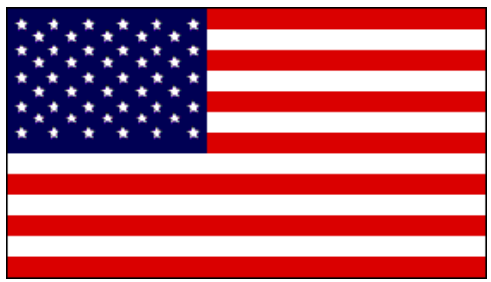
US Hydrogen and Fuel Cells: Progress in 2004

Country Statement for the IPHE Steering Committee
May 26-28,2004
Beijing, CHINA



United States of America

Major Awards in 2004

- Announced by Energy Secretary Spencer Abraham April 27, 2004 in Detroit, MI.
- Total of $350 million in federal money, plus $225 million in private cost-share
- 130 awards including over 100 partners at universities, national lab, and industry
- Awardees include many global private sector partners

Selection of New Hydrogen Projects

Hydrogen Storage - $150M over 5 years

- Three Centers of Excellence for exploratory research; individual projects to explore new materials for hydrogen storage ($25M in cost share)

Vehicle and Infrastructure "Learning" Demonstration - $190M over 5 years

- Automobile/energy company teams will demonstrate integrated and complete system solutions in real world environments ($190M in cost share)

Fuel Cell Research - $13M over 2 years

**in addition to $75M awarded in FY2003*

- Consumer electronics, fuel cells for auxiliary power generation, and off-road fuel cell R&D ($9.5M in cost share)

Hydrogen Education - $4.5M over 5 years

- Curricula and teacher professional development, education materials, co-sponsorship of events ($800K in cost share)

Active Solicitations

- Production and Delivery – July 2004 Selections
- Coal-based Production – Opens this Fall
- Nuclear-based Production – Open, September Selections
- Codes and Standards – October 2004 Selections
- Basic Research – 2005 Selections

Note: Cost share amounts are in addition to government award amounts

"Today, the Department of Energy has selected recipients for $350 million of research grants...the administration is now acting upon the Congress' appropriation. ... We want to be the country that leads the world in innovation and technological change."

- President George W. Bush
April 26, 2004

Fuel Cell Research and Development Awards

- Announced $75 million in awards
- 13 firms and educational institutions in 12 states
- Goal of reducing costs and improving durability

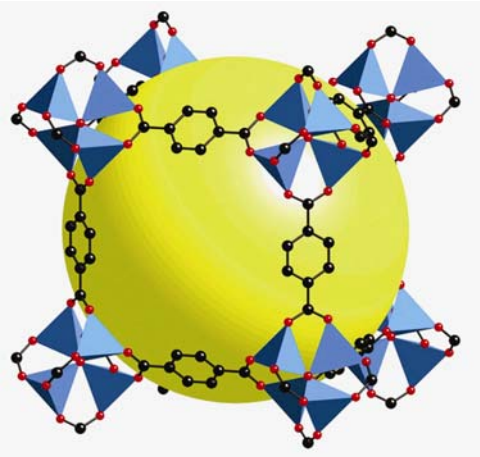
Hydrogen Storage Centers of Excellence

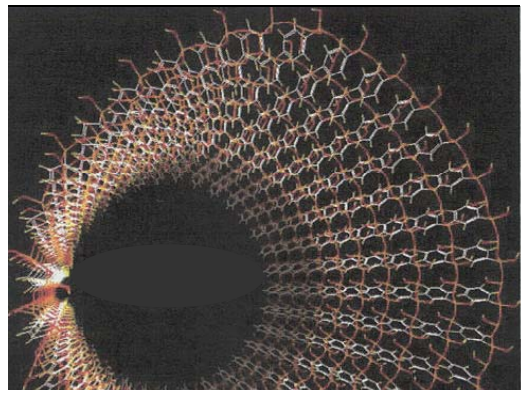
• 3 “Centers of Excellence” for exploratory research in hydrogen storage; each center includes a DOE national laboratory lead and several university and industry partners

• Additional 14 individual projects focusing on new materials and analysis

• Goal of storing enough hydrogen to enable greater than 300 mile driving range without impacting cargo or passenger space

• DOE share for this National Hydrogen Storage Project is $150 million over 5 years with an additional private cost share of approximately $20 million





Vehicle and Infrastructure "Learning" Demonstration

- $190 M with 50-50 cost share, for total of $380 M, over 6 years
- Will help DOE focus its research and development efforts
- provide insight into vehicle and infrastructure interface issues
- Will help address codes, standards and safety issues

Nearly all major US auto and fuel companies involved in 5 partnerships

“Hydrogen 101” Education Launch

- Hydrogen education workshops for journalists, legislators, regulators and other policy makers
- Launch event held in Lansing, MI, with a second held in Austin, TX and more scheduled
- Also developing hydrogen curriculum for middle school and high school students- tomorrow’s leaders!

DOE-NHA University Competition

Natural Resources Canada

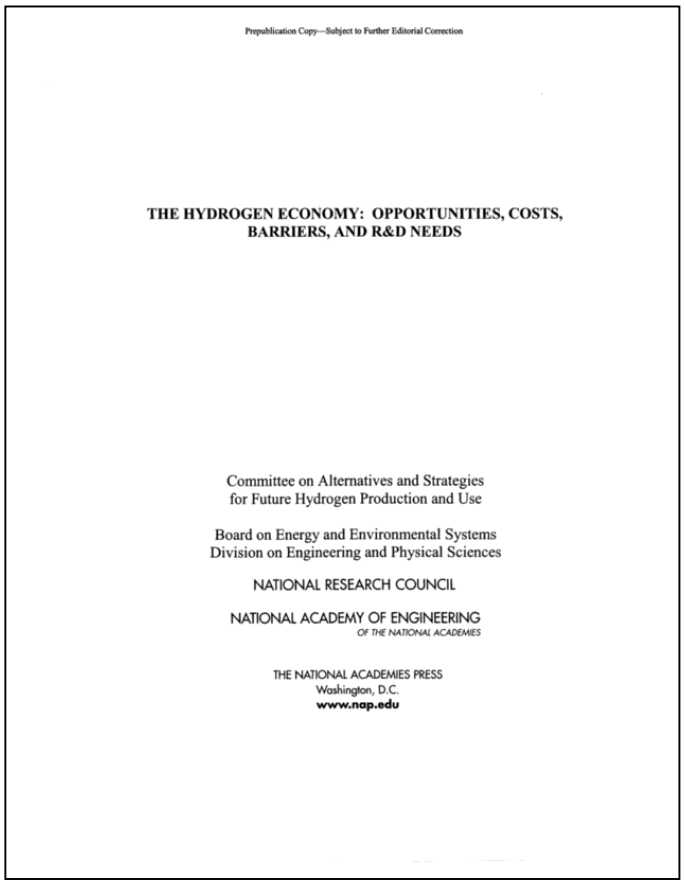
Ressources naturelles Canada

Winning Design

- Student teams competed to develop and design a hydrogen fueling station
- More than 15 North American universities participated
- Winner is University of Victoria in British Columbia, Canada
- Other Top 5 include Humboldt State, U.C.-Davis, U. of Missouri-Rolla & U. of Toronto

NAS Report Affirms Potential of Hydrogen

THE NATIONAL ACADEMIES
Advisers to the Nation on Science, Engineering, and Medicine



Prepublication Copy—Subject to Further Editorial Correction

THE HYDROGEN ECONOMY: OPPORTUNITIES, COSTS, BARRIERS, AND R&D NEEDS

Committee on Alternatives and Strategies
for Future Hydrogen Production and Use

Board on Energy and Environmental Systems
Division on Engineering and Physical Sciences

NATIONAL RESEARCH COUNCIL

NATIONAL ACADEMY OF ENGINEERING
OF THE NATIONAL ACADEMIES

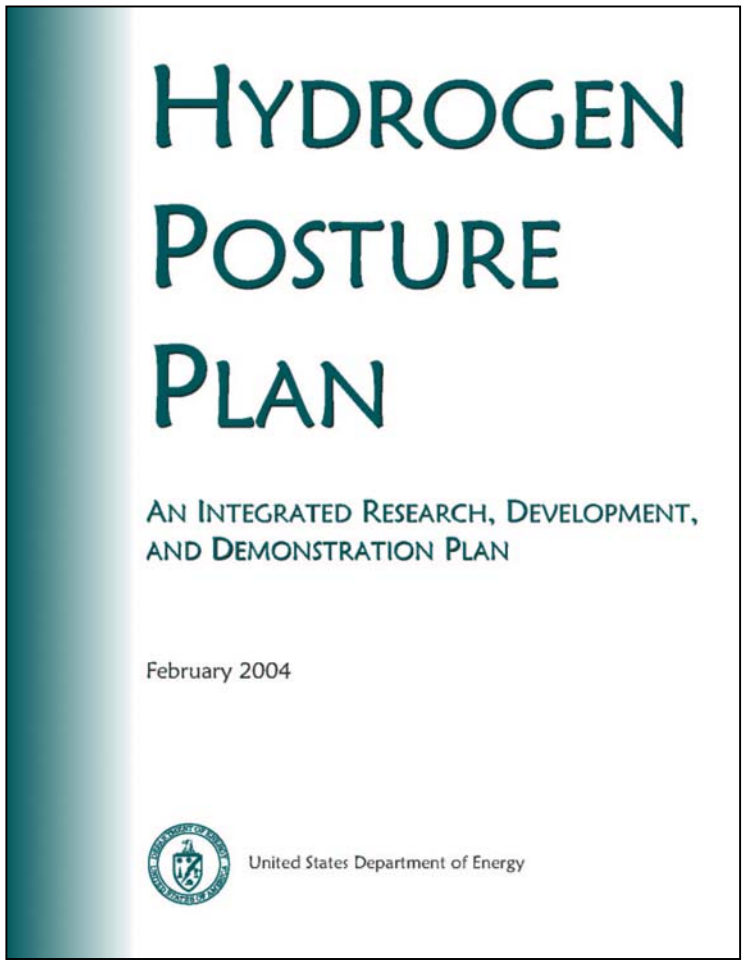
THE NATIONAL ACADEMIES PRESS
Washington, D.C.
www.nap.edu

"A transition to hydrogen as a major fuel in the next 50 years could **fundamentally transform the US energy system**, creating opportunities to **increase energy security** through the use of a variety of domestic energy sources for hydrogen production while **reducing environmental impacts**, including atmospheric CO_2 emissions and criteria pollutants. . . . .This committee believes that investigating and conducting RD&D activities to determine whether a hydrogen economy might be realized are **important to the nation**."

- NAS Panel

Hydrogen Posture Plan

The Posture Plan was released March 2004



Describes technology development to support commercialization decision by industry in 2015

Covers basic research through technology validation

- Office of Science
- Fossil Energy
- Nuclear Energy
- Energy Efficiency & Renewable Energy

Posture Plan Outlines

- activities
- performance-based milestones for technology development allowing stakeholders to track progress through 2015
- deliverables

Highlights of Technical Progress

- High-volume cost of today's automotive fuel cells reduced from $275/kw to ***$225/kW.***
- Cost of natural gas-based hydrogen from $5.00/kg to $3.60 gge (delivered, untaxed, co-producing electricity at 8¢ per kWh)
- Conducted Nobel laureate roundtable to brainstorm ideas for innovative hydrogen storage materials. "Grand Challenge" issued to the Nation's best scientists and engineers at our universities and national labs to develop low-pressure hydrogen storage materials that will revolutionize fuel storage systems.

Private Sector Investment

ChevronTexaco ExxonMobil ConocoPhillips bp

GM DaimlerChrysler Ford

Auto and Energy companies are joining DOE for the

FreedomCAR & FUEL Partnership

The Private Sector has invested billions in hydrogen and fuel cell technologies research and development.

IPHE Collaboration

- Coordinated RD&D on a global basis
- Countries agree to share technical information
- Countries develop consensus-based “functional” standards
- Countries to support the Global Technical Regulation (GTR) process

U.S. suggests member countries agree to task the ILC to draft a roadmap leading to a GTR

Other International Activities Update

Bilateral and Regional Cooperation

- Secretary of Energy went to Brazil to sign an agreement on hydrogen R&D, & met with Brazilian counterparts on a USAID/DOE Hydrogen Roadmap
- Cooperation with China for the "Green Olympics" continues, as well as US-China cooperation on a China Hydrogen Roadmap (Roadmap meetings taking place in Beijing May 23,2004)
- EC and US jointly planning a conference on hydrogen storage in Italy in 2005 and European counterparts will attend DOE Hydrogen office's Annual Program Review May 25-29, 2004 in Philadelphia
- APEC Energy Working Group drafted Interim Framework Document on Hydrogen following a workshop in Honolulu, HI March 29-31, 2004
- Cooperation with USAID on an India Hydrogen Roadmap
- Participation in North America Energy Working Group workshops
- Hydrogen Workshops with Italy as part of climate change technology partnership
- International Fuel Cell Bus Workshop to coordinate data on demo projects

US Concept of the Hydrogen Economy

Assuming the Transition to the Hydrogen Economy has been Accomplished…

Major Sources and Methods for Making Hydrogen in US Will Be:

- **Renewable sources including wind, solar, and others**
- **Fossil sources with sequestration, particularly coal**
- **Nuclear**
- **For the transition, natural gas steam reformation**

Major Methods for Distributing Hydrogen in US Will Be:

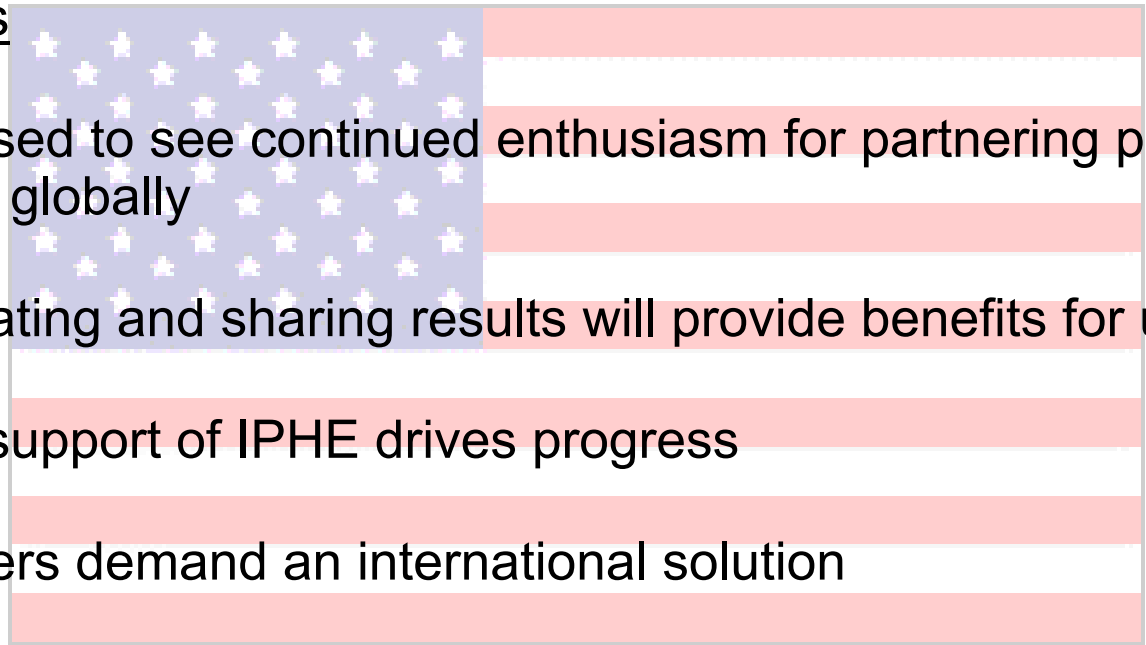
- **During the transition, distributed production from natural gas**
- **In the long-term, we will allow distribution methods to evolve naturally with production strategies**

Major Users of Hydrogen in US Will Be:

- **Vehicles**
- **Stationary**
- **Auxiliary uses, portable, and other niche markets**

Concluding Remarks

Key messages



- US is pleased to see continued enthusiasm for partnering public-private and globally
- Communicating and sharing results will provide benefits for us all
- High-level support of IPHE drives progress
- Global drivers demand an international solution

Thank you to People's Republic of China for hosting