



## Potential of BTL Fuels in Combustion Engines

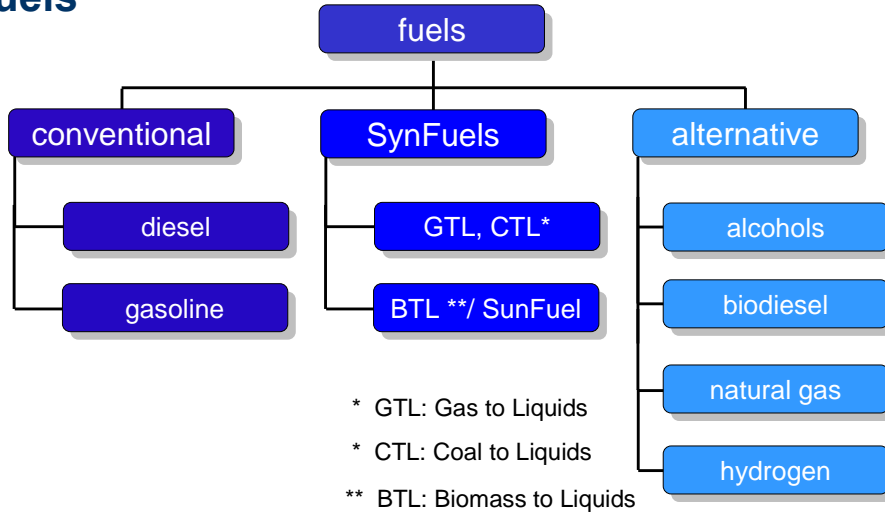
Dr. Hartmut Heinrich

2nd International BTL-Congress, 12<sup>th</sup> October 2006, Berlin

## Requirements

- ➔ **resolute additional improvement of the fuel efficiency of the vehicle**
- ➔ **including of alternative energy sources in fuel production**
- ➔ **development of CO<sub>2</sub>- neutral pathes in vehicle usage**

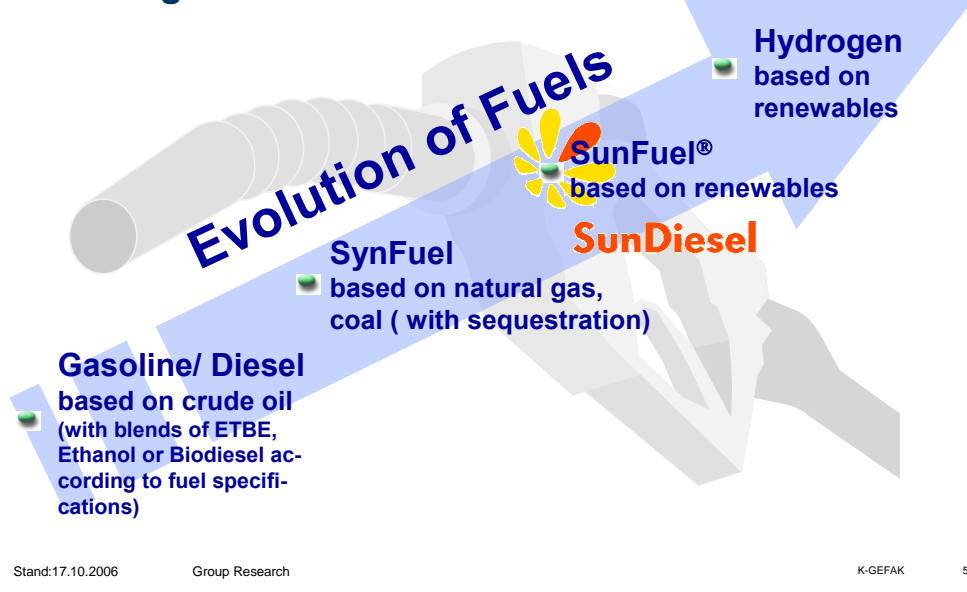
## Fuels



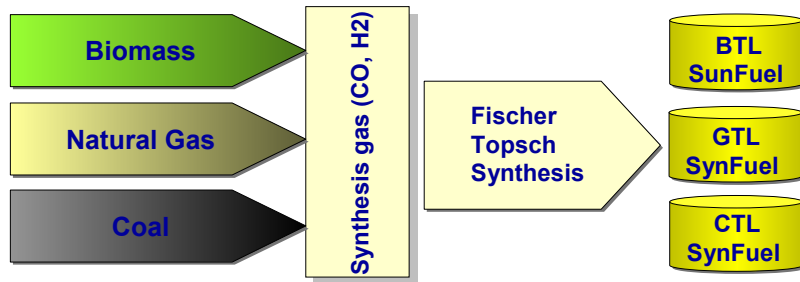
## Demands on Future Fuels

- gasoline biodiesel Ethanol (E85) methanol  
not to diversify on the fuels side  
→ economically unacceptable solution  
diesel LPG DME but natural gas hydrogen  
● to blend into existing fuels  
→ relating to existing fuel specifications  
ethanol ⇒ ETBE, biodiesel  
● to diversify on the primary energy side  
from crude oil to natural gas, „clean“ coal and biomass  
no hen and egg - problem

## Volkswagen Scenario for the Evolution of Fuels



## Synthetic Fuels (BTL, GTL, CTL) Diversification of primary energy sources



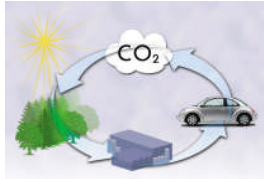
- Usage of existing engine technology
- usage of existing distribution infrastructure
- constant high fuel quality

## Potential of synthetic fuels

1. Direct **enhancement of local air quality** by using synthetic fuels in existing vehicles due to especial pureness of fuels

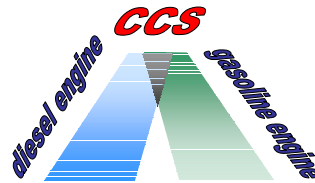


**water- white  
 product  
 odourless**

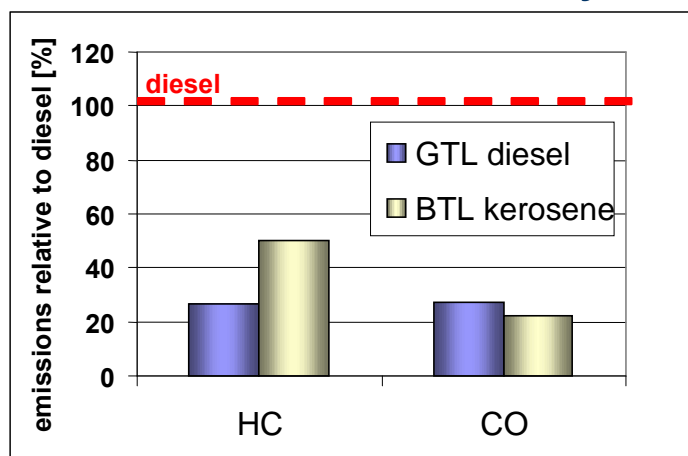


2. **Reduction of global CO<sub>2</sub>-emissions** if flared gas or biomass is used as source for synthetic fuels

3. Possibility of **development of new combustion processes** with enhanced properties due to designability of synthetic fuels

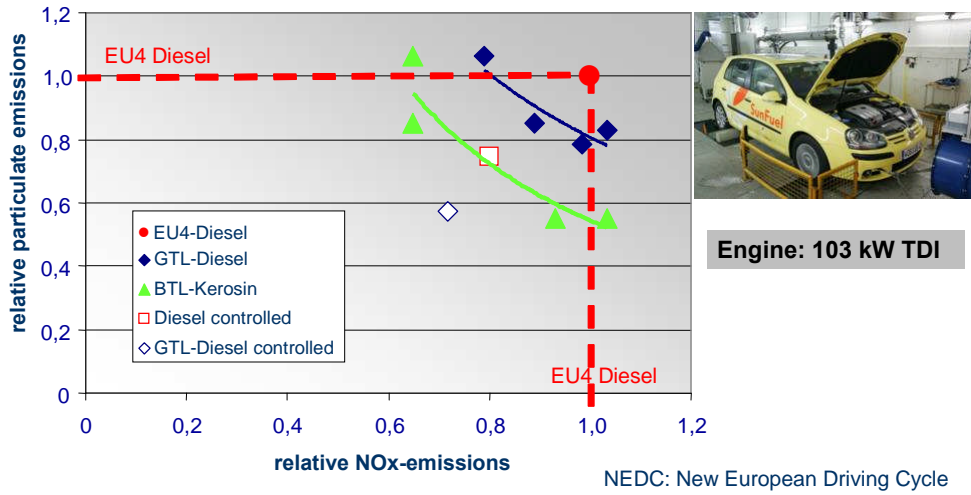


## Direct Enhancement of Local Air Quality, NEDC



NEDC: New European Driving Cycle

## Direct Enhancement of Local Air Quality, NEDC



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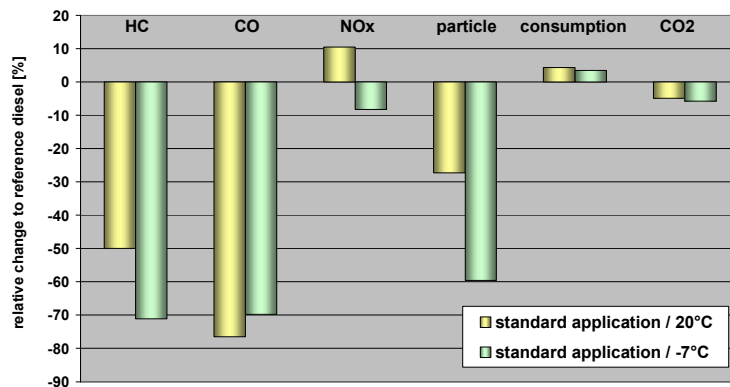
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9

## Direct Enhancement of Local Air Quality, NEDC

Emissions and consumption in NEDC at 20°C and -7°C  
 SunFuel (BtL kerosene) in comparison to reference diesel



NEDC: New European Driving Cycle

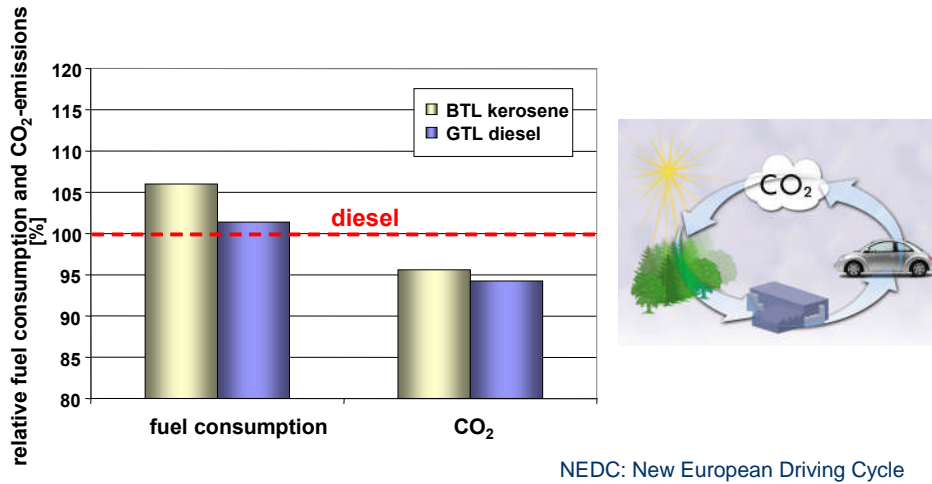
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10

## Direct Enhancement of Local Air Quality, NEDC



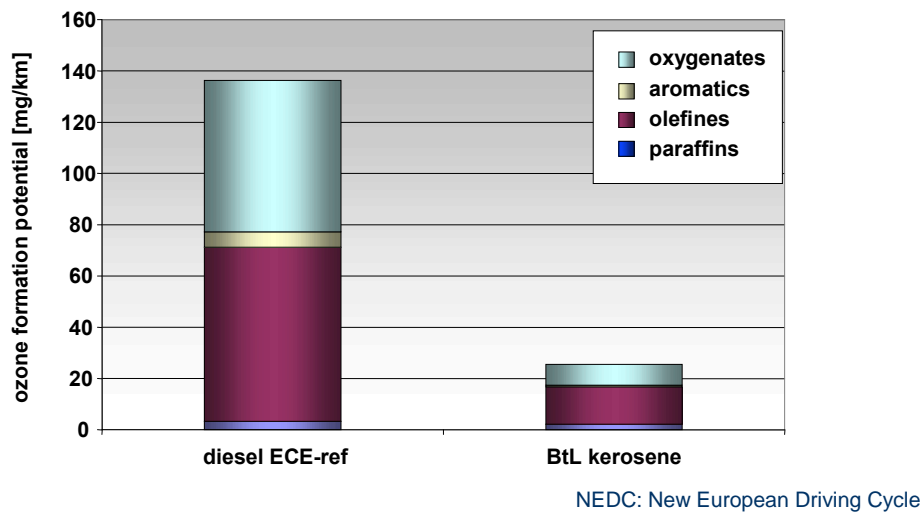
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11

## Direct Enhancement of Local Air Quality, NEDC



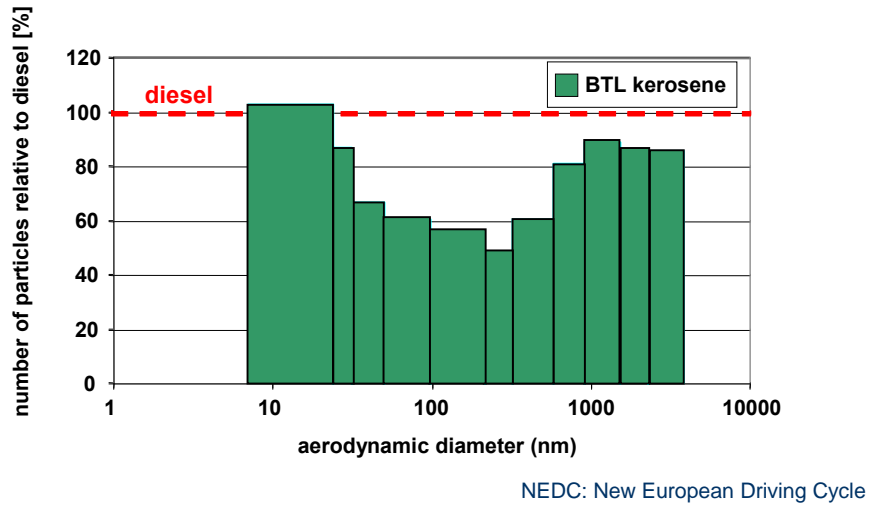
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12

## Direct Enhancement of Local Air Quality, NEDC



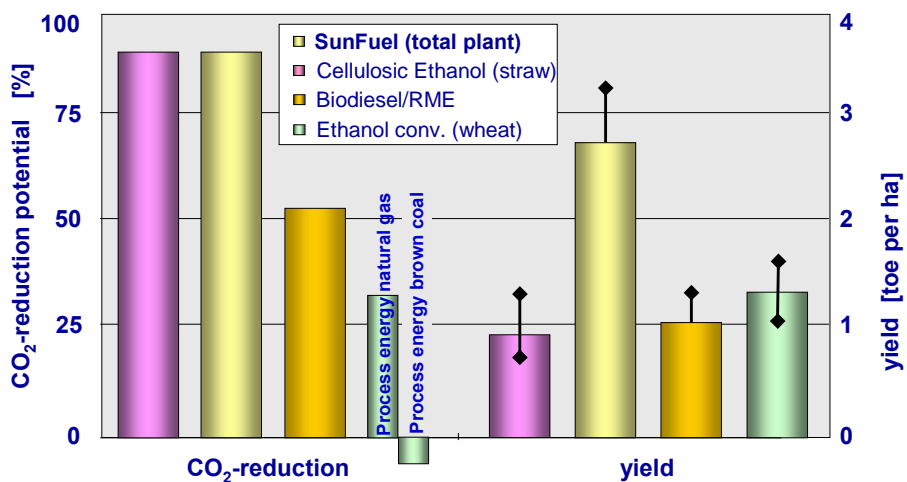
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## Potential for CO<sub>2</sub>-Reduction and Yield



Quellen: WTW-Update 2005 (CONCAWE, EUCAR, JRC), FNR 2004, Iogen/eigene Berechnungen 2006

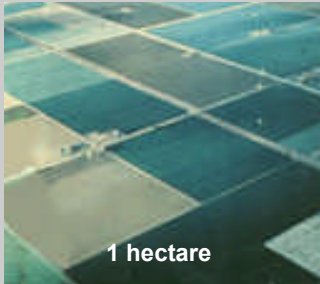
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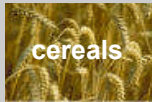
14

## Liquid Biofuels



1 hectare

litres per year and hectare



cereals



1,660 l gasoline equivalent



energy crops



3,907 l diesel equivalent



rapeseed



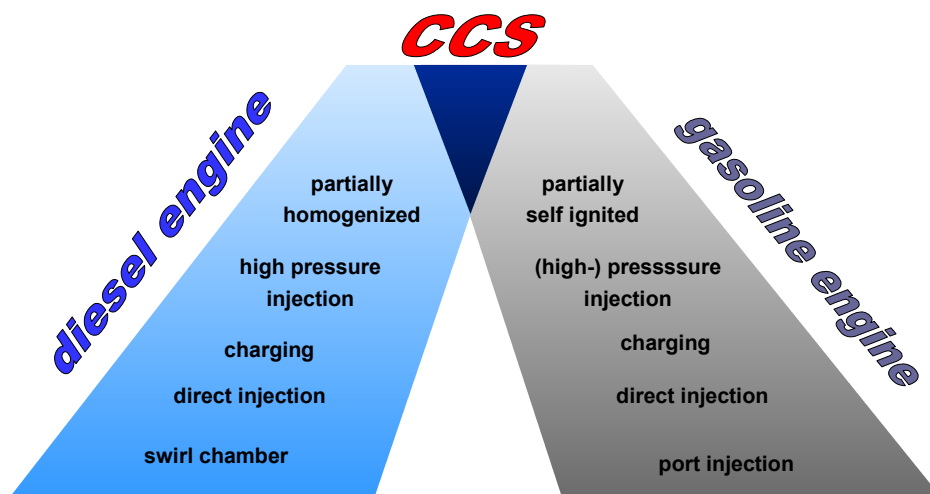
1,408 l diesel equivalent



1,420 l diesel equivalent

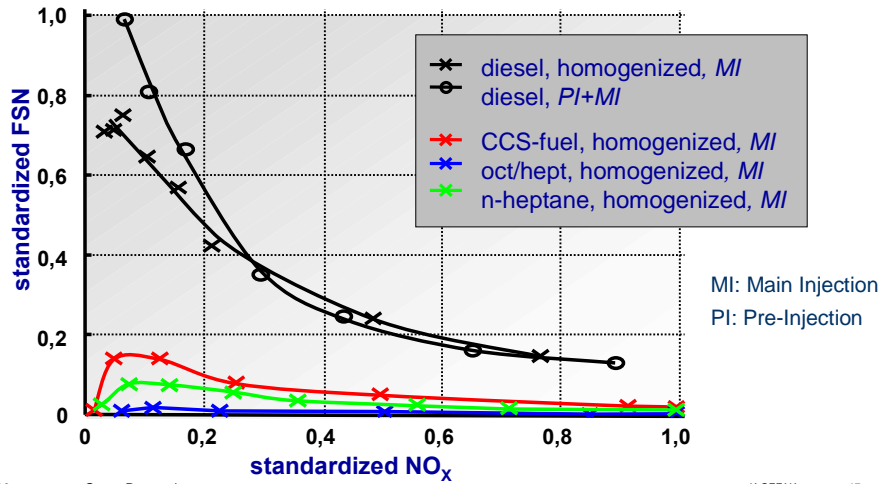
Source: FNR (Fachagentur Nachwachsende Rohstoffe, Germany, 2006)

## CCS - Development of a New Combustion Process



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CCS – fuel-investigations (n = 2000/min, p<sub>mi</sub> = 6,8 bar)



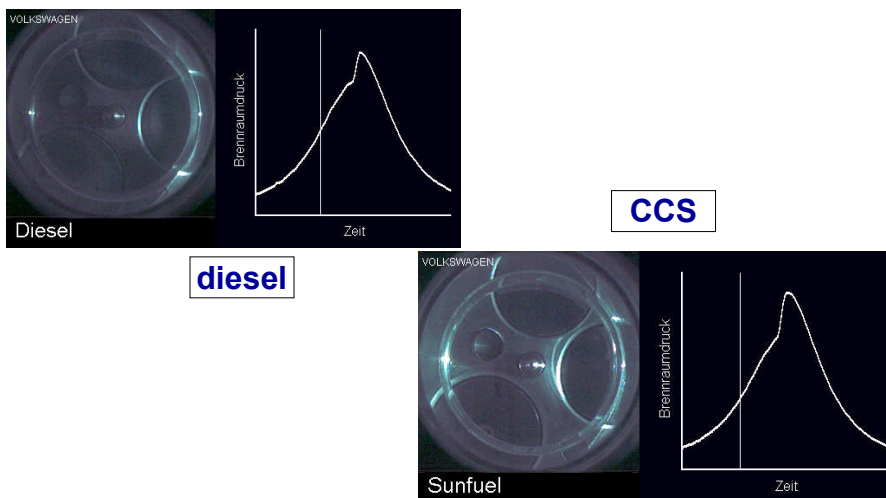
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## Fuels and Combustion Processes Comparison between Diesel und CCS



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## Volkswagen's Activities on SunFuel



Cooperation with the countries Niedersachsen, Brandenburg and Hessen for development of a biomass infrastructure for SunFuels.

**Target:** investigation of the availability of energy plants in that region



Cooperation with CHOREN Industries GmbH (SunFuel producer) and Daimler-Chrysler

**Target:** production and testing of BTL-Fuel / plants



Operation of an experimental farmland (5 ha) with the University of Kassel near Wolfsburg with different energy plants

**Target:** demonstration of an environment friendly culture of high yields of biomass

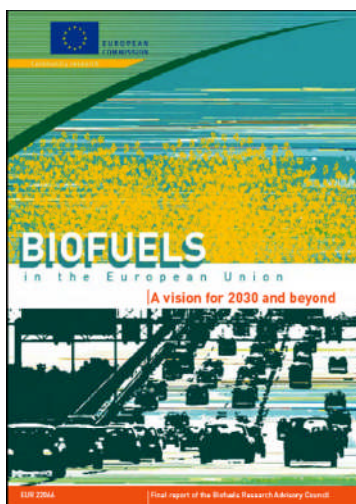
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19

## European Technology Platform for Biofuels



Presentation of the Vision Report by the Biofuels Research Advisory Council on June 8th in Bruxelles

**Vision: by 2030, the European Union covers 25% of its transport fuel needs by clean and CO<sub>2</sub>-efficient biofuels.**

At the very beginning: biofuels of the 1. generation (Ethanol, Biodiesel).

Mid- to longterm: biofuels of the 2. generation have a higher potential

Launch of the "European Technology Platform for Biofuels" on June 8th in Bruxelles

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20

## Conclusion

Detailed measurements on engine test benches and vehicle dynamometer test show the excellent emission behaviour of BTL fuels.

BTL meets all requirements on a high potential alternative fuel:

1. BTL's properties similar to the today's diesel fuel
2. BtL is compatible to existing and future engine technology
3. BtL is compatible to existing distribution infrastructure  
but
4. BtL leads to highest WTW CO<sub>2</sub>-reduction
5. BtL has major advantages in terms of emissions
6. BtL diversifies primary energy

**BTL: the Route into a Sustainable Future**

## BTL: the Route into a Sustainable Future

