

# Research Institute for Sustainable Energy

*Assisting the development  
of the Australian sustainable energy industry*

# **Biofuels –**

## **Developments in Germany and in the EU**

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**Based: University Furtwangen, Black Forest, Germany**

- **Germany's situation**
- **Biomass resources in Germany**
- **Biofuels on the market**
  - gas/methane, oils, diesel, ethanol
- **Biofuels close to market**
  - synfuels from biomass
- **European Union's Agenda on biomass**
- **Summary / Objectives at RISE**

# Germany – Basic Facts

## Germany

Area 0.36 Mil. km<sup>2</sup>

Population 82 Mil.

**Ratio: 228 inh./km<sup>2</sup>**

## Australia

Area 7.7 Mil. km<sup>2</sup>

Population 20.5 Mil.

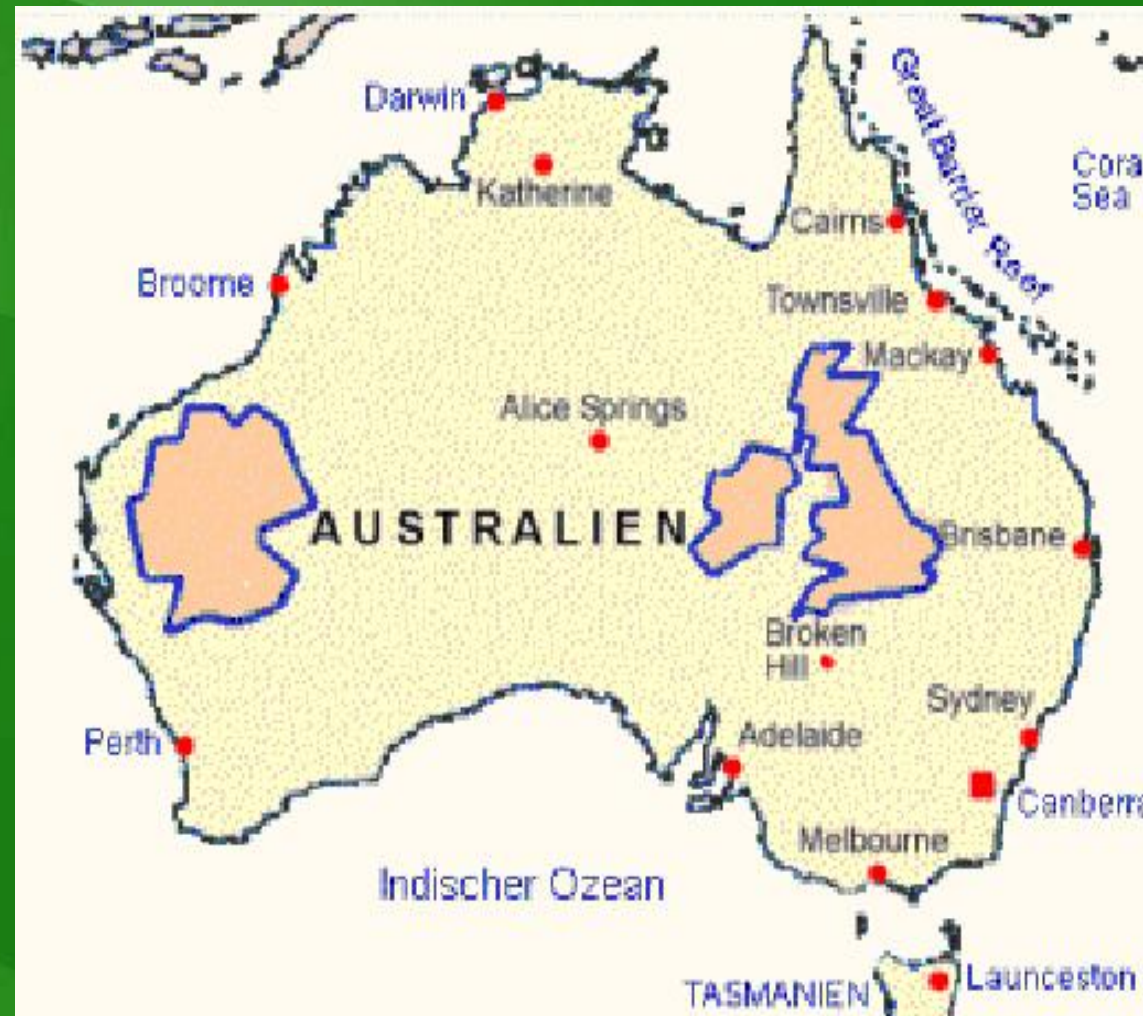
**Ratio: 2,7 inh./km<sup>2</sup>**

## Western Australia

Area 2.5 Mil. km<sup>2</sup>

Population 2 Mil.

**Ratio: 0,8 inh./km<sup>2</sup>**



# Germany – Primary Energy Situation

## Primary energy consumption 2005

Total: 14,300 PJ (equiv. 350 mio. t crude oil, toe) (1PJ = 10<sup>15</sup> J)

Source	% of Total	Import %	Own Reserves
Mineral Oil	36	96	very few
Natural Gases	22	83	few
Coal	24	8	medium
Atomic	13	100	very few
Renewables & others	4	> 5	average

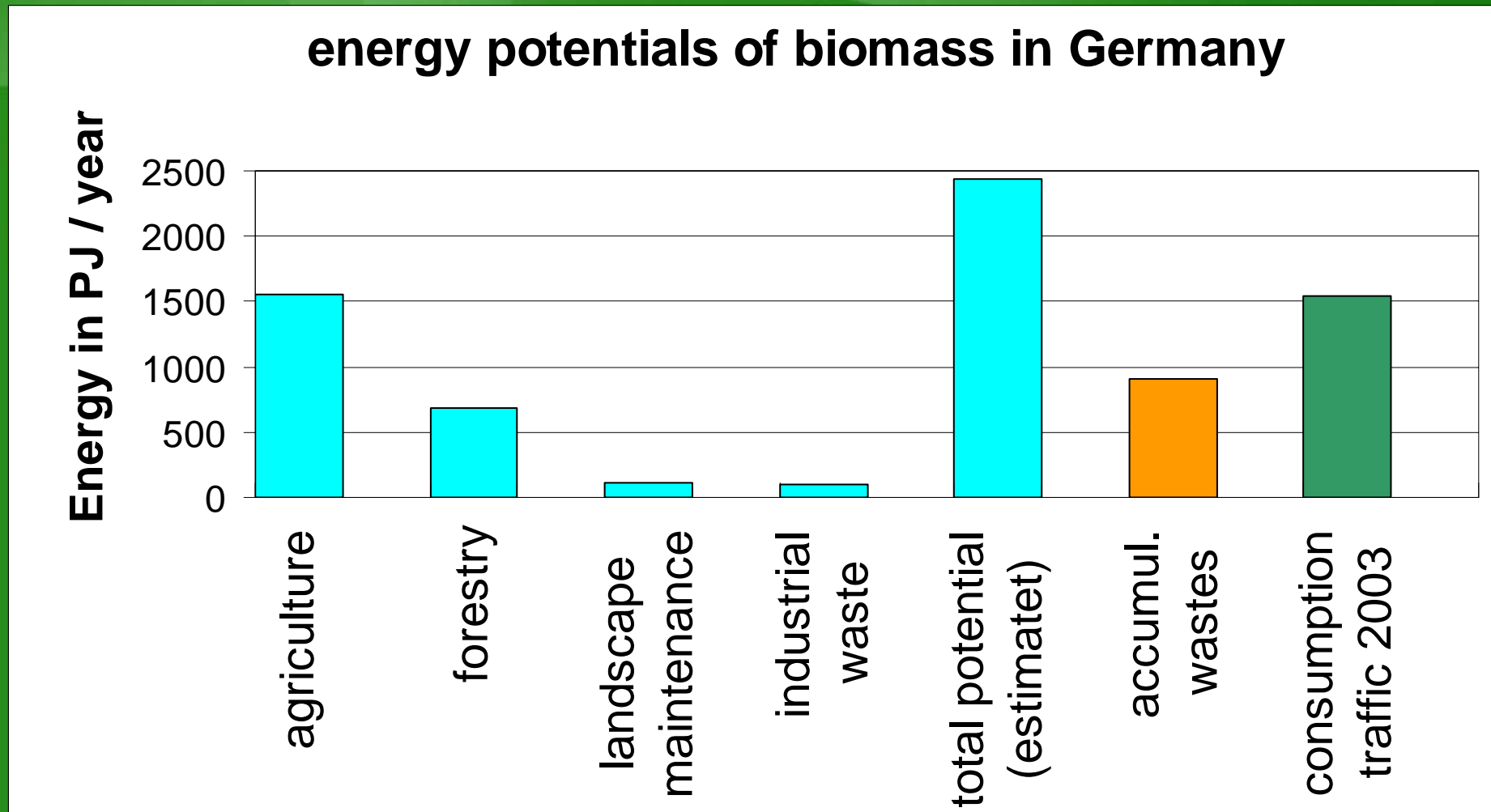
# Germany – Potential Renewables (prim. e.)



## Estimates for renewable energy resources (2005), Gov.

Source	Potential	Used 2005	estim. 2020
Hydro	90 PJ	85 %	98 %
Wind	730 PJ	13 %	40 %
Solar	1460 PJ	1 %	20 %
Geothermal	1730 PJ	0.3 %	3 %
Biomass	1278 PJ	31 %	66 %
<b>Total</b>	<b>5288 PJ</b>	<b>12.6 %</b>	<b>35 %</b>
<b>Nega-Watts</b>	<b>6500 PJ</b>	<b>2.6 %</b>	<b>38 %</b>

# Germany – Biomass Potential Estimates (2003), Univ. Kassel



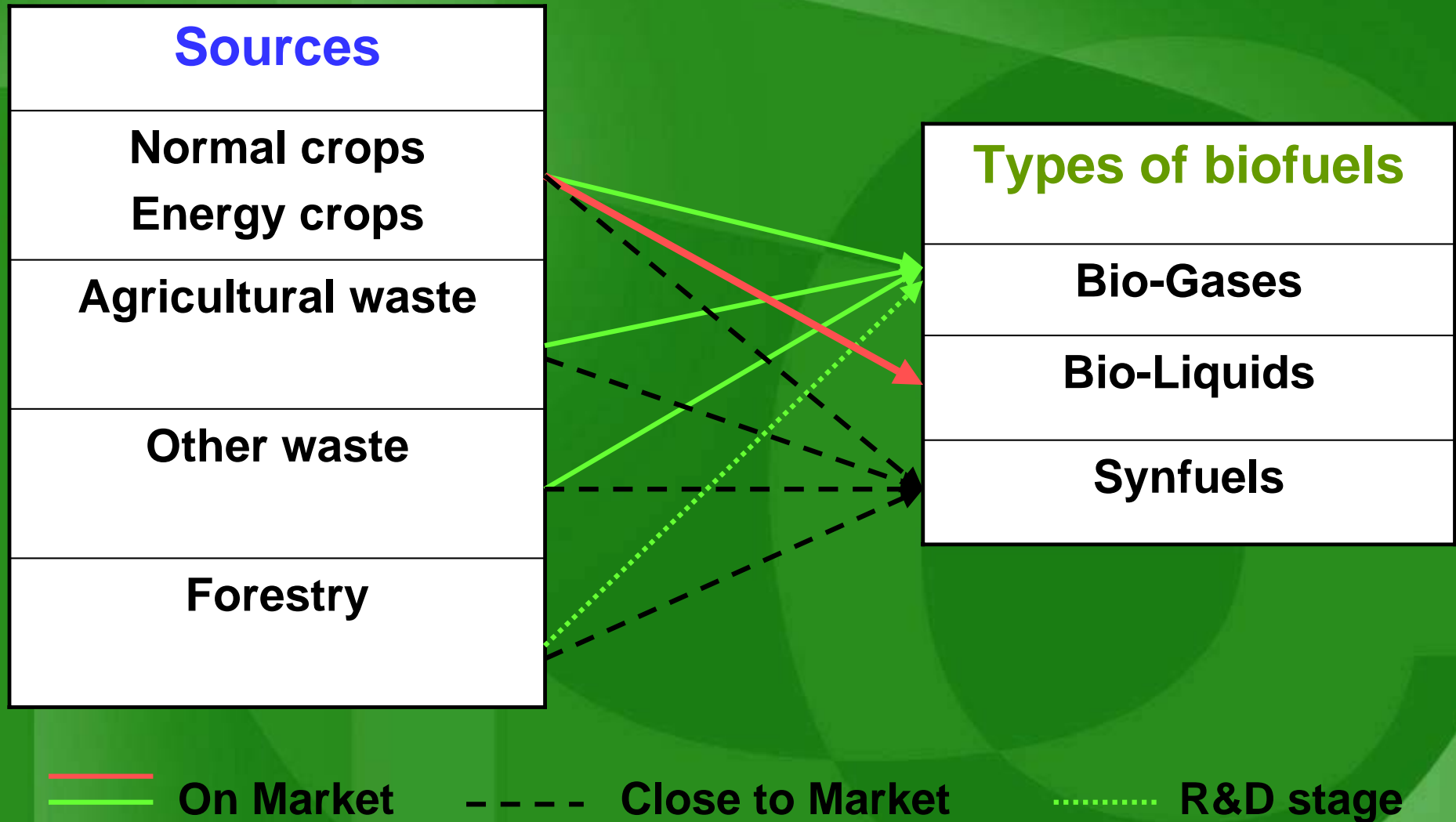
# Germany – Current Fossil Fuels Prices & Tax



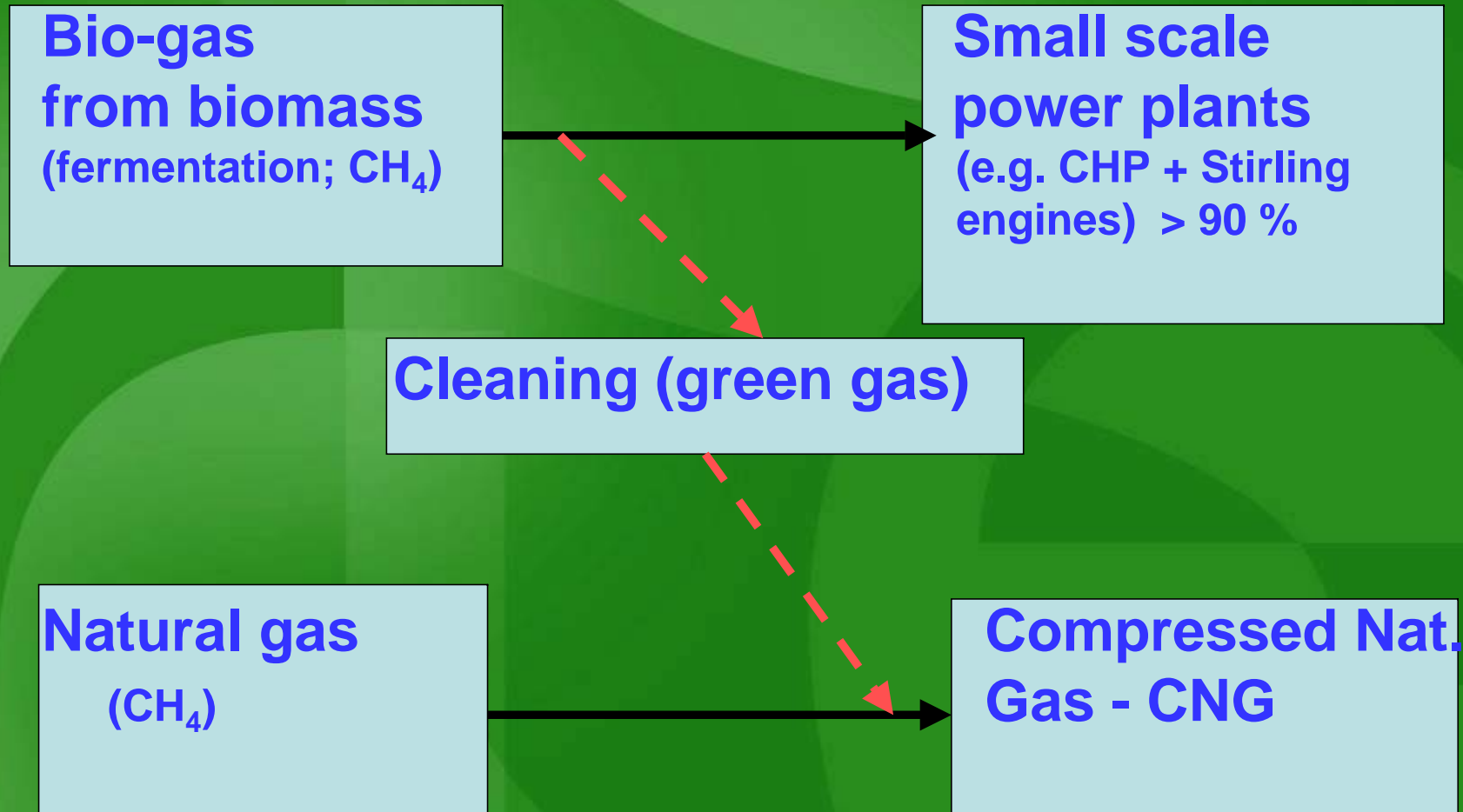
Name	RON	Av. price	Tax
Normal (unleaded)	> 91	1.30 Euro ~ 2.10 A\$	0.83 Euro = 64 %
Super (premium unl.)	> 95	1.33 Euro ~ 2.15 A\$	0.84 Euro = 63 %
Super plus	> 98	Phasing out	
Ultimate, V- Power, ....	> 100	1.48 Euro ~2.39 A\$	0.86 Euro = 58 %
Diesel	Not applic.	1.20 Euro ~ 1.94 A\$	0.64 Euro = 53 %

RON = researched octane number

# Biofuels – Sources and Types



# Bio-Gas



# Biogas – CNG market

2006 → 50,000 vehicles (modif. or new)  
600 service stations  
approx. A\$0.8 /ltr.  
low taxation (no fuel tax)

2008 → 1000 service stations for 1 Mil.  
vehicles planned

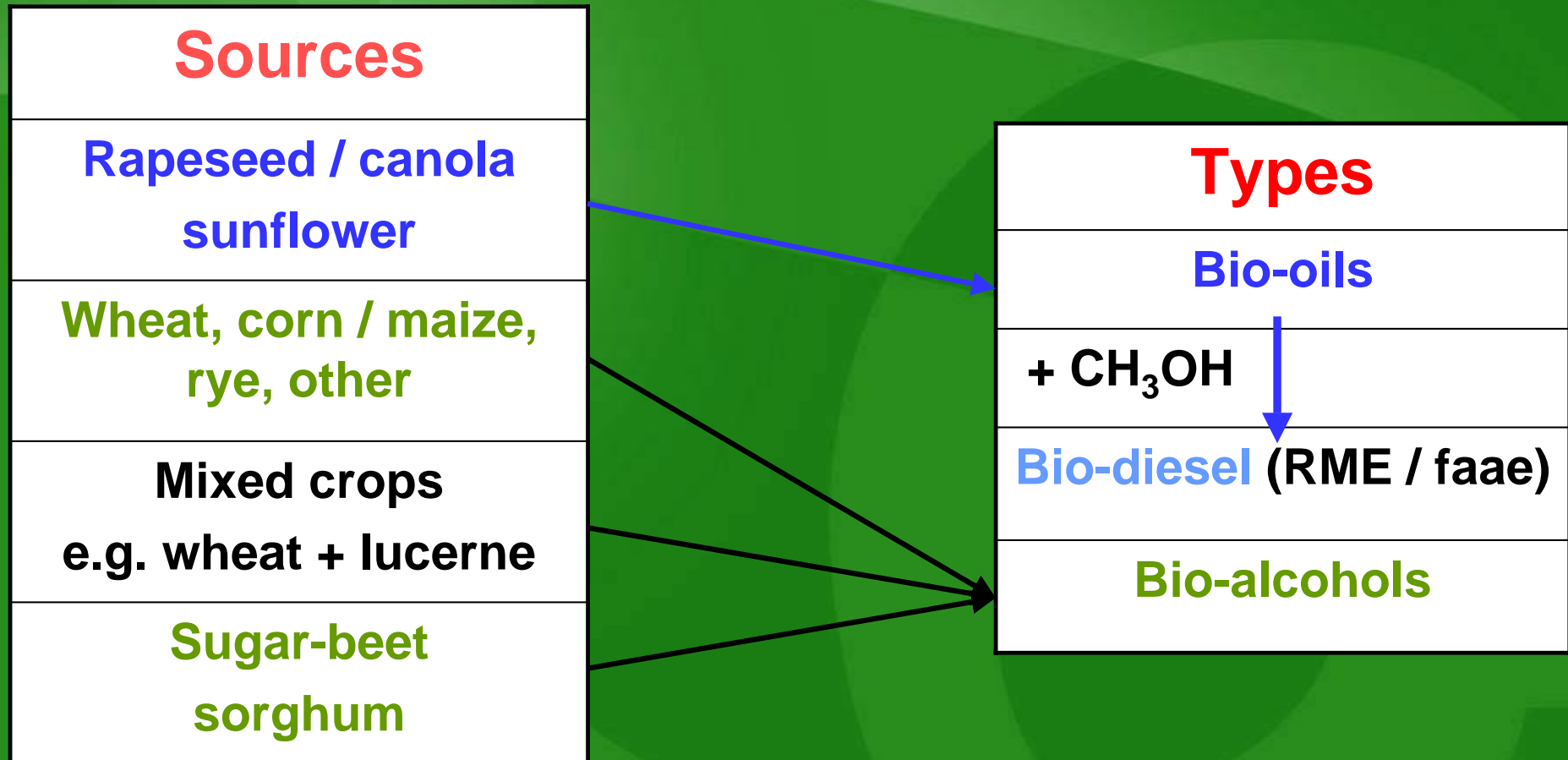
2015 → End of exemption from fuel tax

**Sidestep: *LPG-market is booming (propane; butane)***

***Consumer confusion***

- *names: CNG, LNG, LPG, other ?*
- *units: Euro/kg, Euro/ltr., energy ?*

# Bio-Liquids – Sources and Types



RME = rapeseed methyl ester, faae = fatty acid alkyle ester

Classified as food (quality for use as fuel?)

- 2005 → can be used by **old** diesel-vehicles  
or  
modified diesels engines (**non-turbo!**)
- 130 service stations + food stores  
approx. A\$1.2 /ltr., low taxation
- 2008 → end of low taxation for rapeseed-oil  
sold via gas-stations
- oil sold via food stores??

# Bio-Liquids – Bio-Diesels (RME / faae)



## Discussions about quality (DIN 14214)

- 2004 → industry begins blending bio-diesel / std.-diesel  
up to 5 % of bio-diesel could be blended in  
suitable for all diesel engines**
- 2006 → 3 Mil. vehicles may use RME  
often only small modifications needed  
1,900 service stations  
Low tax, approx. 8 cents cheaper than diesel  
→ Production 4 to 5 Mil. t RME**
- 8/2006 → 15 cent/ltr. fuel tax introduced  
drastic market decline**
- 2008 → further tax increases planned**

# Bio-Liquid – Bio-Alcohols

Mainly ethanol produced; pure ethanol taxed as liquor

E85 introduced in market, equiv. to premium-unleaded

2006 → old. modif. vehicles and some new models (Ford flexi-fuels) may use E85  
few service stations  
prod. cap. ethanol approx. 0.7 Mio tons/y

2007 → increase in available models (flexi-fuel)  
approx. 1000 E85-service stations planned  
price approx. A\$ 1.5 / ltr., low tax

→ ETBE will replace MTBE (antiknock)

→ blend with unleaded planned (max. vol. 5%),

2009 → > 15 cent/ltr. fuel tax will be introduced  
Market reaction?

MTBE = Methyl-tert-butyl-ether, ETBE = Ethyl-tert-butyl-ether

# Summary – Biofuels on Market in Germany



- **Sales depend heavily on grade of taxation**
- **Existing tax-exemptions planned to expire**
- **At present not competitive against fossil fuels without subsidies (tax exemptions)**
- **Political will required (self-reliance on energy?)  
→ at present mixed signals**

## Synthetic biofuels → biomass-to-liquid (BTL), Synfuels

### Example:

- Carbo-V-technology by CHOREN Industries
- backed by VW, DaimlerChrysler, Shell, others
- claim: can use any type of biomass, “design” fuel

2002 → pilot plant in operation ( $\alpha$ - plant, tests)

2006 → 20,000 t/y plant under construction

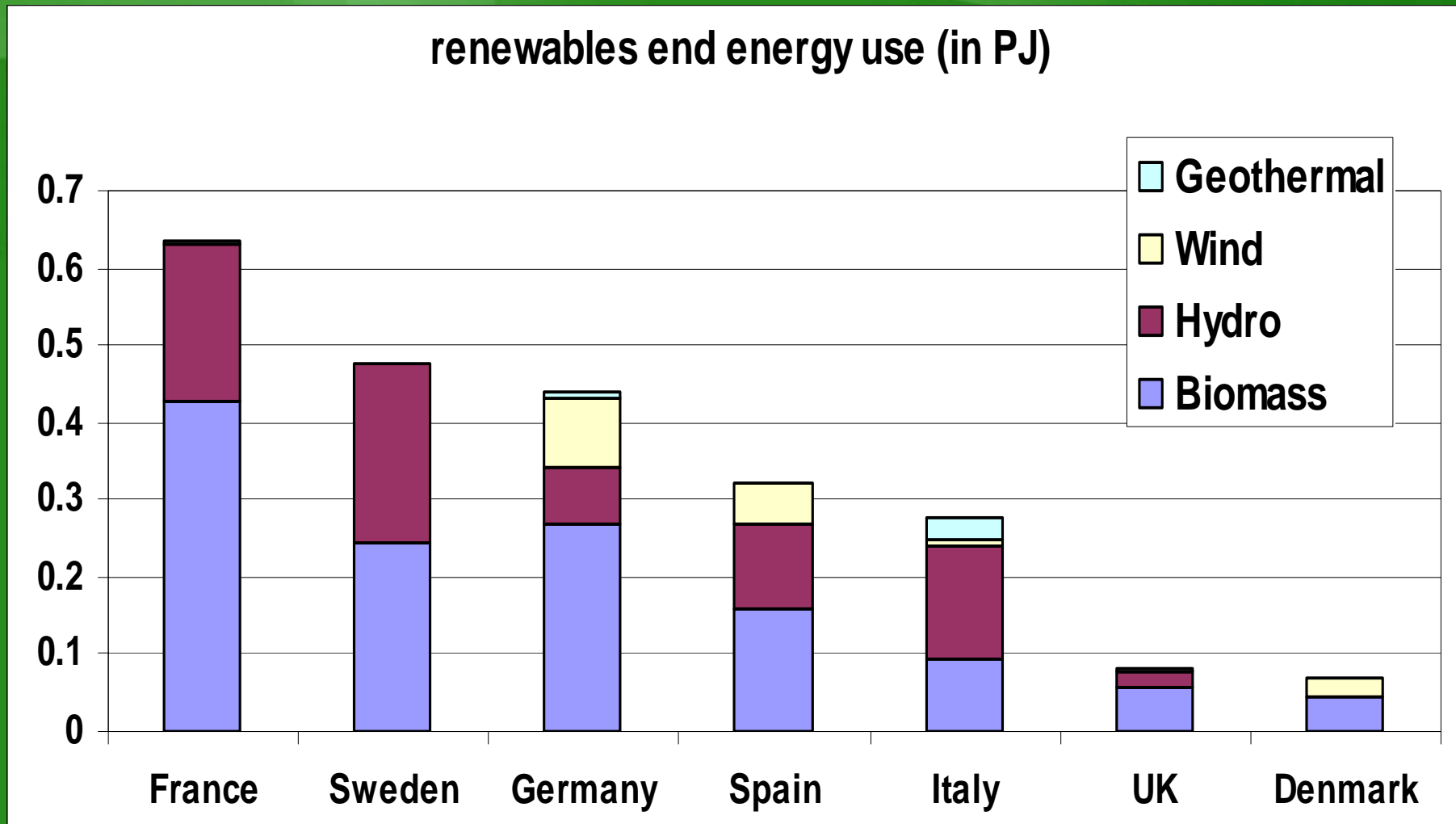
2008 →  $\beta$ -plant in operation (Sundiesel)

???? prices yet unclear

energy-efficiency (input/output) of process

# Renewables – European Situation

## Situation of renewables in EU-countries 2004



# Solar Energy – European Situation

## Situation of solar energy in EU-countries 2005

<b>Country</b>	<b>Solar-thermal GWth inst.</b>	<b>Solar- elec. GWp inst.</b>
France	0.64	0.0327
Sweden	0.181	0.0042
<b>Germany</b>	<b>5.000</b>	<b>1.537</b>
Spain	0.383	0.0577
Italy	0.371	0.036
UK	0.141	0.0107
Denmark	0.243	0.0026

# Biofuels – European Agenda 2020 (EU 31)



Agenda for biomass use, published Dec. 2005

2005 → 4% (69 mil. toe) of prim. e. out of Biomass

2010 → increase to 150 mil. toe (~12%) prim. e.  
(~ 6% liquid fuels)

## Goals:

- broaden biomass basis for bio-diesel
- but: focus on bio-ethanol (capacities higher)
- increase production within EU
- regulate imports (taxes)
- increase research within EU

Budget of 9 billion Euros in discussion for research

2020 → increase to 20 % of prime energy from renewables

**Why is Germany looking at biofuels?**

**Current trends on biofuels in Germany**

**European plans (Agenda 2010)**

**My plans at RISE:**

- **Investigate production methods for biofuels**
- **Look at energy efficiency (output / input) of such methods**

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**RISE**

*Thank you!*

## Lines of conflict:

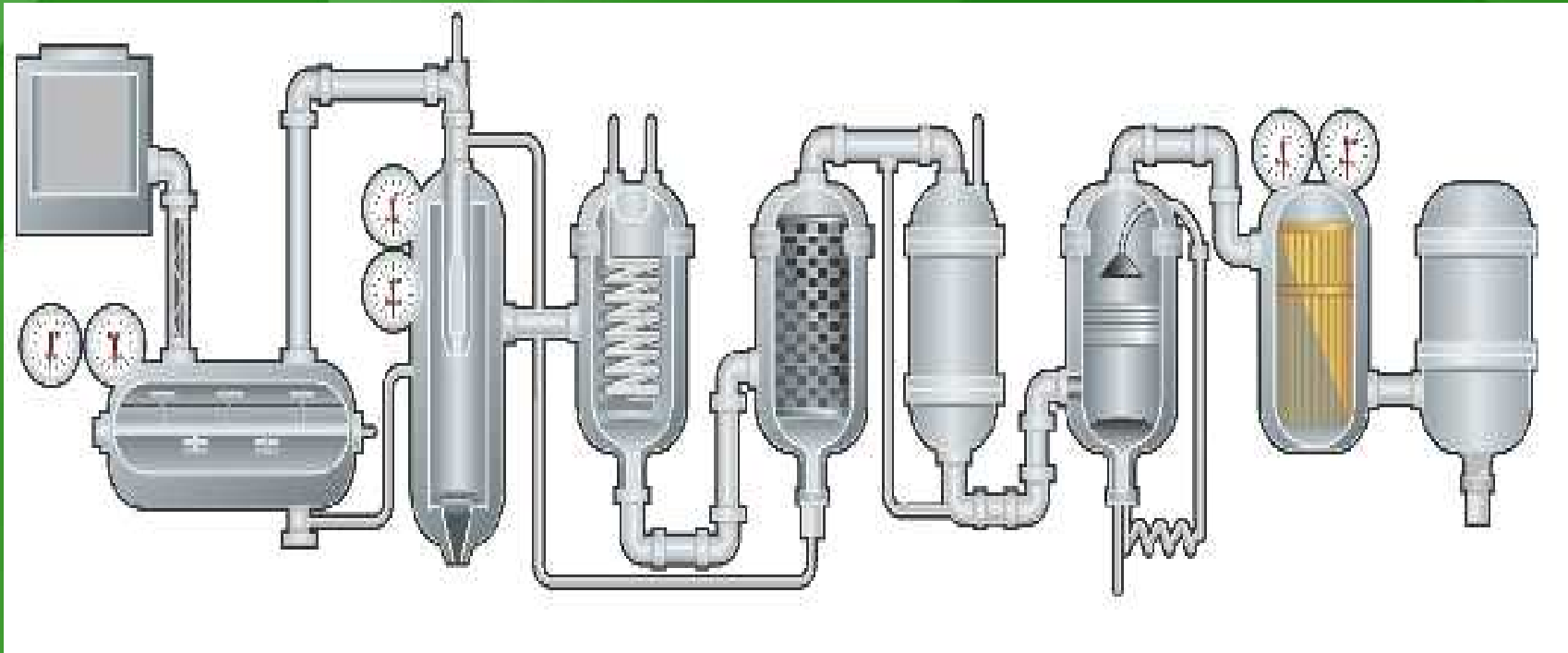
**Cheap food** vs. **Cheap fuels**  
(FAO experts meeting April 16, 2007, Rome)

**Water for food** vs. **Water for fuels**  
(Nestle-COE Brabeck-Letmathe)

**CO<sub>2</sub>-neutral??**

## Carbo-V-Process by CHOREN (process general)

Biomass treatment    Raw gas    Syngas    Synfuel



[www.choren.com](http://www.choren.com)

# Bio-fuels in Germany and EU – References



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