

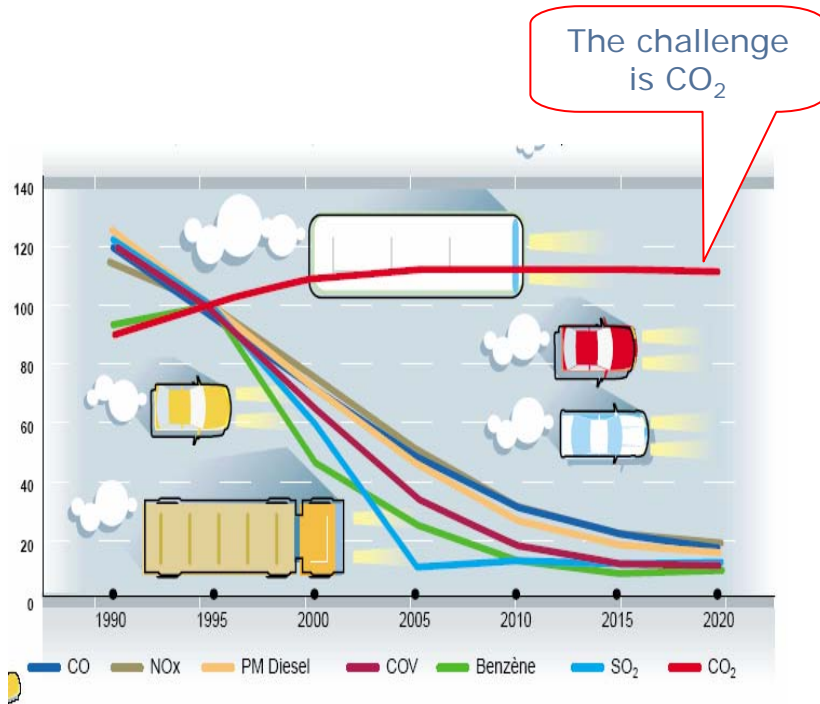
PSA Peugeot Citroën

The energy challenge

For automobiles

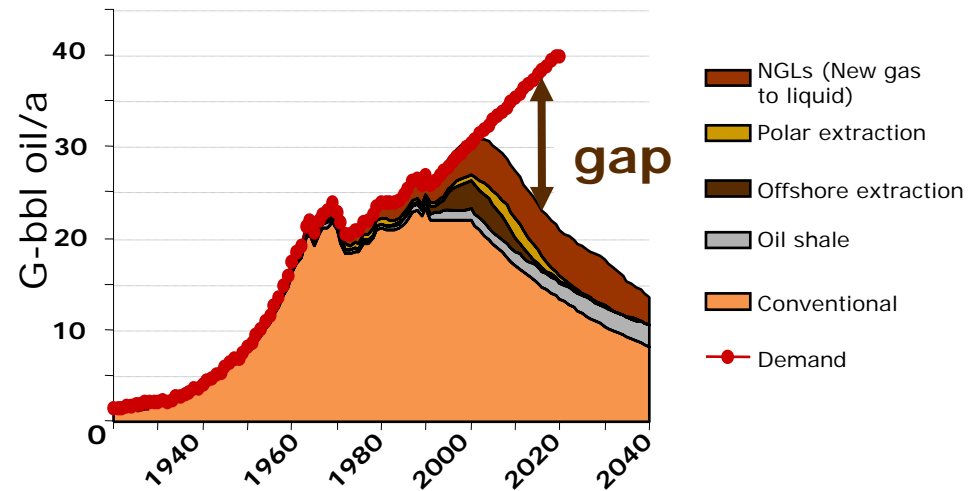
- ▶ Francis Roy, Fuel cell programme manager

▶ Transport emissions



Source : Auto oil study

▶ The Energy situation



Source : IEA Projection
- www.peakoil.net

- A Vision in 3 steps
 - Today
 - Tomorrow
 - Further out
- 2 main levers
 - Technological
 - Energetic
- Objective
 - To propose on a large scale affordable, efficient and driveable vehicles

▶ In the short term

▶ Technological way

- Diesel provide an immediate response :
 - significant reduction in CO₂ per km
- PSA Peugeot Citroën in Europe (2006, 8 months)
 - 37 % of vehicles < 120 g CO₂ / km
 - 63 % of vehicles < 110 g CO₂ / km

Average emissions in Europe for all type of fuel : 161 g CO₂/km in 2005

This performance reflects our expertise in common-rail diesel engines and our extended line up of fuel-efficient vehicles.

- More than 9 millions of HDi vehicle sold
 - Clean engine thanks to particulate filter (FAP)
 - 1.6 millions of vehicle equipped with the FAP

▶ The most effective solution right away

- ▶ **Affordable, and therefore easy to sell to a wide market**



A pragmatic policy to promote biofuels

▶ In the short term

▶ Energetic way

- **Bio fuel of first generation**

- **Diesel (Fatty Acid Methyl Ester)**

- PSA Peugeot Citroën guarantees its HDI engines' performance in captive fleets up to **30% of bio diesel** blends.

- **Ethanol**

- Brazil : 80% of the Group's sales
- Europe : EURO IV *Flexfuel* offer in summer 2007



Available now for all cars on the road in low percentage blends



- **Compressed Natural Gas (CNG)**

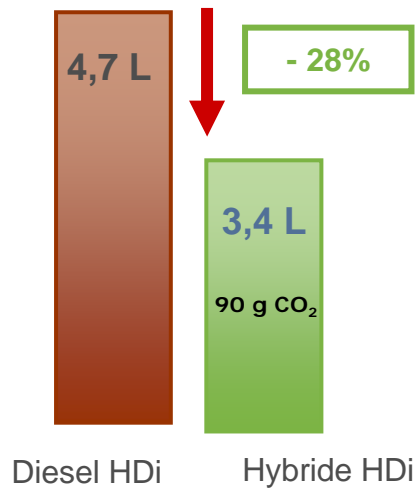
PSA Peugeot Citroën is developing a specific engine for these applications and markets

► In the medium term

- Technological way

Leveraging its expertise in both EVs and high-tech diesel engines, PSA Peugeot Citroën has designed the ...

► Hybride HDi ◀



►► **From 2010**

▶ In the long term

- ▶ Energetical and technological way

▶ Great feedback on electric vehicle

Top seller

with 10 000 electric vehicles sold in the world

- Attractive for urban use
- Batteries are currently the main roadblock to the EV's emergence

▶ An alternative solution : Fuel cell

A solution : Fuel cell vehicle (FCVs)

- ▶ PSA Peugeot Citroën's strategy: The Range Extender
 - Optimizes battery/fuel-cell cost
 - Applications : Light commercial vehicle urban use
 - Zero emission vehicle (ZEV)
 - High fuel cell efficiency
 - Driving range of around 500 km
 - Appropriate level of driving comfort in urban use
 - plug in

- ▶ ▶ **The Range Extender : A first step in Fuel Cell for automotive applications**

A solution : Fuel cell vehicle (FCVs)

▶ PSA Peugeot Citroën *Demonstrators*

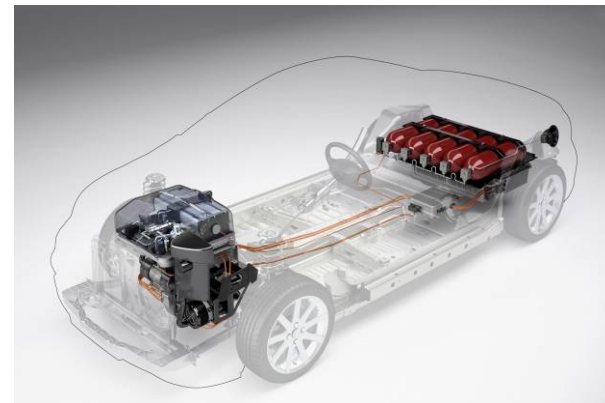
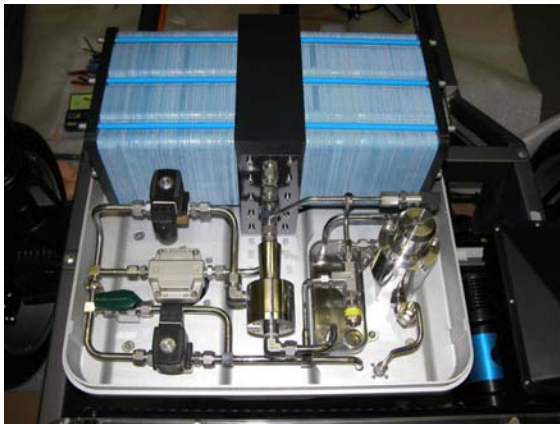


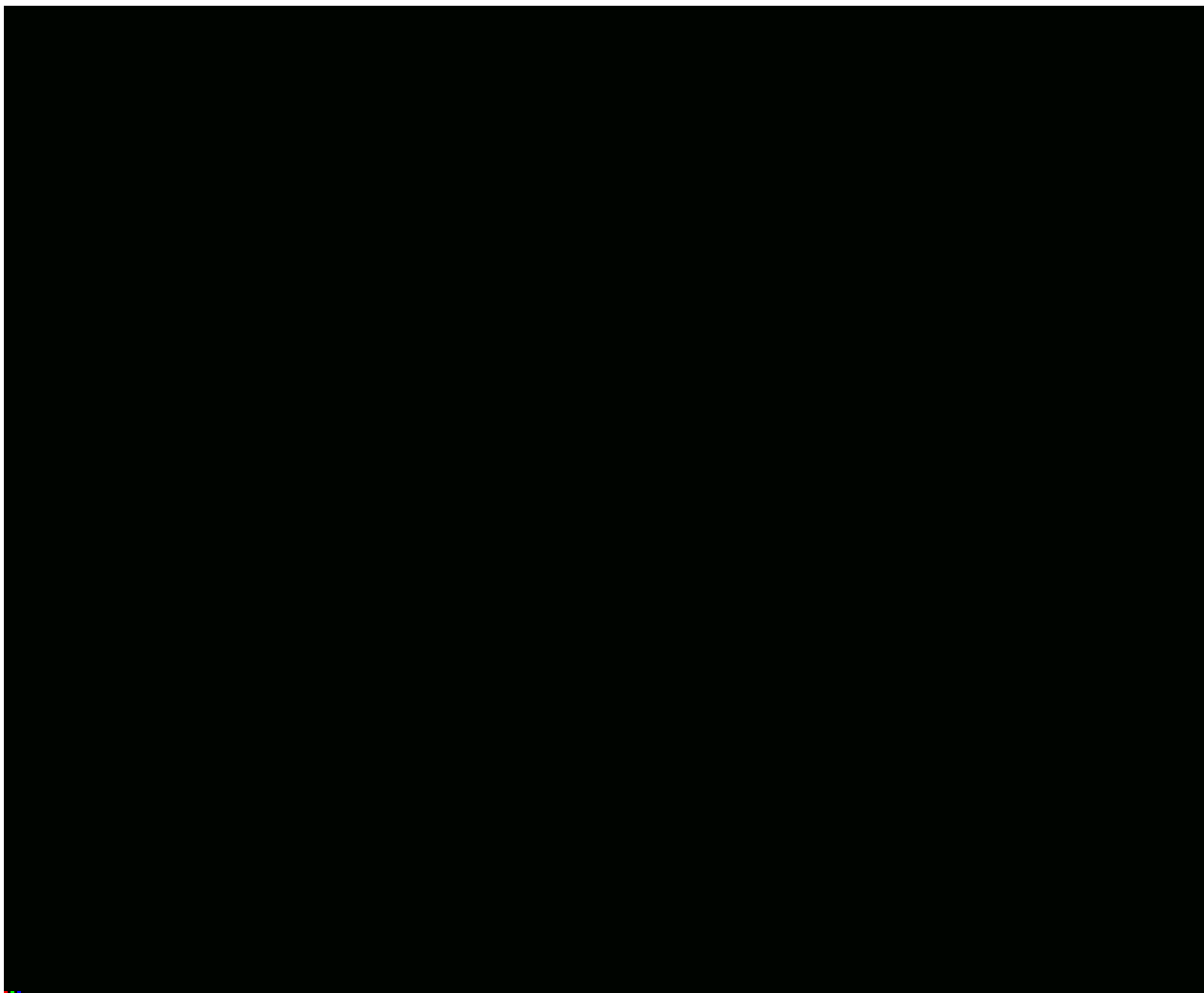
▶▶ World class performance and cost effective

- Maximum power : 80 kW
- Efficiency : greater than 55% (partially loaded)
- KW cost : €100 - 150 €



▶▶ First vehicle integration of GENEPAC technology





▶ Fuel cell vehicles

- Technologic aspects

- MEA : lifetime issue
- Fuel cell system integration in the vehicle
(thermal issue : cold start and cooling)
- Onboard hydrogen storage

- Cost aspects

- Fuel cell cost
- Cost of on board hydrogen storage

▶▶ Technological breakthroughs will be required concerning the fuel cell's core and hydrogen storage

▶ Today :

- Widespread use of reasonably priced, fuel efficient vehicles based on the performance of state of art diesels.
- Broadest possible use of alternative fuels such as biofuels and CNG to reduce our oil dependency and control emissions.

▶ Tomorrow :

- Hybrid diesels to be brought to the market from 2010

▶ Beyond 2020

- The fuel cell technology
But many hurdles to be overcome
 - Fuel cell core and its lifetime
 - Cost
 - Hydrogen storage
- Creating a « hydrogen » economy