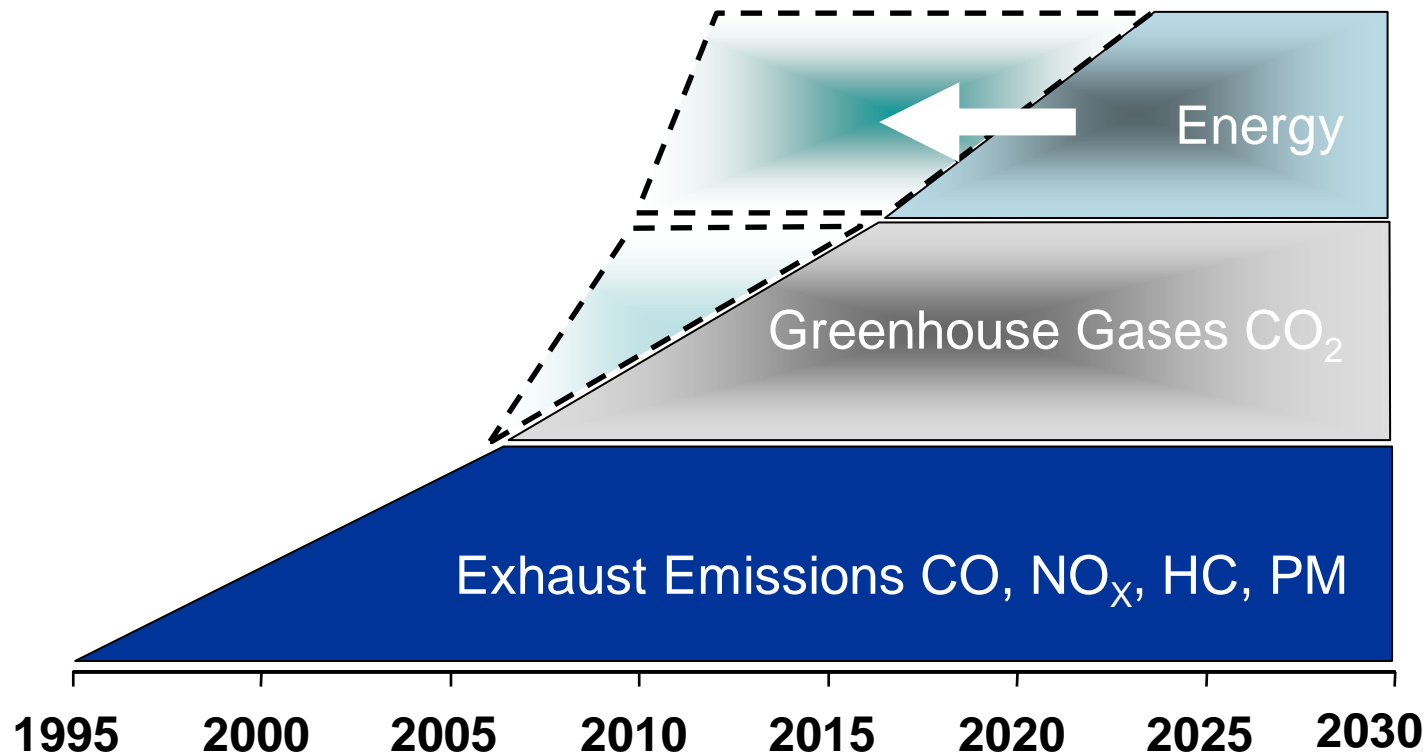


# Strategies for Future Powertrains

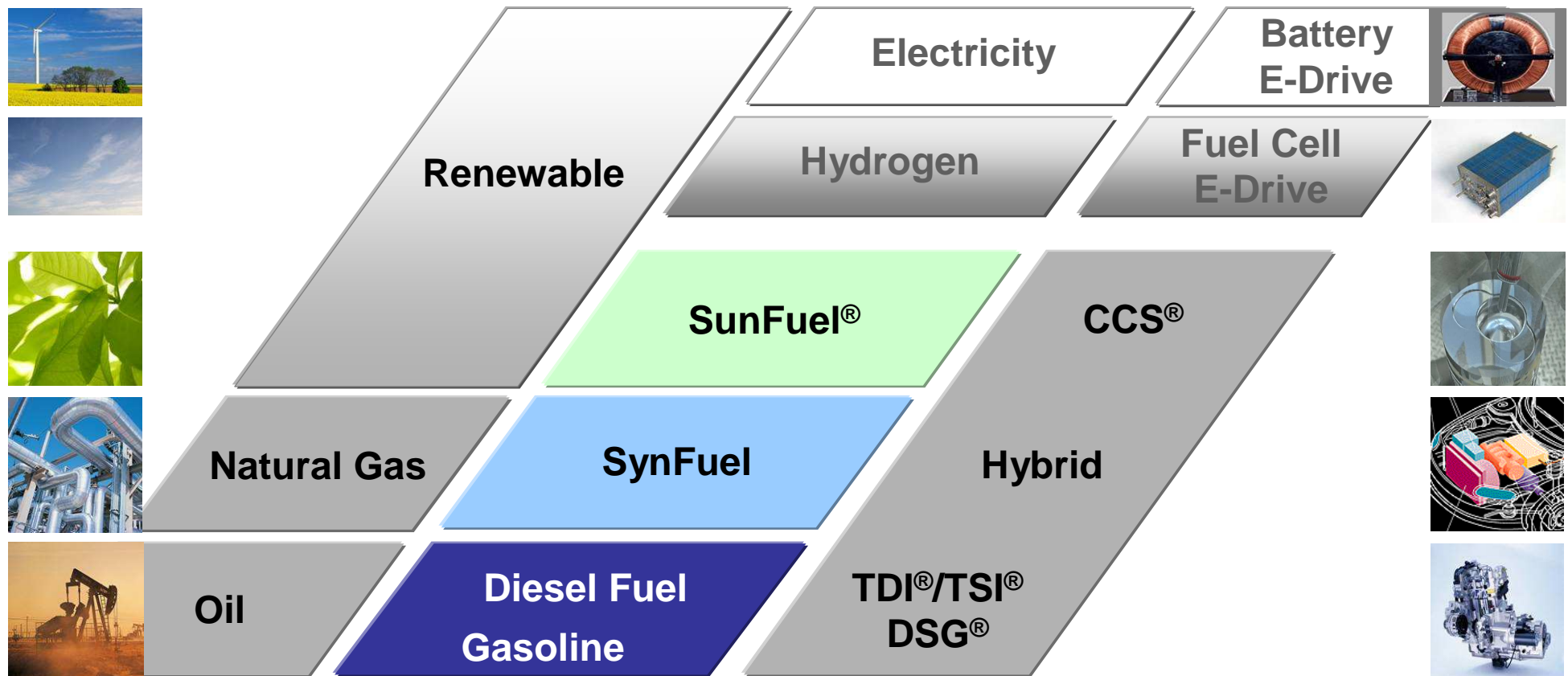
Dr. Wolfgang Steiger  
Volkswagen AG

22.04.2008 TRA 2008, Ljubljana, Slovenia

# Top 3 Mobility Issues

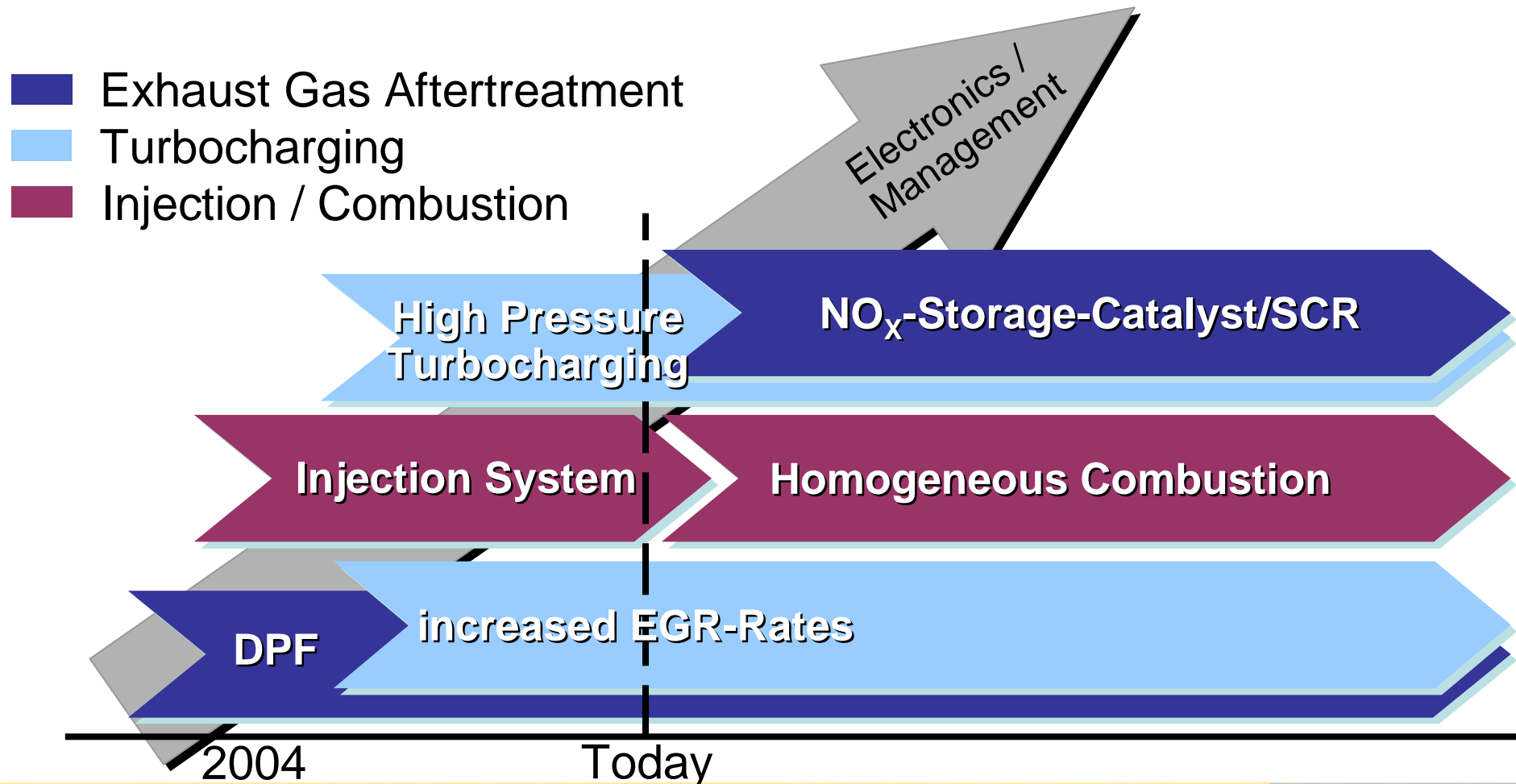


# Volkswagen's Fuel- and Powertrain Strategy



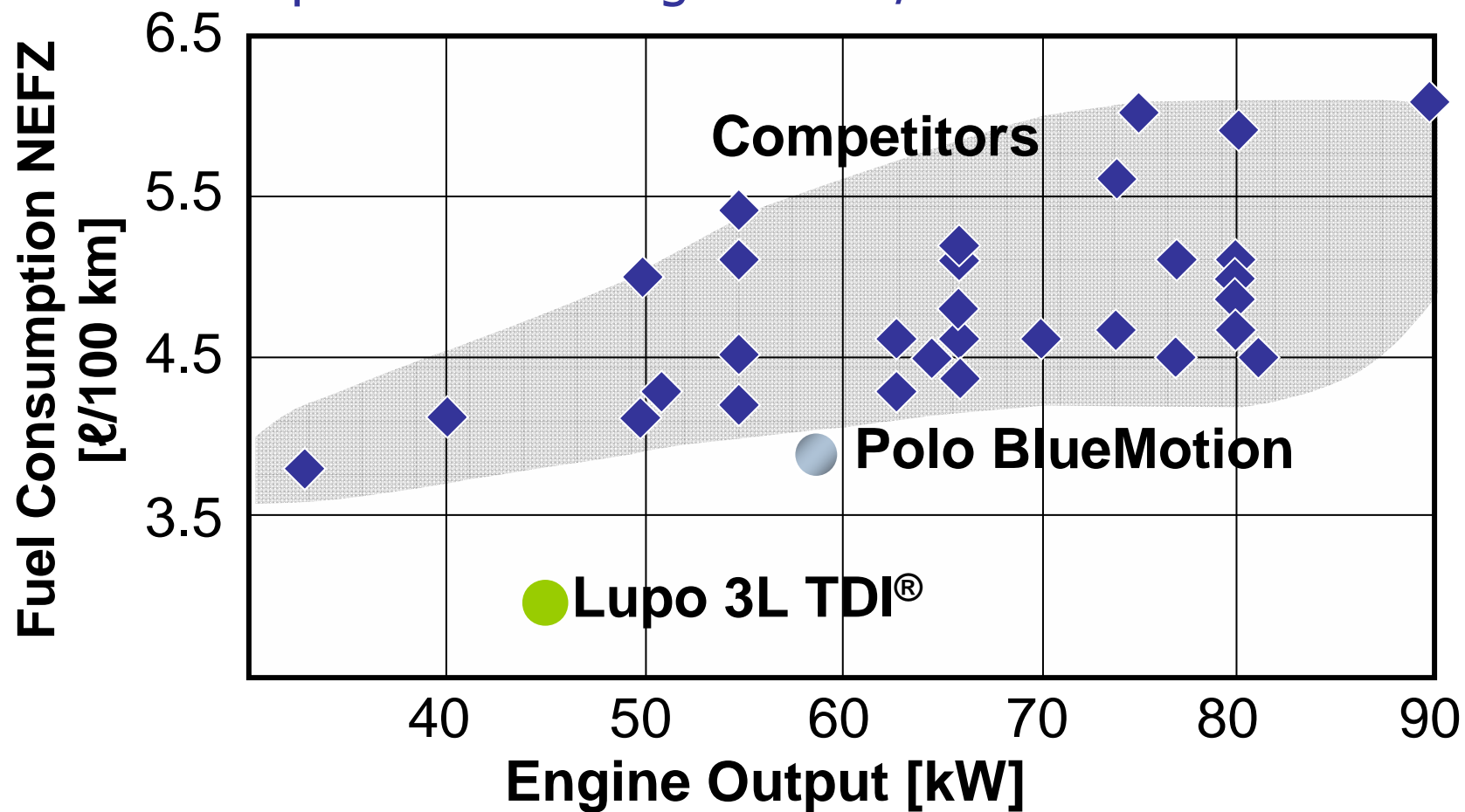
# Future Challenges for the Diesel

## Emissions



# BlueMotion

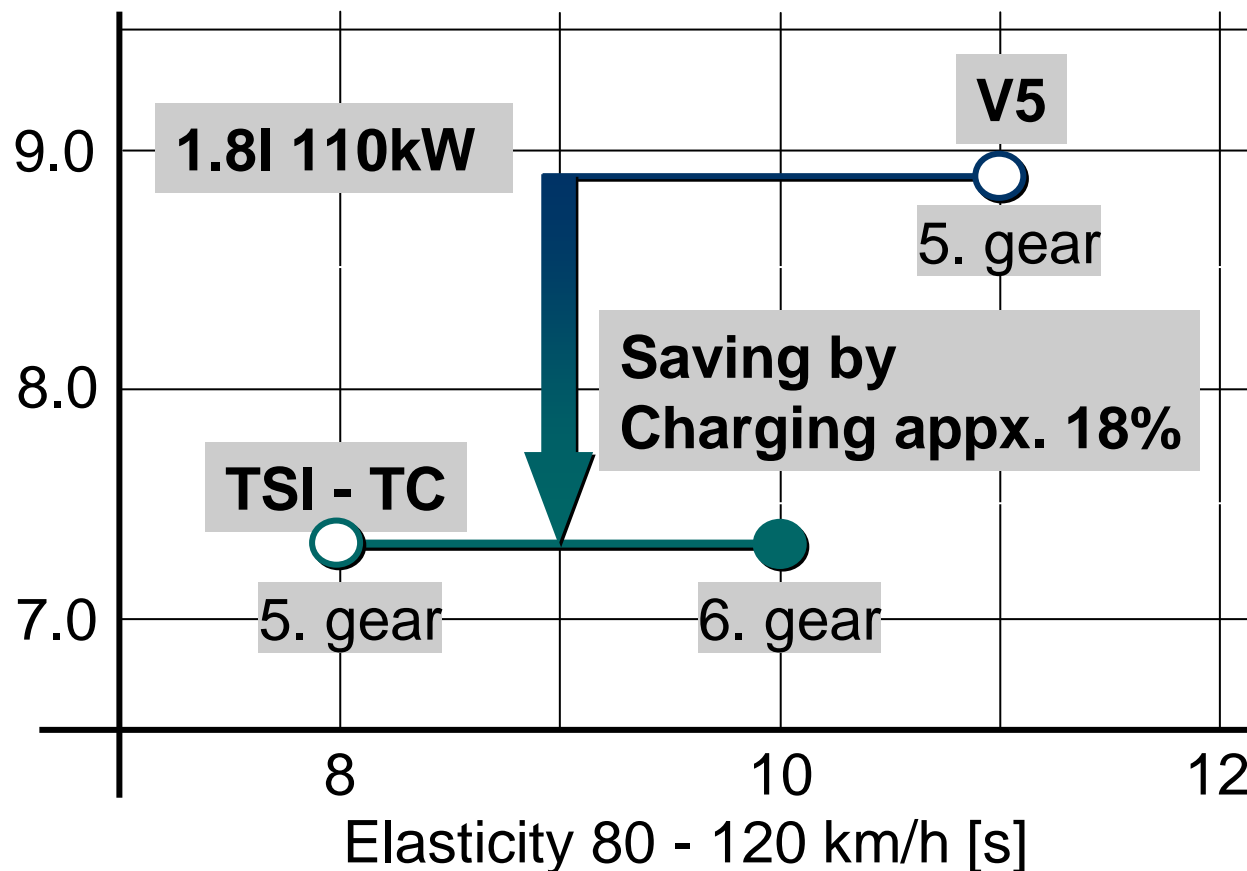
## Fuel Consumption Diesel Engine A00-/A0-Class



# TSI<sup>®</sup>-TC – Fuel Consumption Reduction

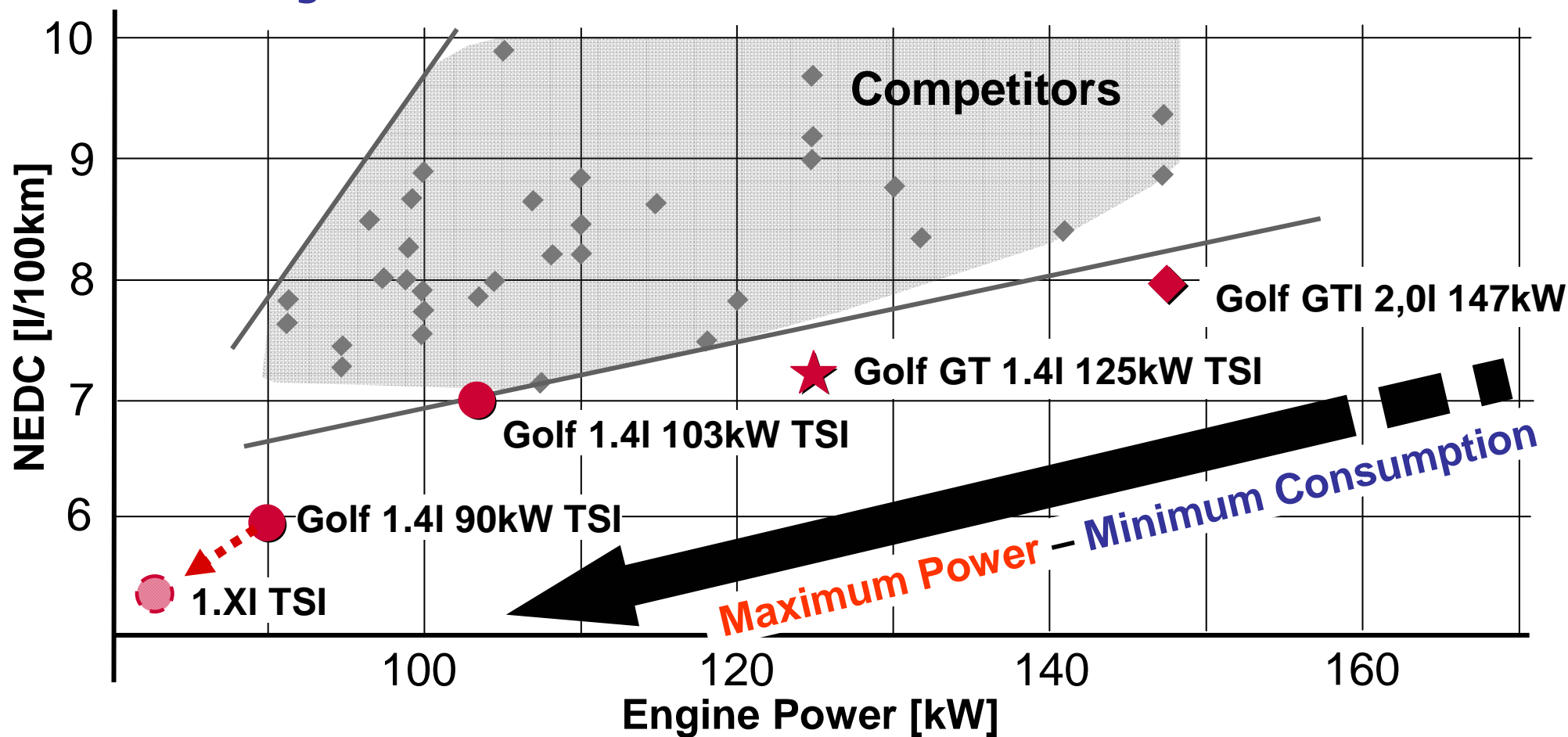
Comparison V5 vs. TSI - TC (125kW)

Fuel Consumption [l/100 km] NEDC



# Gasoline Cars Benchmark

Power Range 90 to 150kW

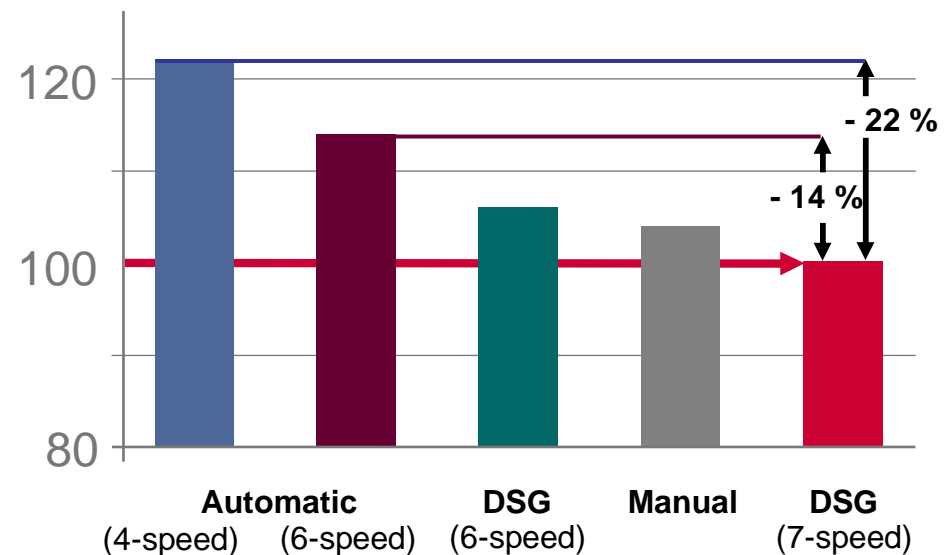


# DSG dual-clutch gearbox

- ▶ 6 / 7-speed direct shift gearbox
- ▶ Consumption lower than manual gearbox
- ▶ Shorter shift times without interruption in power flow
- ▶ Maximum shifting comfort



Rel. Fuel Consumption [%]

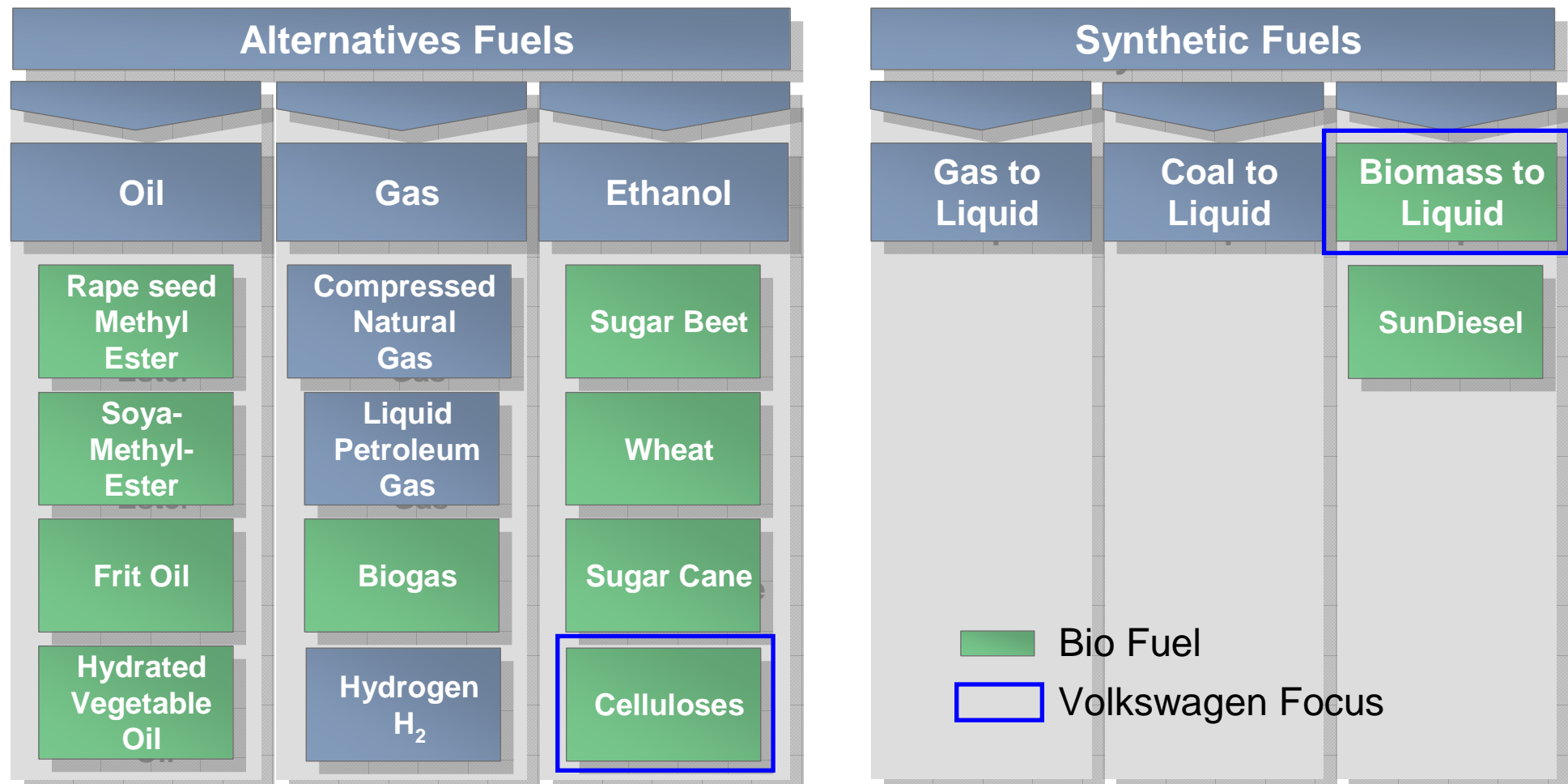




# Sustainability criteria for biofuels

<b>GHG performance</b>	Certification for production sites and raw material
<b>Land use &amp; biodiversity</b>	Land efficiency - risk of mono cultures - use of pesticides and fertilizers
<b>Raw material</b>	Social impacts – usage of food materials – influence on food prizes
<b>Substitution Potential</b>	Is a Substitution of Existing Fuels Possible by More than 10 %?
...	

# Alternative Fuels – Overview



# Characterization of Various Bio Fuels

## 1<sup>st</sup> Generation

- Biodiesel (Rapeseed)
- Ethanol (Wheat, Sugar Beet)



## 2<sup>nd</sup> Generation (SunFuel®)

- Biomass to Liquid (Choren)
- Cellulose Ethanol (Iogen)

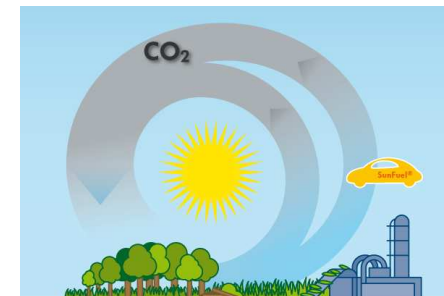


- High CO<sub>2</sub> Avoidance Potential
- No Interference in the Food Chain
- High Hectare Yields

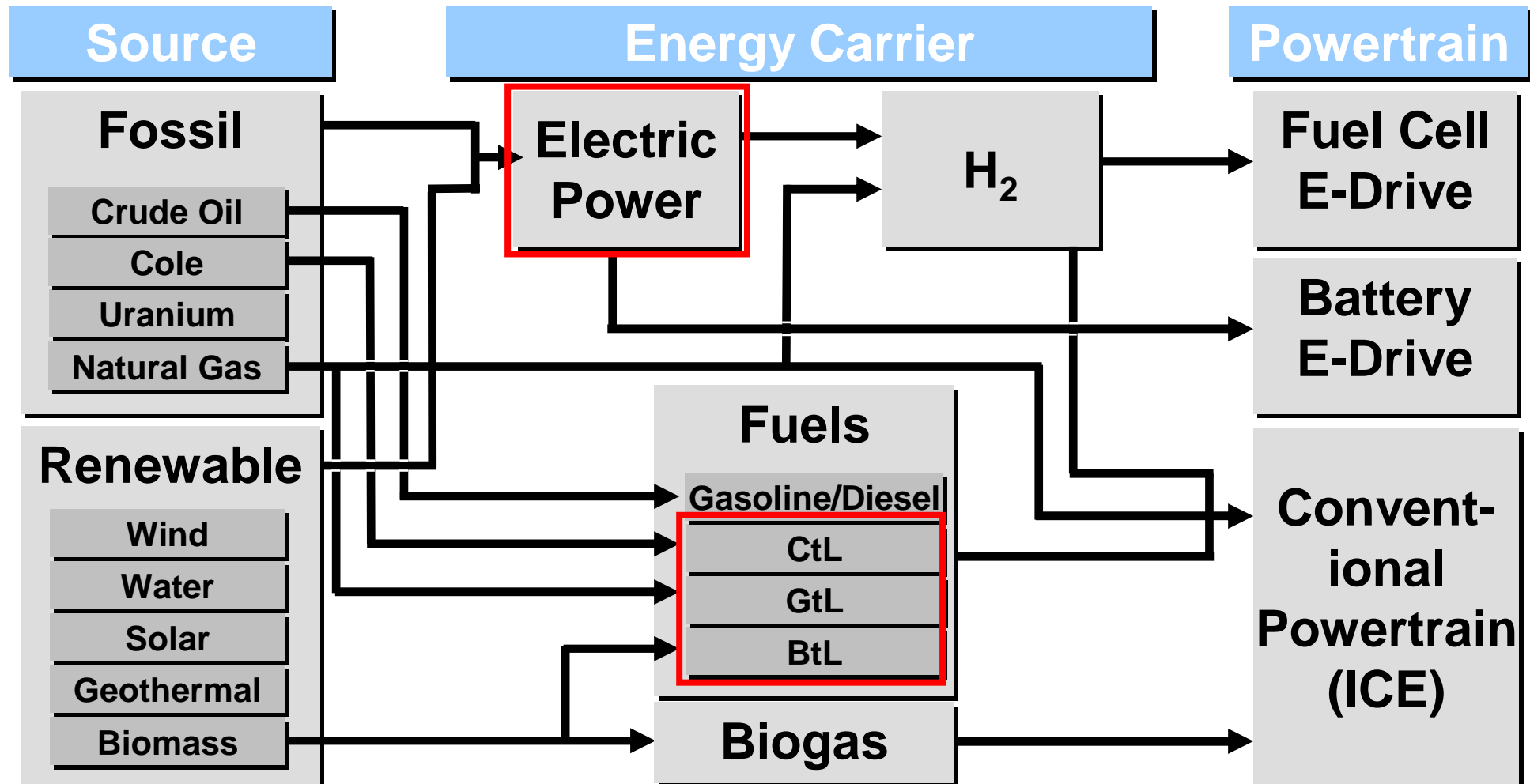


# Improvements by Synthetic Fuels

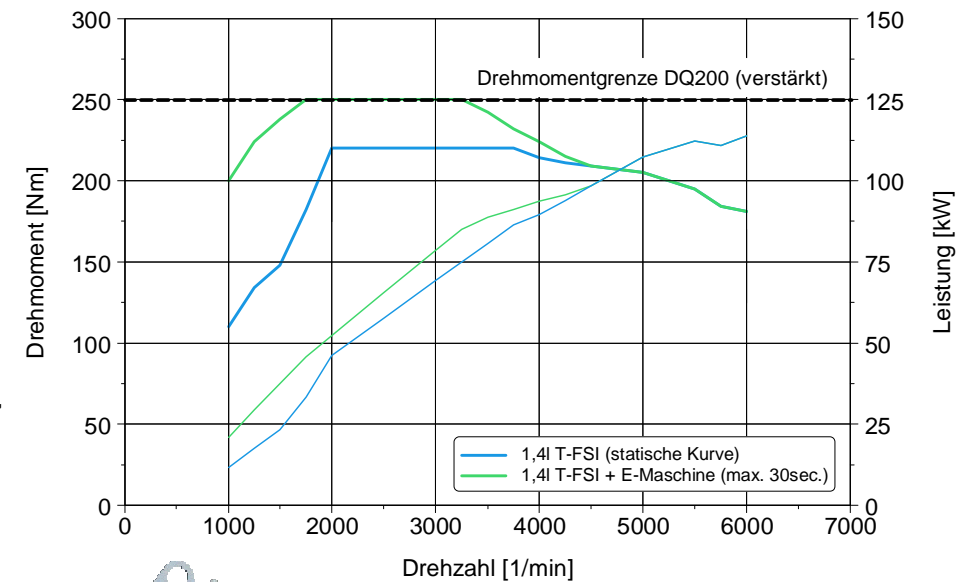
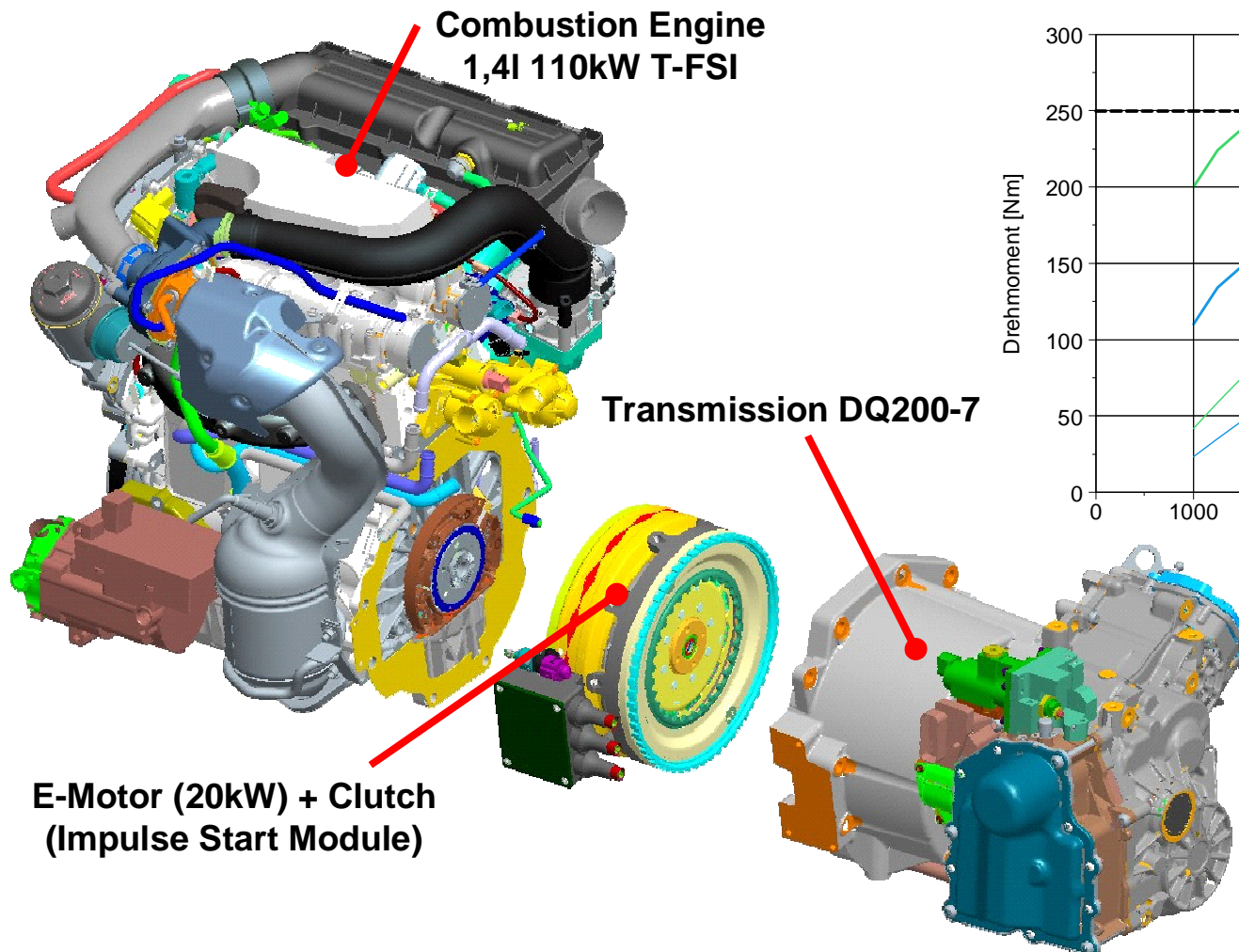
- **Direct Improvement of Local Air Quality by Usage of Synthetic Fuels in Existing Vehicles Based on the Outstanding Purity of the Fuels**
- **Reduction of Global CO<sub>2</sub>-Emissions if Biomass is Used as Primary Energy for Synthetic Fuels**
- **Possibility to Develop New Combustion Systems with Widely Improved Characteristics Based on the Designability of Synthetic Fuels**



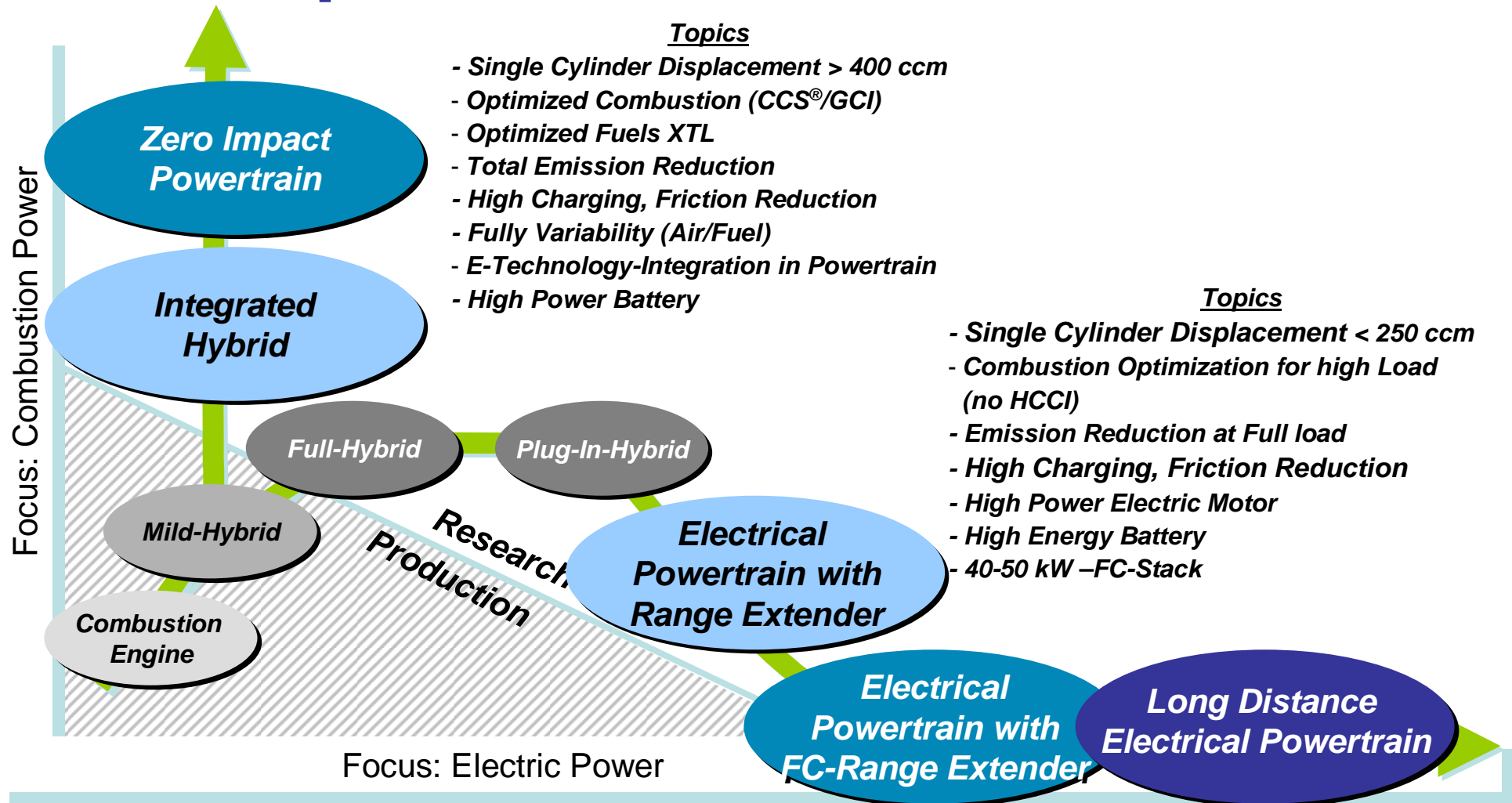
# Energy Pathways



# Hybrid Powertrain 1,4l T-FSI with DQ200



# Roadmap "Universal Powertrain"



# Space up! Blue - Zero Emission Van

**Electric Drive**  
with  
**Lithium-Ion Battery**  
and  
**HT-PEM Fuel Cell**  
as  
**Range-Extender**



<b>Size</b>	3680x1630x1570 mm
<b>Seats</b>	4
<b>V<sub>max.</sub></b>	120 km/h
<b>0-100 km/h</b>	13,7 sec.
<b>Zero Emission mileage</b>	350 km

<b>Electric Drive</b>	45 kW 120 Nm
<b>Battery</b>	Li-Ion 12 kWh
<b>Fuel Cell</b>	High Temperature
<b>Hydrogen</b>	700 bar 3,3 kg
<b>Mileage Battery</b>	100 km
<b>Mileage H2</b>	250 km



# Future Electrical Energy Storages Requirements

