

---

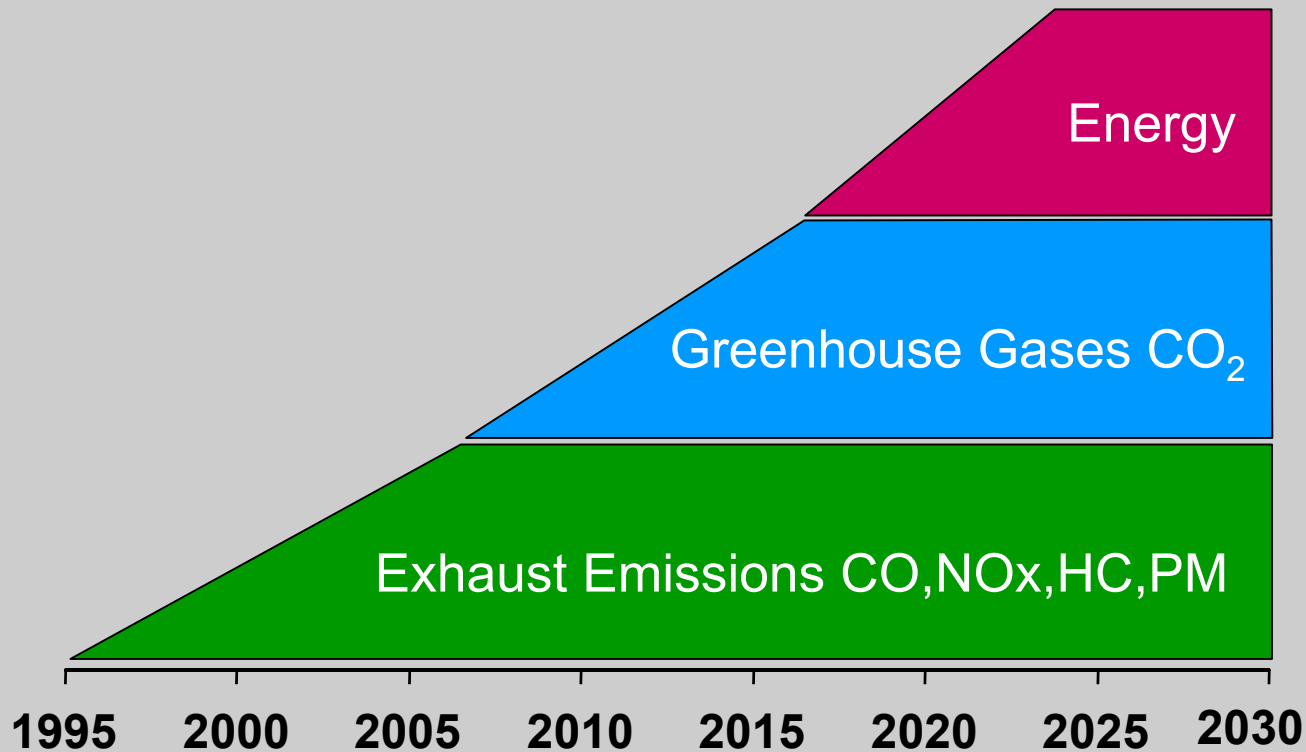
# **SynFuel / SunFuel –**

## **their role in the transport sector**

**Dr. Frank Seyfried**

**26 May Berlin ASPO 2004**

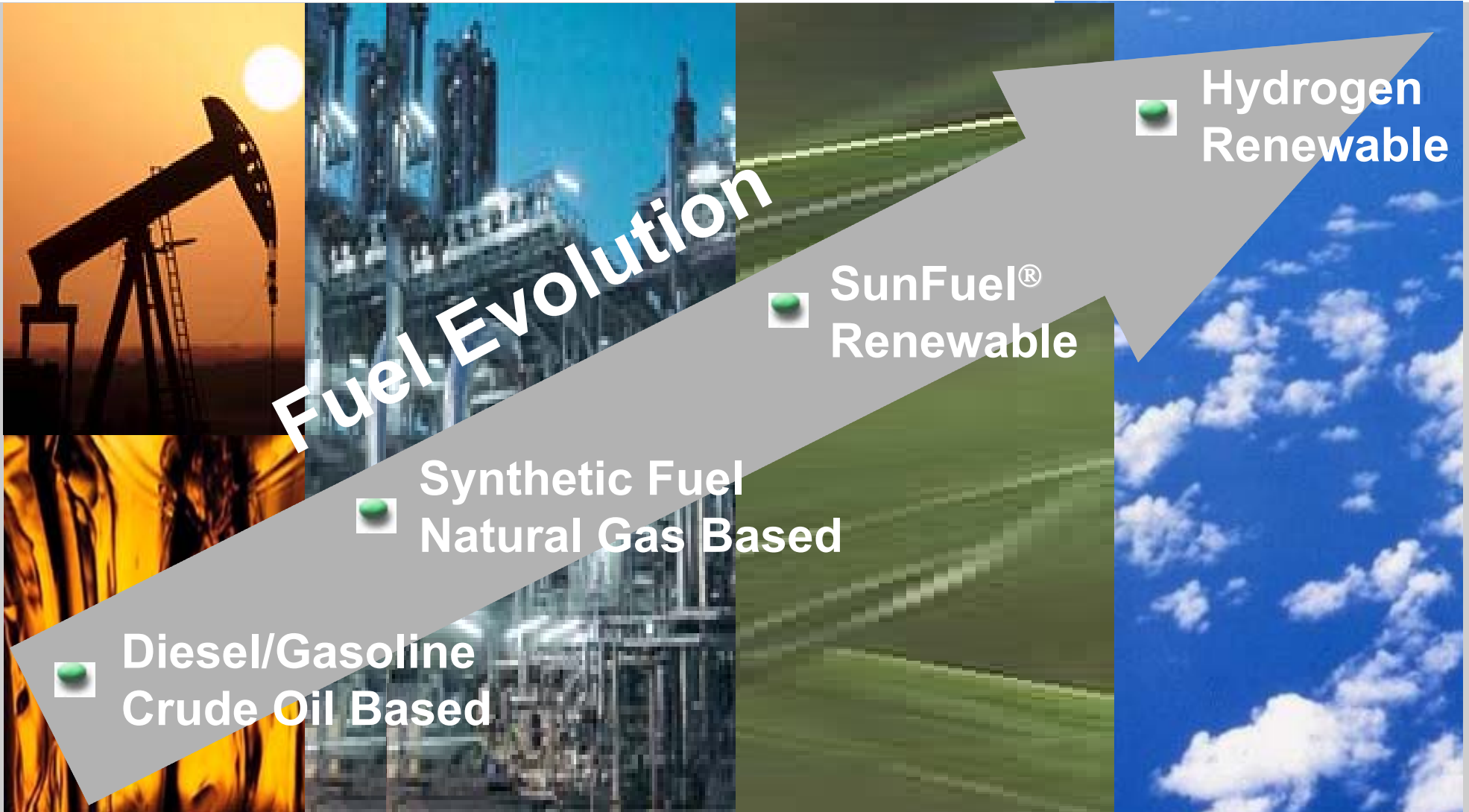
# Evolution of Environmental Aspects



# Conclusions

- Resolute Additional Improvement of Powertrain Efficiency
- Including of alternative Energy Sources in Fuel Production
- Development of CO<sub>2</sub>-neutral Pathes in Vehicle Usage

# VOLKSWAGEN Fuel Strategy



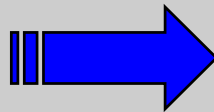
# Hydrogen

## Regenerative Production

- Sustainable Environmental Behavior
- ⊕ ● CO<sub>2</sub>-free Usage in Total Energy Chain
- Unlimited Resource

## 3 Critical Technology Barriers

- Storage for Mobile Use not Available
- ⊖ ● Infrastructure not Available
- Sustainable Production Based on Regenerative Energy with Competitive Cost not Solved



**Long Term Solution**

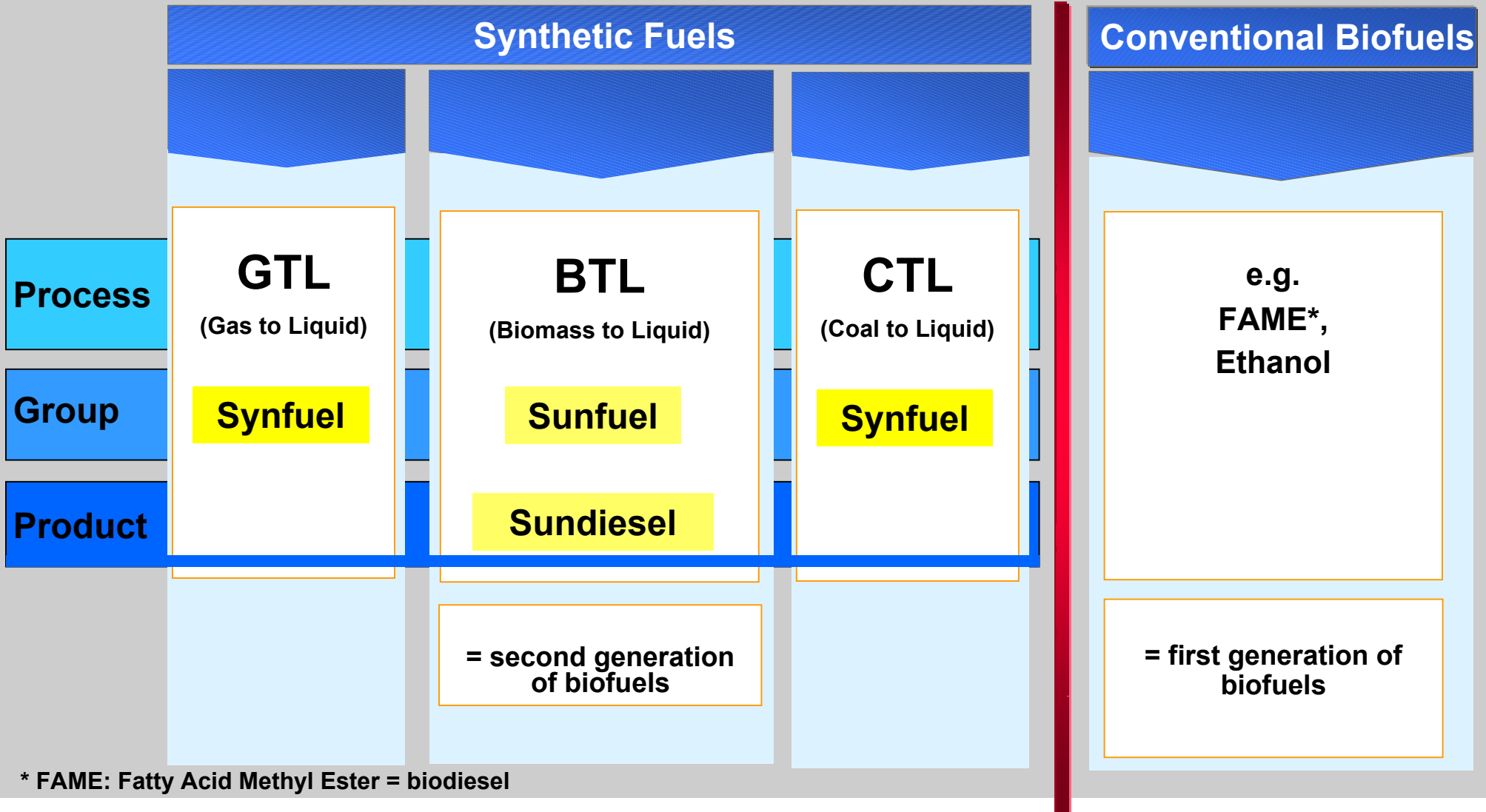
# Synthetic liquefied Hydrocarbon Fuels

- to be Used as Today's Fuels
- Economical Production Based on Natural Gas
- Potential for Fuel Consumption Reduction
- Diversification of Primary Energy Possible including Renewables as Biomass
- Never Ending Resource Due to possible Renewable Energy Path
- Enlarged Potential for Greenhouse Gas Reduction due to renewable energy path (CO<sub>2</sub> neutral)
- Potential for New Advanced Combustion Systems



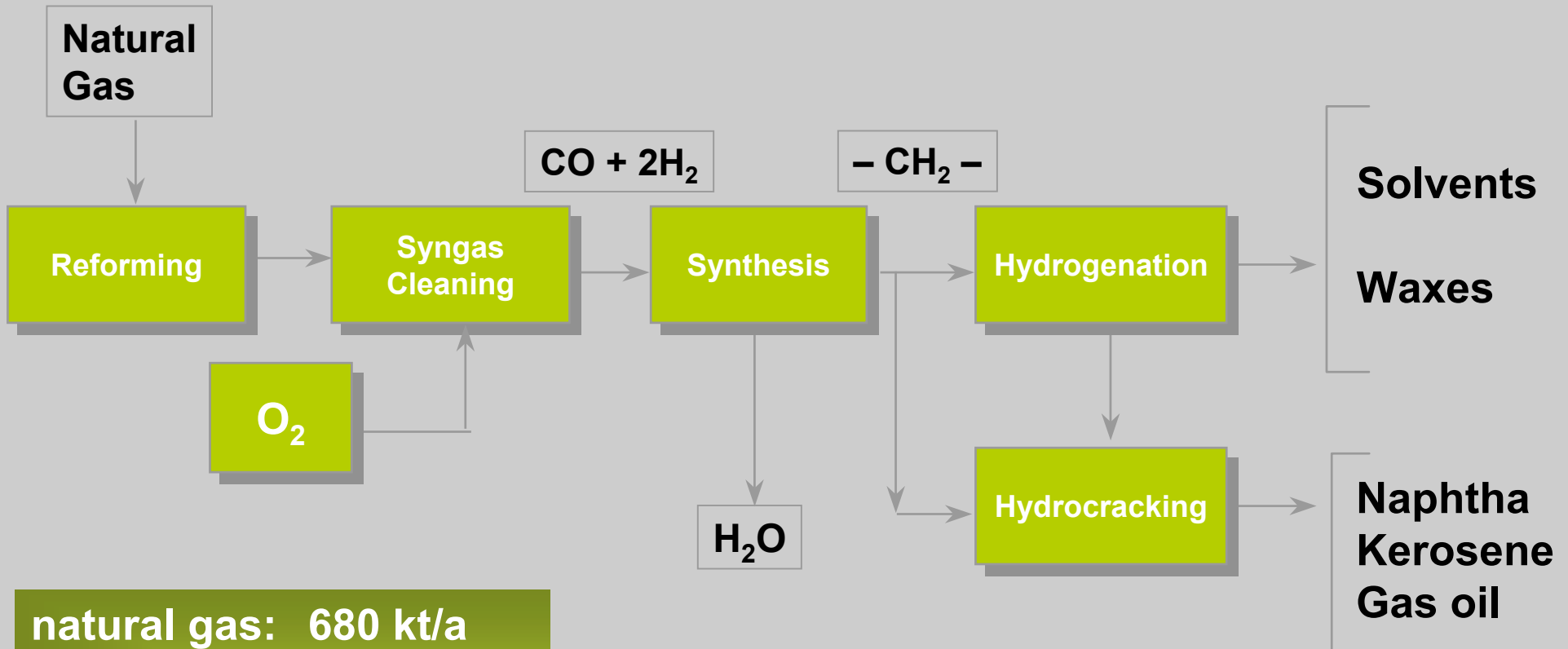
**Short- to Mid-Term Solution**

# Systematics for Synthetic Fuels



\* FAME: Fatty Acid Methyl Ester = biodiesel

# SMDS - Production (Shell Malaysia)



natural gas: 680 kt/a

raw product: 470 kt/a

$\eta_{\text{therm}}$ : 56 %

Source: Shell



# SynFuel: Shell-Volkswagen Cooperation

## GTL Fleet Test Berlin „Way to sustainable Future“



Start 20.5.03

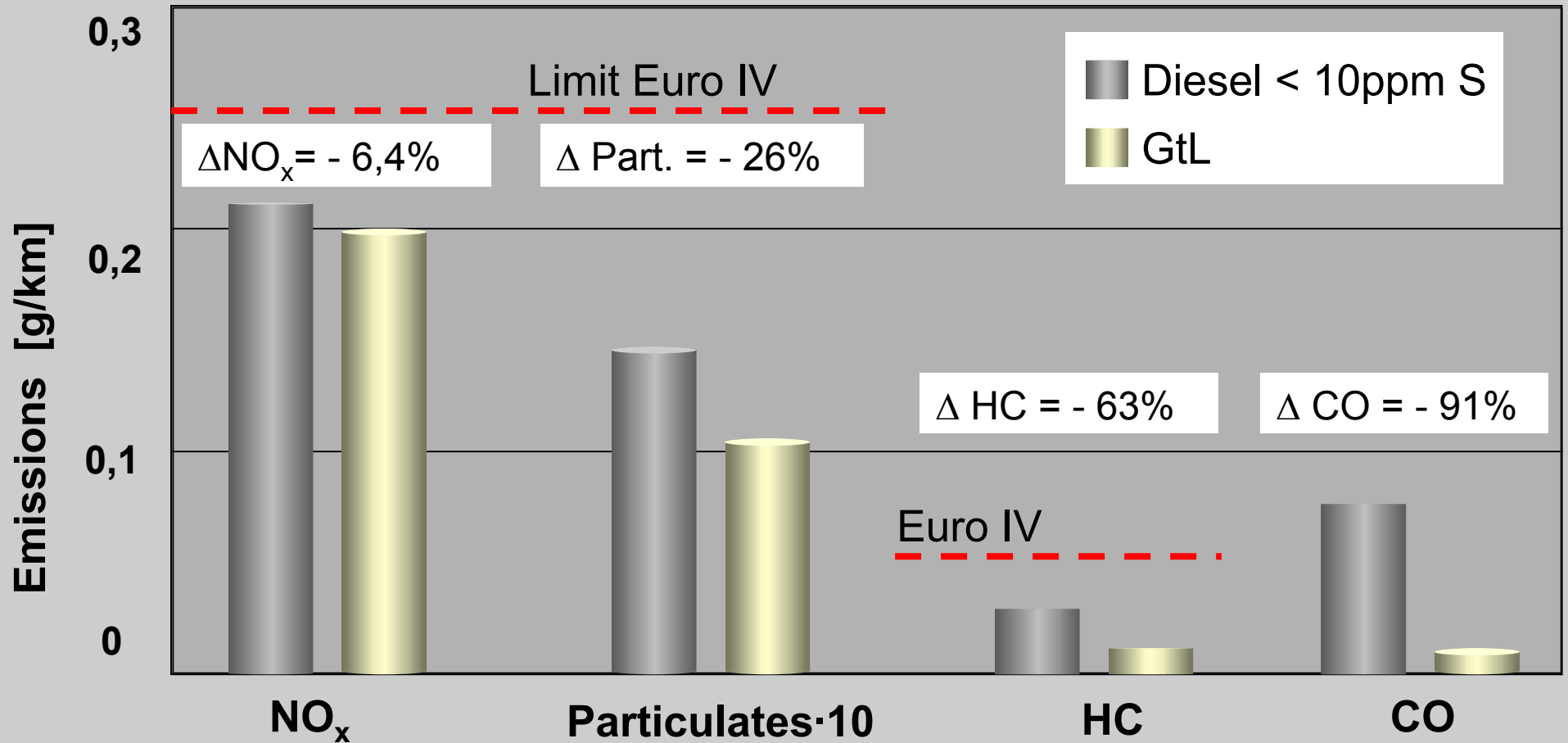
Opening event with  
German Chancellor  
Gerhard Schröder

25 vehicles

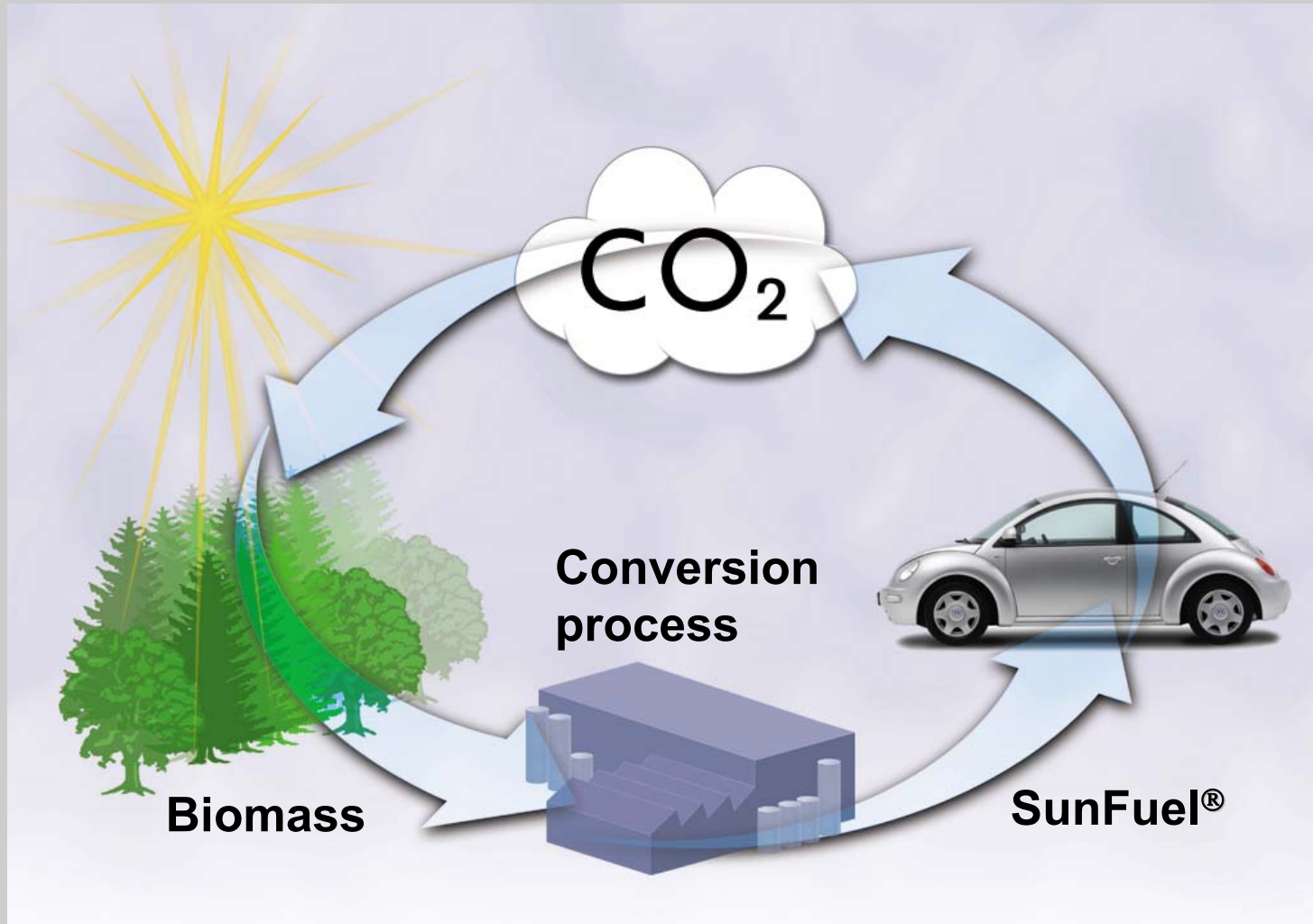
5 months

200.000 km

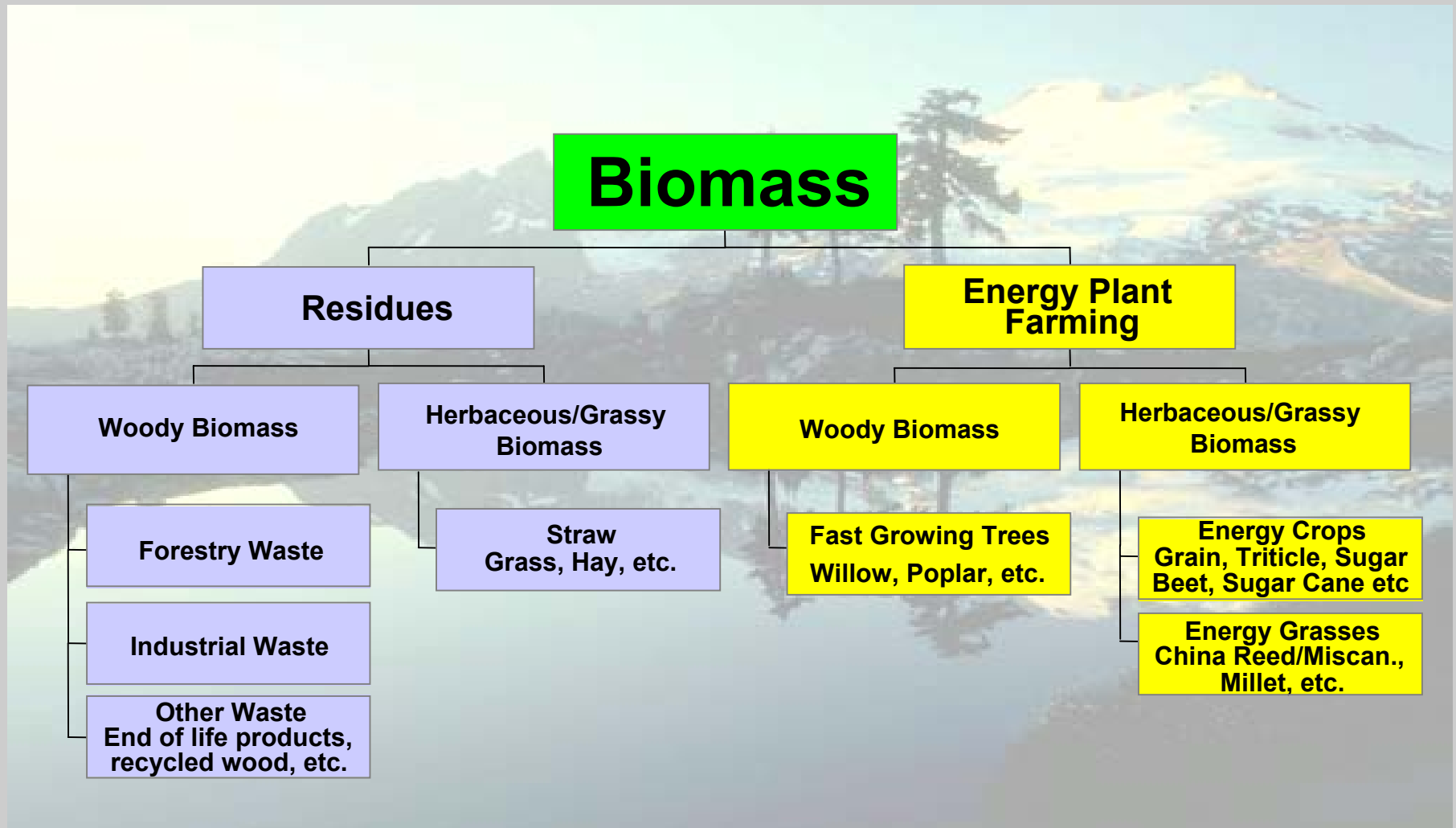
# Emission Comparison Diesel - GtL



# CO<sub>2</sub> loop



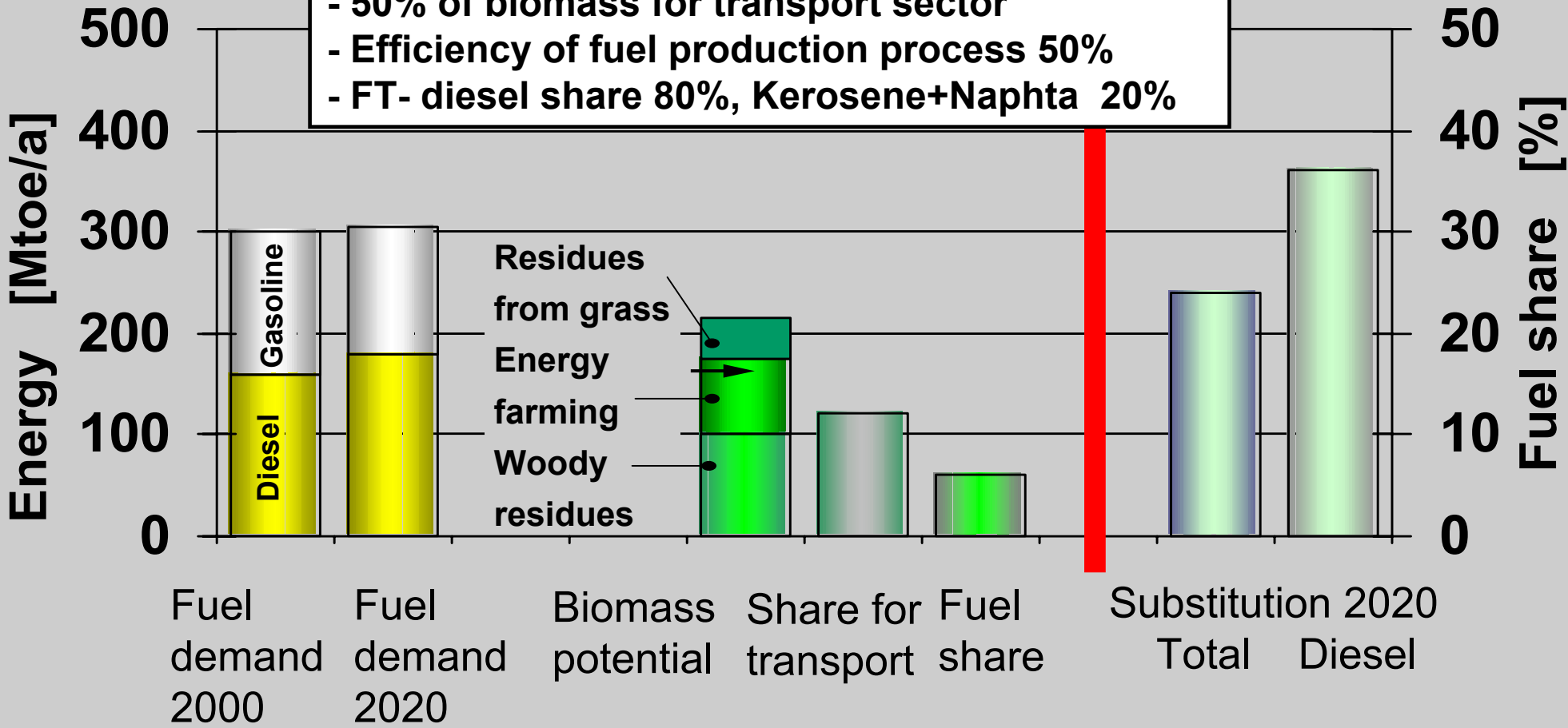
# Plant-Based Solid Biomass



# Biomass Potentials in EU 30 states in 2020

**Boundary conditions:**

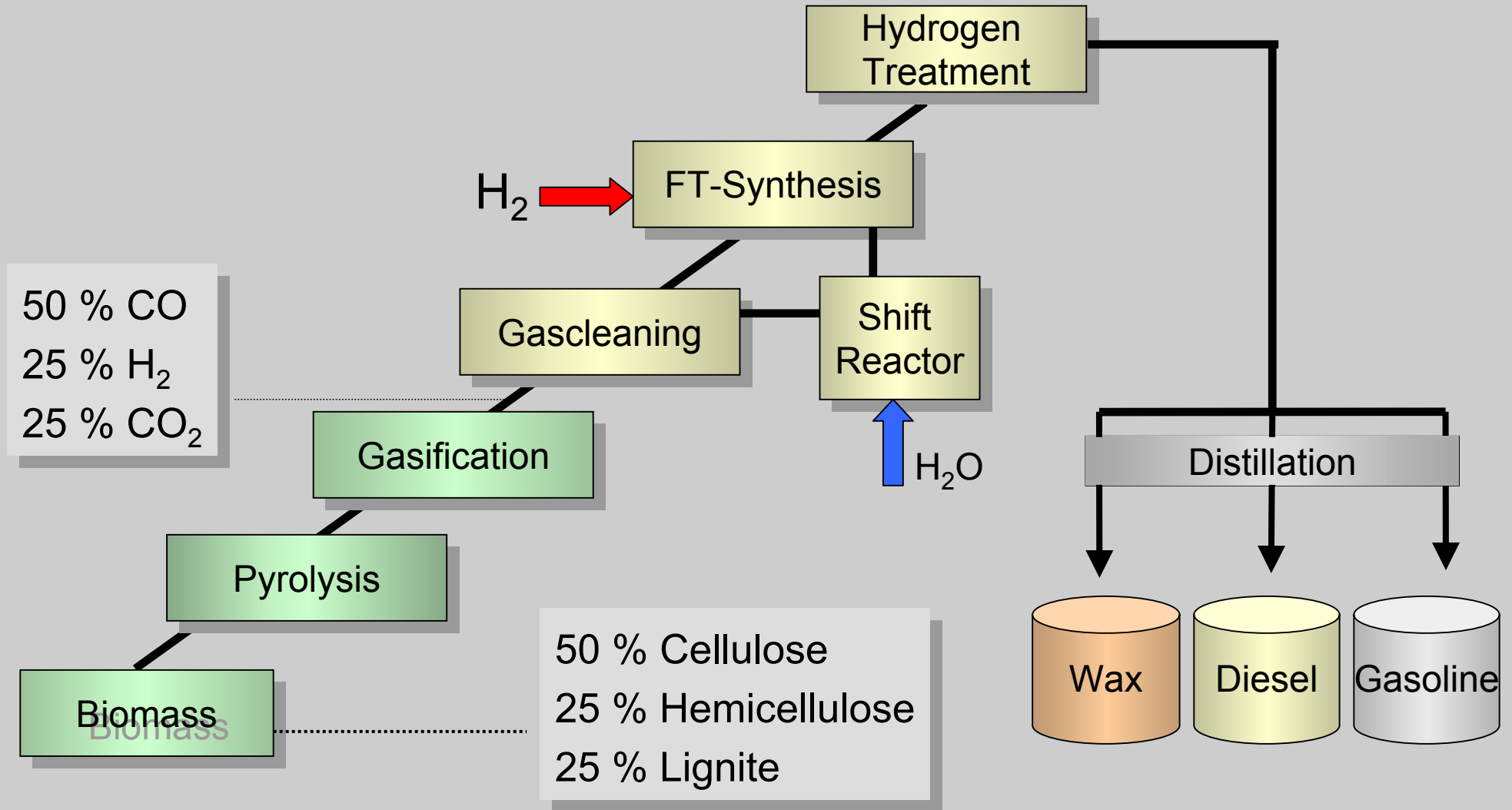
- 50% of biomass for transport sector
- Efficiency of fuel production process 50%
- FT- diesel share 80%, Kerosene+Naphta 20%



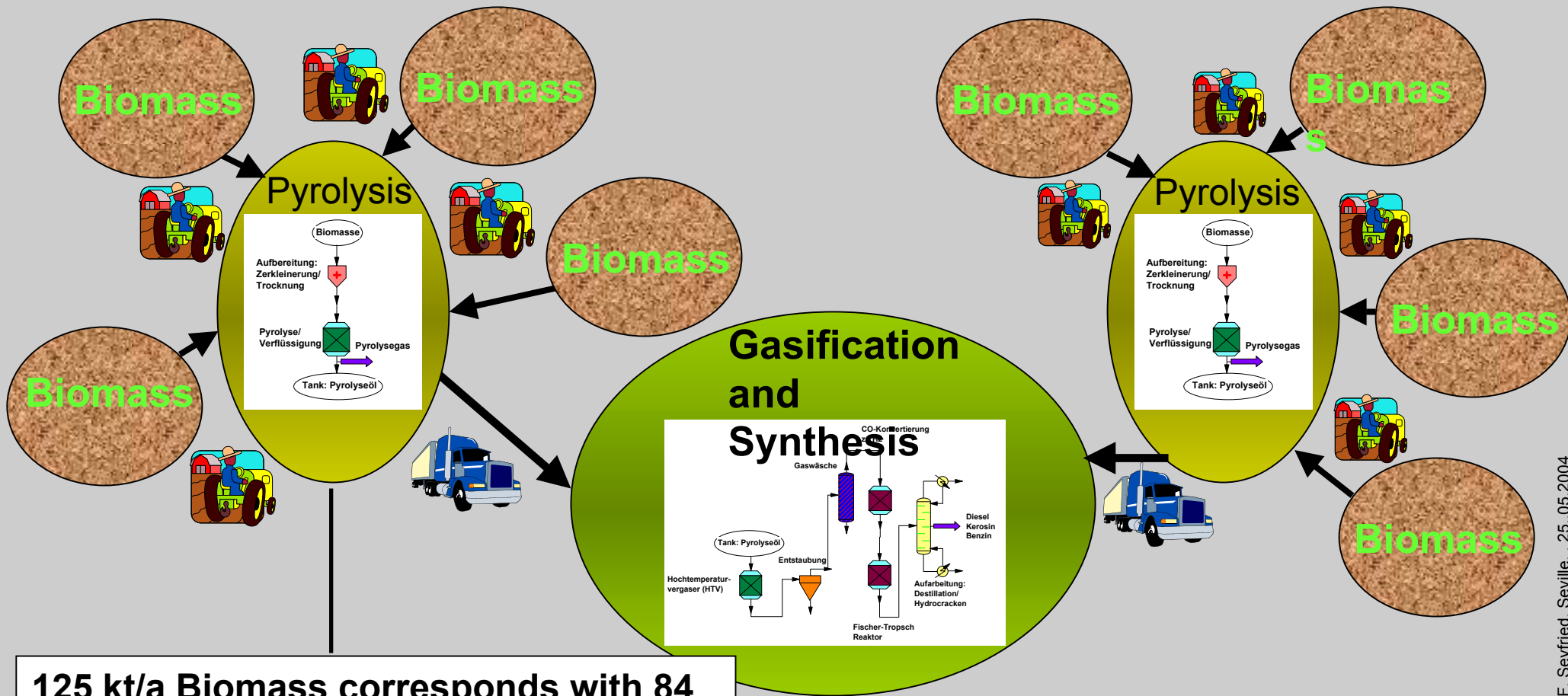
source: DG TREN/LBST/VW

K-EFAD/H - Dr.F. Seyfried, Seville, 25.05.2004

# Biomass to Liquid Fuel Production via Fischer-Tropsch Synthesis



# Logistic and Process Concepts of BtL-Production



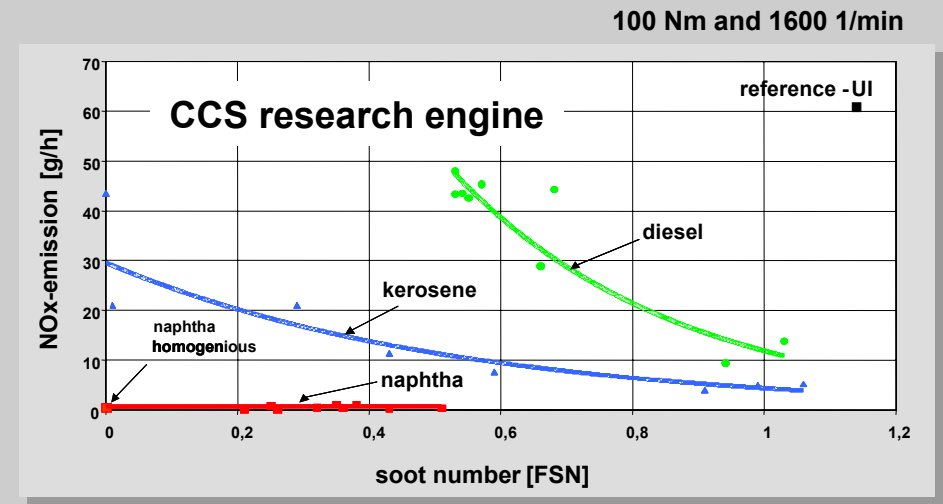
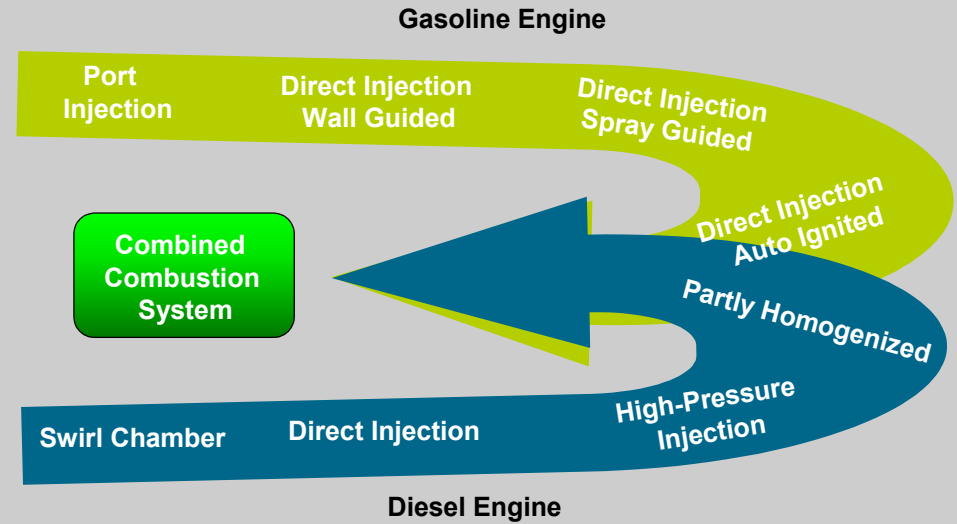
125 kt/a Biomass corresponds with 84 kt/a slurry. **8 Trucks** have to deliver the central gasifier per day



# Synthetic Fuel in new Combustion Processes

★ Synthetic fuels offer opportunities for new combustion processes

★ Significant emission reduction at higher efficiencies





# RENEW Renewable Fuels for Advanced Powertrains

Biomass – Synthesis gas - Fuel

**Gesamt: Budget 19,8 M€**  
**time: 4 years**

**Funding 10 M€**  
**Start: 01 / 2004**



**Prozess**  
- costs  
- efficiency  
- environment



**Commonly agreed recommendations from industry, agriculture, science**



**Fuel-optimisation**



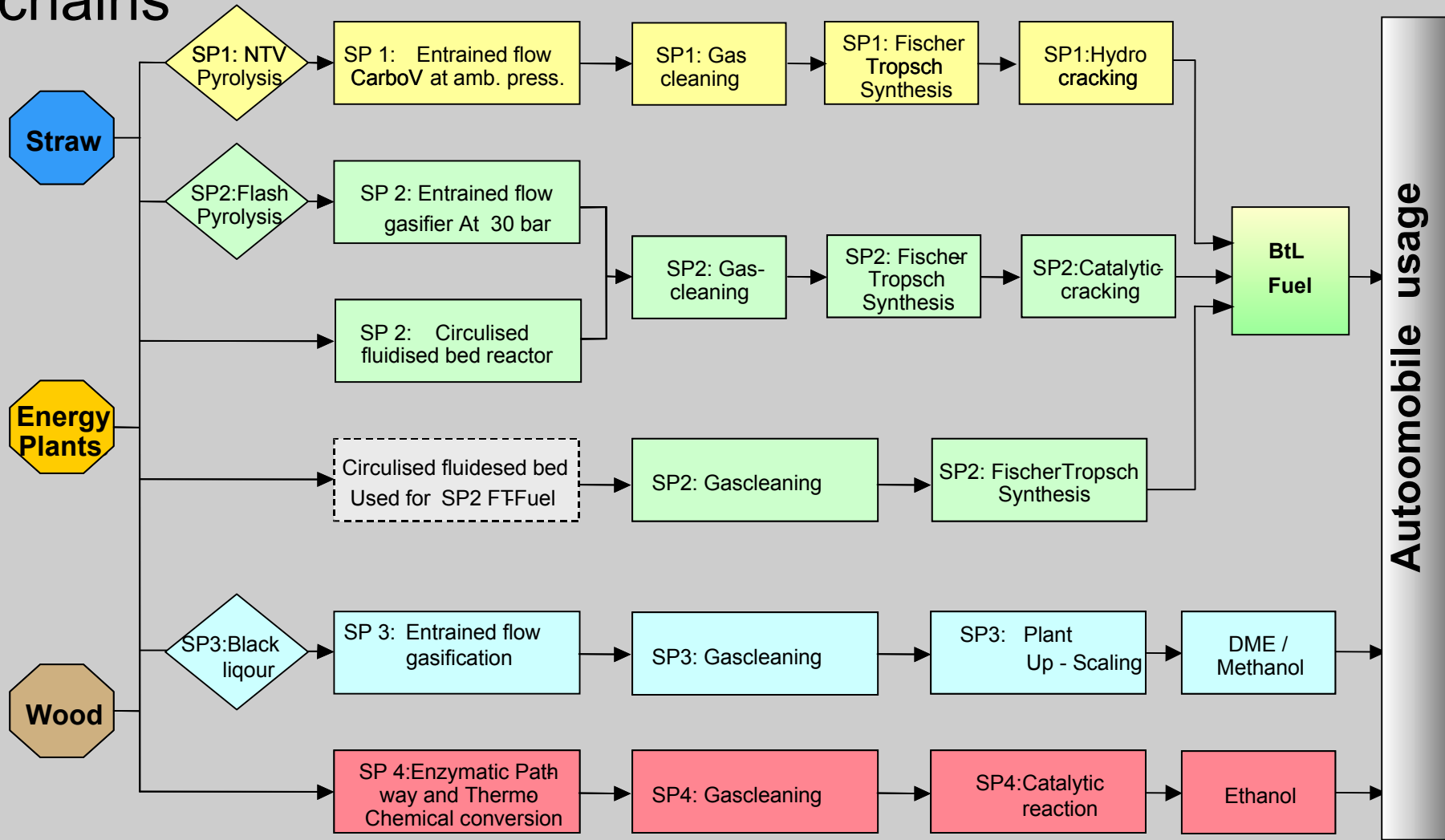
**Biomass-potentials Europe**

## Partners

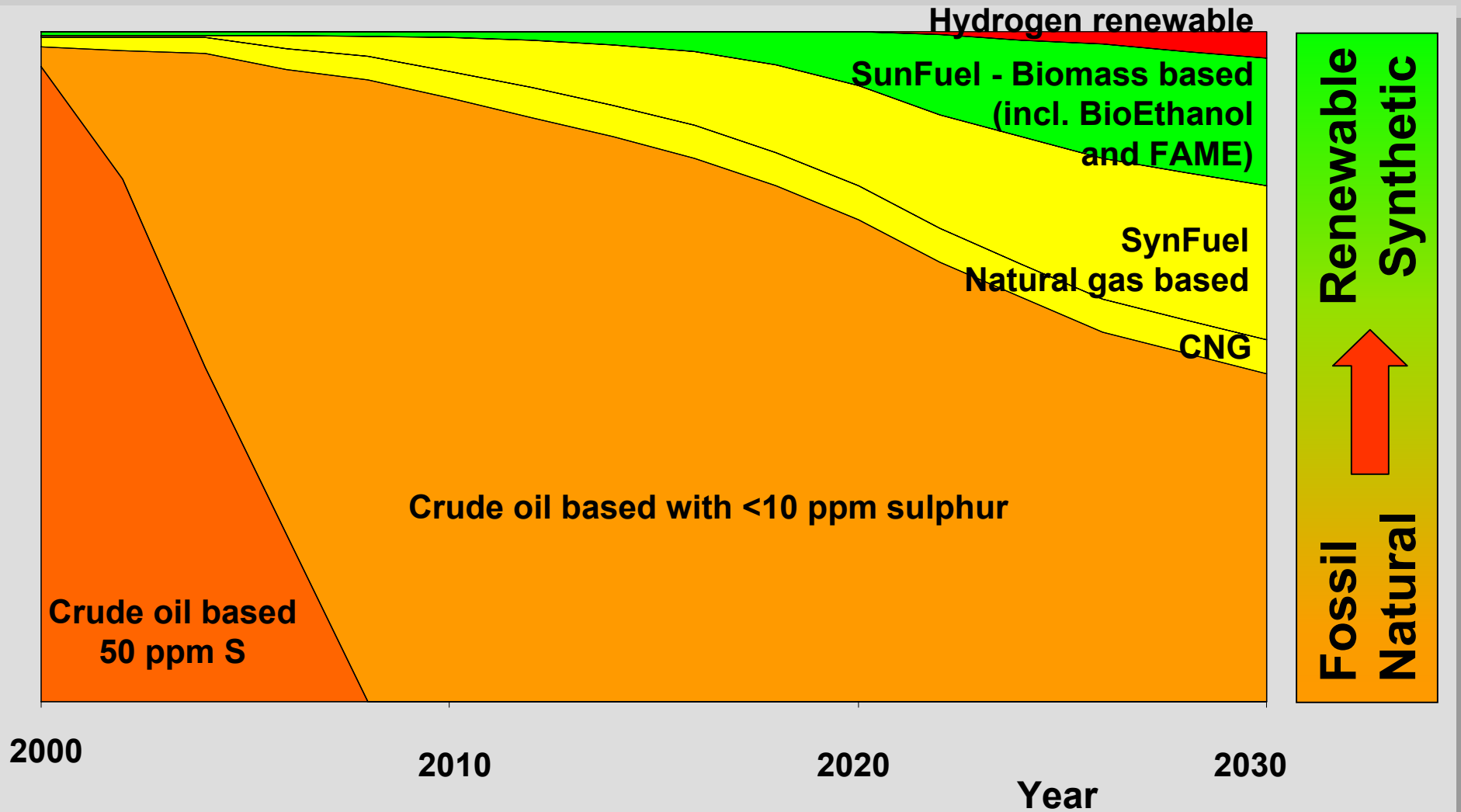
DC, Renault, Volvo, Chemrec, Choren, Abengoa  
+ 24 partners from industry and science

Co-ordination: Volkswagen

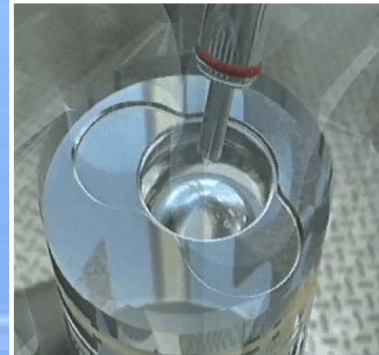
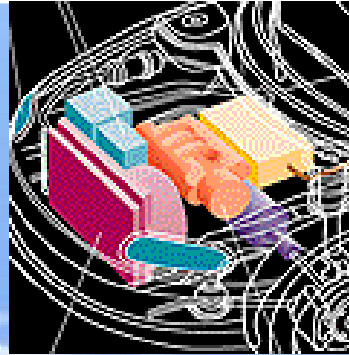
# RENEW process chains



# Scenario Fuel Diversification Europe



# Fuel and Powertrain Evolution



<b>technology</b>	<b>TDI, FSI</b>	<b>mild hybrid, TDI, FSI</b>	<b>combined combustion</b>	<b>fuel cell</b>
<b>fuel</b>	<b>diesel, gasoline</b>	<b>diesel, gas., SynFuel</b>	<b>SunFuel</b>	<b>hydrogen</b>
<b>raw material</b>	<b>mineral oil</b>	<b>natural gas</b>	<b>biomass</b>	<b>regenerative power</b>