Hydrogen and Fuel Cells

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Hydrogen, Fuel Cells and Infrastructure Technologies

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Hydrogen Providing a Clean, Secure Energy Future

All drivers in a hydrogen economy are important:

- Energy Security
- CO_2 and Criteria Emissions Reductions
- Economic Competitiveness

DOE has accelerated hydrogen research efforts to realize hydrogen's benefits by the 2030 – 2040 time frame while maintaining a balanced portfolio of RD&D on other energy-saving transportation and renewable technologies.

U.S. Department of Energy
Energy Efficiency and Renewable Energy

Resources to Support the President's Hydrogen Fuel Initiative ($K)

Major Line Items and Key Activities	FY 04 Appropriation	FY 05 Request
Fuel Cell Technologies: system components, stack components, fuel processors, technology validation	$65,187	$77,500
Hydrogen Technologies: distributed natural gas and renewable production, delivery, storage, safety and codes/standards, infrastructure technology validation, education/analysis	$81,991	$95,325
Coal-based Hydrogen Production: gasification, gas separation	$4,889	$16,000
Nuclear-based Hydrogen Production: high temperature reactions	$6,377	$9,000
Basic Science: production, storage and use	$0*	$29,183
Department of Transportation: safety, codes/standards	$555	$832
Total	$158,999**	$227,840

**Note: Some FY 04 numbers vary slightly due to RESCISSIONS AFTER appropriation and other reductions.

National Academies to Evaluate its Hydrogen Planning

- Focus on the "transition" to a hydrogen economy, critical issues needed for 2015 decision
  - Exploratory research on hydrogen storage and fuel cell cost/durability
  - "Laser-like" focus on *distributed* hydrogen infra-structure. Lowering capital costs and increasing efficiency of natural gas reformers and electrolyzers
- Let the long-term hydrogen economy "evolve"
  - Fundamental and exploratory research on coal/carbon capture sequestration, photoelectro-chemical, photobiological, thermochemical, etc.

U.S. Department of Energy
Energy Efficiency and Renewable Energy

International Partnership for the Hydrogen Economy

Russian Federation

USA

Canada

Iceland

Japan

South Korea

China

India

IPHE Partners' Economy:

- Over $35 Trillion in GDP, 85% of world GDP
- Nearly 3.5 billion people
- Over 75% of electricity used worldwide
- > 2/3 of CO_2 emissions & energy consumption

IPHE Vision:

"… consumers will have the practical option of purchasing a competitively priced hydrogen power vehicle, and be able to refuel it near their homes and places of work, by 2020."

- Secretary Abraham, April 2003

United Kingdom

France

Germany

Italy

Australia

Brazil

Norway

European Commission

FreedomCAR and Fuel Partnership Established

New Energy Company/DOE Technical Teams

- Production
- Delivery
- Fuel Pathway Integration

New Joint Auto/Energy/DOE Technical Teams

- Codes and Standards
- Storage

Status: June 2004

- Comprehensive plan with SDOs developed and contracts in place
- Roadmap underway on the development of Global Technical Regulation(s)
- ICC Hearings successful
- NFPA training modules under development
- Safety Panel established
- Joint Tech Team formed, R&D roadmap under development
- Northeast Incubator Project initiated

Issues

- International more important than domestic
- Codes & standards development must be coordinated with technology development
- Need data to support or validate proposed requirements
- Federal Agencies must be coordinated and working together
- Fuel Quality and Weights and Measures are high priority

Development Needs

- Government Collaboration
  - DOE, EPA and DOT must coordinate
  - Engage in GTR process
- Assist SDOs to develop training programs
- Implement training at workshops and roadshows
- Provide technology data for new “functional” standards
- Coordinate SDO activities with CSTT to identify gaps, form new working groups
- Fund critical R&D to provide data for amended standards
- Collect, analyze and publish historical database

Safety Systems

- Safety can be addressed through comprehensive testing, certification, and functional standards, just like with any other fuel
- Sustained, collaborative government-industry RD&D needed
  - Innovative sensor technologies must be developed
  - New “holistic” approaches to safety
  - Sensors applied appropriately
  - Coordination is key
  - U.S. must be as decisive as European and Asian counterparts

For more information:

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