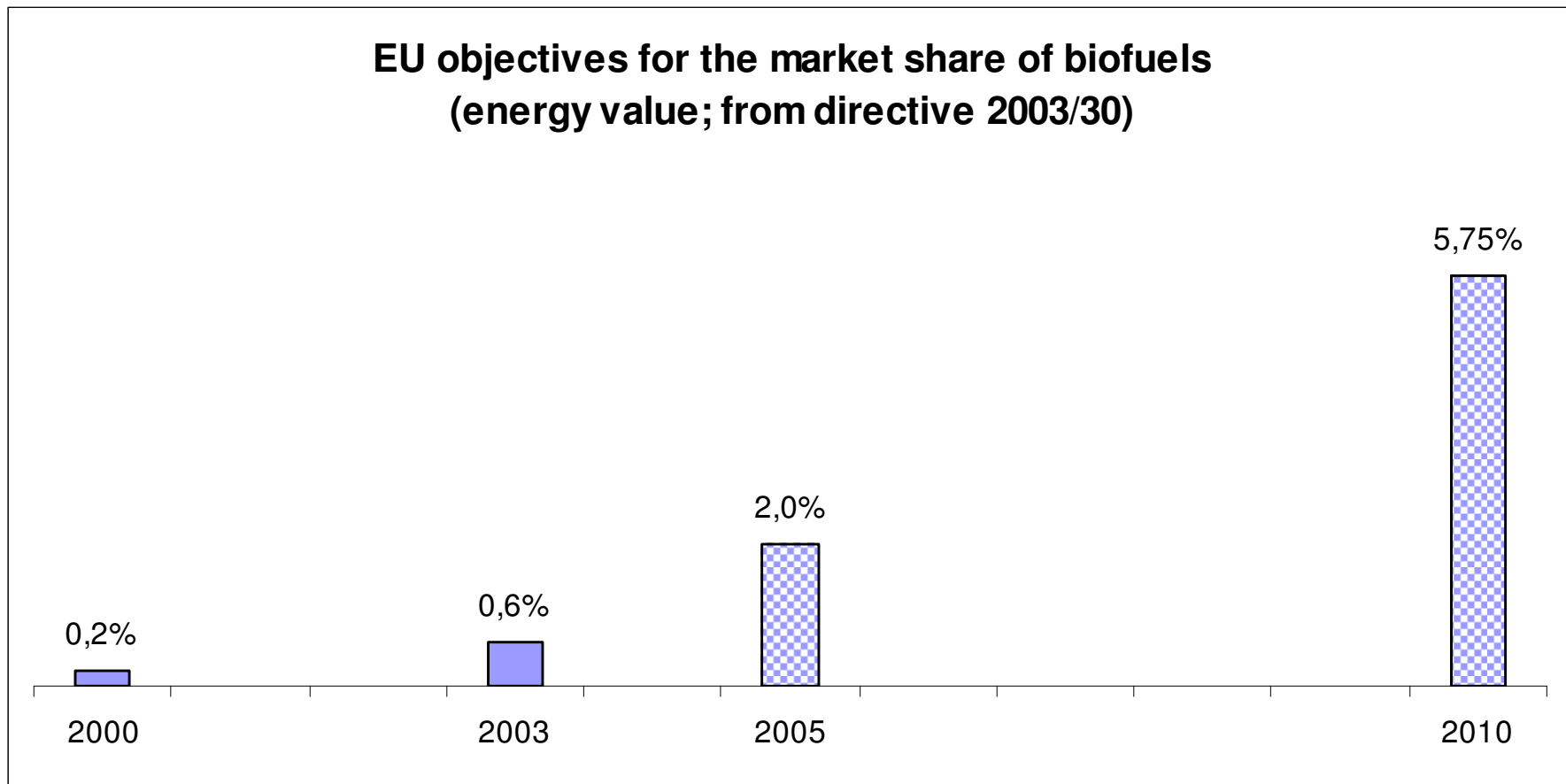
Reasons for the promotion of biofuels

- 1) savings in greenhouse gas emissions
- 2) security of supply (reduce dependence on oil)
- 3) rural economic development

Key advantages of biofuels:

- an alternative fuel that can be used in ordinary engines
- one of the few measures that is having an appreciable impact on greenhouse gas emissions in transport

EU objectives for the market share of biofuels (energy value; from directive 2003/30)

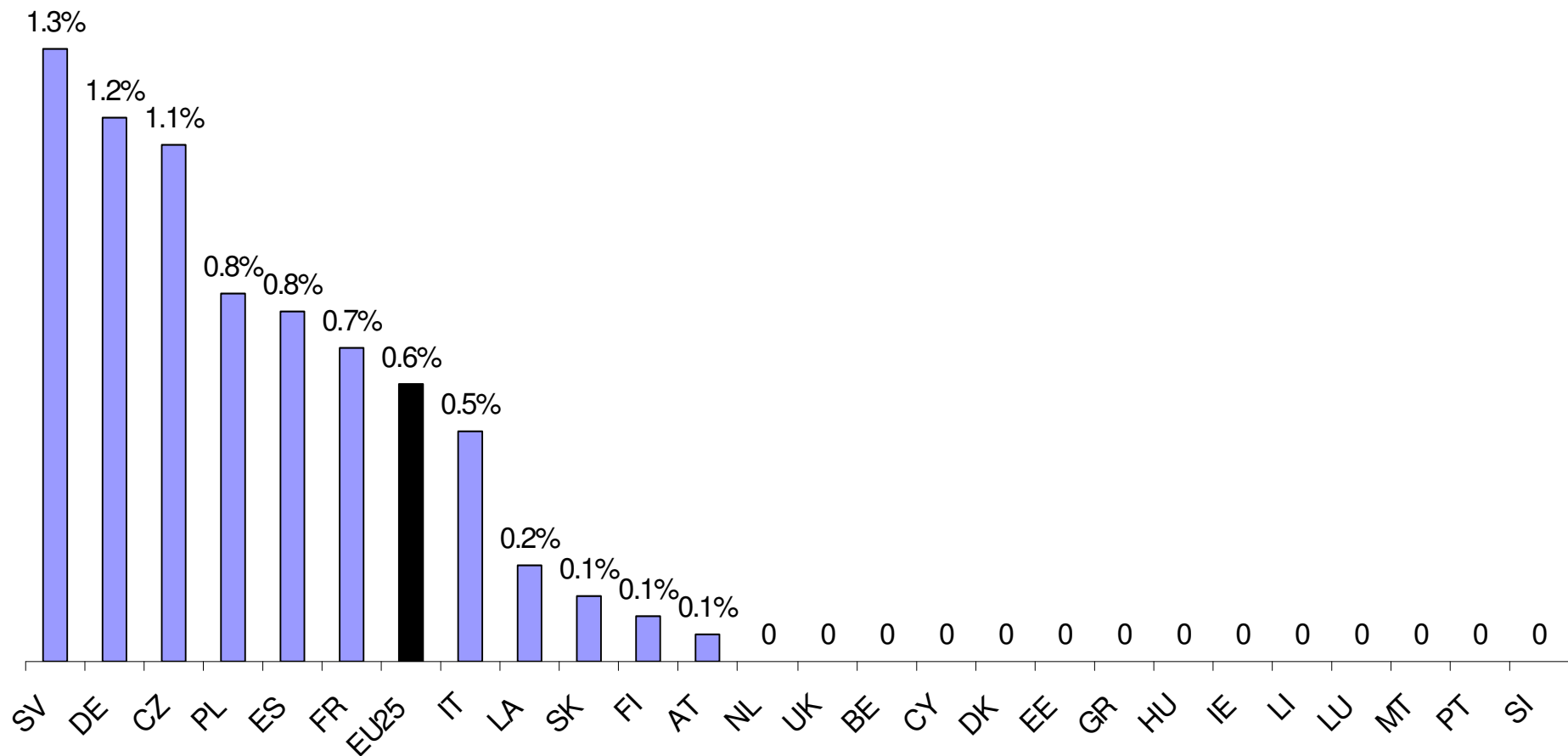


II Progress



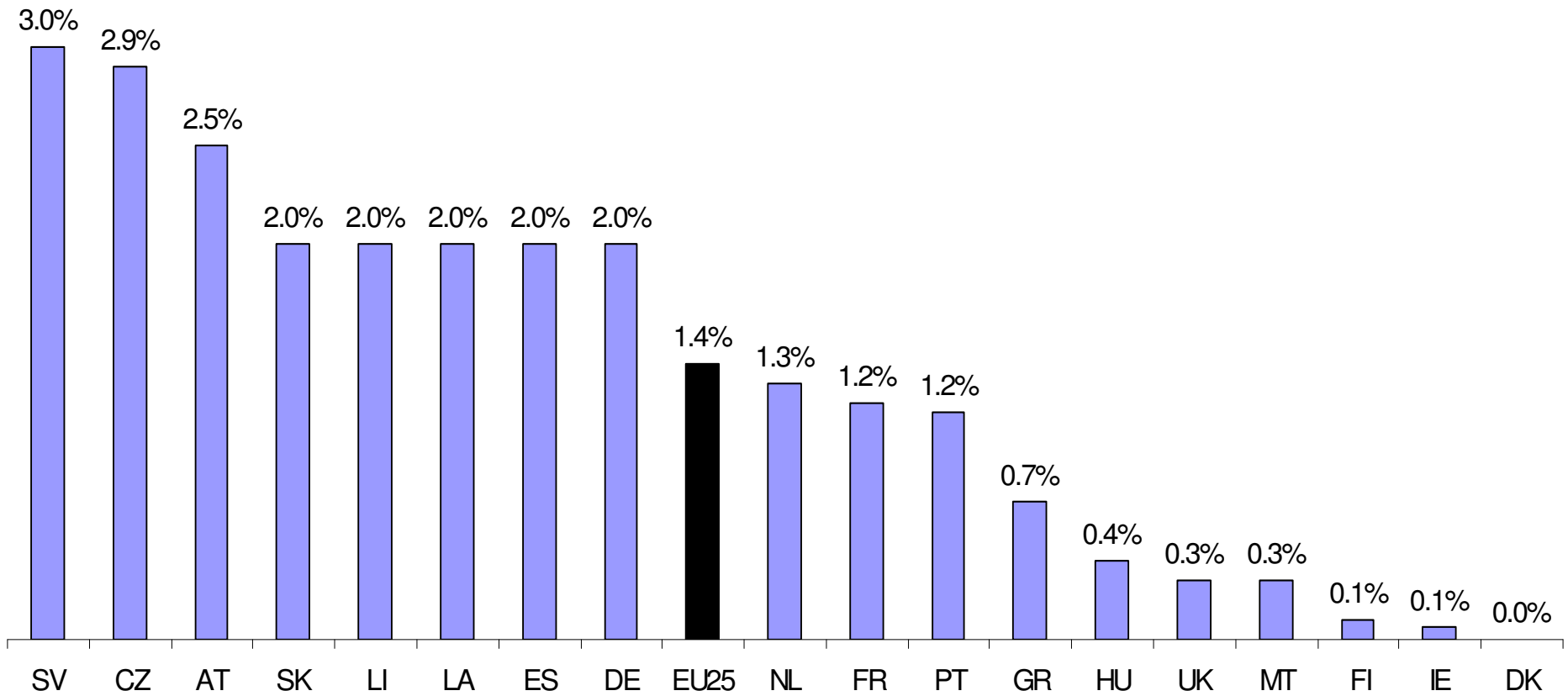


Market share of biofuels, 2003 (EU25)



Source: European Commission estimates based on national reports under biofuels directive

Biofuels targets for 2005 (18 Member states reporting; rounded to .1%)



Methods of implementation:

- 1) Exempting biofuels from fuel taxes (Ge, Sp)
- 2) Other financial incentives
- 3) Obligations/penalties on fuel suppliers (agreed in AT, FR, NL, CZ, UK)

III Fuel specification issues



Two main biofuels

bioethanol (from grain, sugar ...) – replaces petrol

biodiesel (from oil seeds, used cooking oil ...) – replaces diesel

Two ways to meet the objectives of the directive

pure/high blends

played a pathbreaking role in Germany (biodiesel) and Sweden (bioethanol)

but limited potential - require specialised vehicles and distribution

low blends

probably essential to achieve the objectives of the biofuels directive

it looks difficult or impossible to achieve 5.75% share without changes in fuel specification

Fuel specification issues affecting **biodiesel**

EN590: 5% blending limit (equivalent to c. 4.6% by energy value)

EN14214: iodine number max. 120 (an obstacle to the use of feedstocks other than rapeseed)

- 1) how to ensure engine warranties for biodiesel blends > 5%?
- 2) is it important to extend the range of biodiesel feedstocks? if so, how?
- 3) are these issues only for standardisation bodies? or do they affect the reform of the fuel quality directive?

Fuel specification issues affecting **bioethanol** (in the fuel quality directive)

- 5% blending limit (equivalent to c.a 3% by energy value)
 - 15% ETBE blending limit
 - oxygen limit
 - vapour pressure limit (affects cost of blending ethanol)
- 1) how to achieve ethanol blends in the 6-10% range (energy value)?
- 2) how to address the vapour pressure question?

2006: EU Review of the biofuels directive

- Focus on economic and environmental performance of biofuels
- Assessment of implementation in the Member States

PART 2:

Consultancy and Engineering



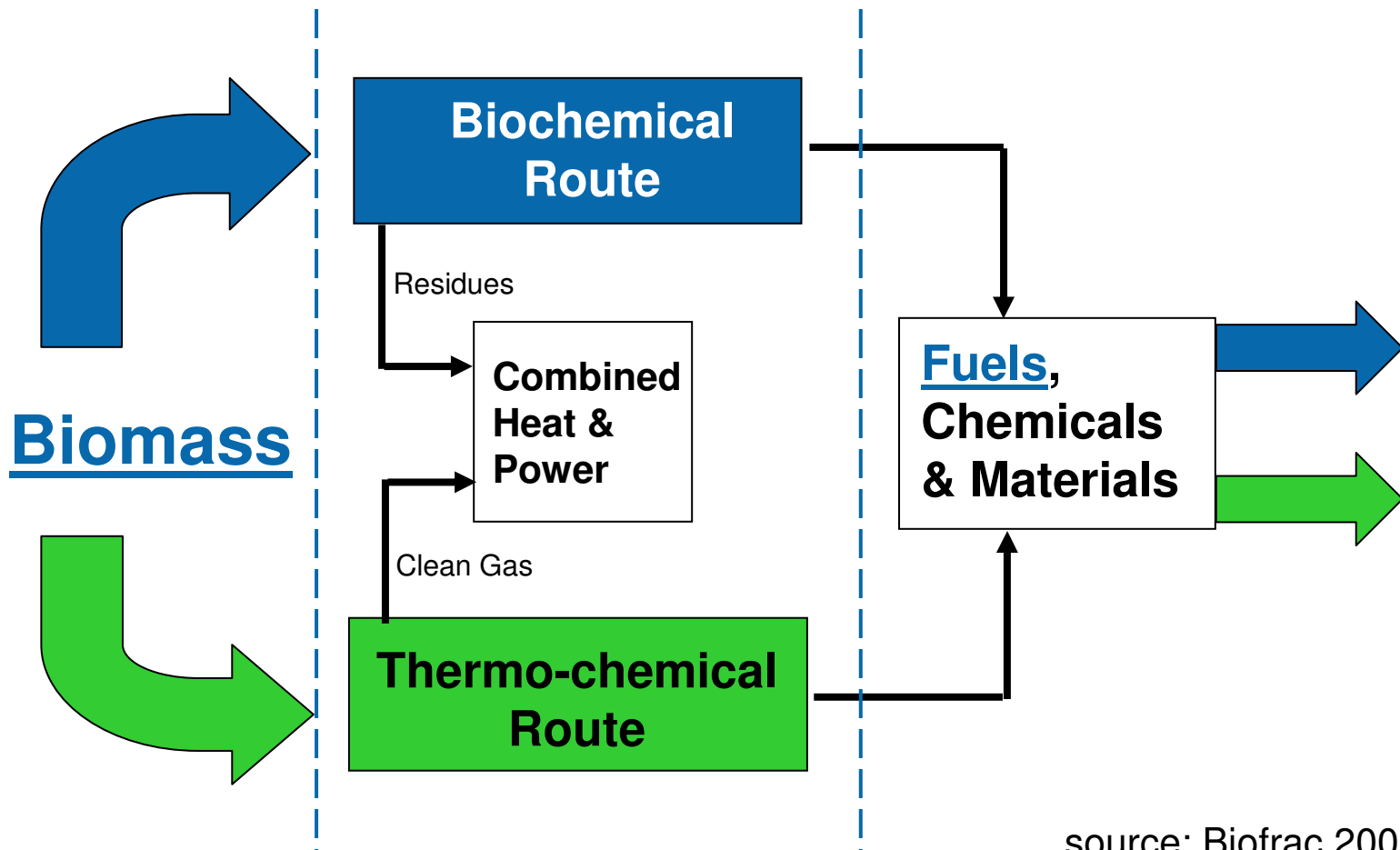
1st and 2nd generation biofuels

- I Biofuel production
- II Prospects of gassification



Gateway to solutions

Biomass conversion



source: Biofrac 2005

1st generation biofuels

Biodiesel

*Virgin plant oils (vpo)
from seeds
from waste (oils/fat)*

*cold pressing, extraction, refining
transesterification (vpo)
refining, transesterification*

Bioethanol

*from sugar crops
from starch*

*fermentation, distillation
hydrolysis, fermentation, distillation*

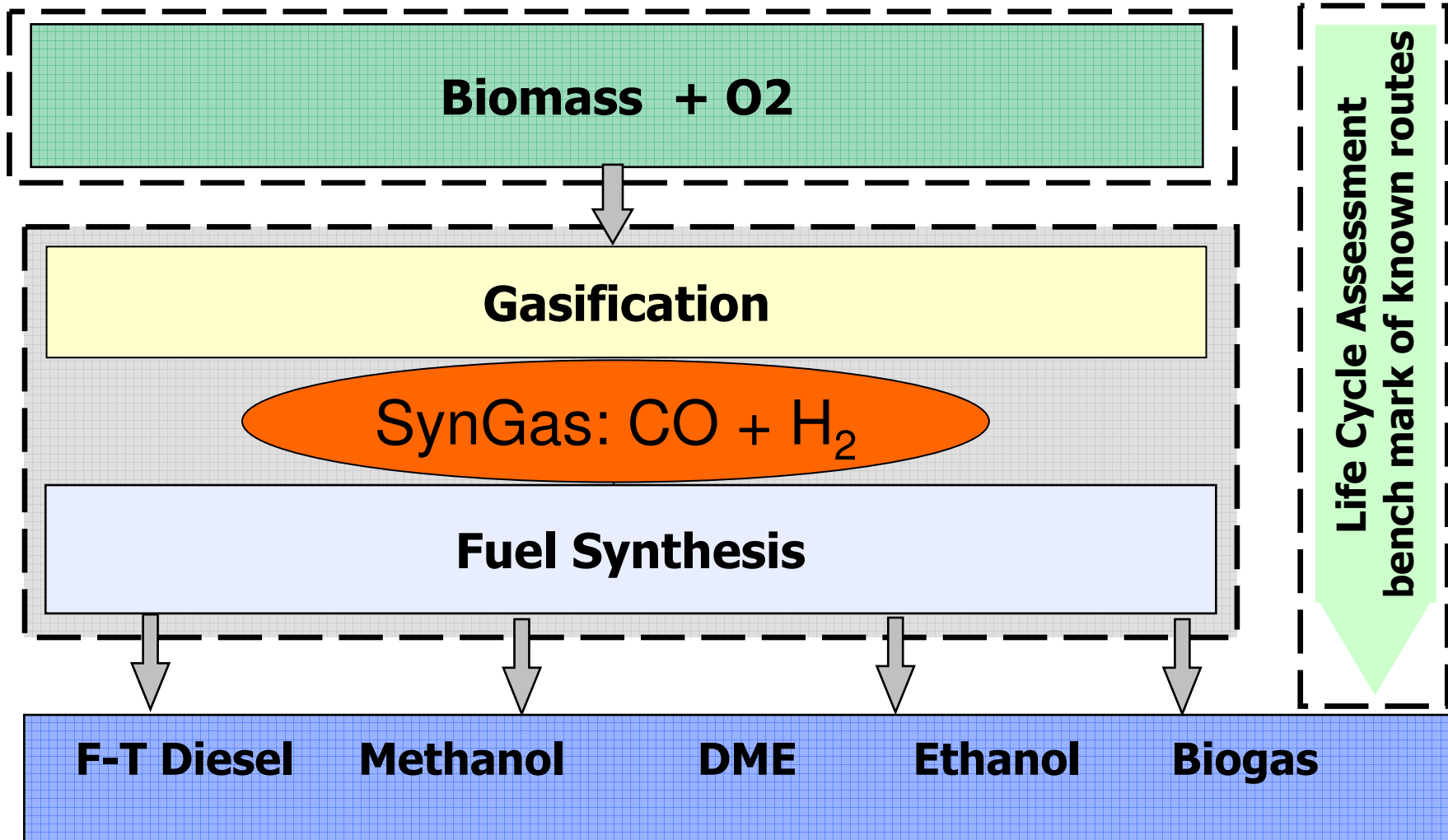
BioETBE

fermentation, synthesis

2nd generation biofuels

Fischer Tropsch diesel	<i>gassification, gascleaning, synthesis, hydrocracking</i>
Biomethanol	<i>gassification, gascleaning, synthesis</i>
BioMTBE	<i>synthesis biomethanol with isobutylene</i>
BioDME	<i>gassification, gascleaning, synthesis</i>
Hydrogen	<i>gassification, CO₂ removal</i>
Pyrolysis diesel	<i>pyrolysis, HDO, refining</i>
Bioethanol	<i>advanced hydrolysis, fermentation, distillation</i>

Gassification-based biofuels will become very important



Synthese of Fuels

1. Manufacture of **synthesis gas**:

Biomass (or coal) + O₂ ==> CO + H₂ (carbon monoxide and hydrogen)

2. Water gas shift **adjusts CO/H₂ ratio**:

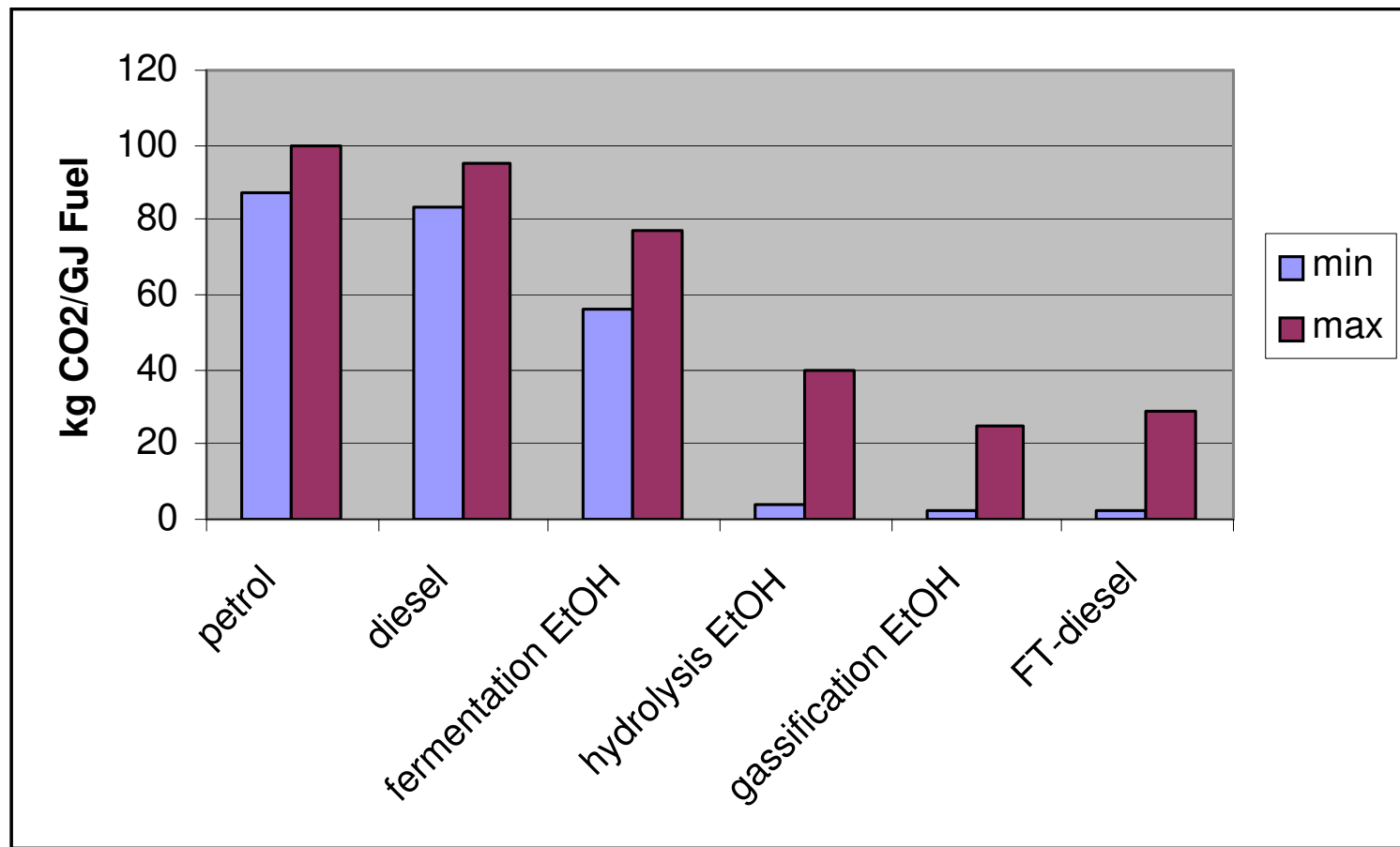
CO + H₂O <==> CO₂ + H₂

3. **Synthesis** with Catalyst

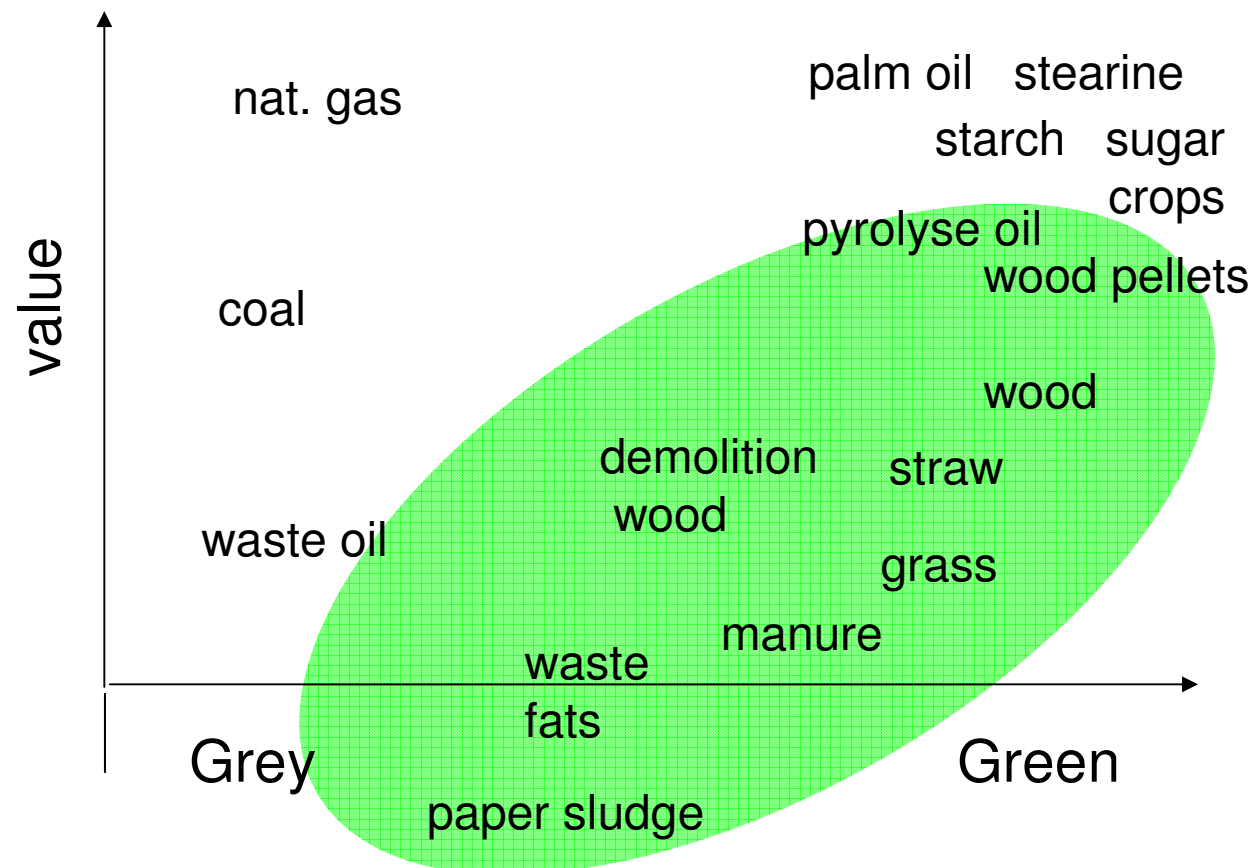
CO + 2 H₂ ==> CH₃OH (methanol)

CO + H₂ ==> "(CH₂)_n" (diesel or gasoline, the Fischer Tropsch reaction)

Emission factors kg CO₂/GJ fuel

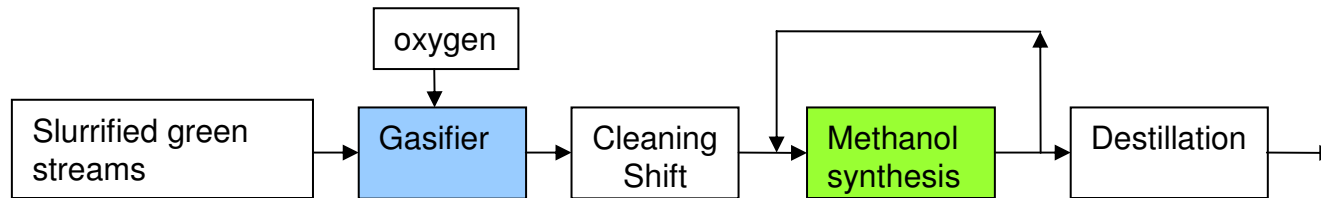


Input pallet biomass and raw materials

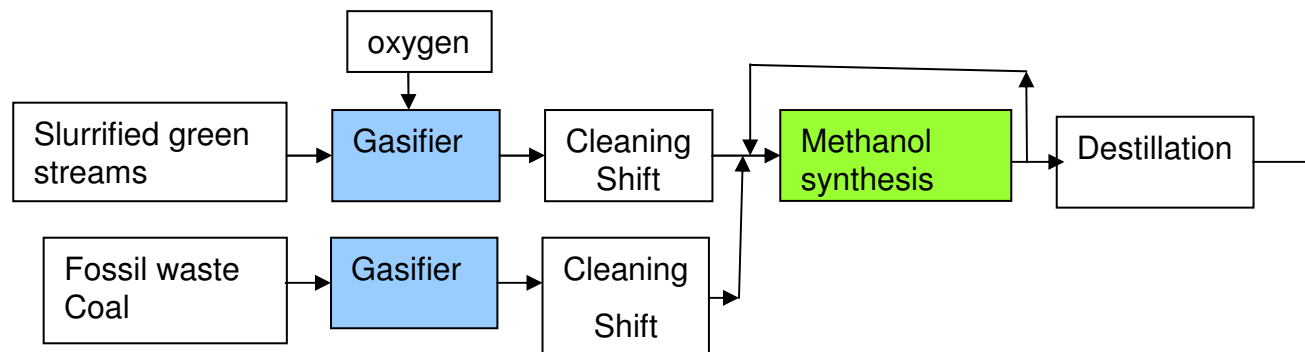


Example: methanol production

Scenario Green



Scenario Green with fossil waste streams



summarizing

2nd generation biofuels are necessary

- to achieve sufficient CO₂ reduction
- to produce significant amounts

Gasification is a flexible technology for

- effective production of biofuels
- possible combining with fossil streams like coal

Realisation of full scale commercial biomass gasification plants is expected within 5 years

