



Building the Hydrogen Economy: Enabling Infrastructure Development



Interim Report



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Overall Project Objectives

- Convene public and private sector officials in an international strategic dialogue to refine and evaluate infrastructure transition planning scenarios for building out the hydrogen economy (Detroit, Paris and Shanghai Workshops)
- Using the IEA Energy Technology Perspectives (ETP) model and other proven tools, quantitatively analyze hydrogen economy scenarios and market transformation planning for key countries and the world out to 2050
- Inform policy makers of opportunities to effectively advance these transition scenarios and strategies for policy instruments



Detroit Workshop Overview

April 3 morning

- Welcome + Plenary Addresses

April 3

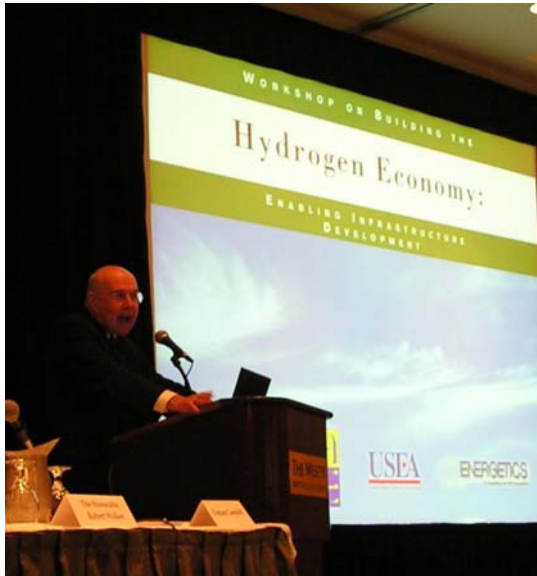
- Facilitated Breakout Sessions on
 - Mobile Applications
 - Stationary Applications
 - Modeling & Analysis

April 4

- Facilitated Breakout Sessions (continued)
- Reports by Discussion Leaders
- Close-out

Detroit Workshop Participants

- Approximately 100 workshop participants from public and private sector
- Representatives from over 20 countries and 5 continents
- Keynote address by former U.S. Congressman Robert Walker





Detroit Workshop Breakout Sessions

- 4 Breakout Sessions discussed Hydrogen Infrastructure requirements focusing on:
 - Planning and Design
 - Engineering and Construction
 - Operations and Maintenance
- Modeling & Analysis Session considered possible transition scenarios to a Hydrogen Infrastructure based on:
 - Existing Models
 - Policy Questions
 - Missing Issues
- Participants included leading representatives from industry, government, and academia
- Workshop presentations and discussion summaries available at:
<http://www.usea.org/iea-ipheworkshop.htm>

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Results from the Breakout Sessions

- Mobile Applications

- Continuation of **Public-Private Partnerships**, Lighthouse Projects
- Develop **comprehensive plan** to address OEM/ energy provider challenges
- Apply **mix of policy tools** (tax incentives, H2 fuel prices, regulations) to create consumer incentives
- Consistent messaging and **sustained policies** from governments
- Build **awareness and trust** amongst consumers through education
- **Main Challenges:** Workforce and safety issues, uncertainty on cost and liability; ensure dialogue between energy providers and OEMs; synthesize dissimilar market strategies
- **Prospective Solutions:** Incentives for workforce, education and outreach efforts, harmonize international codes and standards to encourage industry collaboration

Results from the Breakout Sessions

- Stationary Applications
 - H2 economy **driven by RE development**, relevance of **climate change** and **energy security** issues, impact of fuel price volatility
 - Engage utilities as partners: adopt regulatory structure, **seize cost advantage** of off-peak power, redistribute surplus production
 - **Strengthen partnership** between all infrastructure actors, education campaign to avoid irrational fear over H2 safety
 - Establish **neutral agency** to implement codes and standards
 - **Strengthen legislation** to overcome lack of market transparency
 - **Main challenges**: availability of key materials, (Perception of) security issues i.e. crisis management, terrorist target, insurability/ liability
 - **Prospective solutions**: Develop H2 crisis response plans, “stop looking for 100% solution,” favor first-adopters, promote business case studies involving industry

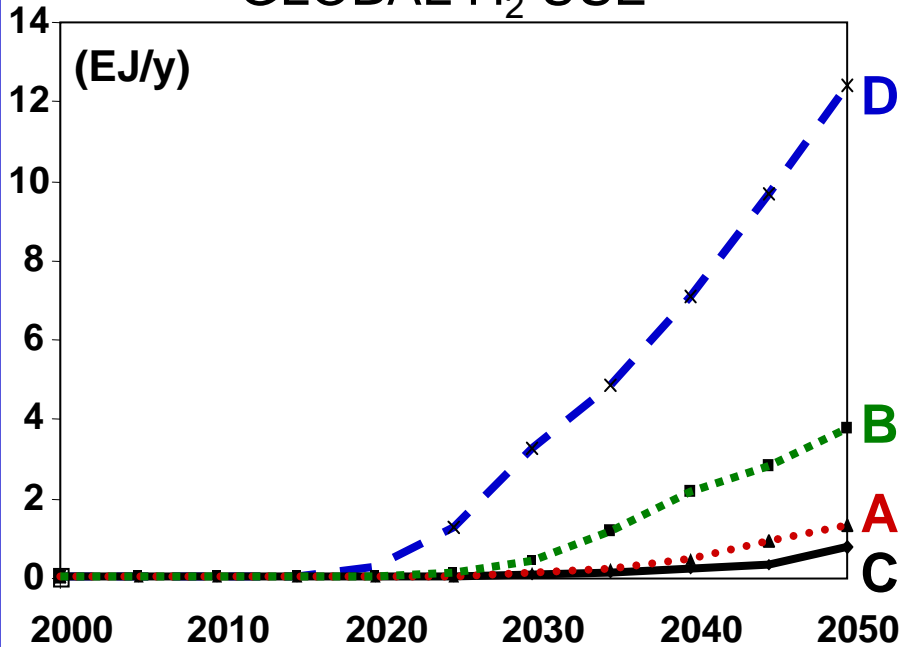
Results from the Breakout Sessions

- **Modeling and Analysis Group**
 - **Critical policy questions:**
 - Technology Policy
 - Consumer Behavior
 - Current v. Long-term Policy Strategies
 - System Analysis/ Spatial Analysis
 - **Missing Issues**
 - Modeling Risk and Uncertainty
 - Broader Systems Issues
 - Technology Characterization
 - Modeling Consumer, Government and Supplier Behaviors
 - **Data Validation and Tool Box**

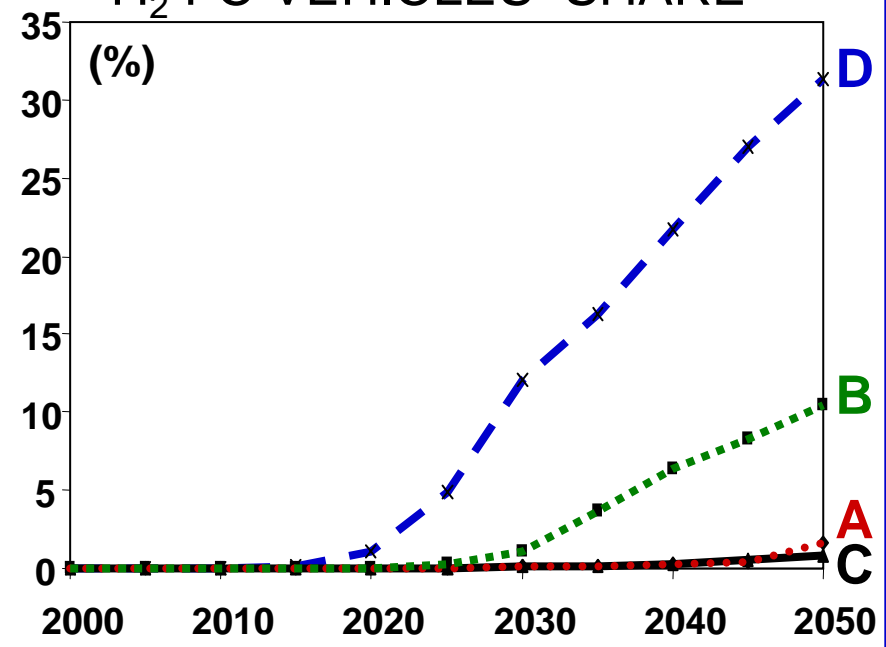
(Participants to continue discussion on Tool Box at Paris Workshop, 10-12 July, 2007)

Market Scenarios

GLOBAL H₂ USE



H₂ FC VEHICLES SHARE

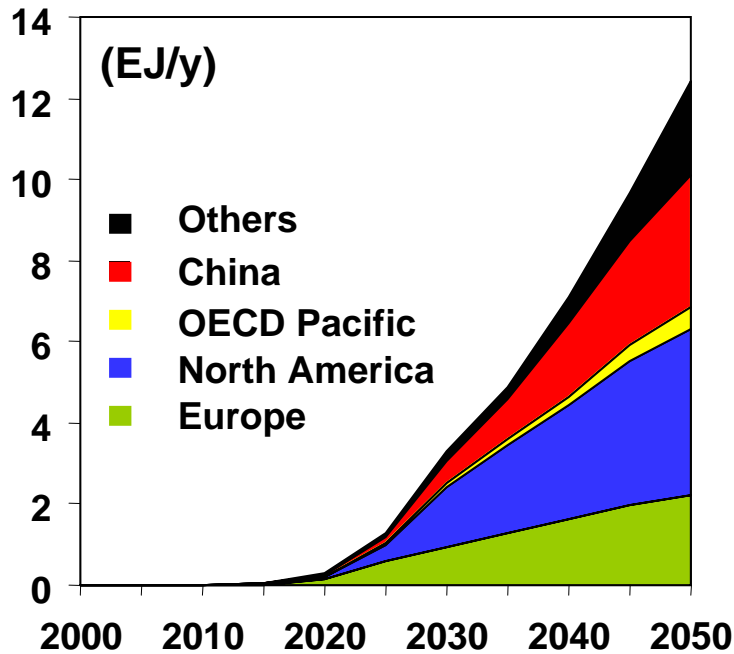


- A - Weak CO₂ policy and tech. development
- B - Strong CO₂ policy in Kyoto countries and tech. development
- C - Strong CO₂ policy in Kyoto countries and tech. lag
- D - Strong CO₂ policy world wide and tech. development

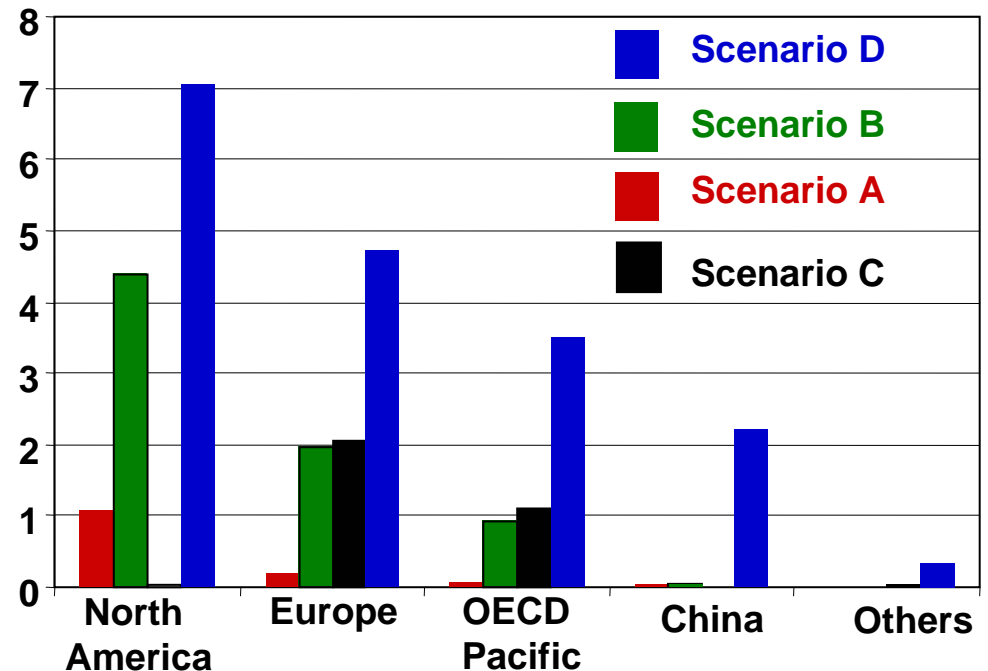
Up to 30% H₂ fuel cell vehicles by 2050

Regional Markets

H₂ Use - Scenario D



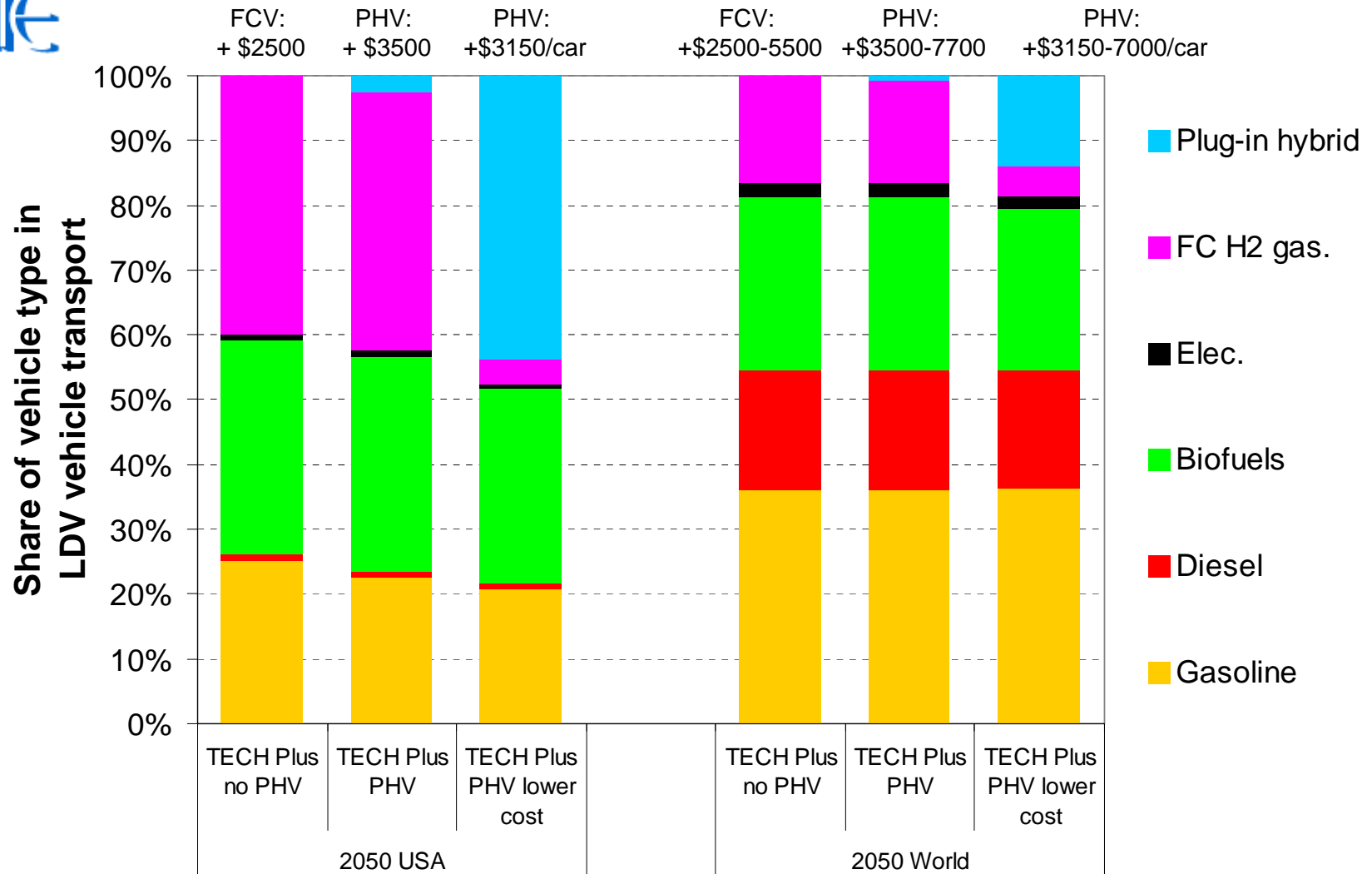
Per capita H₂ use in 2050 - (GJ H₂/pc)



Best scenario: 60% FC vehicles in China by 2050, 42% India and US, 36-48% Europe, 35% Canada, 22% Japan, 10% Australia

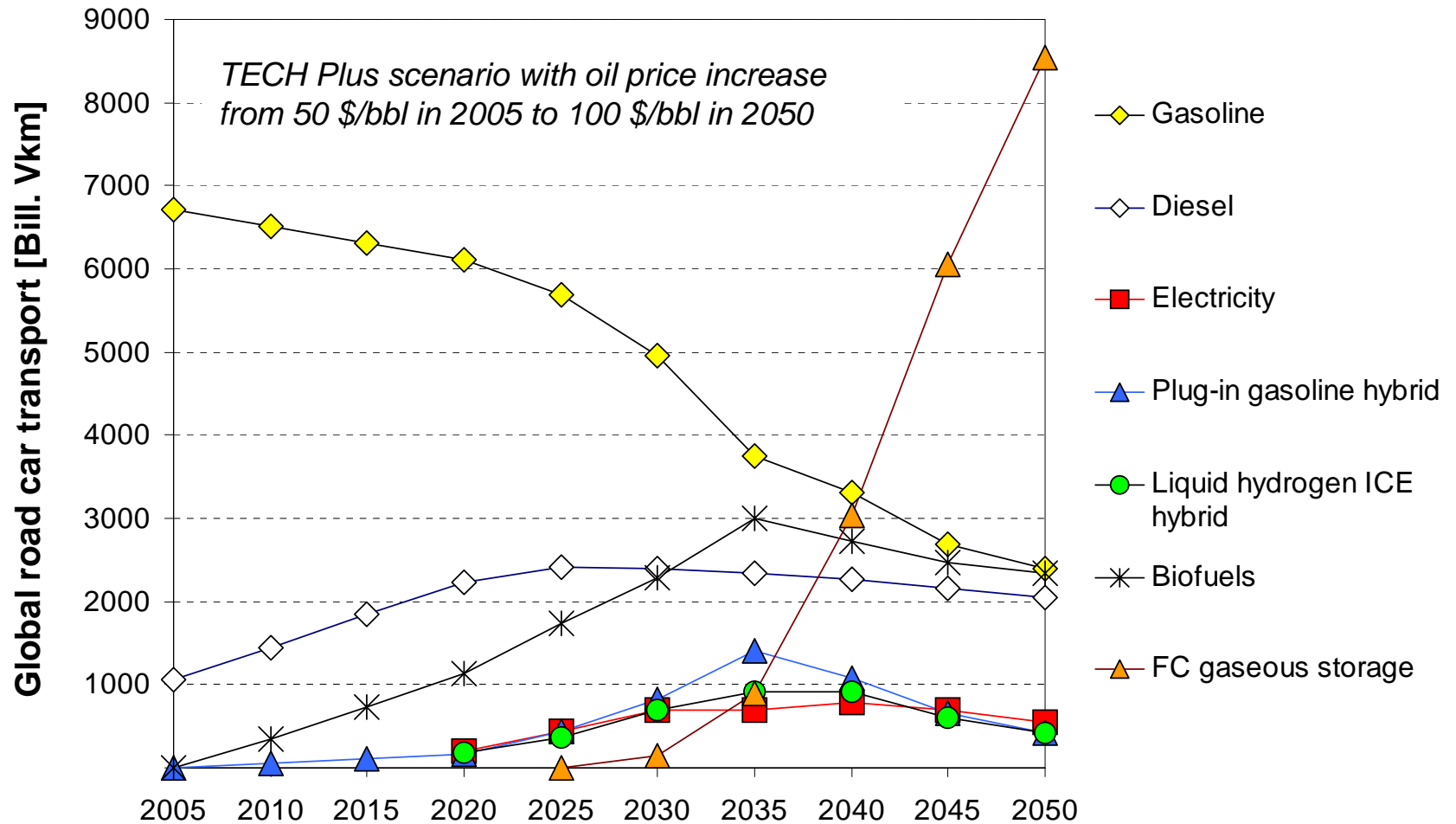
Differences across regions due to discount rate, fuel taxes, infrastructure, consumers' attitude for capital-intensive investment, mobility needs, car-mileage.

Impact of plug-in hybrid vehicles (PHV)



Plug-in hybrids may compete in 2050 with FCVs (very sensitive to assumed future vehicle costs and oil price level)

Impact oil price on vehicle choice (Global level)



Alternative vehicle technologies and fuels benefit from higher oil prices; before 2035: biofuels, PHV and H2 ICE hybrids, after 2035: FCV



Near-Term Project Deliverables

- Interim Project Report for IEA Ministerial
May 2007, Paris France

- Detroit Workshop Report (IEA-IPHE)
June 2007

Report (first of a three-part series) will highlight key messages and recommendations, with special emphasis on the conclusions from the 5 breakout sessions

- Interim Project Report for German G8 Summit
June 2007



Future Project Workshops

- Europe - Africa Region
 - July 10-12, 2007
 - Paris, France
- Asia - Australia Region
 - October 22-24, 2007
 - Shanghai, China



Thank you!

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