

Sustainable Mobility

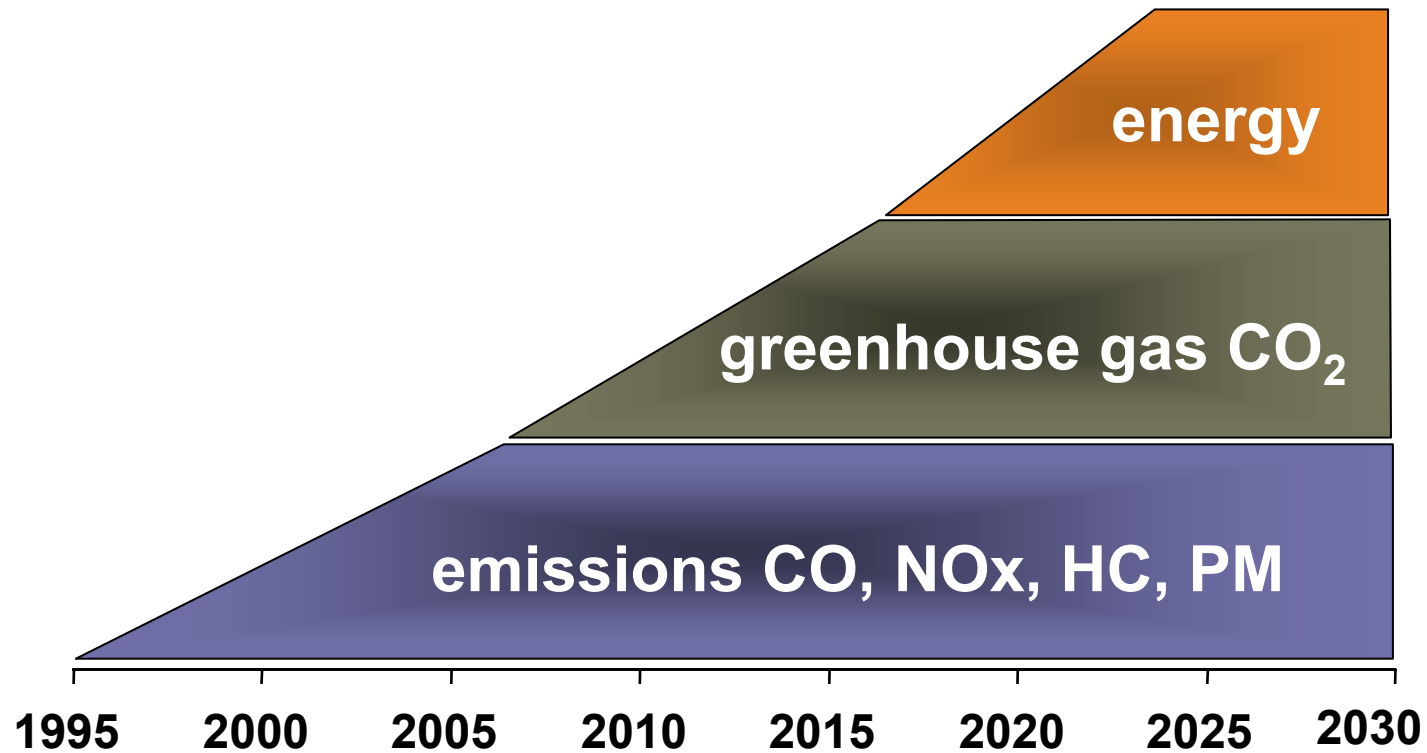
The Contribution of Biofuels and Alternative Fuels to Reduce CO₂ Emissions in the Transport Sector

Dr. Ingo Drescher

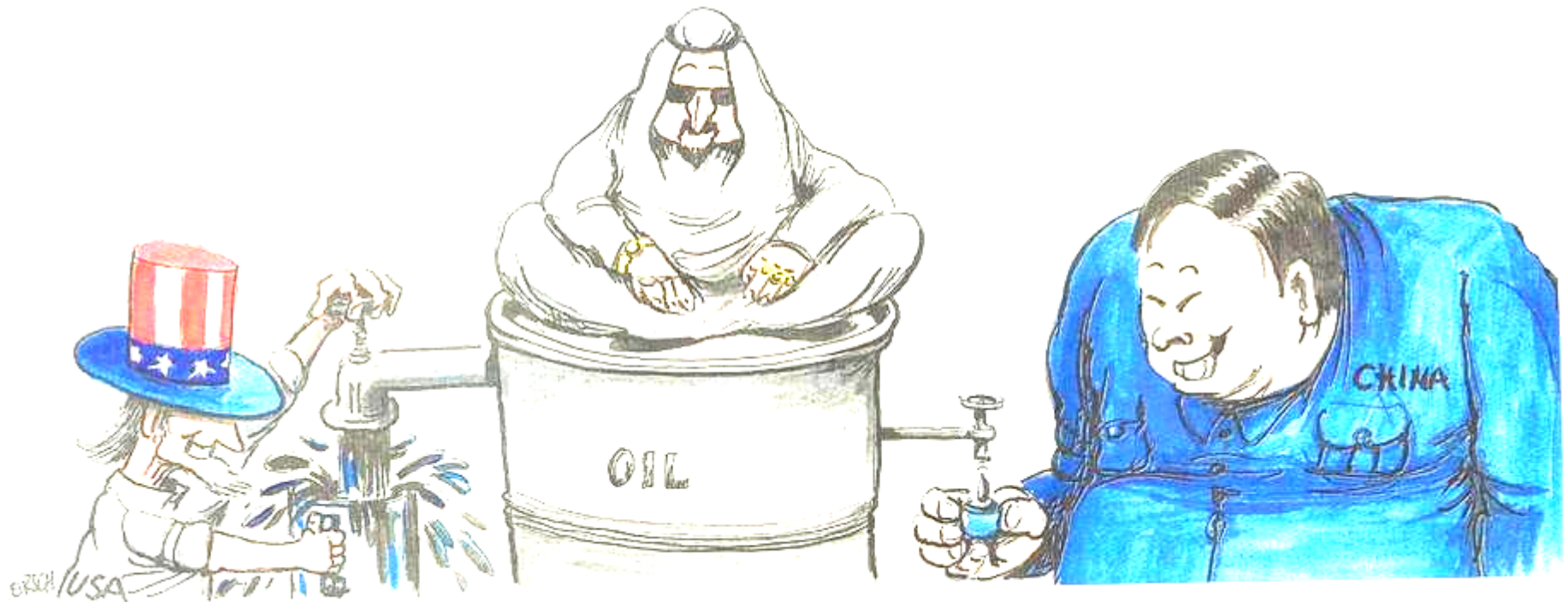
Reduction of Emissions and Geological Storage of CO₂; 15.09.2005

General Conditions

Change of the Priority of Environmental Research



Global Challenge



Source of Caricature: Newspaper „Die Welt“

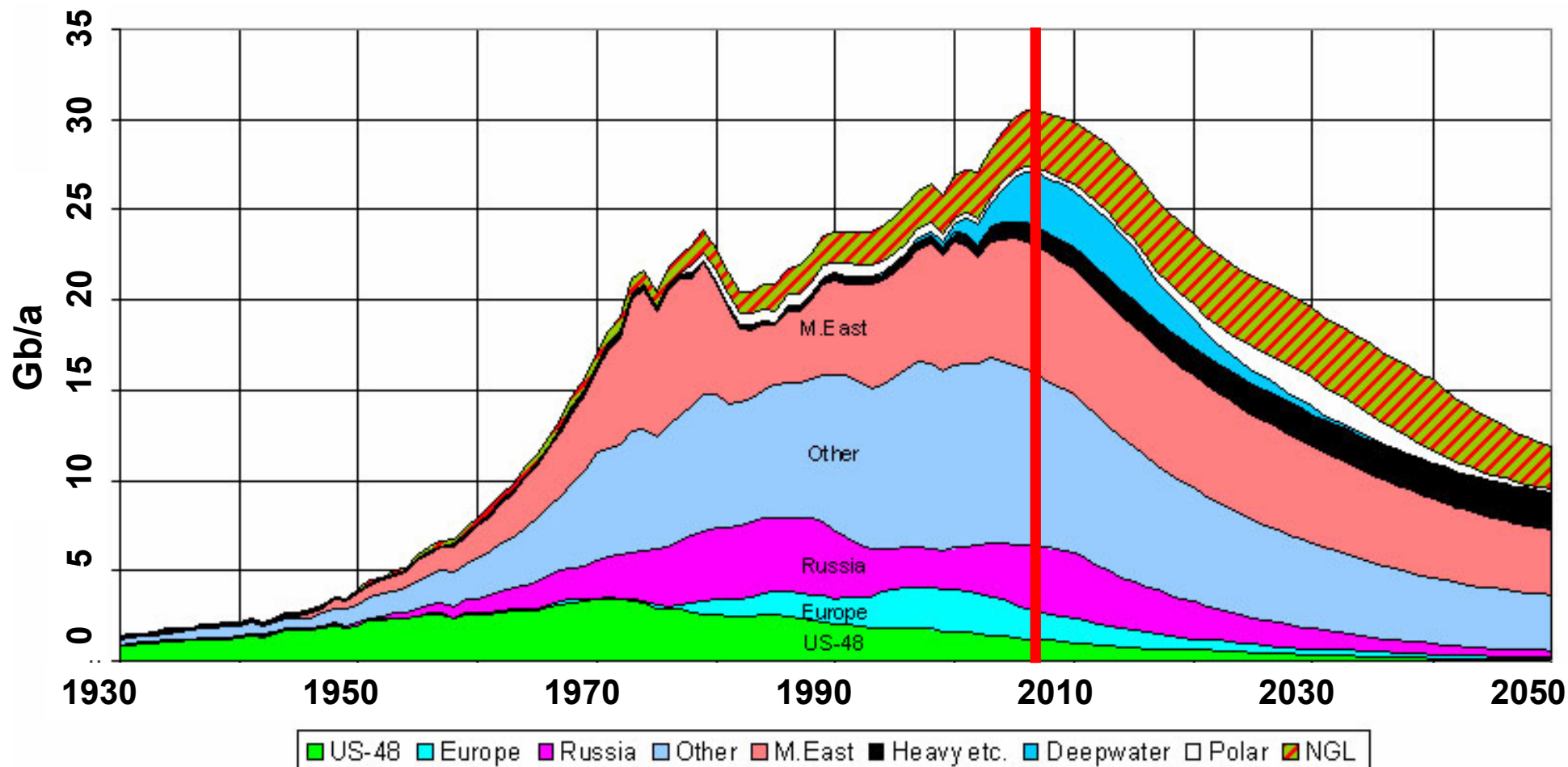
Growth of Crude Oil Consumption (from 2003 to 2004):

China: 14.3% **Inda: 5.1%** **USA: 2.3%** **Europe: 1%**

Source: Mineralölwirtschaftsverband (www.mwv.de)

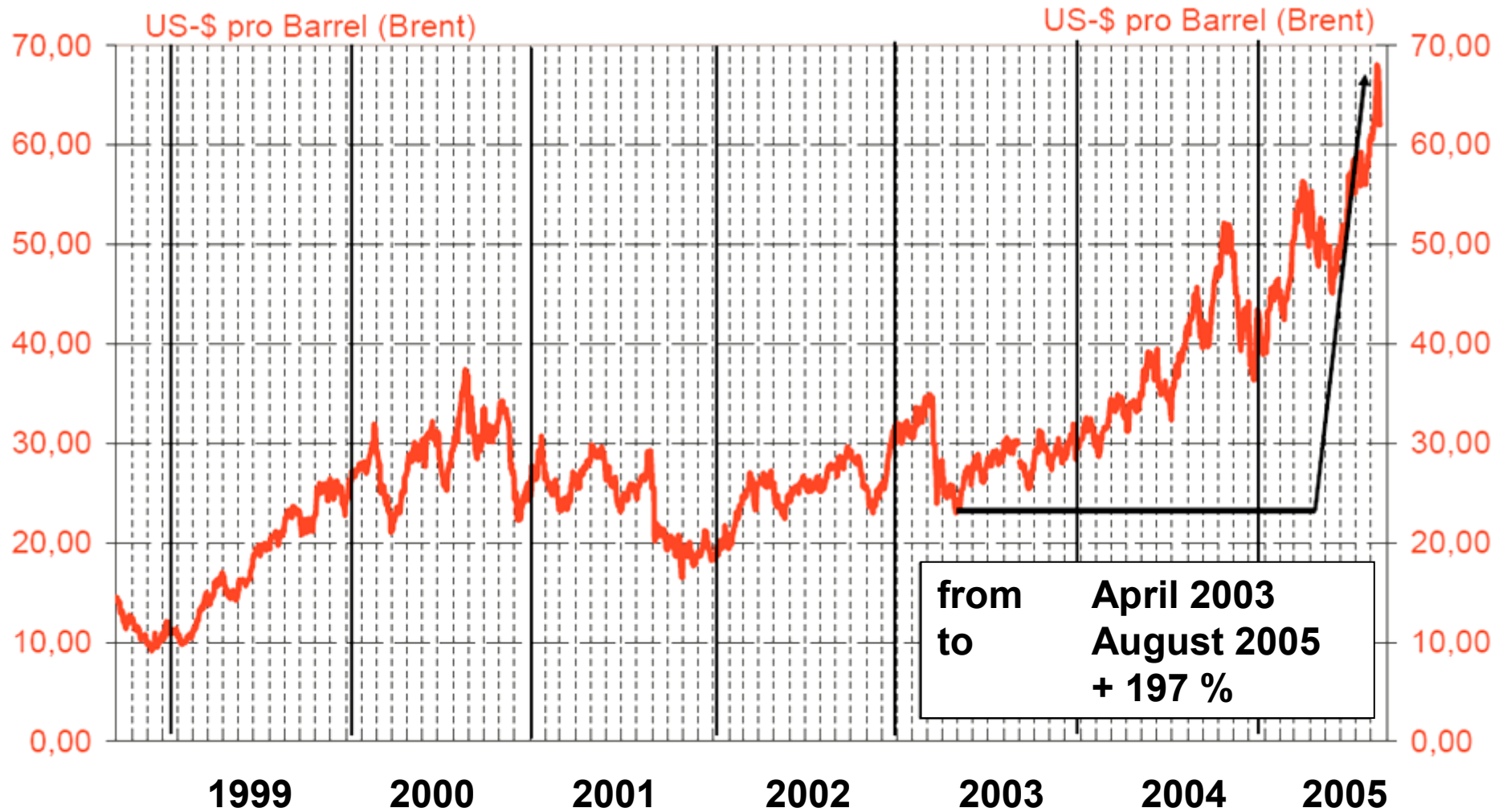
Crude Oil – out put capacity

Mid Depletion Point is expected around **2008** and **2023**



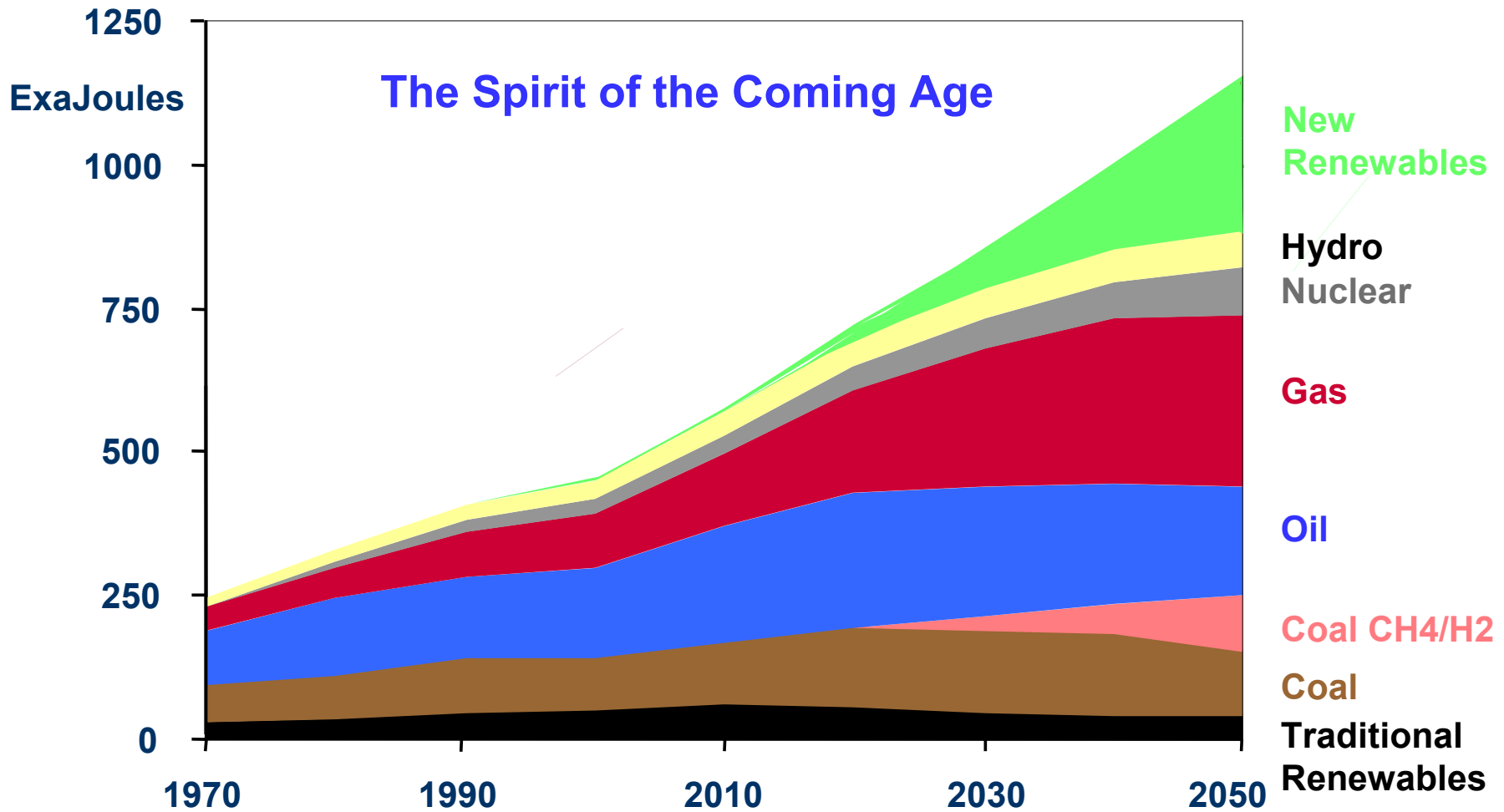
Source: Uppsala Hydrocarbon Depletion Group

Crude Oil Price Trend



Source: Reuters, eia

World Energy Demand



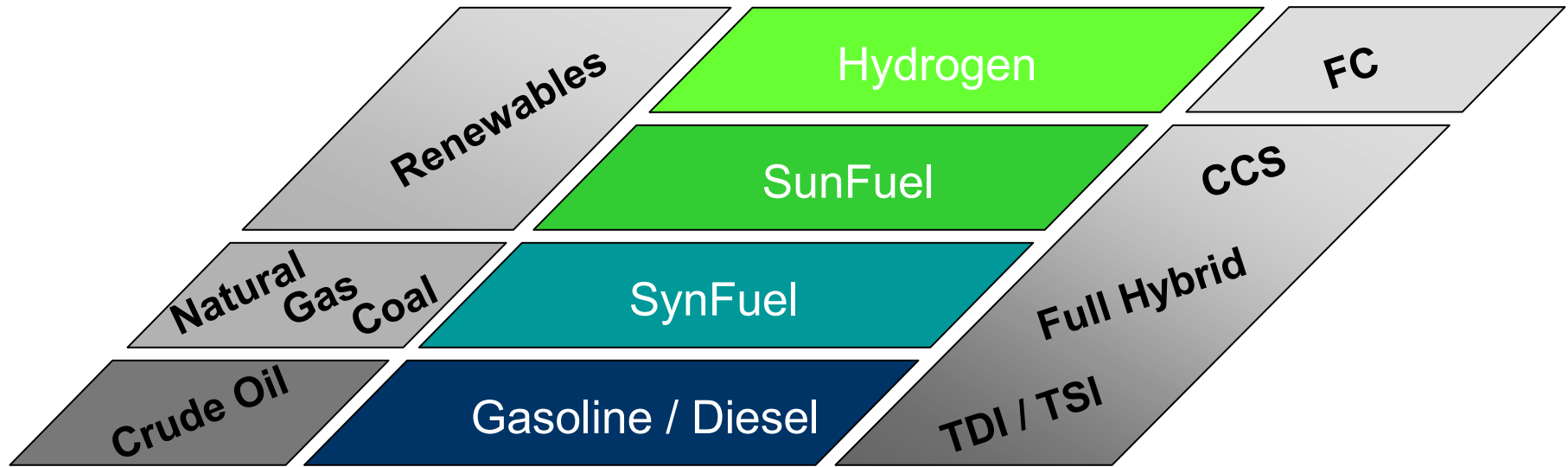
Source: Shell International Ltd

Exa = 10^{18}

1 Exajoule = 34,12 Mio t hard coal

Fuel- and Powertrain Strategy

Evolution instead of Revolution

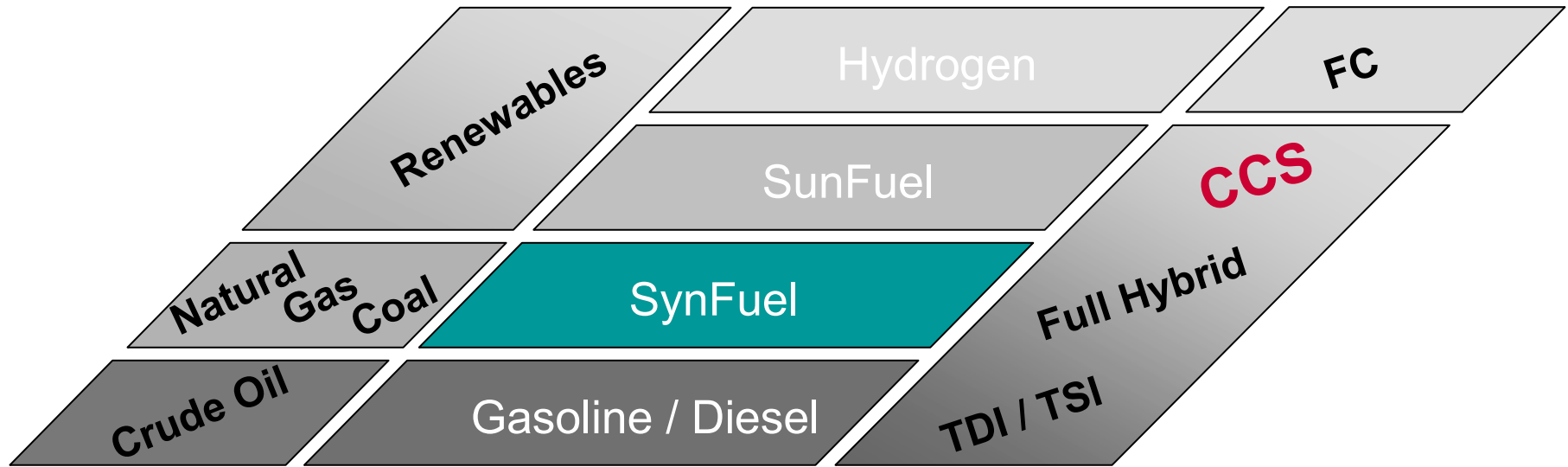


Objectives:

- Sustainability
- Diversification of Energy Sources
- Use of Existing Infrastructure

Fuel- and Powertrain Strategy

Evolution instead of Revolution

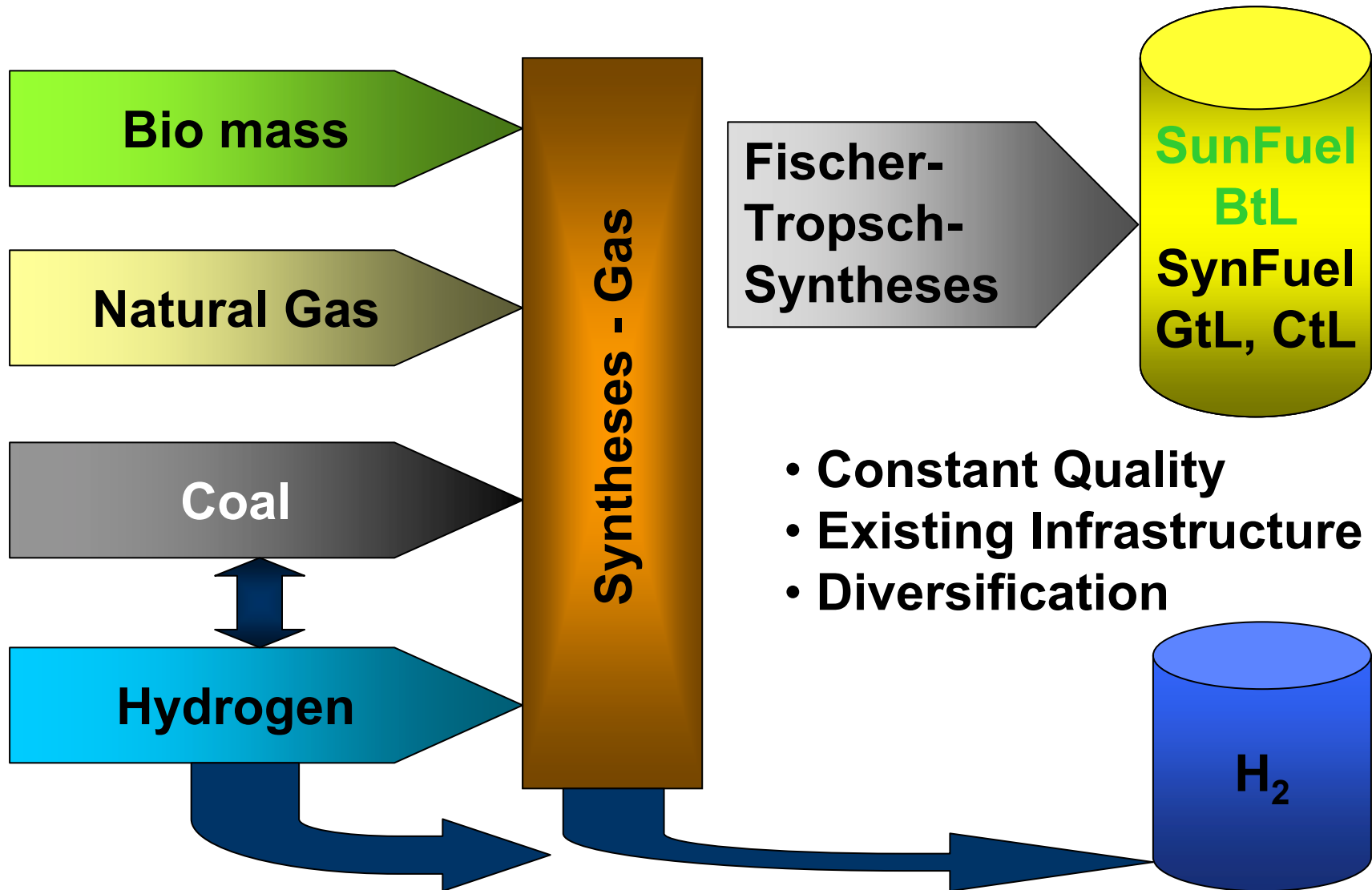


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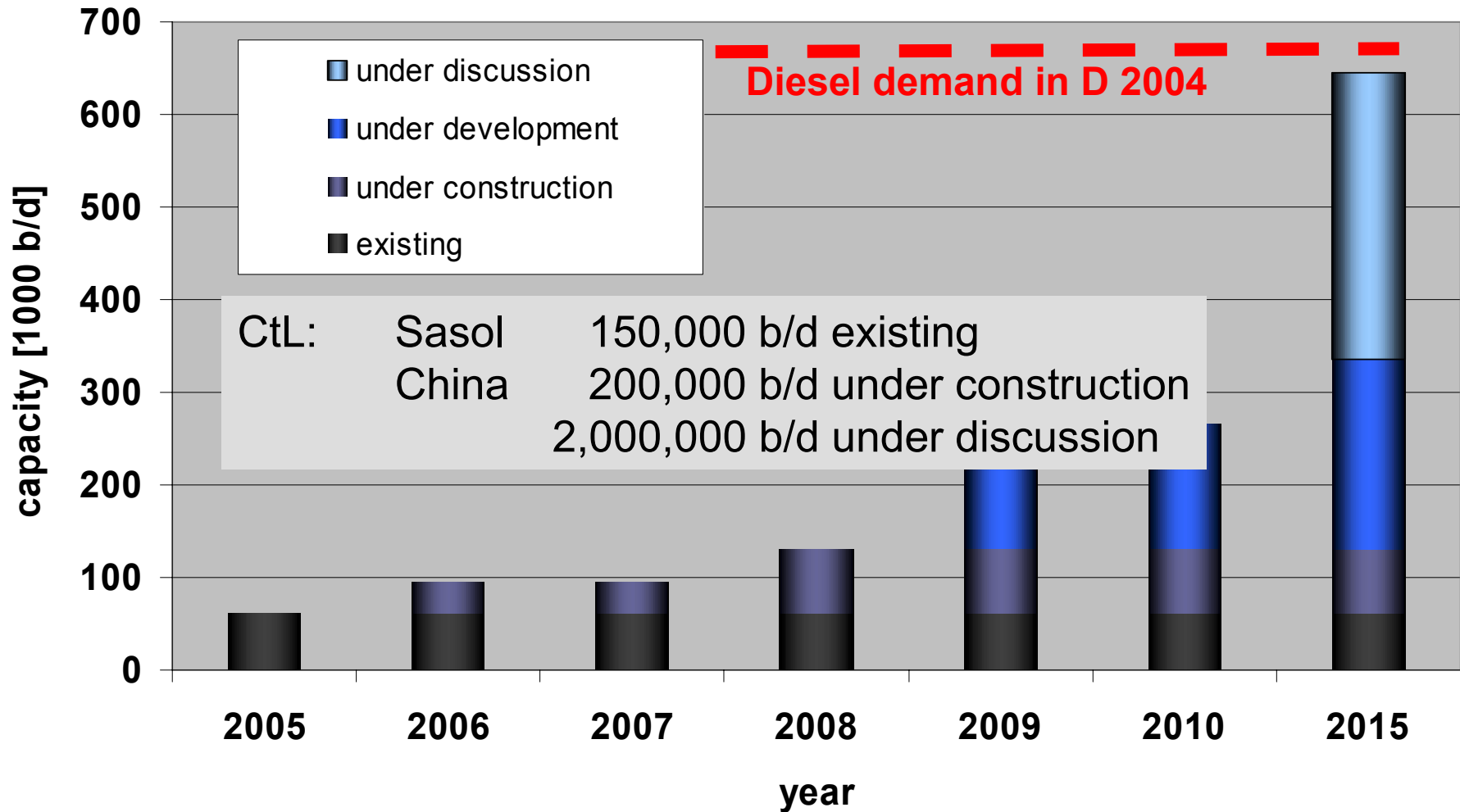
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SynFuel

Diversification of the Energy Sources



GtL Production Capacity



source: various industrial publications

world crude oil demand 84 million b/d

CCS: Combined Combustion System (Partial-) Homogeneous Combustion

Objective:

emission reduction through
(partial-) homogeneous combustion



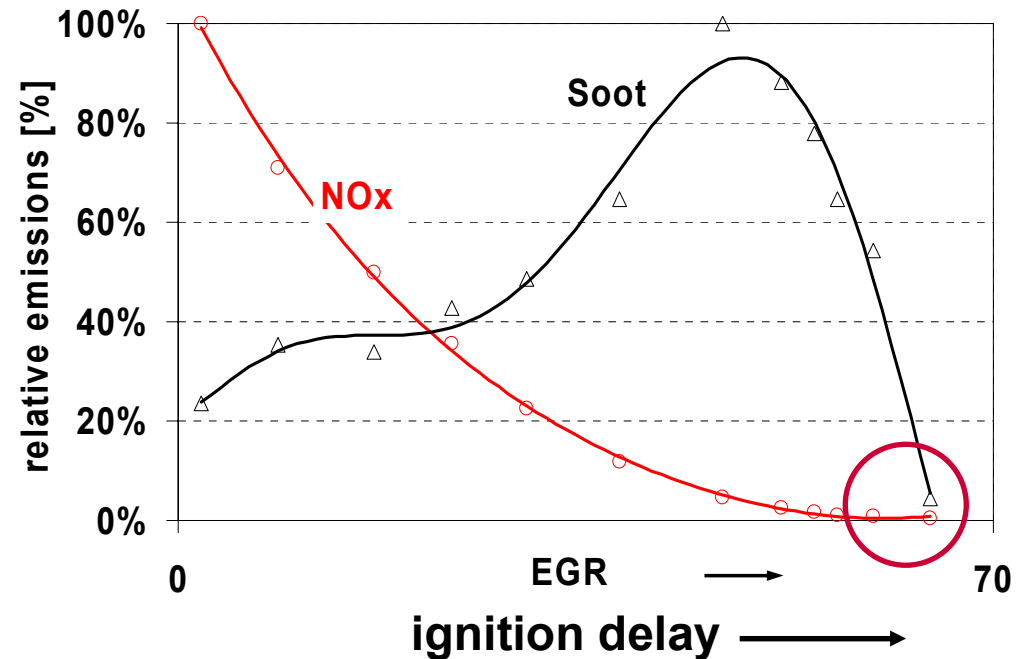
Promote Homogeneous Mixture:

- ⇒ retard self ignition
- ⇒ increase ignition delay



Start of Ignition definite by:

- ~~spark / injection timing~~
- charge (temperature, pressure, EGR)
- fuel air mixture
- fuel



Need of high and constant quality fuels: GtL with kerosene like boiling range

CCS: Combined Combustion System

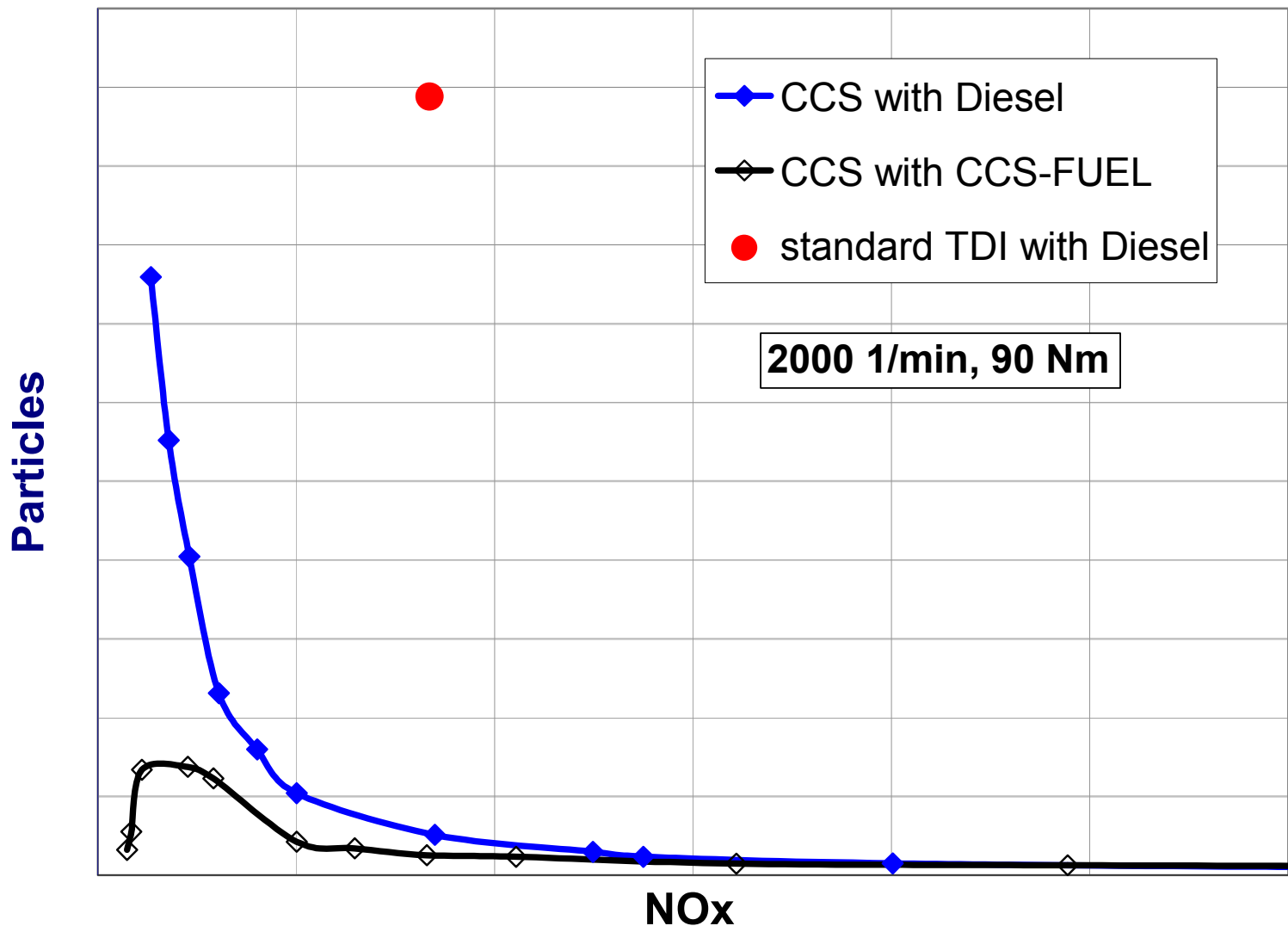
Diesel fuel

„Heterogeneous“ Combustion

„Partial homogeneous“ Combustion



CCS: emission reduction potential



Fuel Specification: CCS-fuel

Unit		Diesel EN 590	CCS - Fuel	Motivation
IBP	°C	≈ 180	> 150	Evaporation
FBP	°C	360	< 220	Evaporation, Ignition Delay
Cetan - Number	-	> 52	45	Ignition Delay
Vol. Energy Content	MJ/l	35 - 36	33 - 34	Compatibility
Sulfur	mg/kg	< 10	< 10	Particles, Poisoning
Aromatics	Vol %	≈ 20%	< 2	Particles, NOx
Poly. Aromatics	Mass %	< 11	< 0,5	Particles, NOx

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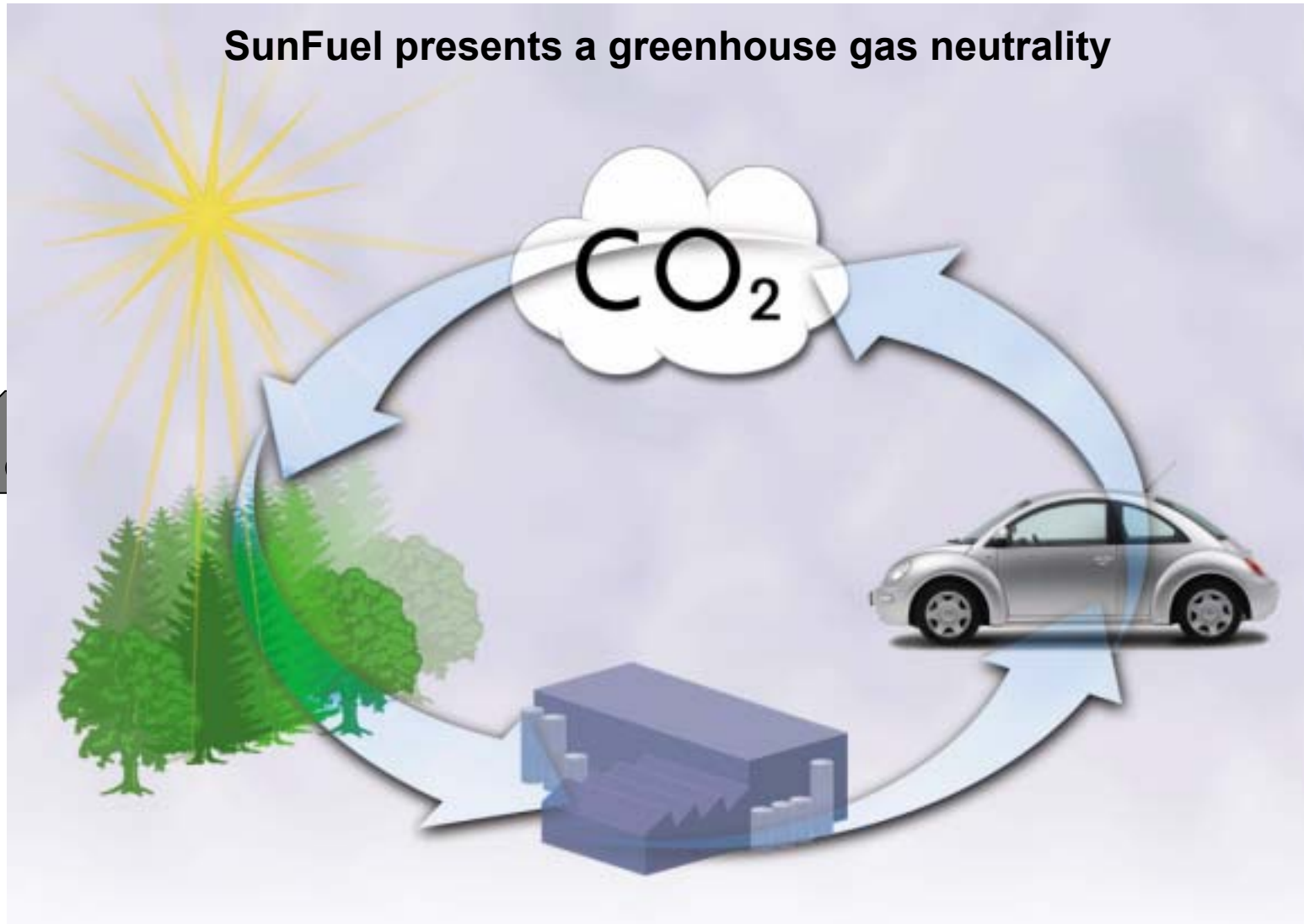
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Fuel- and Powertrain Strategy

Evolution instead of Revolution

SunFuel presents a greenhouse gas neutrality



SunFuel

Emission Results with BtL

Golf V, 2.0 TDI 4V 103kW,
MVEG / NEFZ

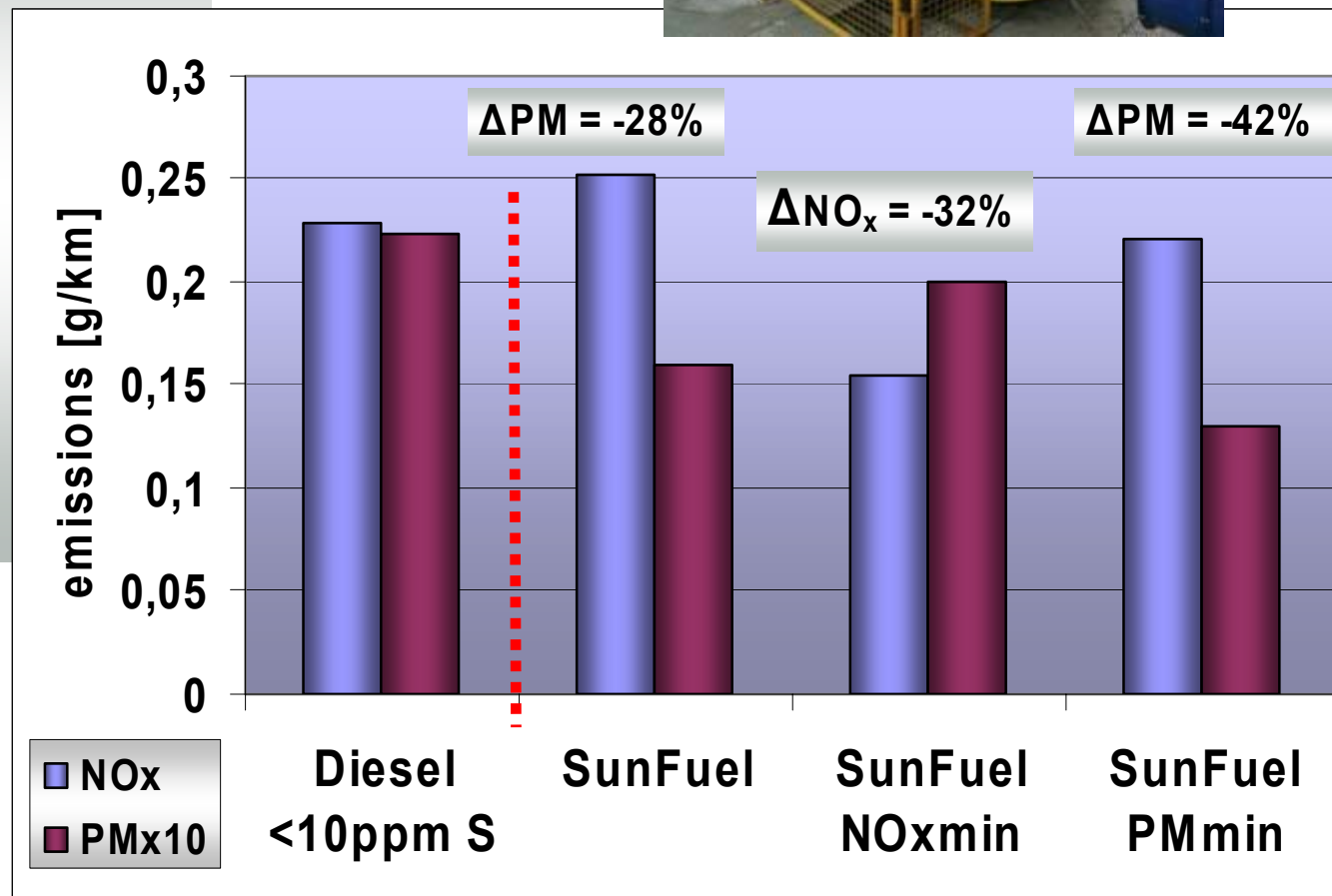
2 measurements:

■ Diesel application

+ 2 applicationen

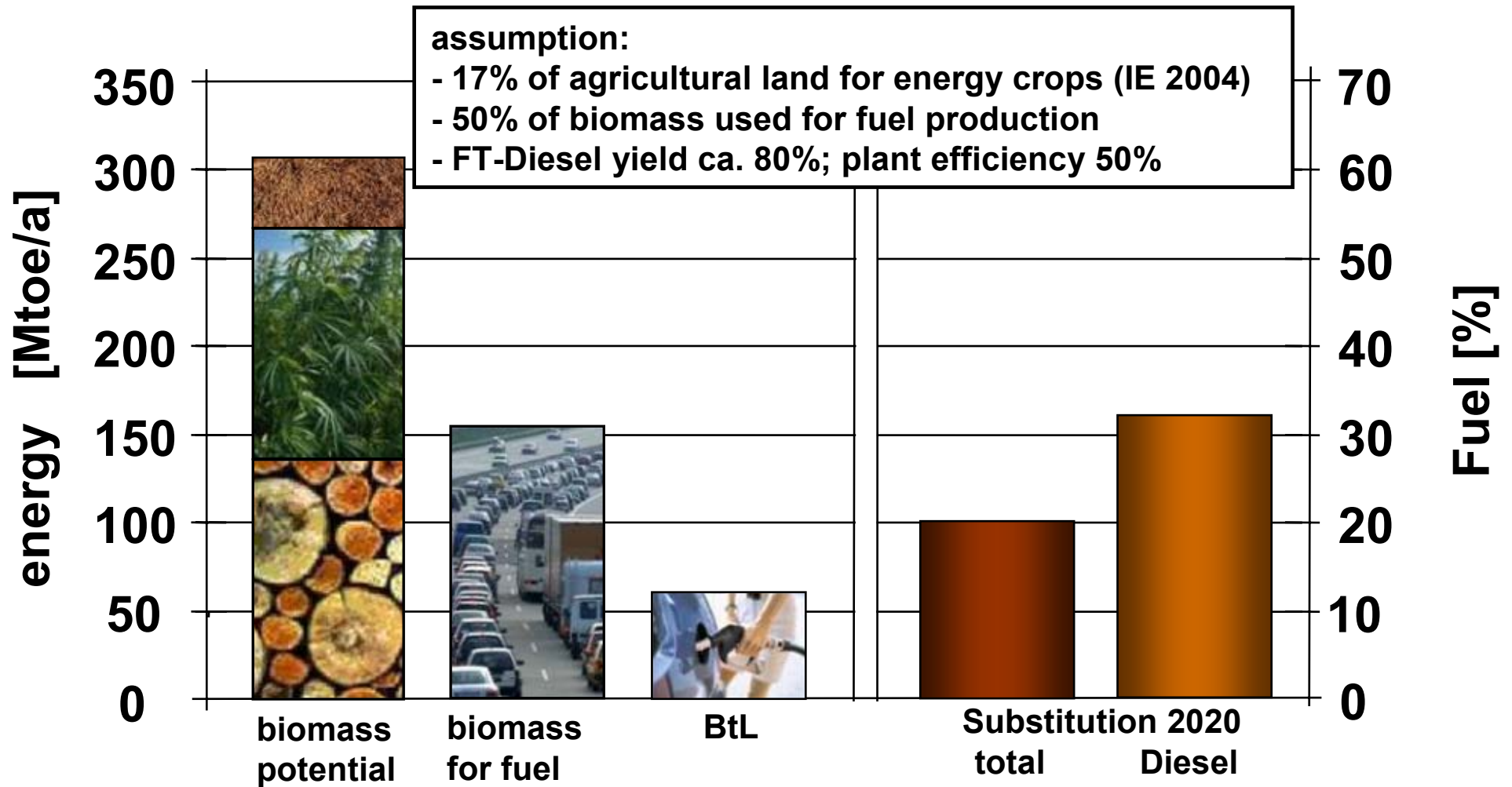
■ minimum NO_x

■ minimum particle



BtL Substitution Potential

EU 30 in 2020



Quelle: IE/LBST/VW

BtL News

Shell and CHOREN signed a Cooperation



2007:
15 kt/a SunFuel production

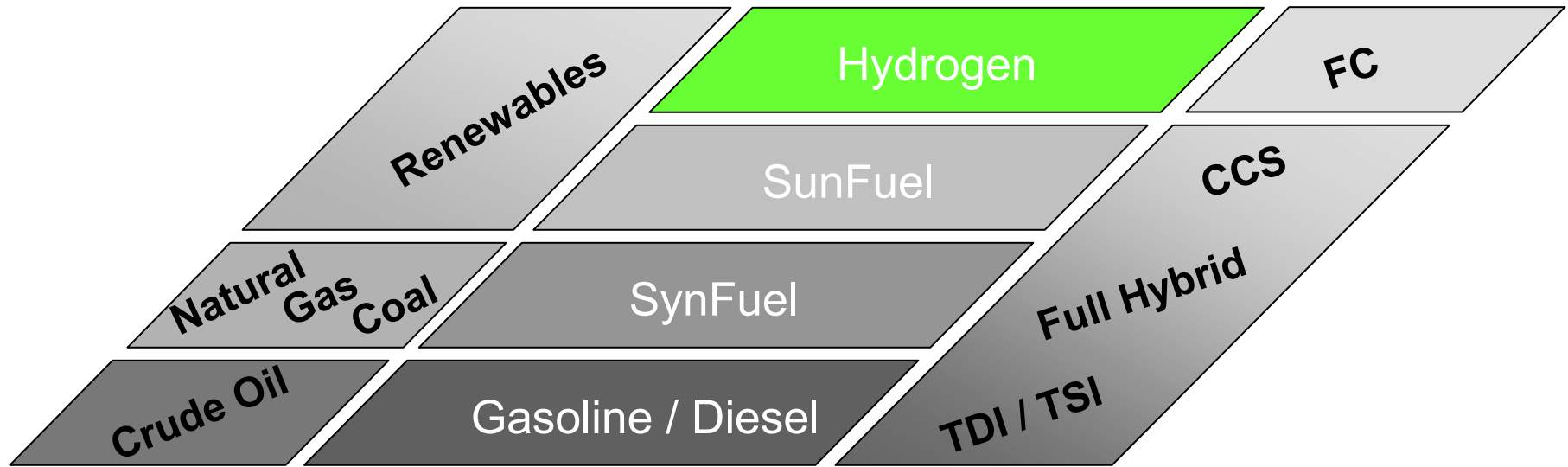
2009:
200 kt/a SunFuel production

break even point
~ 75\$/barrel

SunFuel is becoming reality

Fuel- and Powertrain Strategy

Evolution instead of Revolution



Objectives:

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Hydrogen

if produced from renewables



**sustainable
significant CO2 reduction potential
infinite energy source**

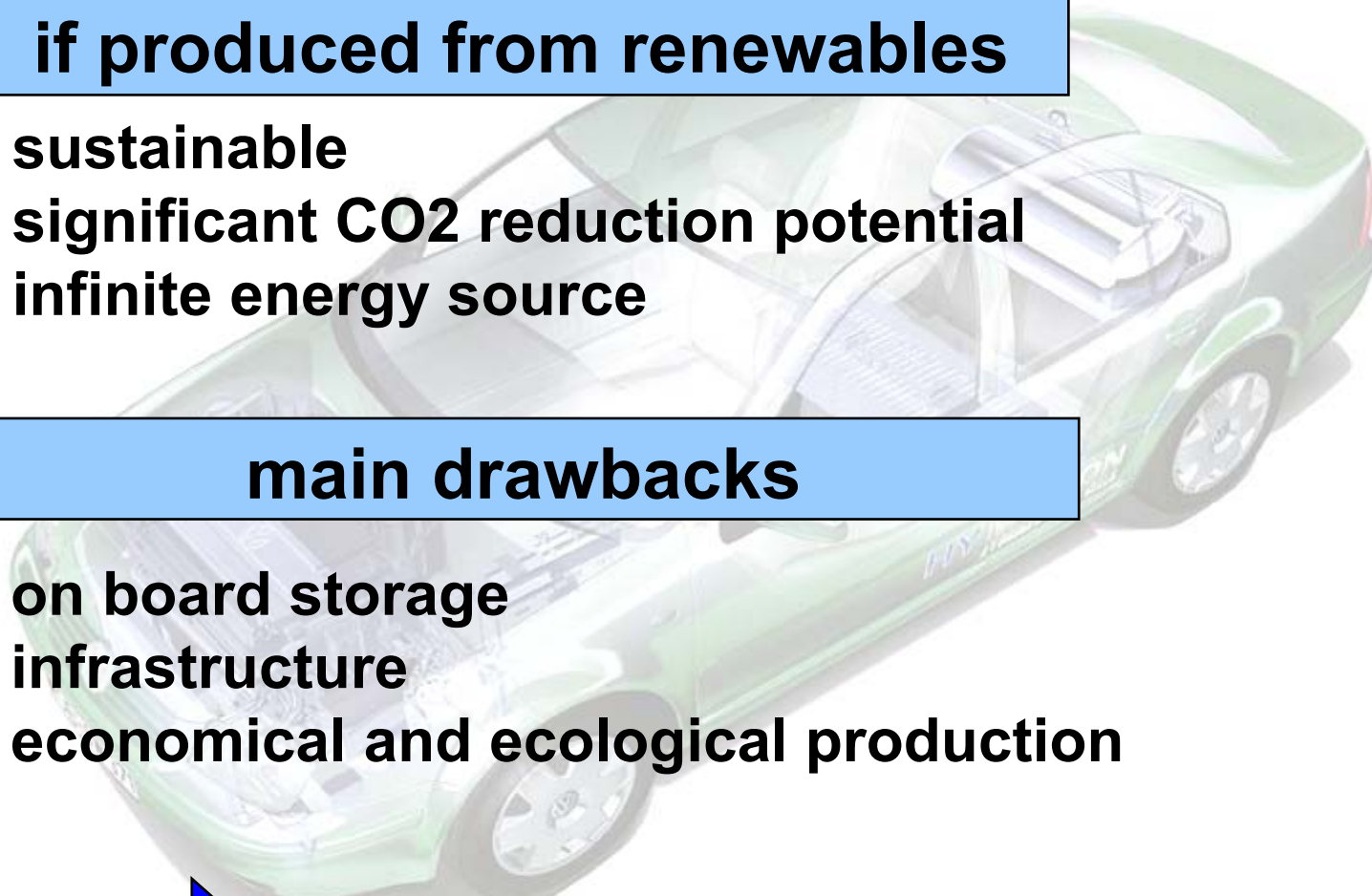
main drawbacks



**on board storage
infrastructure
economical and ecological production**

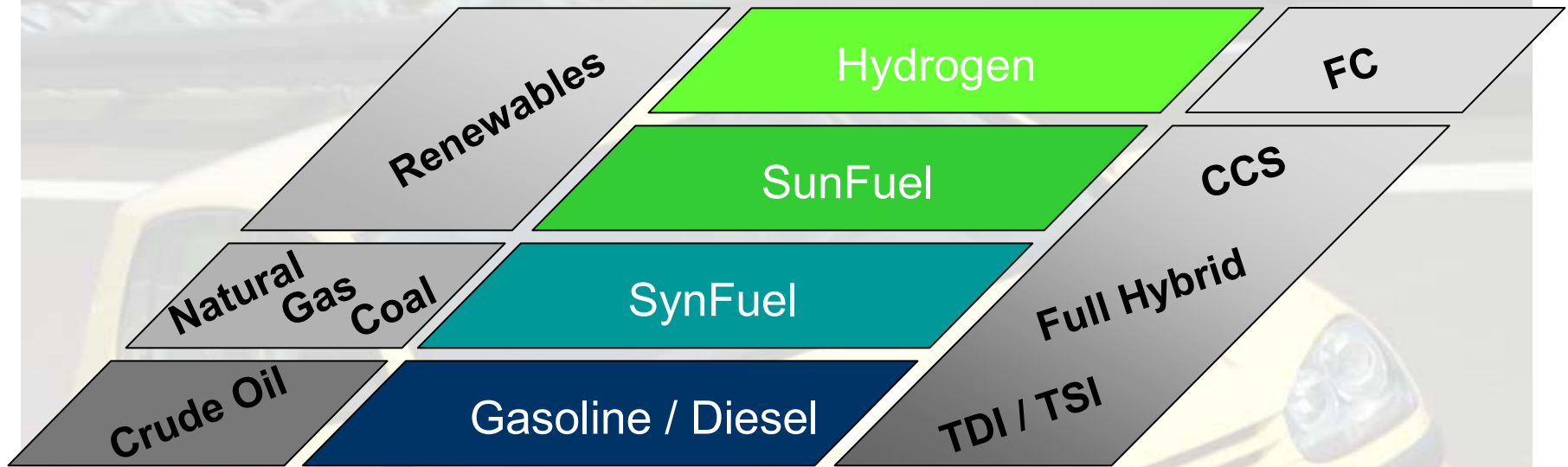


long-term solution (>2020)



Fuel- and Powertrain Strategy

Summary: Evolution instead of Revolution



- **Sustainability**

- Significant Greenhouse Gas Reduction

You are welcome to visit our website:

- **Diversification of Energy Sources**

- more Independence from Crude Oil

- **Use of Existing Infrastructure**

- **Combine Economy and Ecology**

www.sunfuel.de