

BTL-Fuels for the Transportation Sector

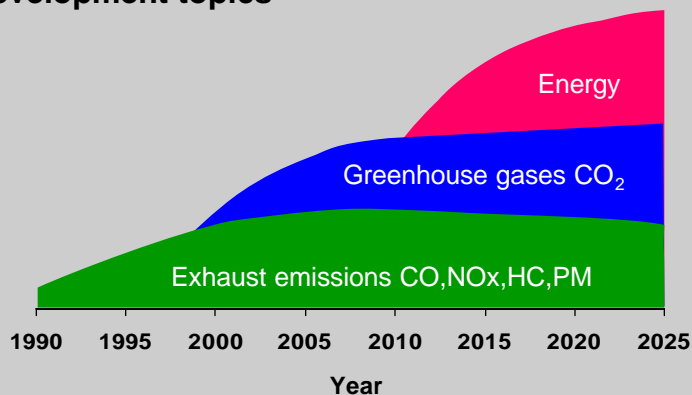
- Volkswagen's View on Future Powertrains and Fuels -

Dr. Hartmut Heinrich

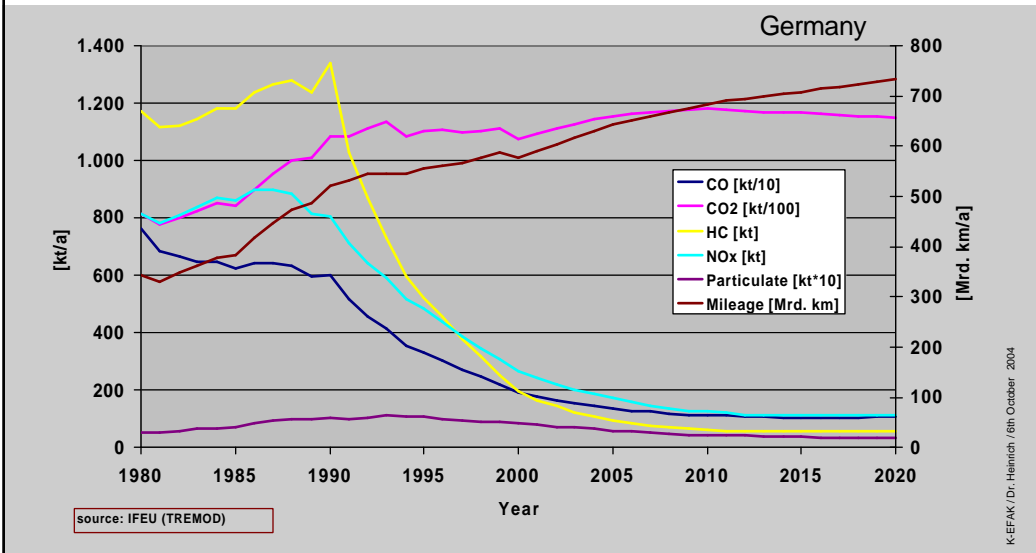
IEA Bioenergy, ExCo54
Ottawa, 6th October 2004

Main Topics

Change in environment related
development topics



Trends in Passenger Car Emissions

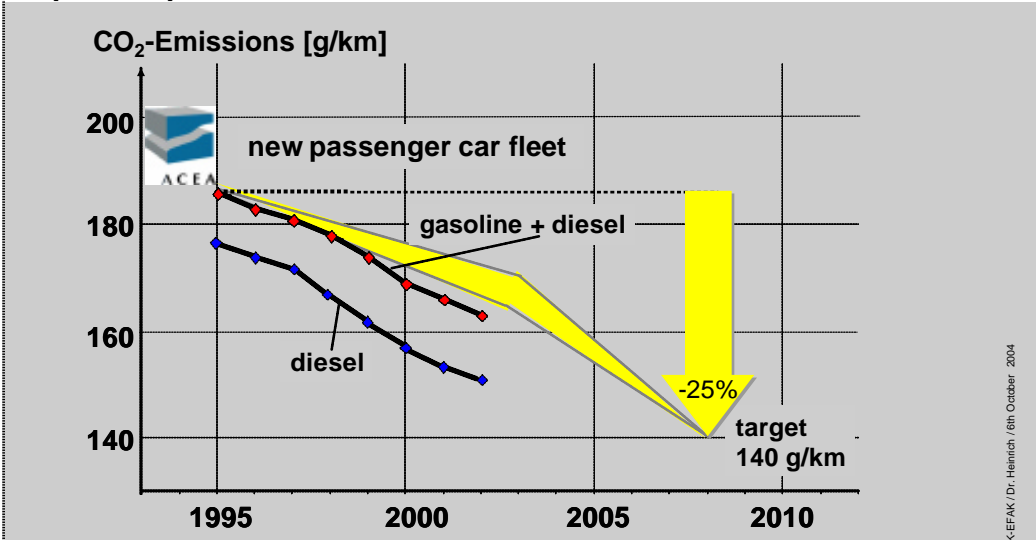


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Self Commitment of European Car Manufacturers (ACEA)

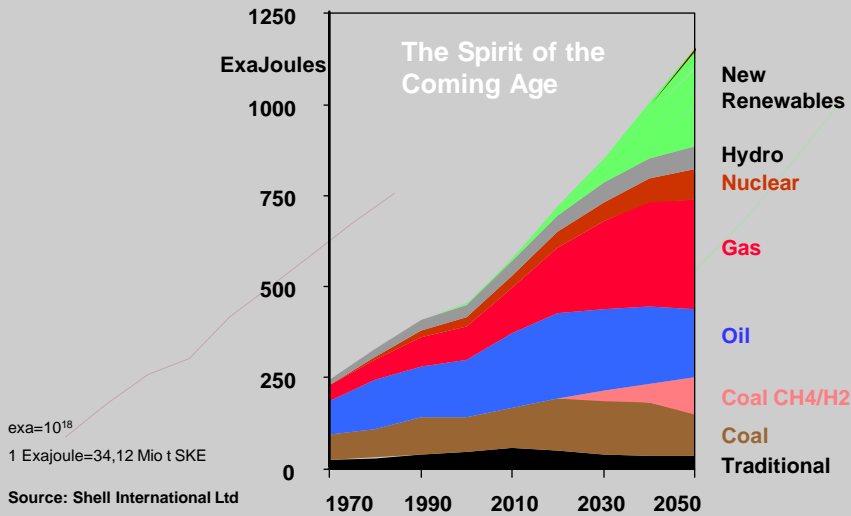


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World Energy Demand



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Conclusions

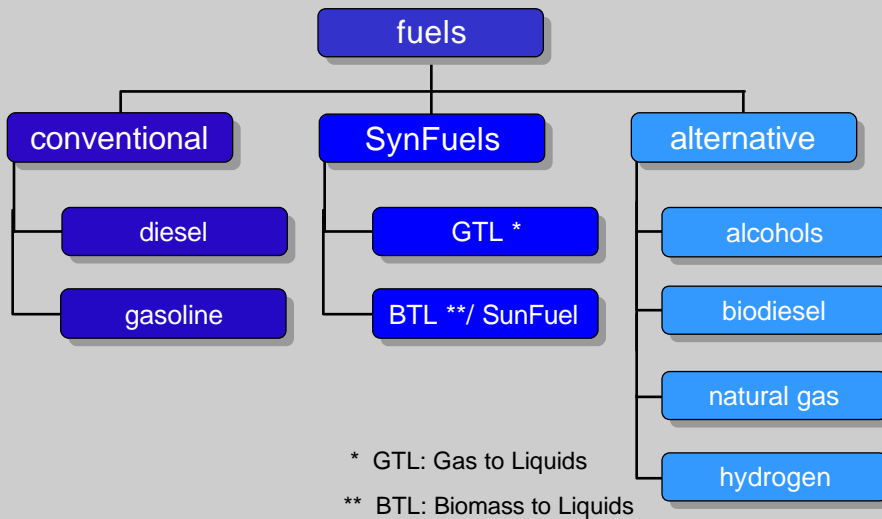
- economical use of existing energy resources by **further improvement of the efficiency** of the vehicle
- **introduction of renewable fuels** with CO₂ - free or CO₂ - neutral paths into the transportation sector

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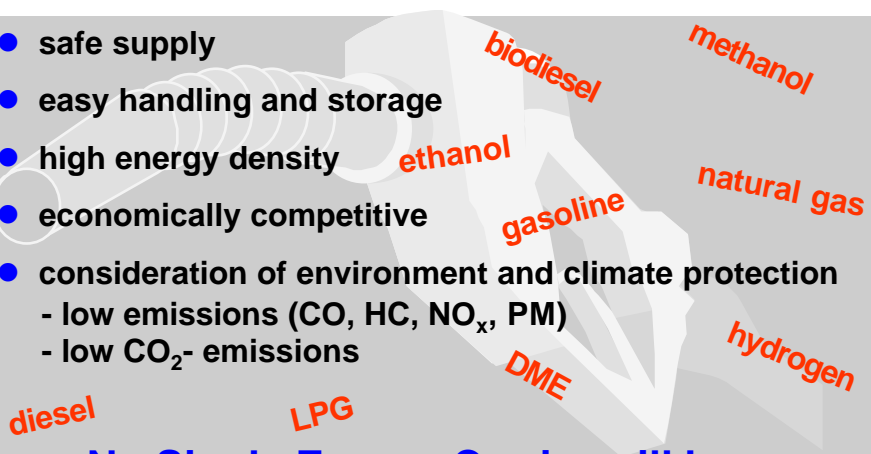
Fuels



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Demands on Future Fuels - 1

- safe supply
- easy handling and storage
- high energy density
- economically competitive
- consideration of environment and climate protection
 - low emissions (CO, HC, NO_x, PM)
 - low CO₂- emissions



**No Single Energy Carrier will be
Able to Fulfill these Demands**

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Demands on Future Fuels - 2

gasoline biodiesel ethanol methanol
not to diversify on the fuels side
→ economically unacceptable solution
diesel LPG DME natural gas hydrogen
but

- **to blend into existing fuels**
→ relating to existing fuel specifications
methanol, ethanol, biodiesel
 - **to diversify on the primary energy side**
from crude oil to natural gas, coal and biomass
- no hen and egg - problem

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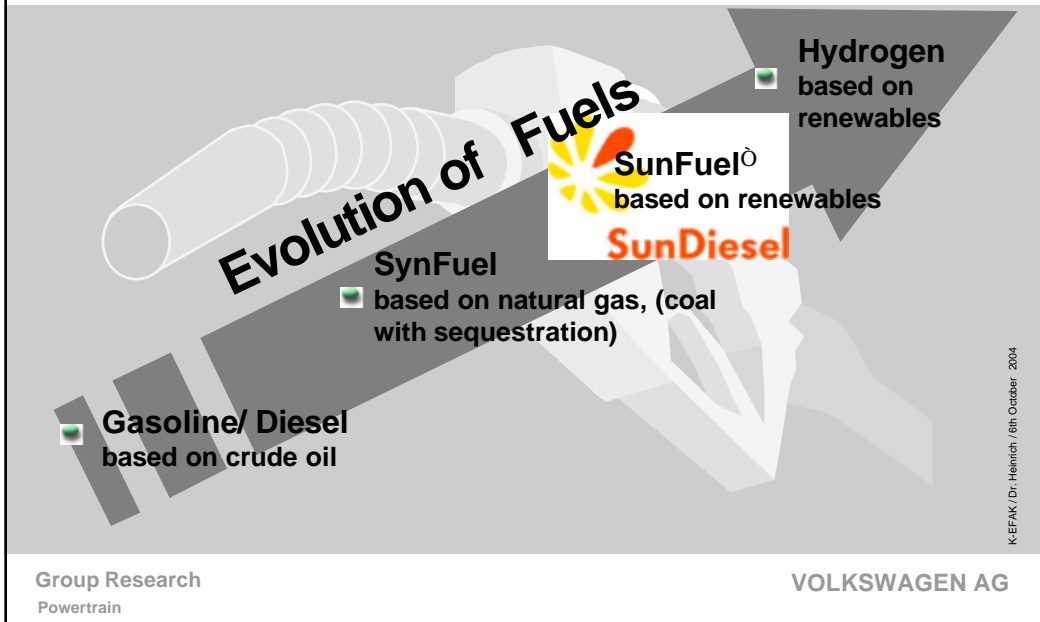
Challenges of the Future

Renewable fuels for the transportation sector

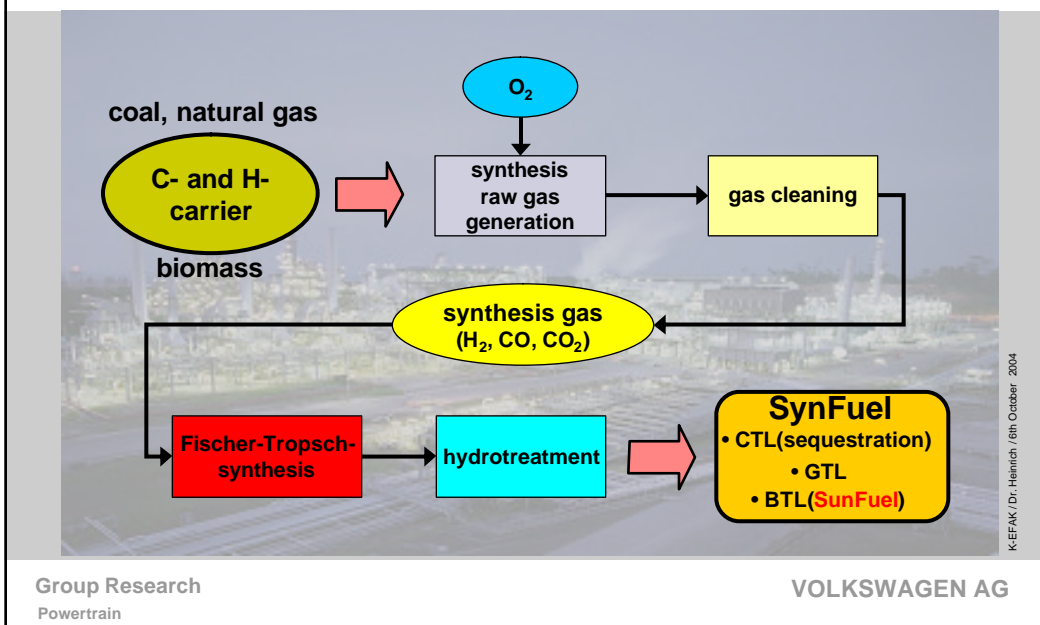
- **renewable liquid fuels**
⇒ biomass ⇒ **SunFuel (BTL)**,
Biodiesel, Bioethanol
- **renewable gaseous fuels**
⇒ biomass and/or renewable
electricity ⇒ hydrogen

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Volkswagen Scenario for the Evolution of Fuels



Simplified Synthetic Fuel Production Process

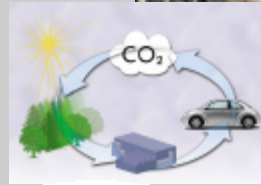


Synthetic Fuels: Categories of Improvement

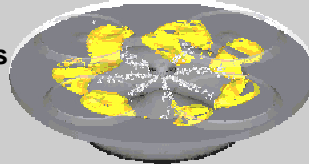
1. Direct improvement of local air quality by usage of synthetic fuels in existing vehicles based on the outstanding purity of the fuels



2. Reduction of global CO₂-emissions if biomass is used as primary energy for synthetic fuels



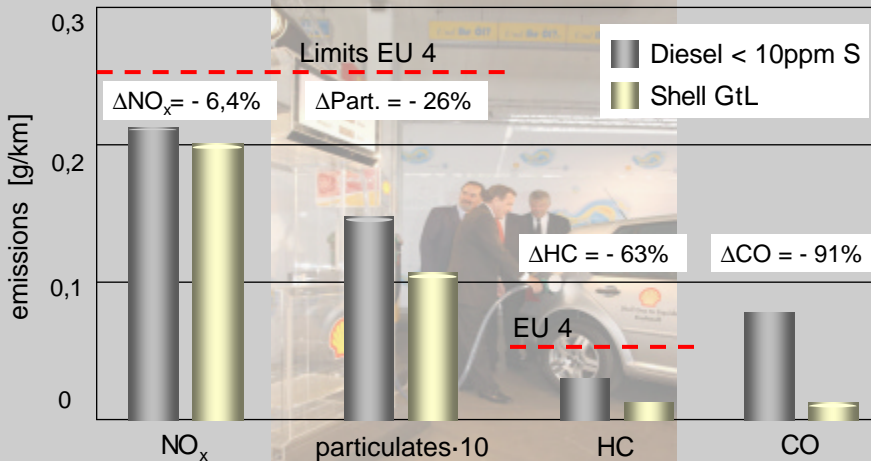
3. Possibility to develop new combustion systems with widely improved characteristics based on the designability of synthetic fuels



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Fleet Test Trial in Berlin 2003

25 vehicles, 5 months



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Shell GTL Retail-Worldwide



Thailand

Shell Pura Diesel

- launched in Bangkok in 2002



Greece

Shell Diesel 2004

- launched 8 July 2003 in Athens



Germany

Shell V- Power Diesel

- Launched 4 June 2004 in Hamburg

- blend of standard diesel, Shell GTL and an additive
- emissions benefits, better engine performance

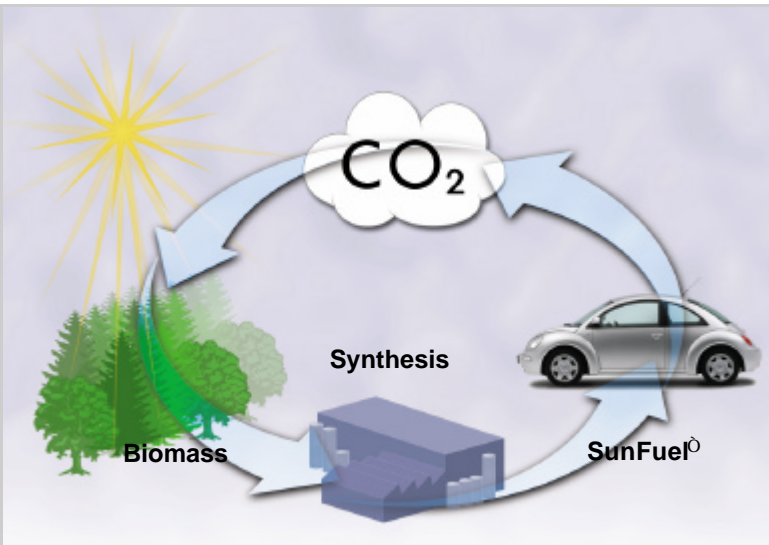
Source: Shell Global Solutions

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CO₂ cycle with SunFuel⁰

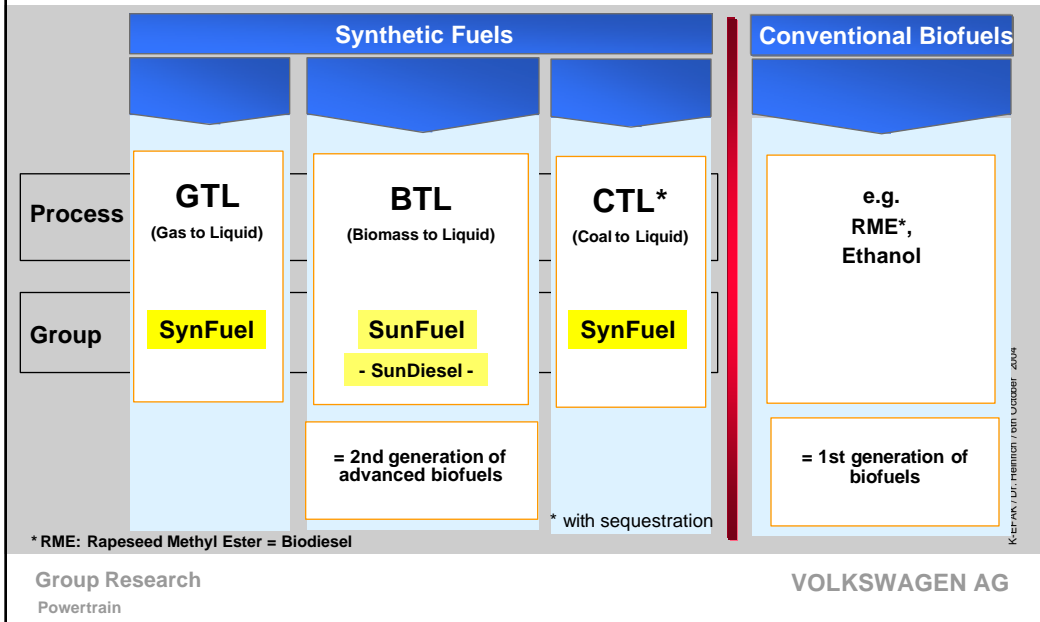


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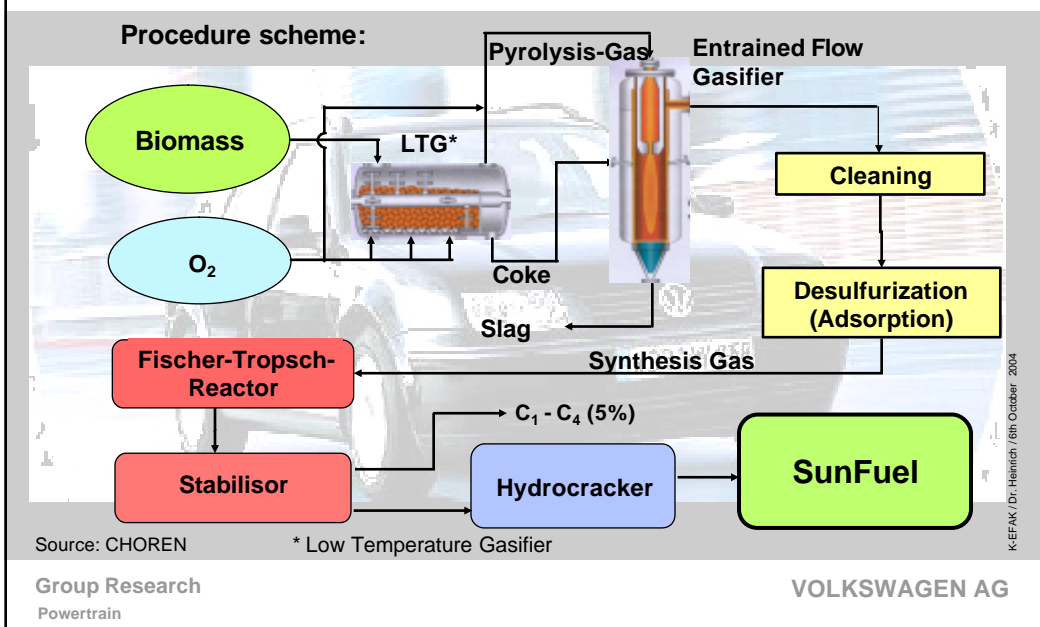
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Classification of Synthetic Fuels



SunFuel-Production by CHOREN's Carbo V Process



CarboV⁰ Test Facility CHOREN

Capacity: 1 MW thermal
 Input: wood
 Straw
 Green plants
 Shredder-Light-Fraction
 Coal

Products: BioSynGas → el. power
 Diesel max. 600ltr/day
 Kerosene
 Methanol
 currently: SunDiesel

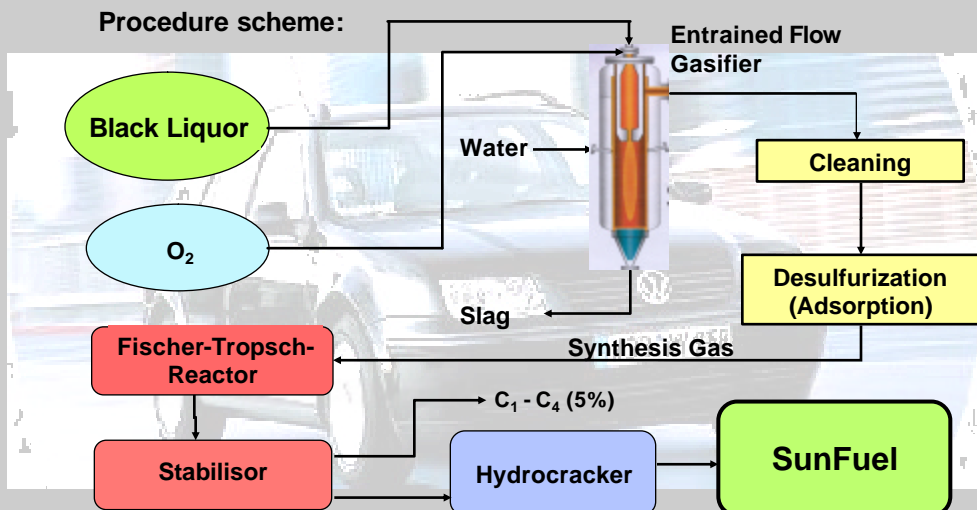


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SunFuel-Production from Black Liquor



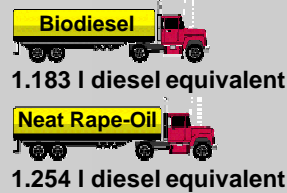
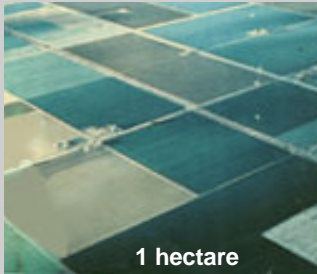
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Liquid Biofuels

litres per year and hectare



Source: FNR (Fachagentur Nachwachsende Rohstoffe, Germany)

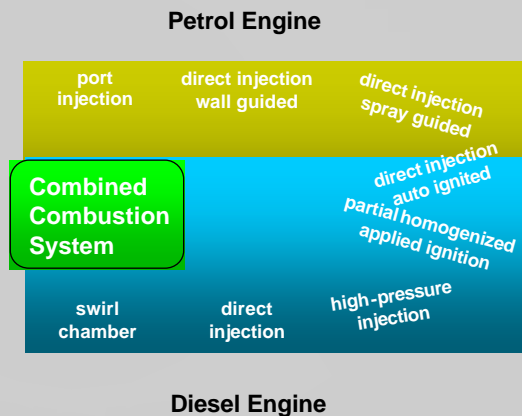
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Combustion System Development

- synthetic fuels enable new optimized combustion processes
- combination of the emission behavior of the petrol engine with the excellent efficiency of the diesel engine



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Renewables2004 – SunDiesel-Demonstration Fleet



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Renewables2004



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Press Release

Moving away from oil with alternative fuels

At the International Forum on Renewable Energies in Bonn, DaimlerChrysler and Volkswagen present their joint alternative fuel strategy with fuels produced by Shell and Choren

Statement by Dr. Hermann Scheer, Member of the Bundestag and Chairman of the International Parliamentary Forum on Renewable Energies:

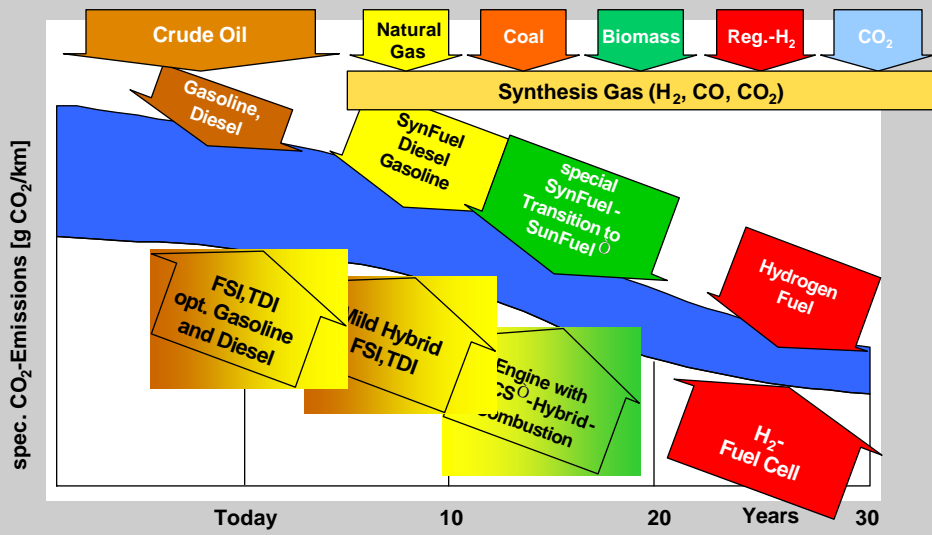
Bonn, 29 May 2004 – I therefore welcome the interest shown and active measures taken by DaimlerChrysler and Volkswagen to make SunDiesel manufactured by Choren Industries ... part of an alternative fuel strategy.

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Volkswagen's Fuel- and Powertrain Strategy



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SunFuel⁰: The Route into a Sustainable Future



Thank You For Your Attention

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