

## Press Release

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## ELECTRIC, HYBRID AND FUEL CELL VEHICLES How do they work?

The EVS21 exhibition will be held in Monaco from 2 to 6 April 2005. Vehicles with three types of engine will be displayed: electric, hybrid, and fuel cell. The only ones to be marketed at present are electric and hybrid vehicles.

Their propulsion mode is explained below. Their common point: all have an electric engine, are thus silent and pollution free.



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Maranello

### Electric vehicles (VE)

It is the model which is best mastered: an electric engine, electronics and batteries. Production costs vary according to the battery technology, but the VE concept is an encouragement to adopt the principle of hired batteries, more convenient for the user. They can be charged through a traditional power point. New generation batteries lead to expect that vehicles with a range of over 300km will be marketed in the near future.

**Use:** in town and its periphery.

**Consumption:** 20kwh/100km, as little as a home water-heater.

**Advantages:** Great comfort and pleasant driving, almost totally silent. The electric engine can run up to one million km without causing atmospheric pollution or spilling oil.

### Hybrid heat/electric vehicles

They have both an electric and a heat engine. The latter gives extra power when required and recharges batteries automatically.

Hybrid vehicles have the power and range of a normal vehicle, but pollute much less. Engine selection is controlled electronically, and the heat engine can be used in its optimal output range.

**Use:** Town, road and motorway.

**Consumption:** 20 to 40% less than a heat-engine vehicle.

**Advantages:** Performance, reduced pollution and CO2 emissions.

### Electric vehicles with fuel cell (FC)

The FC provides the range lacking in the electric vehicle by generating electricity on board. A reverse electrolysis reaction uses the cell's hydrogen and oxygen from the air to produce electric energy for the electric engine. Extra batteries are not necessary.

The reaction with hydrogen is as follows:  $H_2 + 1/2O_2 \rightarrow H_2O + \text{electric energy} + \text{heat}$ .

Part of the problem is storing the hydrogen atoms. Either in direct form – gaseous hydrogen under pressure (300bars), or fluid at a very low temperature – or in indirect form, imprisoned into another molecule to be transformed, such as methanol. Another consideration is the cost of FCs that often use precious metals as catalysts.

**Use:** Town, road and motorway.

**Consumption:** hydrogen or methanol (obtained from natural gas)

**Advantages:** Autonomy, no pollution emitted if hydrogen is stored on board.



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FCX

Source: French Environment and Energy Management Agency (ADEME) www.ademe.fr  
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