

Compatibility Between the Strategy for Emissions Reduction and the Strategy to Reduce CO2 Emissions

P.Pinchon

IFP

CO2 and pollutants emissions reduction strategy : a large number of possible solutions for engines and fuels

Conventional engines

- Port Fuel Injection Spark Ignition (PISI) or Direct Fuel Injection Spark Ignition Engines (DISI)
- Compression Ignition Engines (Diesel and HCCI)

Conventional fuels

- derived from crude oil refining
- with oxygenate components and additives

•Local pollution

•Energy Conversion

•GHG emissions

Alternative engines

- dedicated engines (CNG, GTL, DME,...)
- electrical motor (batteries or Fuel Cell)
- hybrid vehicles (thermal engine and electrical motor)

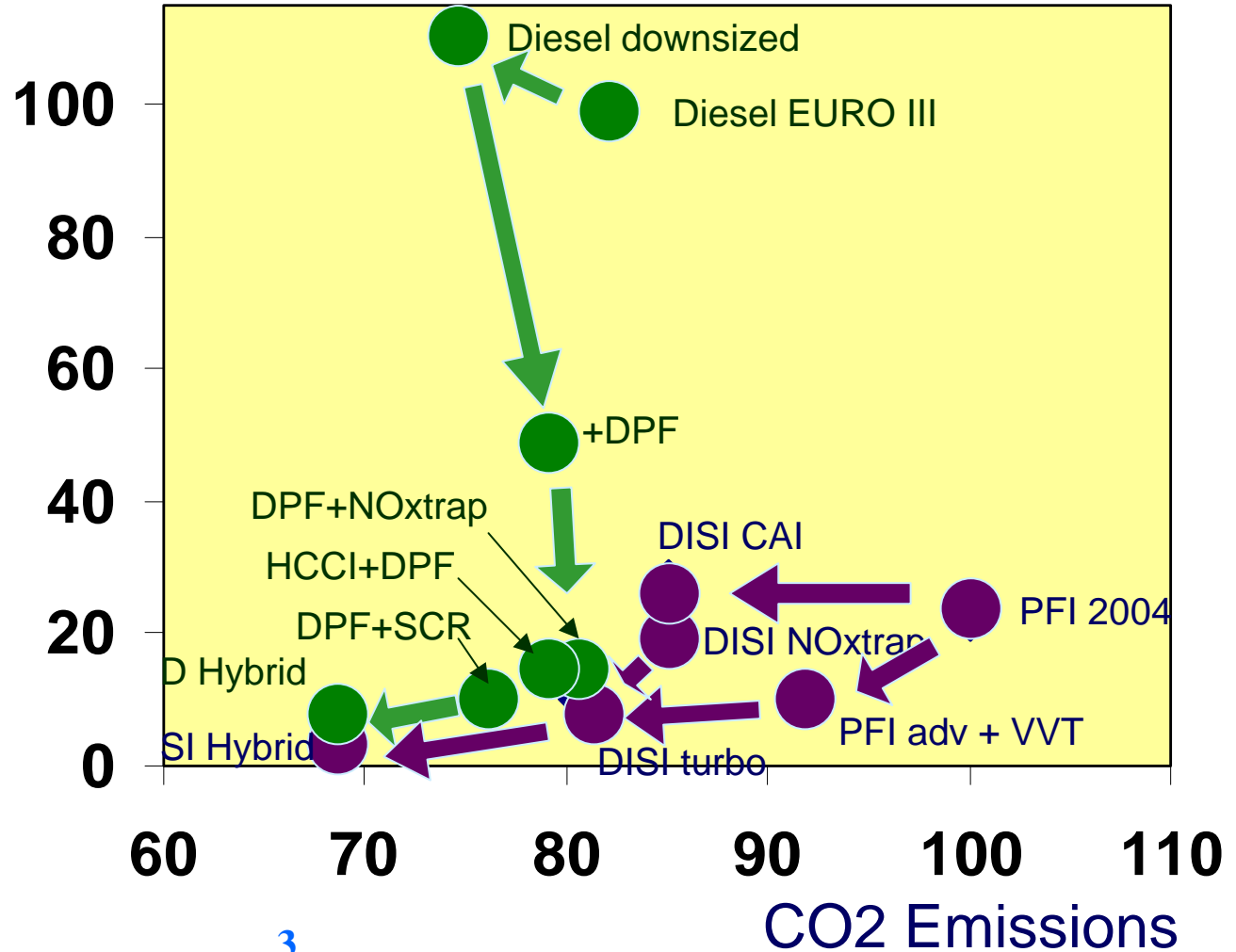
•gaseous fuels: LPG, CNG

• synthetic fuels : DME, GTL, BTL, H2

•bio-fuels : ethanol, methanol, ETBE, MTBE, FAME

Diesel and SI engines have still a high potential of progress but production cost will become a very serious issue

Pollutants Emissions (NOx)



● Diesel

● SI

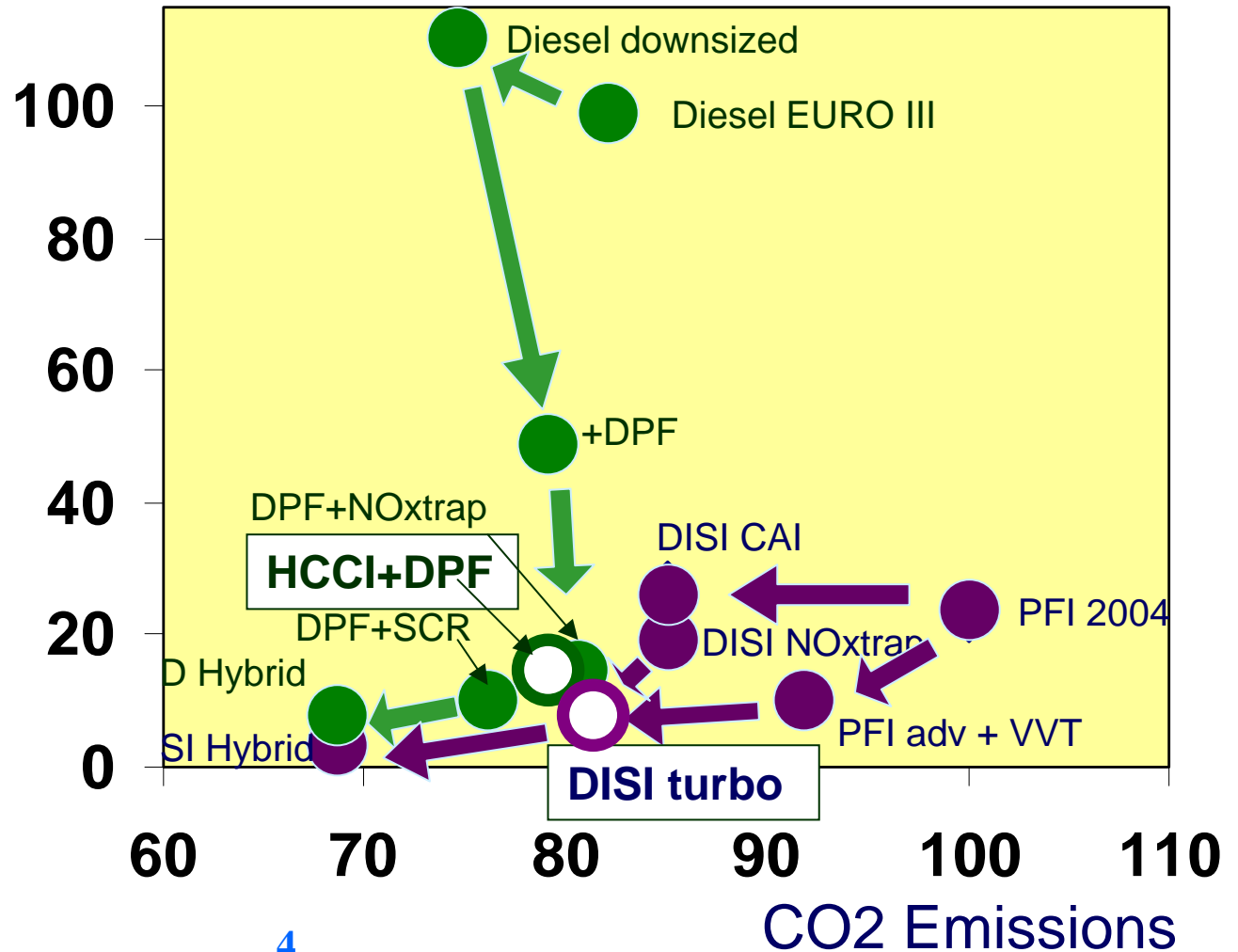
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Two interesting solutions for a middle term:

-HCCI combustion + DPF for diesel engines

-Downsizing with turbocharging+ DI + 3W catalyst for SI engines

Pollutants Emissions (NOx)

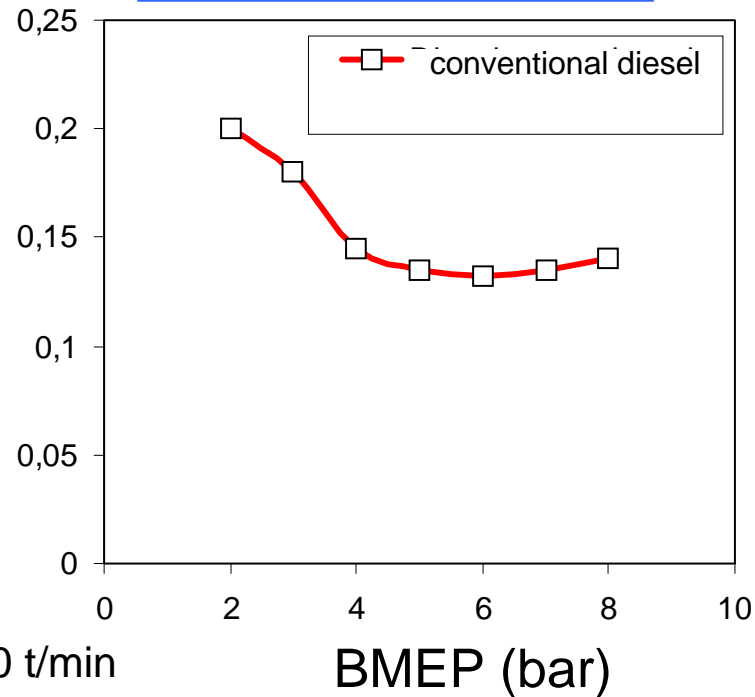


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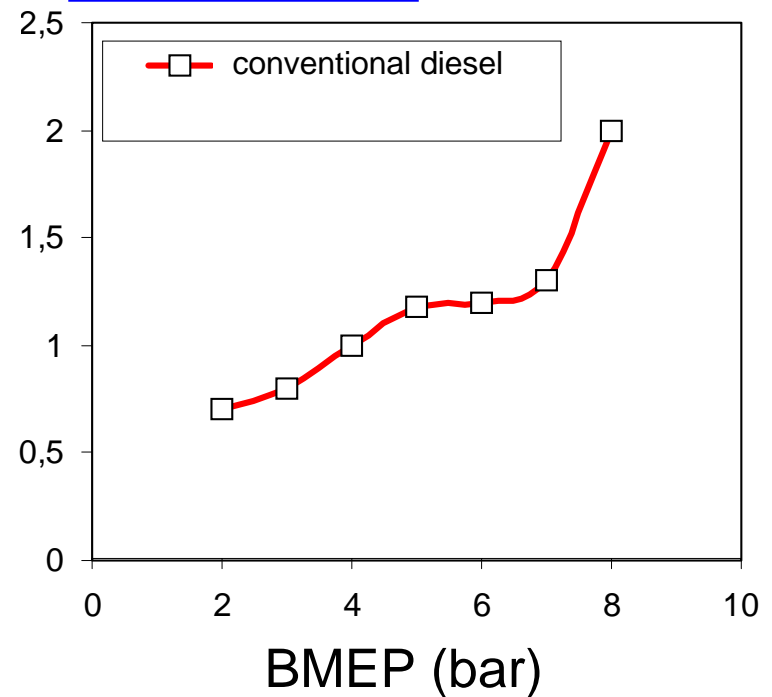
Combustion Control is the key for future diesel emissions reduction

Highly Premixed Combustion Process : the NADI concept

particulates (g/kWh)



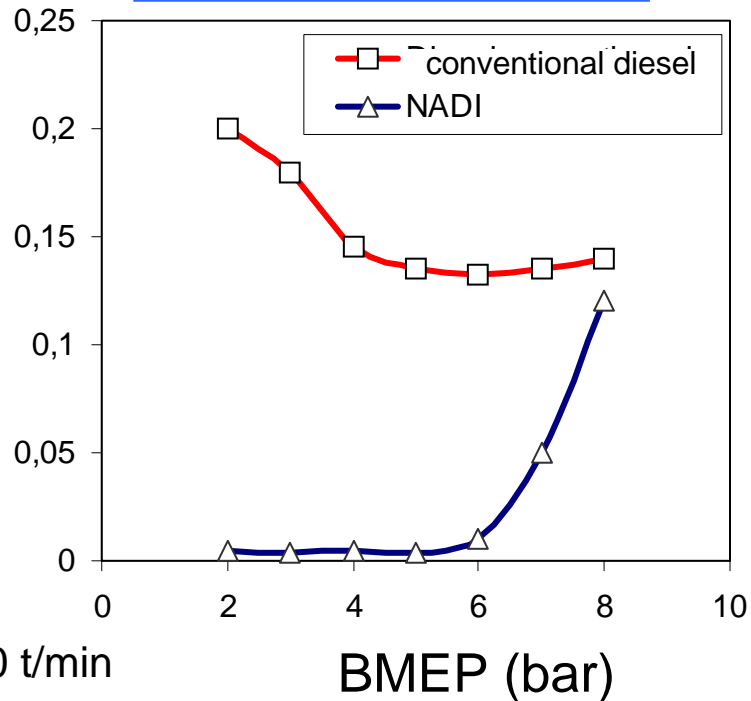
NOx (g/kWh)



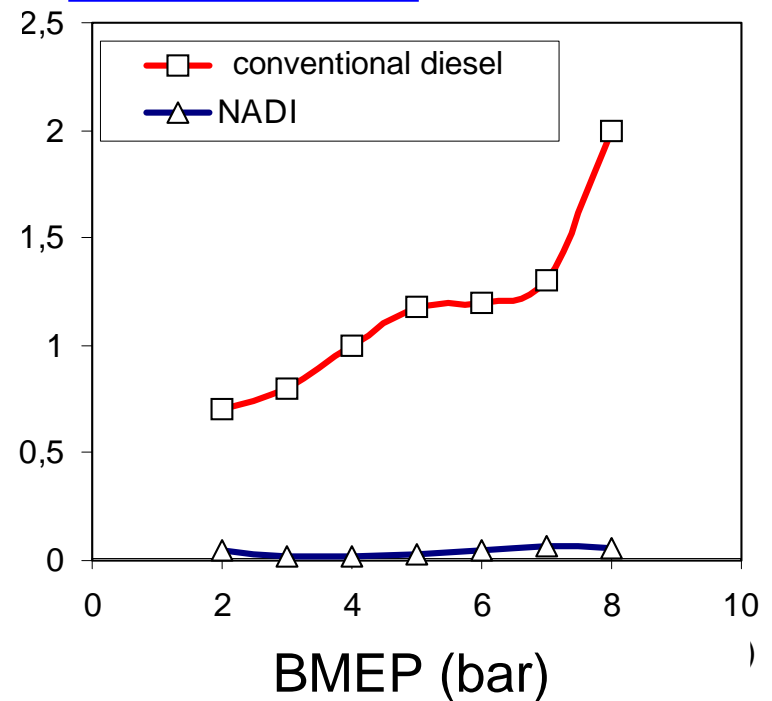
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Highly Premixed Combustion Process : the NADI concept

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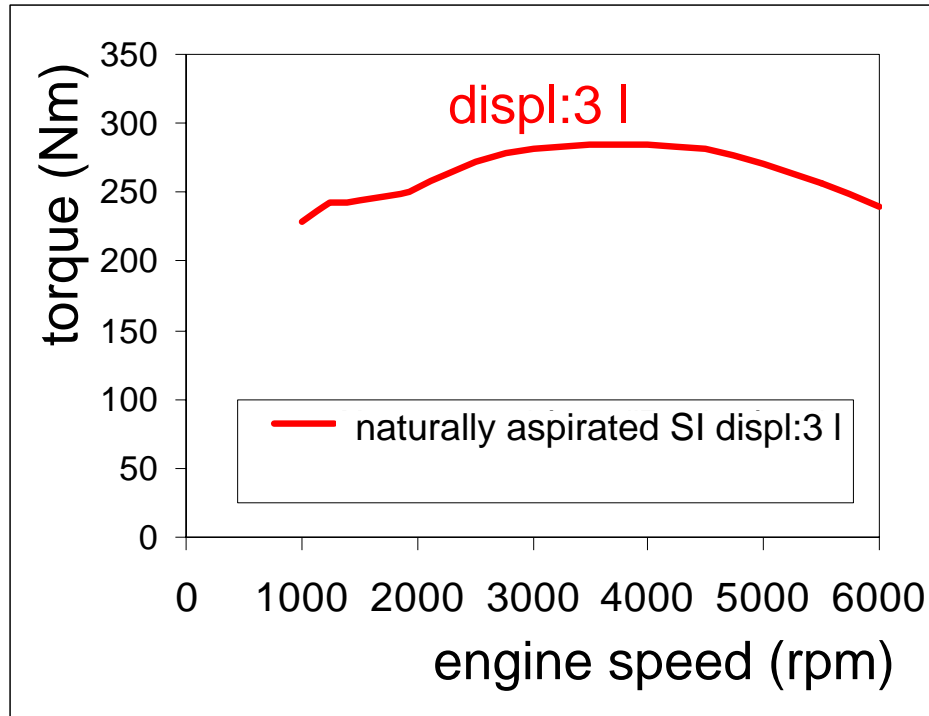
NOx (g/kWh)



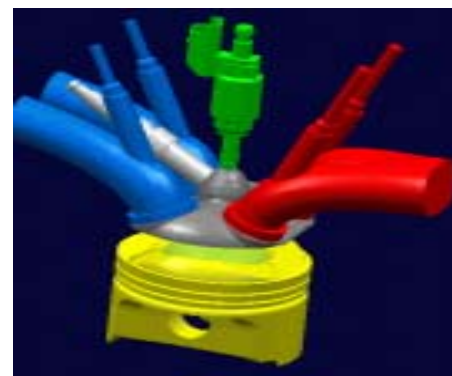
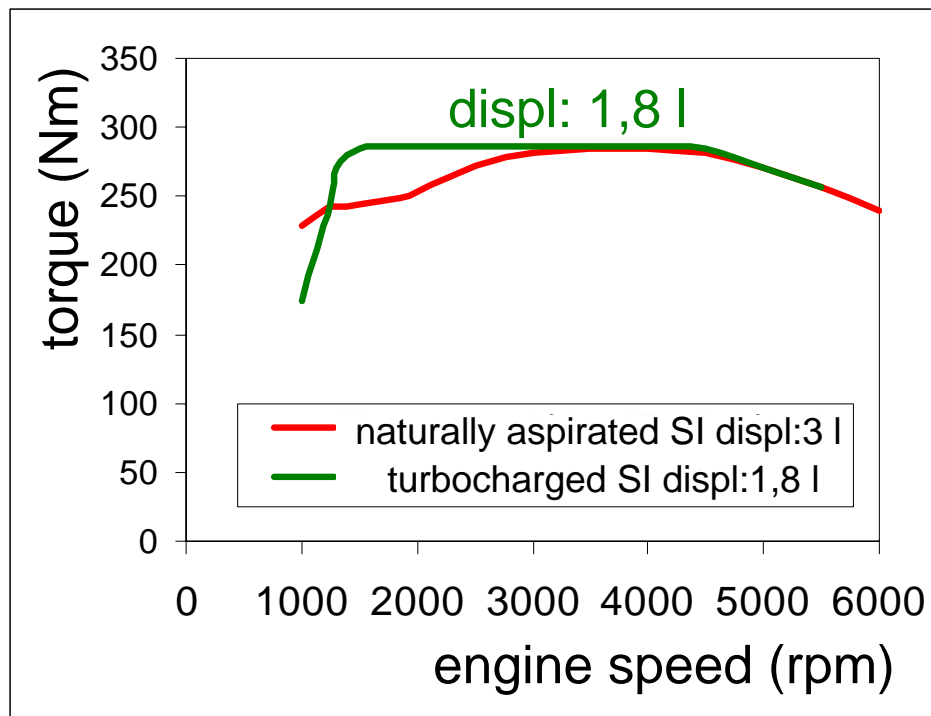
However two important issues are to be overcome : combustion control for any operating conditions and control of HC and CO emissions



Downsizing DI SI engines using turbocharging

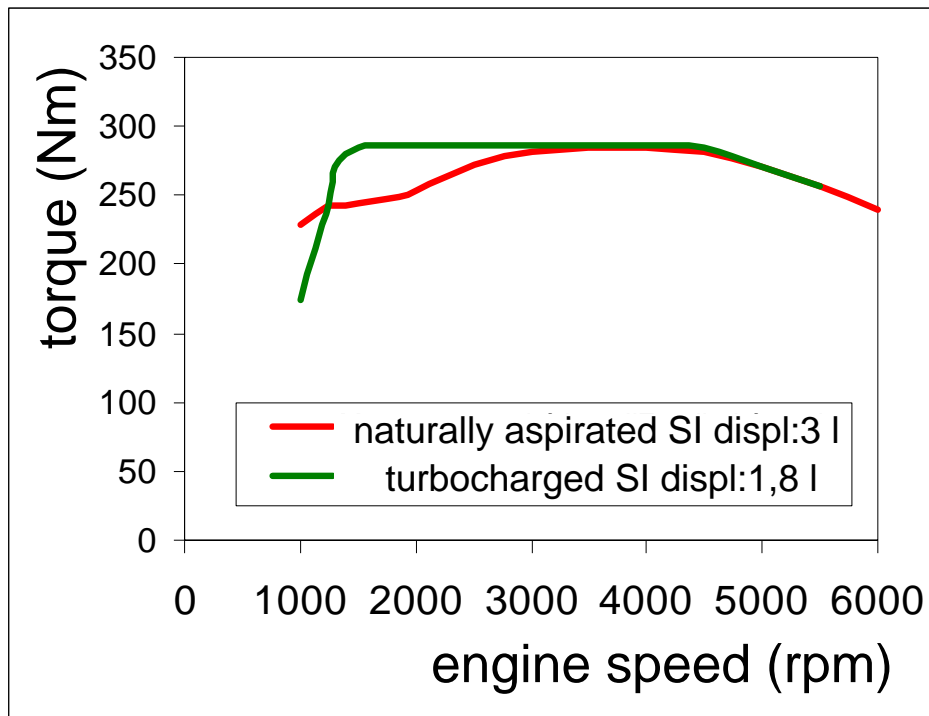


Downsizing DI SI engines using turbocharging



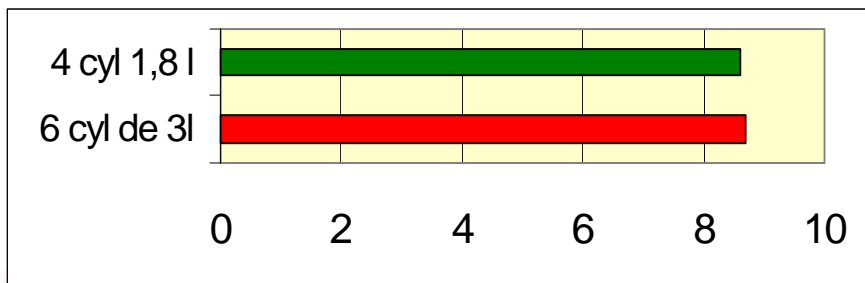
- gasoline Direct Injection
- Variable Valve Timing intake and exhaust
- combustion system optimization

Downsizing DI SI engines using turbocharging

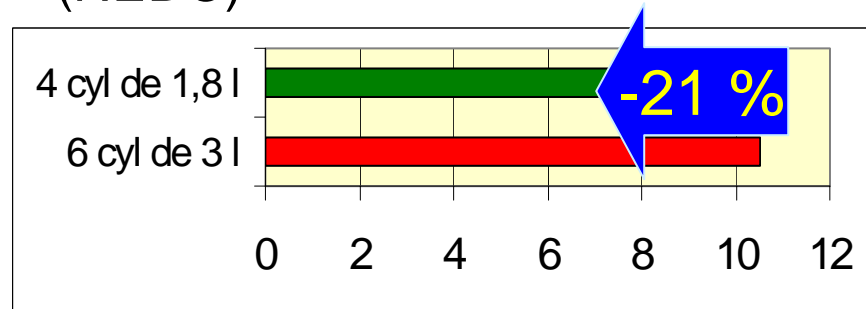


Vehicle Simulation
1800 kg
same transmission

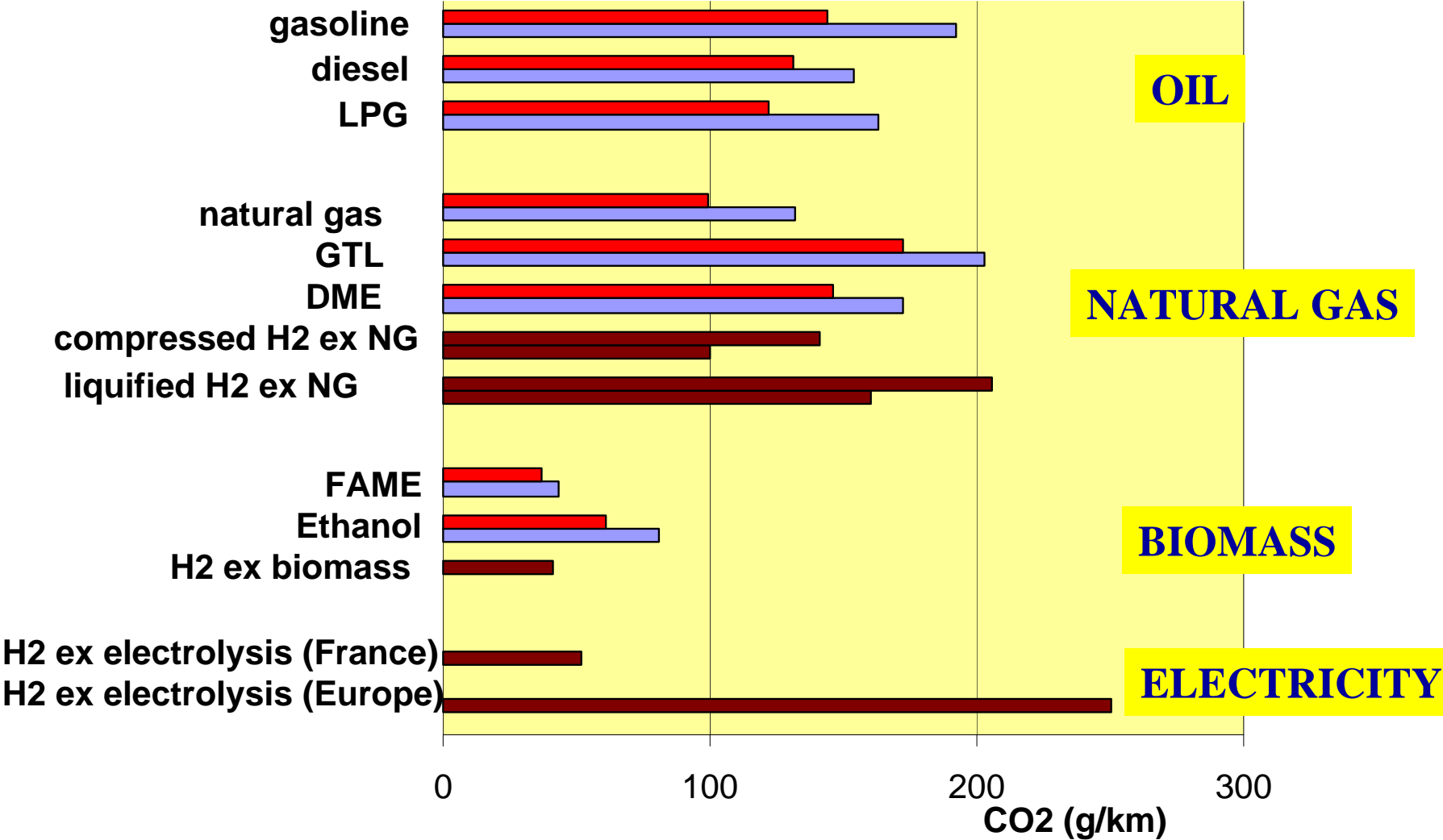
acceleration delay
from 0 to 100 km/h



Fuel consumption reduction
(NEDC)



Well to Wheel analysis



Internal Combustion Engine

Hybrid vehicle

Fuel Cell

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Production and distribution costs

