



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

DOE Hydrogen Program

New Fuel Cell Projects Kickoff Meeting

Patrick Davis

Acting Program Manager

February 13, 2007

Washington, DC

Mission

The Program's over arching goal is to reduce or eliminate dependence on foreign oil.

Mission:

To research, develop, and validate fuel cell and hydrogen production, delivery, and storage technologies.

Hydrogen from diverse domestic resources will then be used in a clean, safe, reliable, and affordable manner in fuel cell vehicles and stationary power applications.

DOE Hydrogen Program

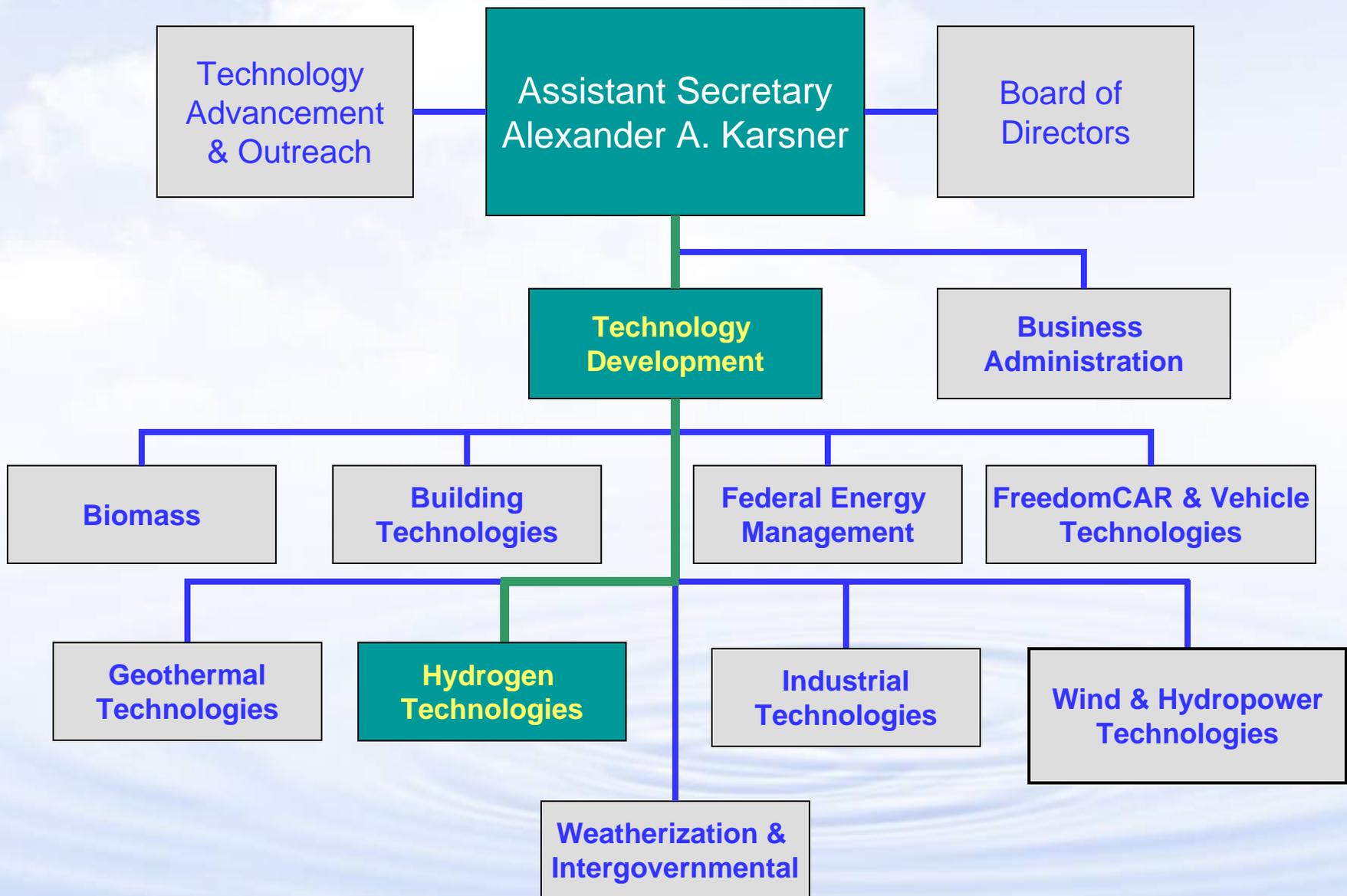
Encompasses research, development and demonstration activities being conducted by the following DOE program offices:

- ⇒ *Energy Efficiency & Renewable Energy (EERE),*
- ⇒ *Fossil Energy (FE),*
- ⇒ *Nuclear Energy (NE), and the*
- ⇒ *Office of Science (SC)*

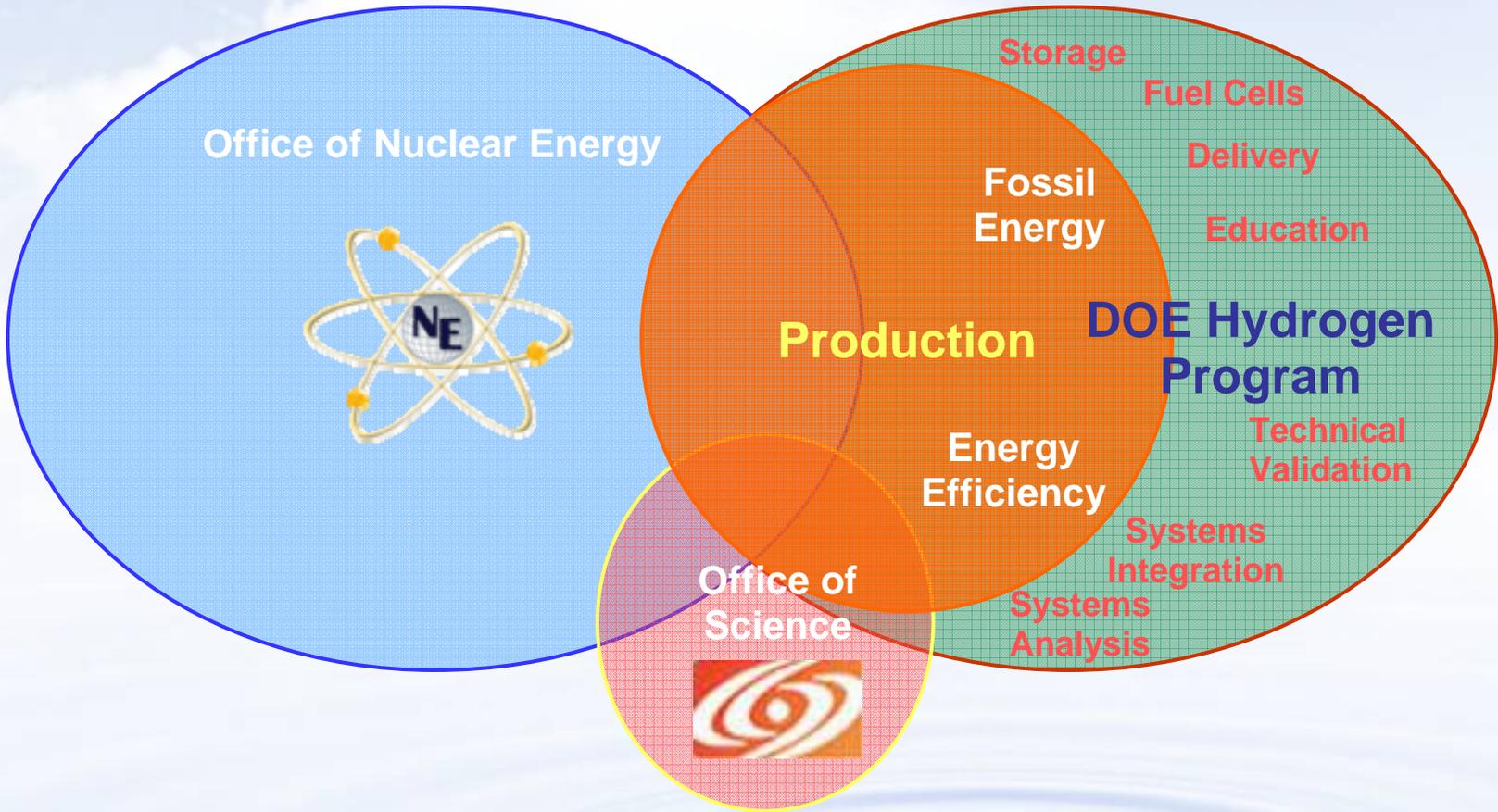
To ensure that:

- 1) these efforts are fully integrated and coordinated,
- 2) the Department speaks with *one voice*, and
- 3) there is a clear line of management responsibility and accountability, the DOE Under Secretary issued a memorandum on March 15, 2004, requiring that all of the DOE Hydrogen Program efforts conducted by these DOE offices be reviewed by the DOE Hydrogen Program Manager (**designated to be the Program Manager for EERE's HFCIT Program**).

Energy Efficiency and Renewable Energy

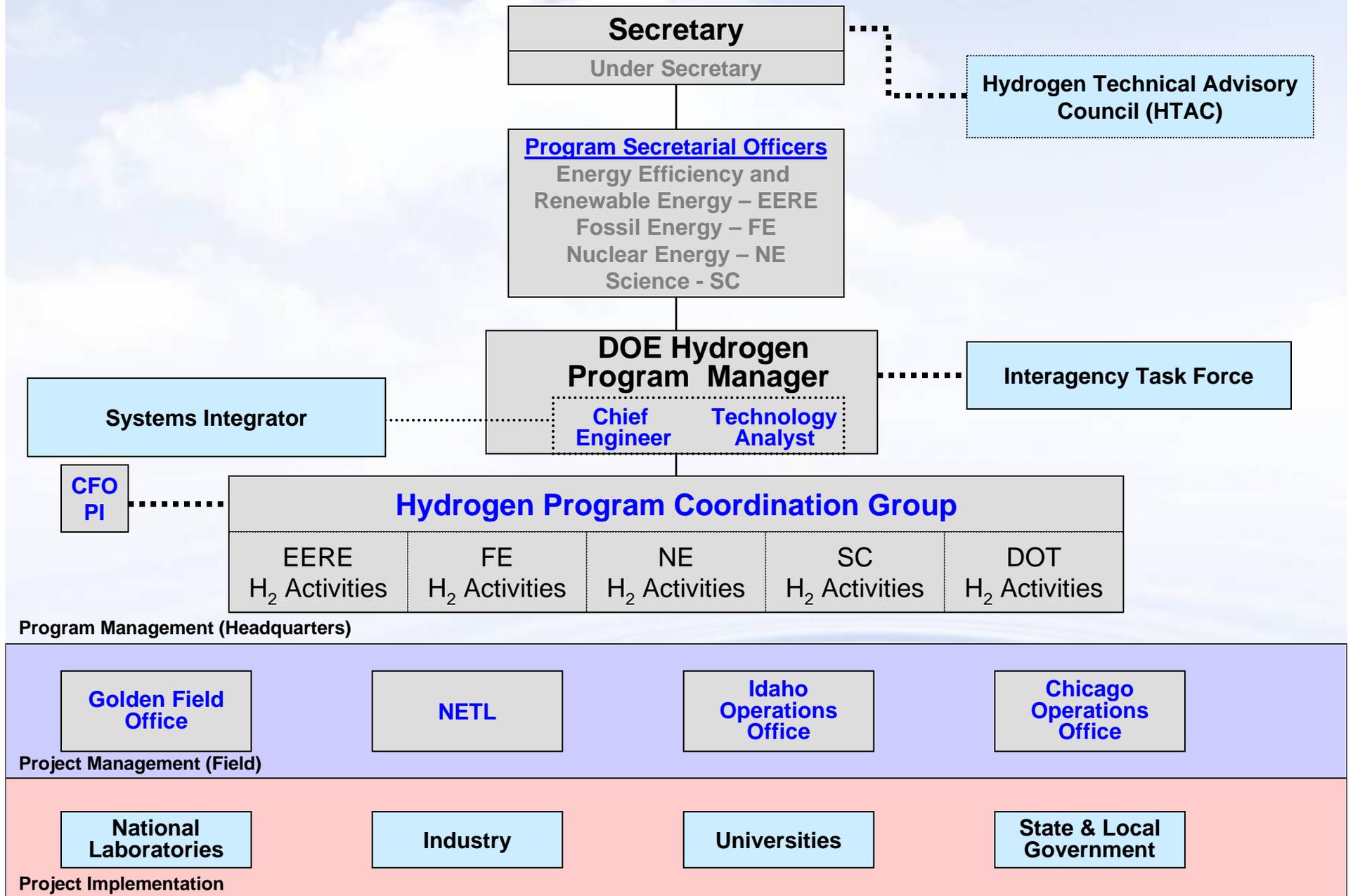


Integrated Hydrogen Program



EERE is working to provide a prosperous future where energy is clean, abundant, reliable, and affordable. FE's primary mission is to ensuring that we can continue to rely on clean, affordable energy from our traditional fuel resources. NE's mission is to support the nation's diverse nuclear energy programs. SC is the single largest supporter of basic research in the physical sciences in the United States (>40%).

DOE Hydrogen Program Organization



Current EERE Hydrogen Program Staff

Hydrogen Technologies Program

Patrick Davis, **Acting DOE Hydrogen Program Manager**

JoAnn Milliken – **Chief Engineer**

Fred Joseck – **Technology Analyst**

Sid Anderson – **Office Manager**

Sigmund Gronich - **Technology Validation**

Christy Cooper - **Education**

Pete Devlin – **Market Transformation**

Patrick Davis - **Safety, Codes/Standards**

Antonio Ruiz - **Safety Engineer**

Hydrogen Production Team

Roxanne Garland

Acting Team Leader

Arlene Anderson

Mark Paster

One new hire

Hydrogen Storage Team

Sunita Satyapal,

Team Leader

Carole Read

Grace Ordaz

Two new hires

Fuel Cell Team

Nancy Garland

Acting Team Leader

John Garbak

Kathi Epping

Amy Manheim

Jason Marcinkoski

Program Goal/Challenges

Goal: *Technology readiness to enable industry to commercialize fuel cell vehicles and hydrogen infrastructure in the 2020 timeframe*

Challenges:

Critical Path Technology

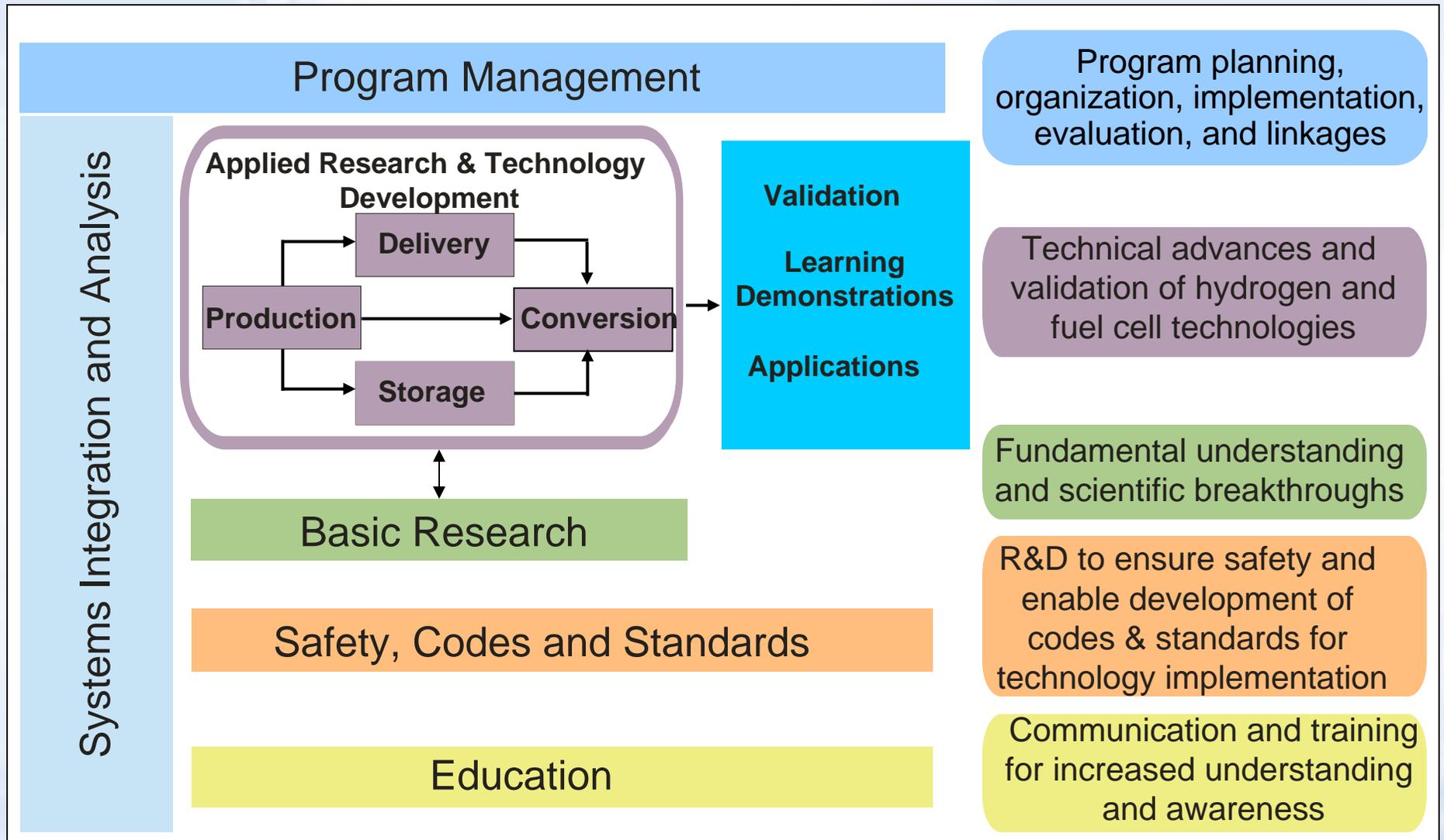
- Hydrogen Storage (target: >300-mile range; status 103-190 miles)
- Fuel Cell Cost and Durability (targets: \$30 per kW, 5000 hours; status: \$110/Kw, 2000 hours)
- Hydrogen Cost (target: \$2.00 - 3.00 per gallon gasoline equivalent*; status: \$3.00/gge for natural gas)

Economic/Institutional

- Codes and Standards (Safety, and Global Competitiveness)
- Hydrogen Delivery (Investment for new Distribution Infrastructure)
- Education (safety and code officials, local communities, state and local governments, students)

*One kilogram of hydrogen contains nearly the same energy as a gallon of gasoline.

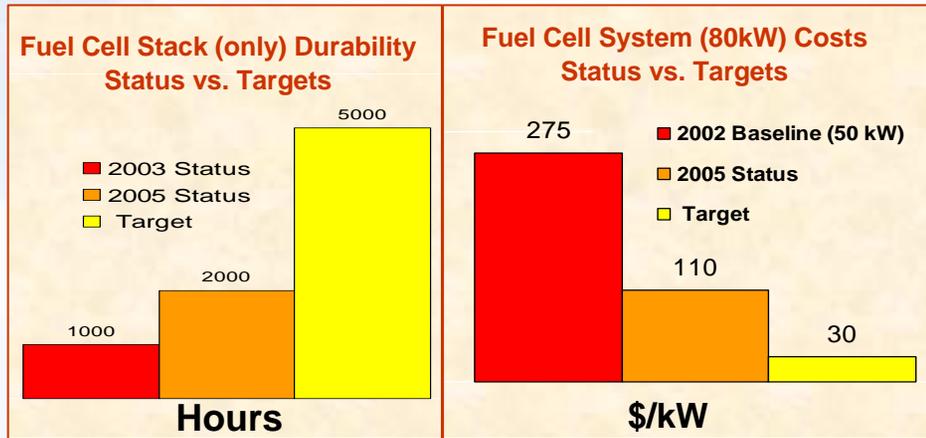
Program Elements



Hydrogen Program R&D Progress

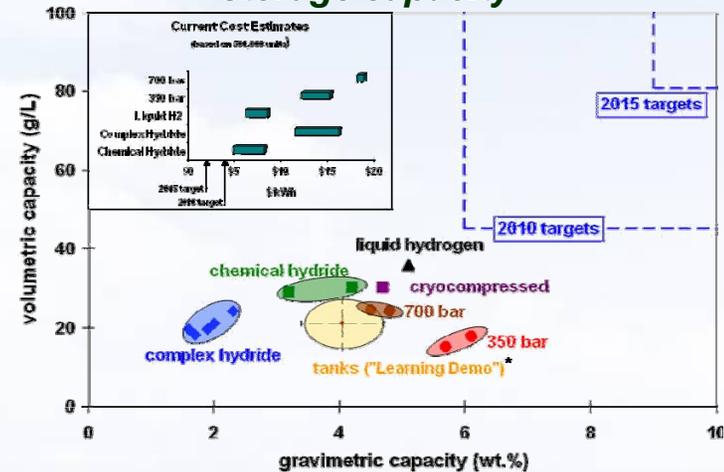
Fuel Cells

Lowered high-volume cost to 4X that of ICEs



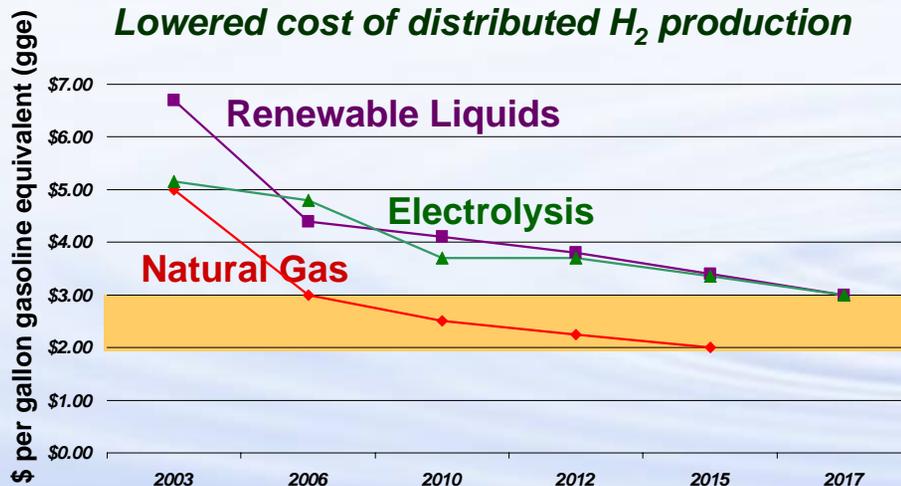
Hydrogen Storage Technology

Identified new materials with potential for high storage capacity



Hydrogen Production

Lowered cost of distributed H₂ production



Technology Validation

Obtained valuable data on FCVs and H₂ stations



69 vehicles, 10 stations in operation

Fuel cell durability:
Maximum: 950 hours

Range: 103 to 190 mi
(equivalent to EPA vehicle sticker rating)

Cost of hydrogen production: \$3.00/gge

Hydrogen Fuel Initiative Budget

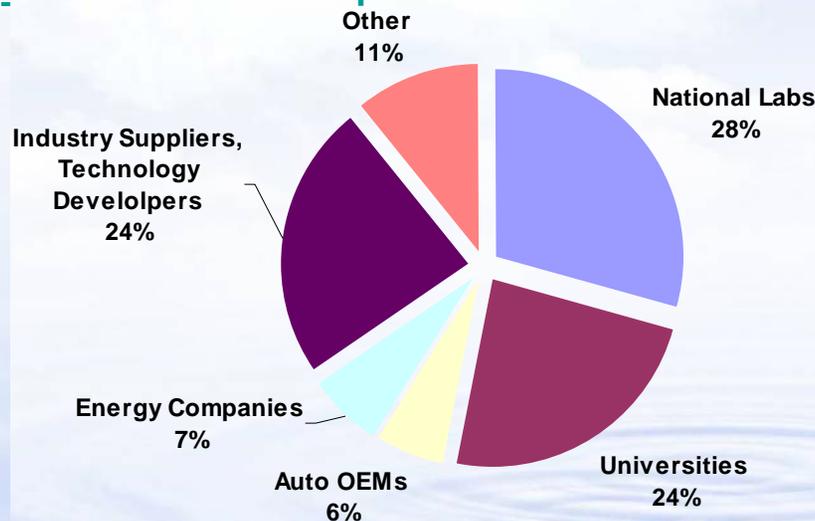
Hydrogen Fuel Initiative			
Funding (dollars in thousands)			
Activity	FY06 Approp.	FY07 Request	FY08 Request
EERE	153,451	195,801	213,000
FE	21,036	23,611	12,450
NE	24,057	18,665	22,600
SC	32,500	50,000	59,500
DOE Total	231,044	288,077	307,550
DOT	1,411	1,420	1,425
HFI Total	232,455	289,497	308,975

Key Activities focus on:

Technology Challenges

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

FY 2006 R&D Participants



Economic/Institutional Challenges

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

Program Evaluation

Annual Program Merit Review & Peer Evaluation

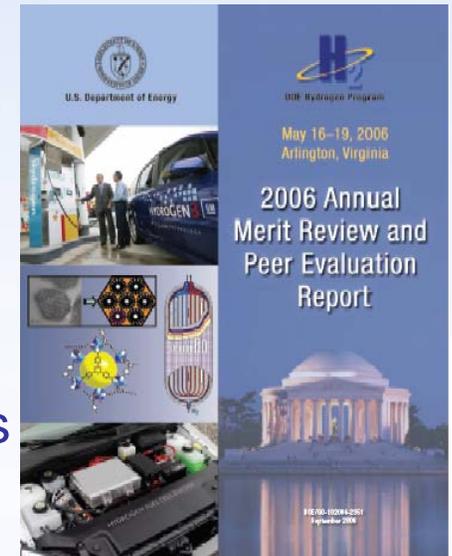
- Projects are rated by peers. Reviewers come from National Labs, Industry, and universities.
- Rating Criteria: relevance, approach, progress & tech transfer

FreedomCAR & Fuel Partnership

- Includes automobile and energy companies
- Technical Teams provide input on technical milestones & system needs, and review/evaluate projects:
 - ➔ Hydrogen Production
 - ➔ Hydrogen Delivery
 - ➔ Hydrogen Storage
 - ➔ Fuel Cells
 - ➔ Hydrogen Codes & Standards
 - ➔ Fuel Pathway Integration

National Academy of Sciences

- NAS reviews the program priorities & technical milestones, and evaluates progress toward achieving them.



***2007 Annual DOE Hydrogen
Program Merit Review and Peer
Evaluation Meeting
May 14-18, 2007 - Arlington, VA***

FreedomCAR and Fuel Partnership



ExxonMobil



Extensive External Coordination

Hydrogen R&D Task Force (Interagency - OSTP lead)

- Key mechanism for collaboration among 8 Federal agencies
- Provides guidance for agency research directions
- Identifies key areas for interagency collaboration



Federal/State/local (Example)

- California Fuel Cell Partnership
- California Hydrogen Highway Network



International Partnership for the Hydrogen Economy

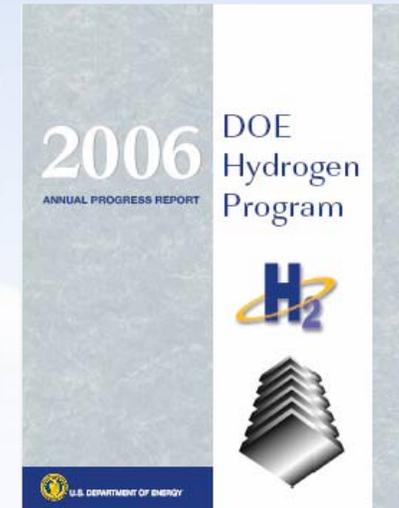
- Accelerates the development of hydrogen and fuel cell technologies to improve their energy, environmental and economic security.
- Provides a mechanism to organize, coordinate and implement effective, efficient, and focused international RD&D and commercial utilization activities
- Provides forum for advancing policies and common codes & standards
- Educates/informs stakeholders and the general public on H₂



For More Information

hydrogen.energy.gov

The screenshot shows the homepage of the DOE Hydrogen Program website. At the top, it features the U.S. Department of Energy logo and the text "hydrogen.energy.gov". A navigation menu includes "Home", "About", "DOE Participants", "International", "Library", and "News/Events". A search bar is located on the right. The main content area is divided into several sections: a sidebar on the left with a list of topics like "Hydrogen Production", "Hydrogen Delivery", and "Hydrogen Storage"; a central "Announcement" section titled "Peer Evaluation Report Focuses on Merit of DOE Hydrogen and Fuel Cell Projects"; a "News" section with the headline "Independent Review Panels Assess Progress Towards Technical Targets"; a "DOE Announces Hydrogen Funding Opportunity for Small Businesses" section; and a "DOE Loan Guarantee Program Promotes Innovative Technologies" section. On the right side, there is a "Features" section with a "President's Hydrogen Fuel Initiative" and an "ADVANCED ENERGY INITIATIVE" banner. The bottom left corner features the U.S. Department of Energy seal.



**Introductory fact sheets
available in the web site library**

All hard copy documents, fact sheets, CDs, etc. can be ordered free-of-charge