Innover pour une énergie durable

Horizon Hydrogène Energie

ICHS3 – September 2009

Hydrogen a safe carrier

Historical perspective, current issues, public acceptance

Marianne.julien@airliquide.com

Director, Horizon Hydrogène Energie Program

Horizon Hydrogen Energy

An innovation program to further develop and market early hydrogen energy applications

oseo

Who ? ***19 partners, more than 150 people***

Who is investing ? ***Private - 123 M€ & Oseo Innovation- 67 M€***

How long ? ***2009 - 2016***

Horizon Hydrogène Energie

Innover pour une énergie durable

Adoption of hydrogen as an energy vector

A three step individual process

1 Awareness

Taking actions for Climate Change is urgent

2 Acceptance

Hydrogen is one of the solutions for mobility

3 Adoption

It is worth the effort

Horizon Hydrogène Energie

Innover pour une énergie durable

Taking actions for Climate Change is urgent

Some historical steps

- 1898 Svante Ahrrenius' warning
- 1990 First IPCC report
- 1992 Earth Summit Rio
- 2002 Kyoto Protocol
- 2003 European Directive, CO_2 emission quotas
- 2006 Stern Report
  Al Gore movie
- 2007 SSecond IPCC report : « 90% scientific consensus »
- 2008 European « Energy & Climate » directive package
- 2009 Post-Kyoto in Copenhagen

World citizens are now aware…

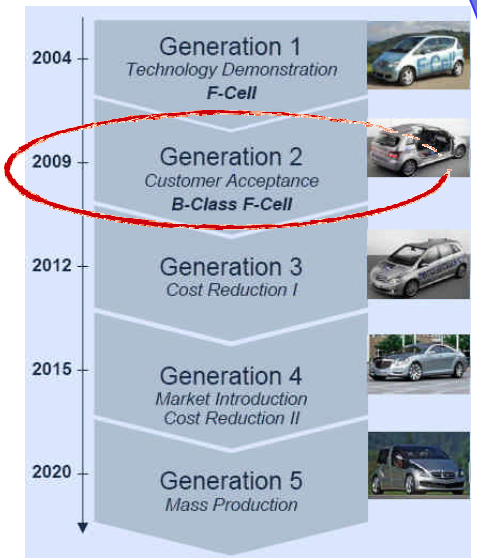
Step 2 : Hydrogen is one of the solutions for mobility

Some historical steps

- **1845 first e- produced from Hydrogen**
- 1920s JBS Haldane : concept of renewable hydrogen from wind
- 1937 Hindenburg accident
- **1970 Hydrogen Economy Concept**
- 1974 International Association of Hydrogen Energy
- 1989 US- NHA with 10 members
- **1996 Toyota first fuel cell concept car**
- 1997 Addison Bain : causes of the Hindenburg accident
- 1999 Icelandic New Energy
- **1999 First H2 stations in Germany**
- 2001 honda H2 produced from wind in California
- 2001 BallardPower System first PEMFC
- 2002 Jeremy Rifkin « *The Hydrogen Economy* »
- **2003** June – R Prodi (EU)
  Sept – G Bush (US) + IPHE

Where are we today ?

- Hydrogen Hyways
  300 filling stations in operations
  California, Germany, Scandinavia…
- More than 50 buses running, several hundred demonstration cars
- 850 forklift using H2 Fuel Cells in North America
- 5000 stationnary systems
- More than 25 000 micro-fuel cells sold



Roadmap Daimler

***~ 1.2 billion € investments** from governments*
R&D, RCS and demonstrations

Horizon Hydrogène Energie

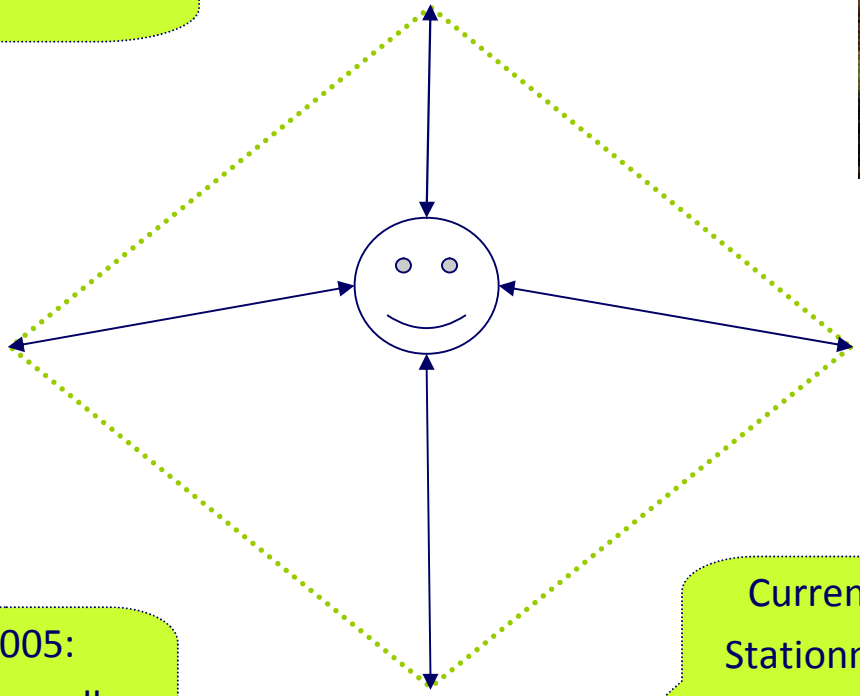
Innover pour une énergie durable

Step 3 – Hydrogen energy is worth the effort

Four key questions raised

up to -100% CO2 emission reduction…step by step

Green… ?



Safe … ?

… and still easy to use ?

DOE 2005:
$2 to $3 per gallon equivalent

…and its cost ?

Current 5000 €/kW
Stationnary 500 €/kW
Mobility 50 €/kW

3 steps to be made by all stakeholders

1. **Awareness** : the current energy eco-system is NOT sustainable

2. **Acceptance** : Hydrogen is NEEDED with electricity and biofuels to reduce CO_2 emissions from the transport sector

3. **Adoption** : the effort required to make Hydrogen a safe, easy to use, cost-effective and low-carbon energy carrier is WORTH the environmental & health benefits