



Hydrogen & Fuel Cells IEA Activities



**Neil Hirst, Director
IEA Energy Technology and R&D Office**

**IPHE Steering Committee Meeting
27-28 January 2005 - Paris**

IEA H₂/FC Activities

Implementing Agreements: R,D&D

- H₂ production & storage, stationary and mobile fuel cells, CO₂ capture & storage, system integration ...

IEA Secretariat: Policy Analysis

- Policy studies (not only hydrogen...)
- International cooperation, liaison with IPHE, EUTP

Hydrogen Co-ordination Group: Policy

- Policy advice, strategies, cooperation

Implementing Agreements

■ Hydrogen

(H₂ production, storage, system integration, ...)

■ Advanced Fuel Cells

(stationary & mobile Fuel Cells)

■ Greenhouse Gas R&D Program

(CO₂ capture & storage, H₂ from fossil fuels)

■ Relevant activities in other IAs:

Clean Coal Centre, Advanced Motor Fuels, Hybrid Vehicles, Bioenergy, Hydropower, ETSAP, ...

Participation in IAs

■ IEA countries and non-IEA countries

Australia, Austria, Belgium, Canada, Denmark, EC, Finland, France, Germany, Iceland, India, Italy Japan, Korea, Lithuania Netherlands, New Zealand, Norway, Spain, Sweden, Switzerland, UK, USA, Venezuela, ...

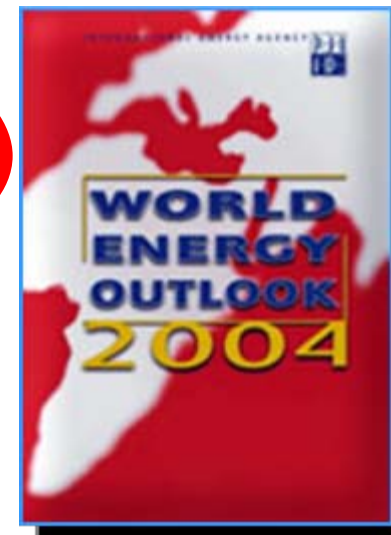
■ Industrial Sponsors

Alstom, BP, Chevron-Texaco, EPRI, ENI, Exxon-Mobil, RWE, Shell, Total-Fina-Elf, Norsk-Hydro, Australian Coal Industry Consortium, BHEL- India, Coal Association- New Zealand, Danish Power, Eskom - South Africa, ...

■ More than 25 years of international cooperation in energy technology

Secretariat's Policy Analysis

World Energy Outlook (WEO)



Energy Technology Perspectives Project (ETP)

- Analytical Policy Studies
- Projected H₂&FC cost (2003)
- H₂ and FC in transport (2003-2004)
- H₂ Infrastructure investment (2004)
- WEO Alternative Scenarios (2003-2004)
- Prospects for CO₂ C&S (2004)
- Prospects for Hydrogen & Fuel Cells (Dec. 2005)



Hydrogen Co-ordination Group

- **Since April 2003 ...**
- **24 IEA countries, 3 IAs (HIA, AFC, GHG)**
- **Voluntary Contributions from IEA Member Countries**
- **HCG Co-Chairs:**
 - **Henk Barten (The Netherlands)**
 - **Robert Dixon (United States)**
 - **Koji Nakui (Japan)**



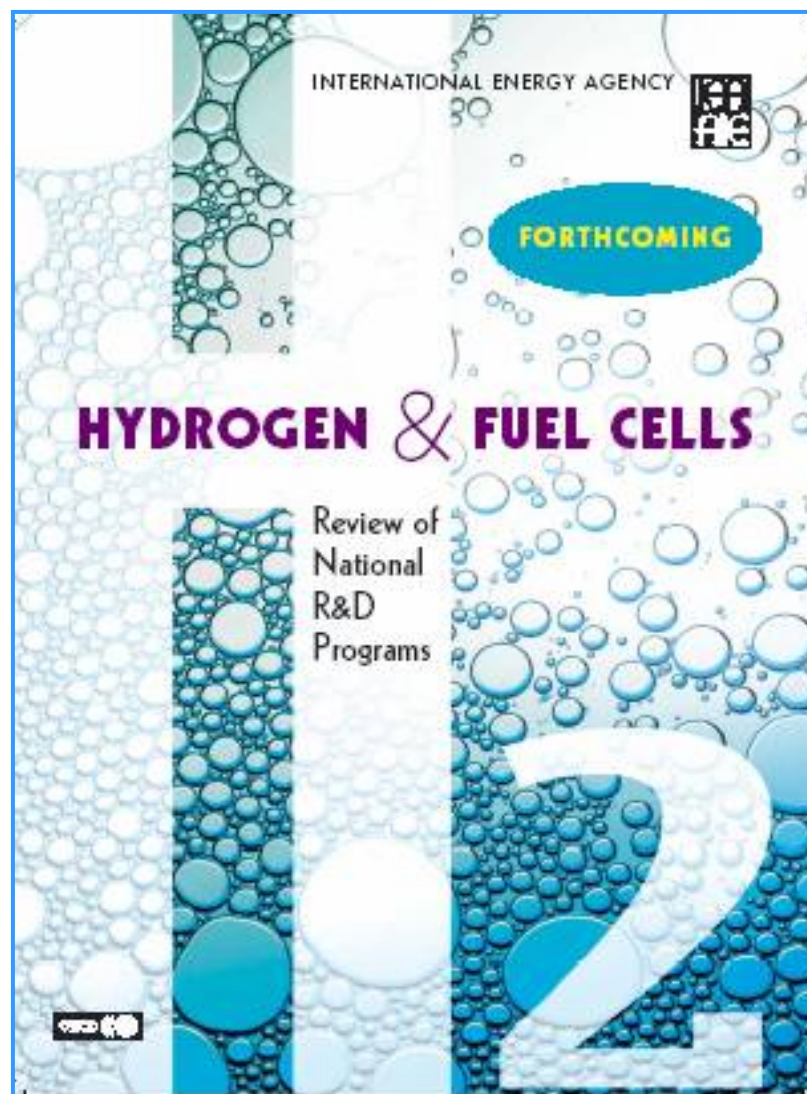
HCG Ongoing Work

- 1 - Review of national R&D programs in IEA countries;**
- 2 - Assessment of priorities and gaps in R&D activities;**
- 3 - Policy analysis to help guide the IEA work.**



1 - Review of National Programs

- A first-of-kind map of public R&D and policy efforts in IEA countries
- Released at UNFCCC-COP10, Buenos Aires, Dec. 2004



1 - Investment & Co-operation

National Programs

- US: \$1.7 bn over 5 years
- EC: up to €2 bn in FP6 (incl. renew.)
- Japan: ¥30 bn/y tripled from 1995
- and ... Canada, China, France, Germany, Italy, Iceland, Korea, UK, ...

~ \$ 1bn/y global public effort

International Co-operation

- IEA Hydrogen Co-ordination Group and Implementing Agreements
- International Partnership on Hydrogen Economy (IPHE)
- EU Technology Platform
- Bilateral Agreements

Oil & Gas Companies

Car Makers

Chemical Industry

High Tech Process Gas

Private Sector

Even a larger, global R&D effort ...
\$ 3-4 bn/y ?

Power Plants Makers

Fuel Cells Producers

Electrical Utilities

Coal Industry

2 - R&D Priorities and Gaps

- Three reports in preparation by the Implementing Agreements (May 05) on:

- Hydrogen Production
- Hydrogen Storage
- Fuel Cells



IEA AFC Stationary Fuel Cells

Hydrogen Fuel Cells

IEA Hydrogen
Coordination Group
November 29-30, 2004

**Hydrogen Production
Gaps and Priorities**

IEA Hydrogen
Implementing Agreement (HIA)
International Collaboration in Hydrogen R&D

IEA Hydrogen Coordination Group
Paris, November 29, 2004
By Trygve U. Riis, Chairman HIA
Elisabet F. Hagen, operating agent, HIA annex 16

**Hydrogen Storage
Gaps and Priorities**

Hydrogen Implementing Agreement

Trygve Riis, Chairman
Gary Sandrock, Annex 17 O.A.

**IEA Hydrogen Coordination Group
Paris, November 29, 2004**



2 - Emerging R&D Priorities ..

- Increase efforts in key R&D areas:
 - Reduce cost of CO₂-free hydrogen
 - Reduce cost, improve life-time of fuel cells
 - Improve hydrogen storage in FC vehicles
 - Develop CCS to extract H₂ from fossil fuels
- Assess hydrogen/fuel-cell potential

2 – Policy Priorities ...

- **Quantify infrastructure investment**
- **Set and harmonise international standards**
- **Improve co-ordination with private sector**
- **Inform policy makers and the public**
- **Cautious optimism and realism !**



3 - Policy Analysis

- Quantitative analyses to support HCG work:
 - Transition to hydrogen: next 2-3 decades
 - Fully developed market: further 2-3 decades
 - Mapping the uncertainties (performance, costs)
 - Impact of “*Technology Learning*”
 - Analysis of governmental policies & measures
- Two workshops to set data & discuss results
- Involvement of HCG, IA and external experts
- Report: December 2005
- HCG Sponsors: Australia, Canada, France, Germany, Italy, Japan, Netherlands, UK, US
- Interest expressed by IPHE-ILC

3 - Questions to Address

Transition Issues

- **Transition cost and infrastructure investment needs**
- **Potential penetration in different world regions**
- **Which policies & measures to speed up deployment ?**



3 - Questions to Address

Long-term Perspectives

- Impact on energy security in the mid-long term
- Impact and cost-effectiveness in reducing CO₂ emissions
- Prospects for H₂/FCs in the future energy mix



3 - Questions to Address

Strategy and Technology Issues

- Which H₂ source? Gas, coal, renew. nuclear, all?
- Are H₂ and FCs necessarily linked together?
- Is transport the most attractive market for H₂& FCs?
- Competition and synergy with other transportation options (hybrid vehicles, on-board reforming FC vehicles, ...)
- Stationary and portable applications (distributed power generation, electricity and energy storage, portable appliances ...)
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IEA Message

- **Improve IEA-IPHE cooperation and exploit synergies, e.g.:**
 - IPHE Scoping Paper – IEA P&G Papers
 - IPHE Socio-Economics – IEA Policy Analysis
- **Use the IEA Framework for R&D collaboration (WPs, IAs)**
 - Established, flexible network for R&D partnerships
 - IEA countries, and increasing participation of non-IEA countries, e.g., Russia, China, Brazil ...
 - Both governments and industry involvement
 - Intellectual property protection



Thanks