U.S. HYDROGEN PROGRAM
Update to IPHE - ILC

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June 2007

Hydrogen Fuel Initiative Budget

Activity	Funding ($ in millions)			
	FY2005 Approp	FY2006 Approp	FY2007 Approp	FY2008 Request
Hydrogen Fuel Initiative				
EERE Hydrogen (HFCIT)	166.8	153.4	193.5	213.0
Fossil Energy (FE)	16.5	21.0	23.6[1]	12.5
Nuclear Energy (NE)	8.7	24.1	19.3	22.6
Science (SC)	29.2	32.5	36.4	59.5
DOE Hydrogen TOTAL	221.2	231.1	272.8	307.6
Department of Transportation	0.5	1.4	1.4	1.4
Hydrogen Fuel Initiative TOTAL	221.7	232.5	274.2	309.0

[1] FY07 Request

Key Activities focus on:

Technology Challenges

- Fuel Cell Cost and Durability (targets: $30 per kW, 5000 hours)
- Hydrogen Storage (target: >300-mile range)
- Hydrogen Cost (target: $2.00 - 3.00/kg) independent of production pathway, includes delivery

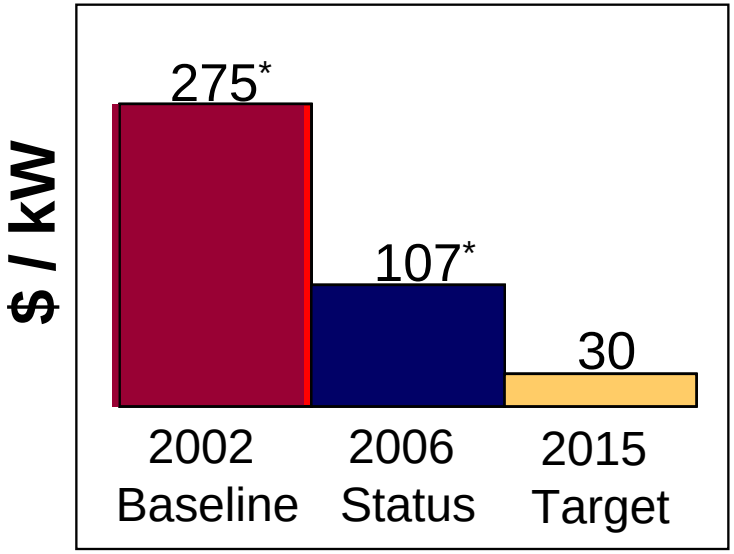
Economic/Institutional Challenges

- Safety, Codes and Standards
- Hydrogen Infrastructure
- Market Transformation
- Education (safety and code officials, local communities, state and local governments, students)

Fuel Cell Progress

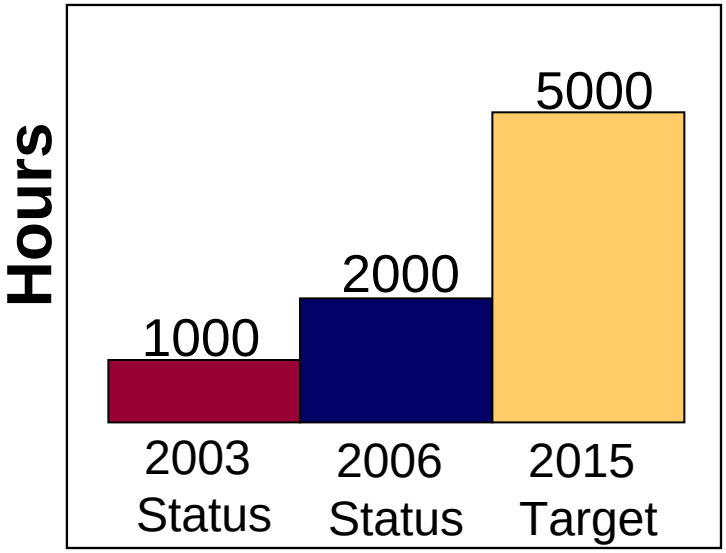
R&D accomplishments have led to reduced cost and improved durability.

Fuel Cell System Cost Status vs. Targets



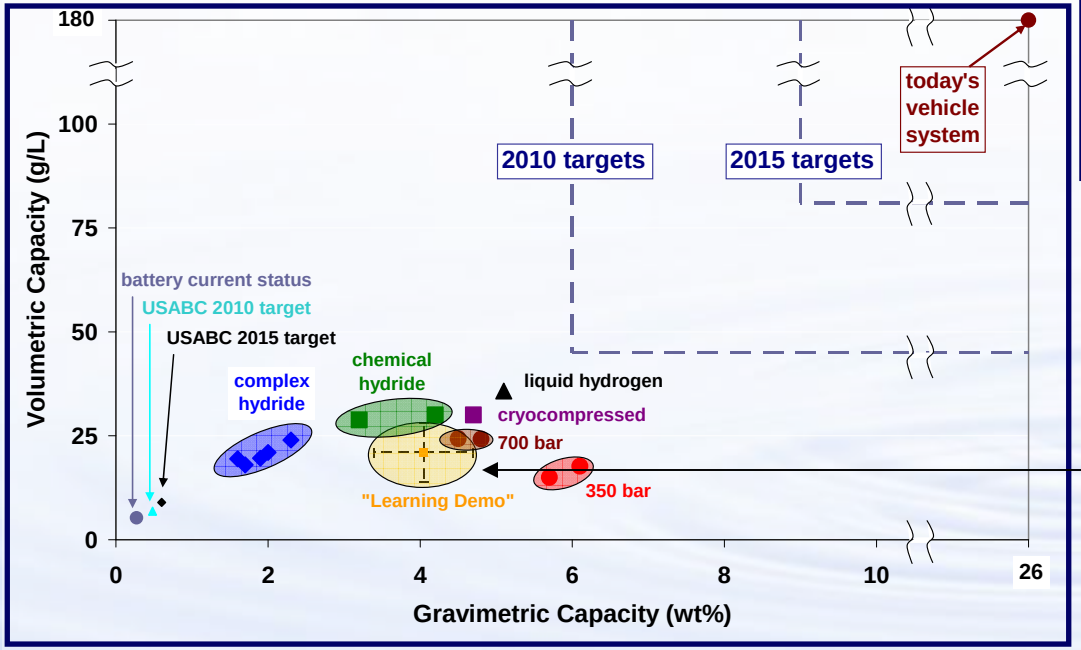
*projected to high volume production of 500,000 units/year

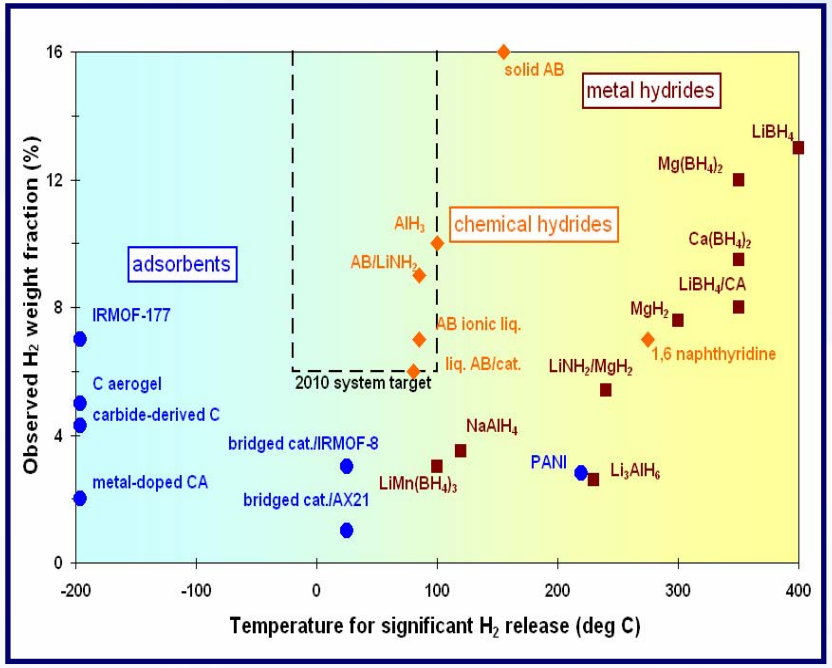
Fuel Cell System Durability Status vs. Targets



Hydrogen Storage Progress

No technology meets targets
Promising materials continue to be identified



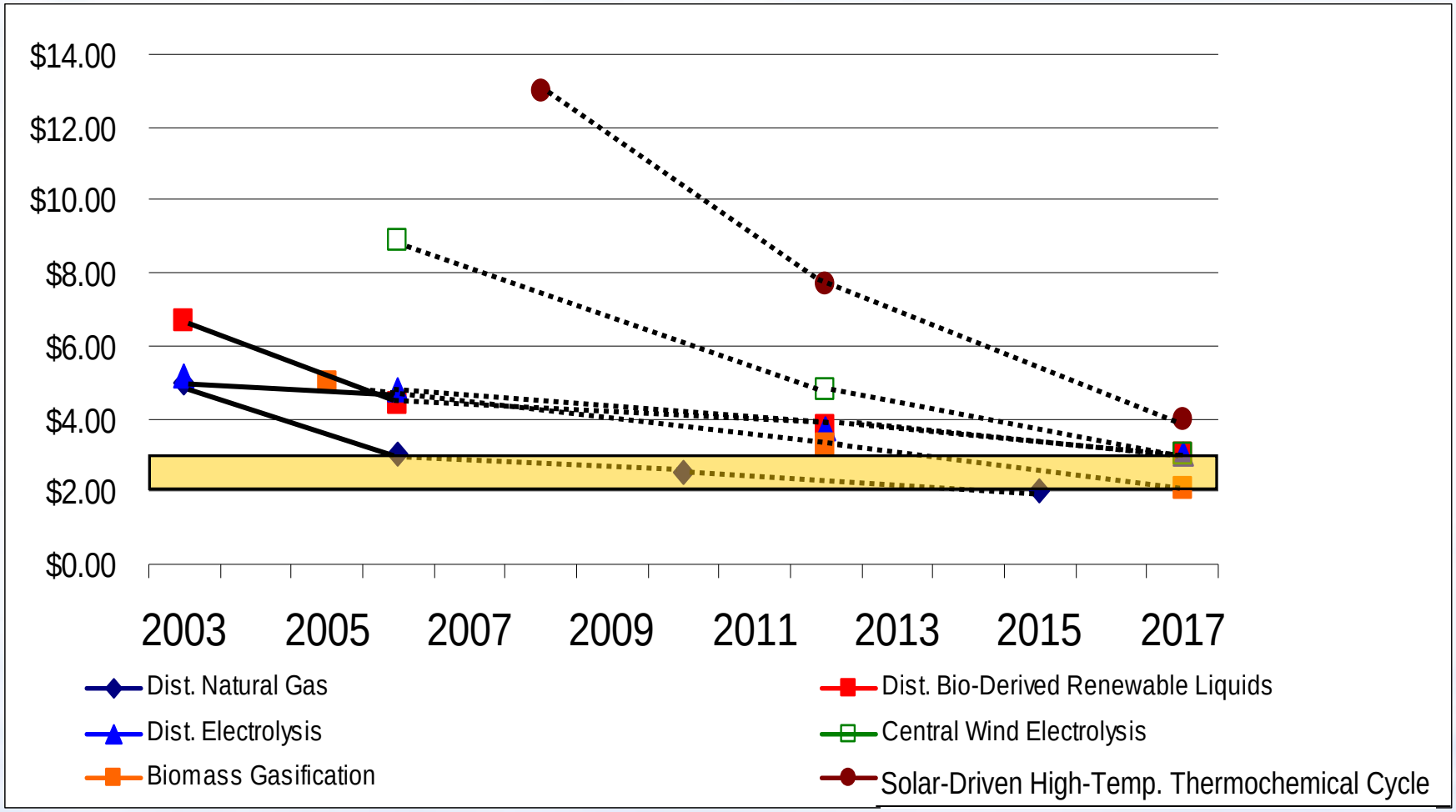


Current status:
~ 103-190 miles through independent validation
(DOE "Learning Demonstration" activity)

Estimates from developers & analysis results; periodically updated by DOE. "Learning Demo" data is for 63 vehicles.

Hydrogen Production Progress

R&D accomplishments continue to help reduce cost.



Hydrogen Delivery Progress

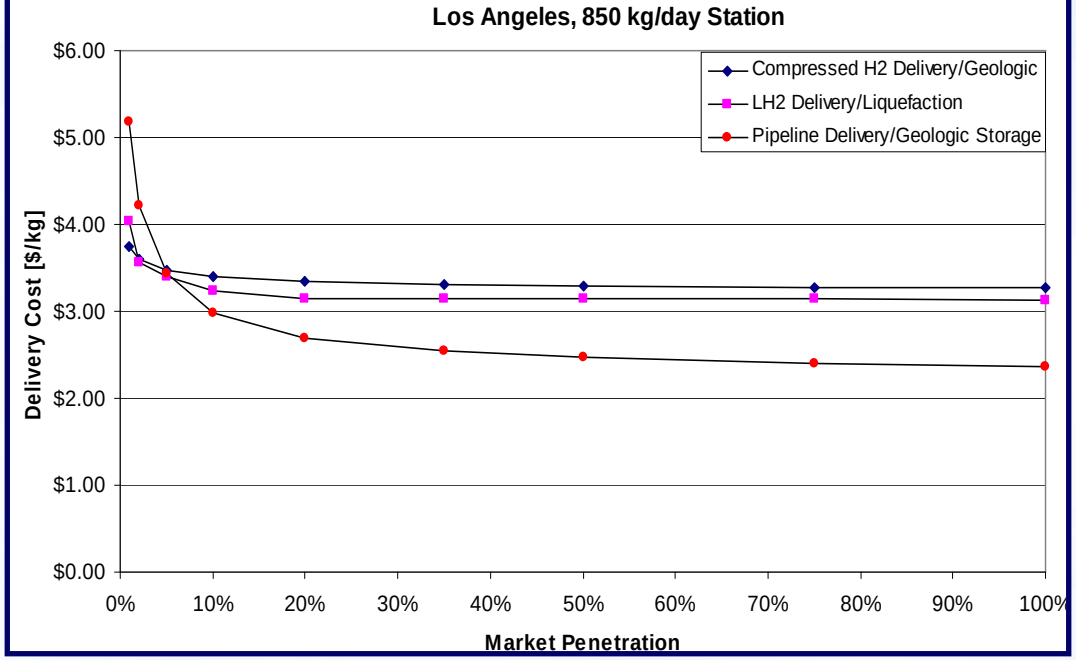
Current: $2.50-$12.00/kg
Target: <$1.00/kg
(Includes refueling site operations)

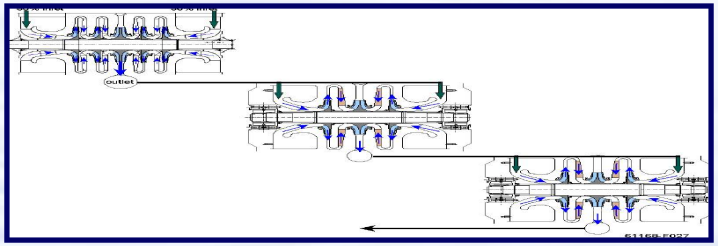
Pathways

- Gaseous Hydrogen Delivery: Pipeline, Tube Trailers
- Liquefaction and Liquid Hydrogen Truck Delivery
- Carriers

Progress

- Research portfolio of projects established and now well funded
  - Compression, Storage, Liquefaction, and Pipelines
- H2A Delivery Analysis updated and improved
- Roadmap, Multi-Year R&D Plan, and Targets updated





New concepts for centrifugal compression underway

Technology Validation Progress

Obtained valuable data on FCVs and H_2 stations

- 77 vehicles, 12 stations in operation
- Fuel cell durability: Maximum 1200 hours
- Range: 103 to 190 mi (equivalent to EPA vehicle sticker rating)
- Cost of hydrogen production: $3.00/gge
- Gen 2 vehicles being delivered in 2007-2008

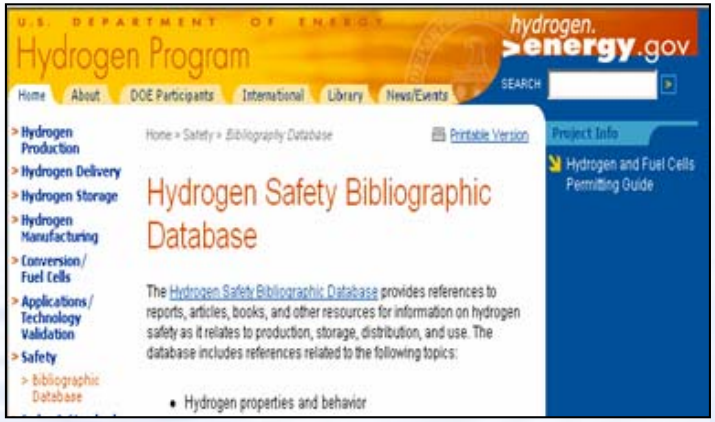
Safety Codes and Standards Status

Version 1.0 of Technical Reference for H_2 Compatibility of Materials Complete
http://www.ca.sandia.gov/matlsTechRef/

- Fuel Quality
  - Critical contaminants identified
  - Composite test matrix compiled
  - Participating in HyQ with EC
- Hydrogen safety sensors targets updated for stationary, on-board, and interface sensors
- Results published on hydrogen combustion and release scenarios
- High-pressure (70 MPa) refueling modeling and testing begun

H_2 INCIDENTS DATABASE

www.h2incidents.org



BIBLIOGRAPHIC DATABASE

www.hydrogen.energy.gov

- Contains ~400 documents related to hydrogen safety

Education Status

Safety & Code Officials

- DOE Introduction to Hydrogen Safety for First Responders web-based course (www.hydrogen.energy.gov/firstresponders)
- Introduction to Hydrogen for Code Officials (planned for 2007-08)
- "Prop course" for hands-on vehicle safety training (planned for 2007-08)

INCREASE YOUR H2IQ hydrogen.energy.gov

Local Communities

- Public education program "Increase your H2IQ"

State and Local Government Representatives

- Ongoing collaboration with state and regional leaders

End Users/Early Markets

- Information resources on early market applications
  - Podcasts
  - Fact sheets
  - Vidcasts (planned for 2007)

Schools/Universities

- Middle school/high school curriculum development and teacher training
- Support textbook database update, H2U student design contest (planned for 2007-08)

Solicitation planned for FY2008

- **State and local government outreach**
- **Early market deployments and coordinated outreach**
- **University programs**

Systems Analysis Accomplishments

Well-to-Wheels Analysis

- Completed WTW sensitivity analysis of production and vehicle impacts on petroleum use and GHG emissions.

Infrastructure Analysis

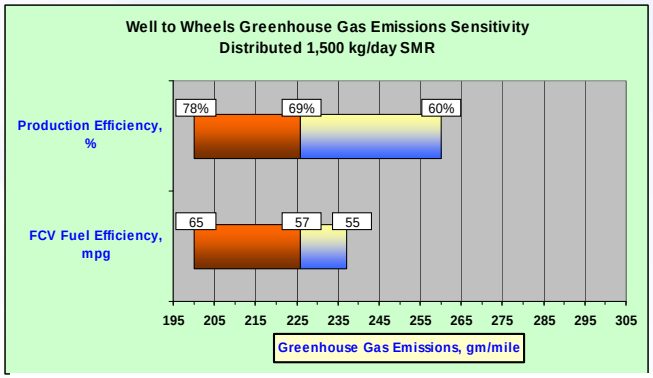
- Completed infrastructure analysis of the U.S. natural gas infrastructure to determine limitations and supply capacity for major cities during the market transformation.

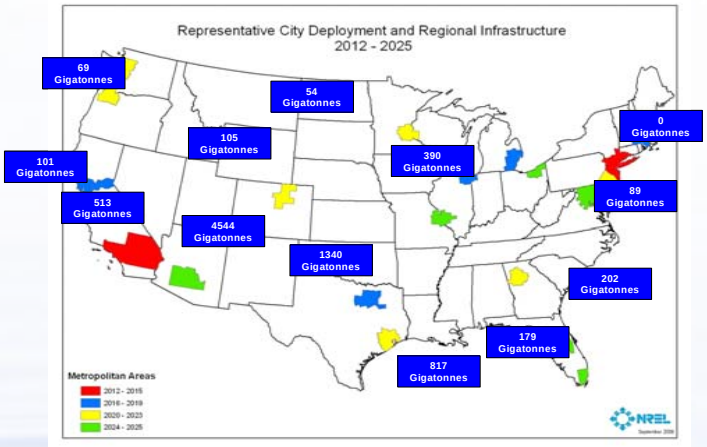
Resource Analysis

- Completed analysis of potential CO2 sequestration capacity, costs and locations.
- Completed analysis of hydrogen supply from indigenous resources.

Models

- Completed the HyPro infrastructure model
- Completed test version of the Macro-System model





Manufacturing & Market Transformation

Manufacturing R&D Status

Progress

- Workshop on Manufacturing R&D for the Hydrogen Economy, July 13-14, 2005
  - R&D priorities identified
- Roadmap on Manufacturing R&D for the Hydrogen Economy
  - Based on workshop results, feedback from industry
- Pre-solicitation meeting May 18, 2007

Future Plans

- Solicitation planned - Summer 2007

Market Transformation Status

Progress

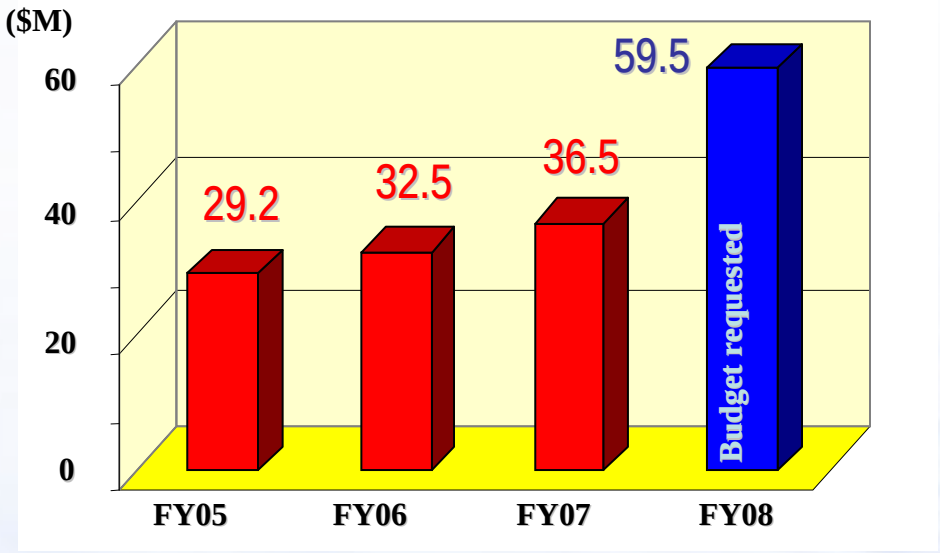
- Request for Information (RFI) on Hydrogen and Fuel Cell Early Markets, April 26, 2007
  - Seeks public input in three areas by June 30, 2007:
    - Early market financial assistance
    - Fuel cell performance testing
    - Community partnerships, including utility applications

Future Plans

- GovEnergy2007 Conference, August 5-8, 2007, New Orleans
- "New Technology" track focusing on fuel cells and early market opportunities for Federal facility and energy managers
- Funding Opportunity in early 2008

Basic Science Status

Selected new awards- announced May 15, 2007
6 new projects in nanoscale catalysts ($5.6 M over 3 years)
7 new projects in hydrogen storage ($5.6M over 3 yrs)



Basic Science Funding
Office of Science, Basic Energy Sciences

Fundamental science and understanding being made in key areas:

Membranes for separation, purification and ion transport

Design of catalysts at the nanoscale

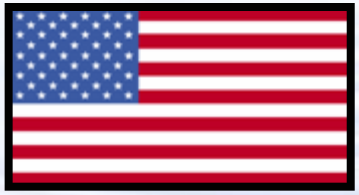
Solar hydrogen production

Bio-inspired materials and processes

Novel materials for hydrogen storage

Status of FutureGen

- U.S. (Department of Energy), India and Korea and 12 private firms in the FutureGen Industrial Alliance will build the world's first near-zero emissions plant that produces H_2
- H_2 to produce 275 MWe; total $1.7B (as spent)
- Includes carbon sequestration in a saline reservoir
- Host site to be selected in Fall of 2007—4 sites currently being considered (Illinois-2; Texas-2)
- Plant technologies to be selected by end of 2007
- Five year operation period beginning 2012
- Monitor storage site for two years afterwards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www.hydrogen.gov

Thank you