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

DOE Hydrogen and Fuel Cells Coordination Meeting

Steve Chalk, Program Manager
Hydrogen, Fuel Cells and Infrastructure Technologies

June 2-3, 2003

President Bush Launches the Hydrogen Fuel Initiative

"Tonight I am proposing $1.2 billion in research funding so that America can lead the world in developing clean, hydrogen-powered automobiles.

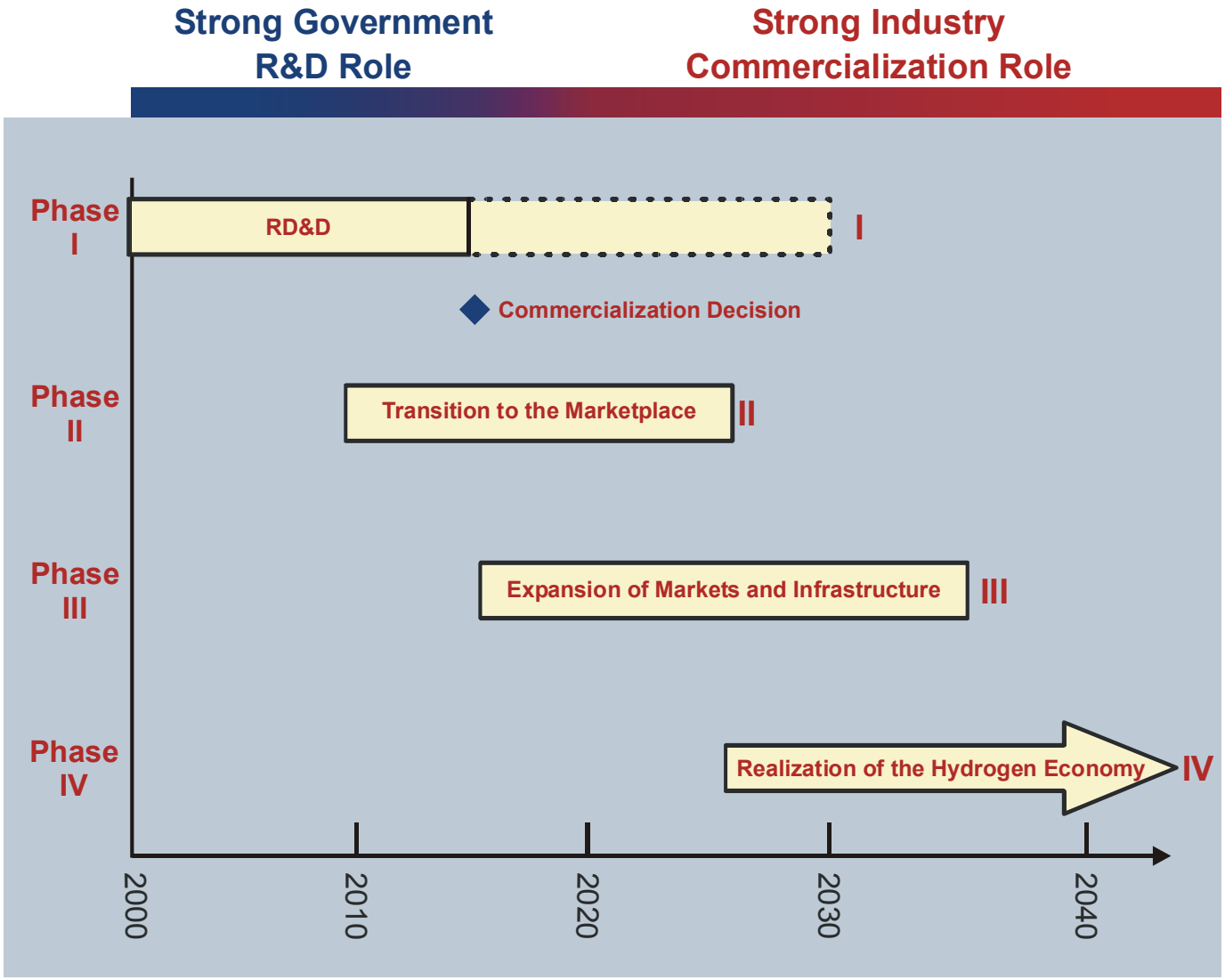
"A simple chemical reaction between hydrogen and oxygen generates energy, which can be used to power a car producing only water, not exhaust fumes.

"With a new national commitment, our scientists and engineers will overcome obstacles to taking these cars from laboratory to showroom so that the first car driven by a child born today could be powered by hydrogen, and pollution-free.

"Join me in this important innovation to make our air significantly cleaner, and our country much less dependent on foreign sources of energy."

2003 State of the Union Address
January 28, 2003

Timeline for Hydrogen Economy



Transitional Phases

I. Technology Development Phase

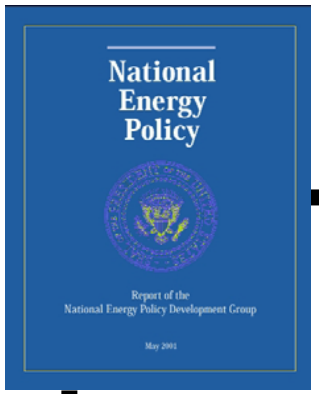
II. Initial Market Penetration Phase

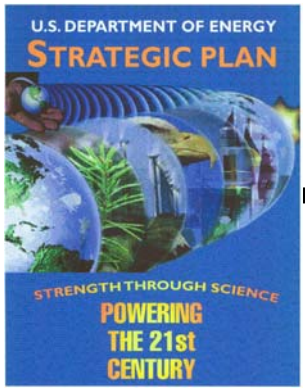
III. Infrastructure Investment Phase

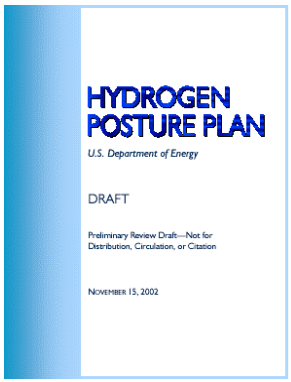
IV. Fully Developed Market and Infrastructure Phase

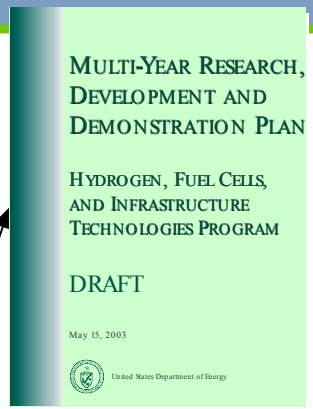
Planning

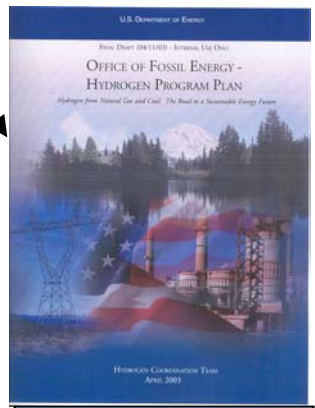
Policy







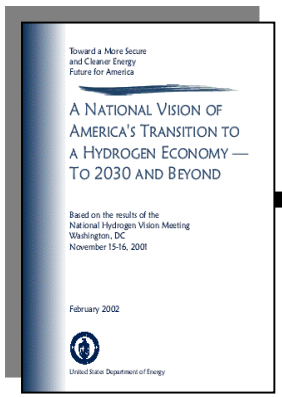


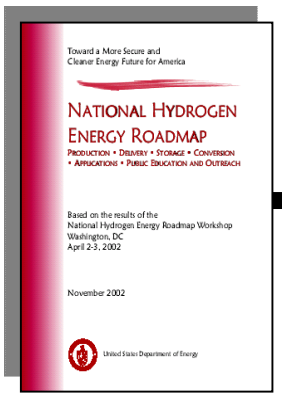


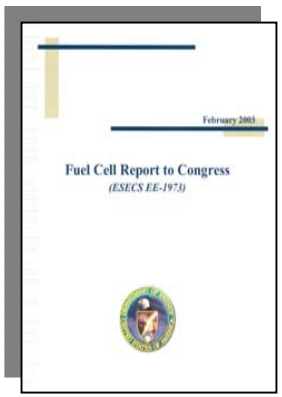
Nuclear Hydrogen Initiative Program Plan

DRAFT

Stake-holder Input







National Academy of Sciences Interim Report

- **Safety**
  The Committee recommended that DOE make significant efforts to address safety issues.
- **Systems Integration and Analyses**
  The academy recommends that R&D successes & failures be analyzed and modeled both as individual technologies, and as components parts of a greater system.
- **Exploratory Research**
  The Committee encouraged DOE to continue funding fundamental, exploratory research for promising, high-risk new technologies.
- **Organization**
  The Committee supports the DOE in its efforts to integrate various hydrogen-related RD&D programs, the Office of Science, and the private sector.

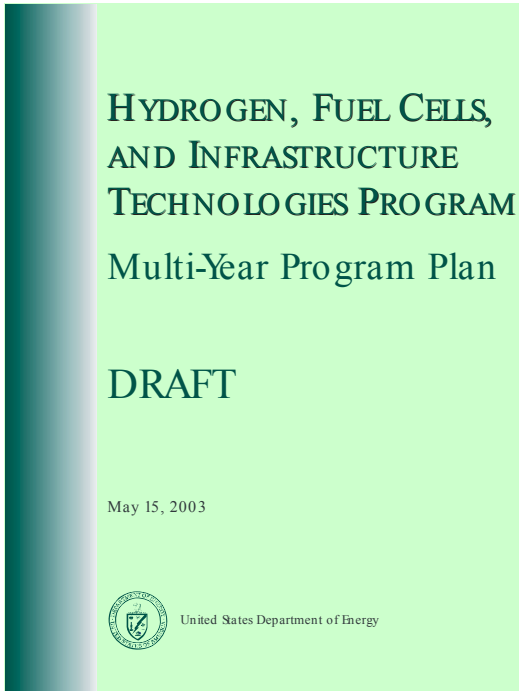
THE NATIONAL ACADEMIES
Advisers to the Nation on Science, Engineering, and Medicine

Find more information at www.nas.edu under BEES-J-02-04-A.

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

Draft Multi-year Research, Development and Demonstration Plan

- Introduction
- Program Benefits
- Technology Development and Management Approach
- Technical Plan
  - -Hydrogen Production
  - -Hydrogen Delivery
  - -Hydrogen Storage
  - -Fuel Cells
  - -Technology Validation
  - -Codes & Standards
  - -Safety
  - - Education
- Systems Integration & Analyses


HYDROGEN, FUEL CELLS, AND INFRASTRUCTURE TECHNOLOGIES PROGRAM

Multi-Year Program Plan

DRAFT

May 15, 2003

United States Department of Energy

www.eere.doe.gov/hydrogenandfuelcells

Program Strategic Performance Goals

Program Strategic Performance Goals	Status	Target
A. H2 production (natural gas – delivered)	$4.50/gge	$1.50/gge by 2010
B. H2 production (biomass – plant gate)	$3.60/kg	$2.60/kg by 2008
C. H2 storage energy density	1.2 kWh/kg 0.65 kWh/l	2.0 kWh/kg by 2010 1.5 kWh//l by 2010
D. Validate integrated H2 infrastructure project	$4.50/gge	$3.00/gge by 2008
E. Global technology regulation for H2 fuel cell vehicles and infrastructure	National plan under review	Draft technical specs. By 2007
F. Educate key target audiences on hydrogen	TBD	5% increase by 2008
G. Reduce cost - vehicle fuel cell power systems	$250/kW	$45/kW by 2010
H. Increase electrical efficiency of stationary fuel cell systems (natural gas)	<30%	≥40% by 2010
I. Validate fuel cell performance in systems context	1,000 hours durability	2000 hours durability by 2008

U.S. Department of Energy
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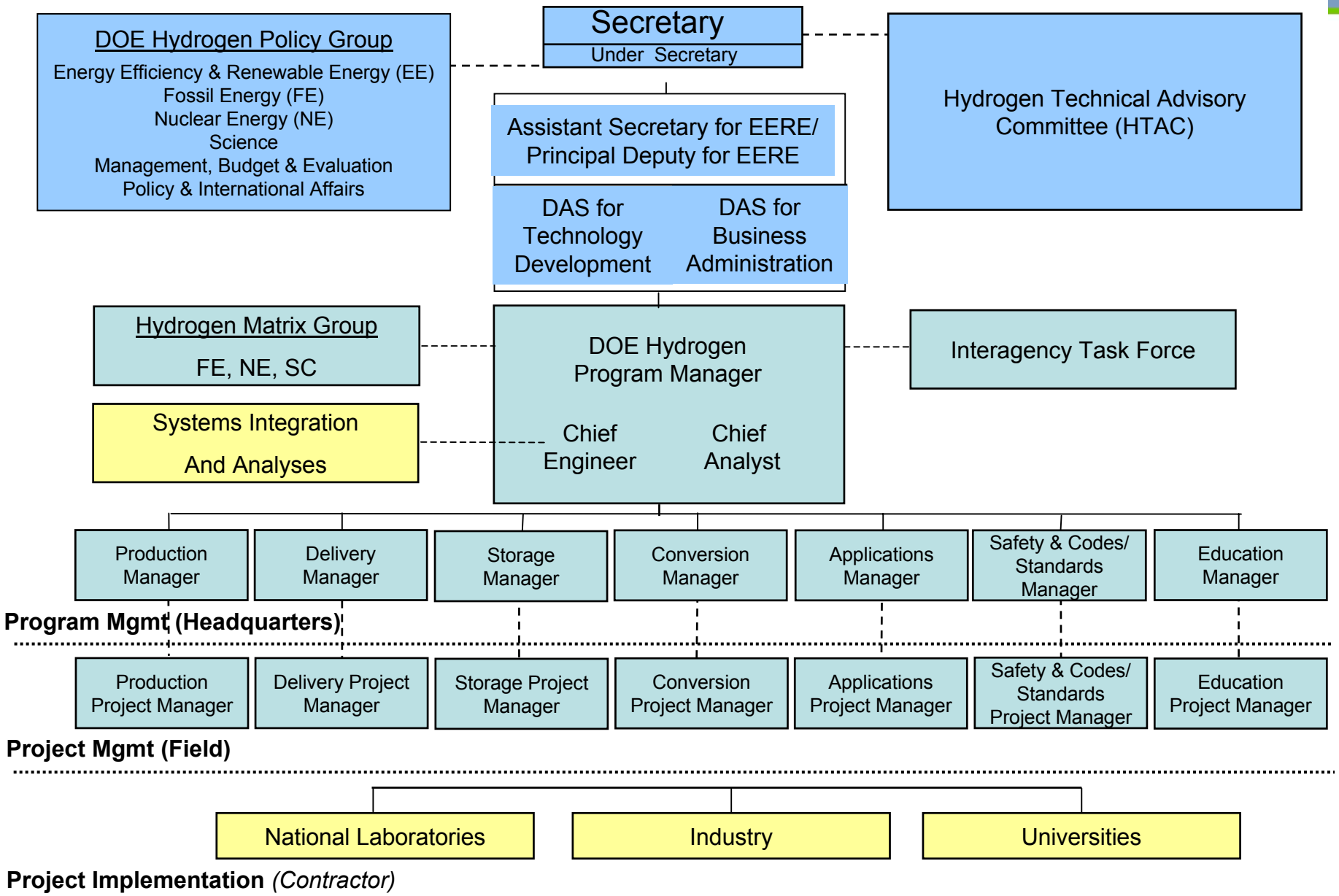
New Management Structure



Future Opportunities

"Grand Storage Challenge"	Solicitation to be announced in June 2003. Contact: JoAnn Milliken
Hydrogen Production	Solicitation: May 2003 Contact: Pete Devlin
Fuel Cells (Portable, Auxiliary, Off-Road)	Solicitation: April 9, 2003- June 5, 2003 Contact: Pat Davis/John Garbak
Codes/Standards	Solicitation:No immediate releases Contact: Neil Rossmeissel
Technology Validation and Demonstration	Solicitation: May 2003 Contact: Sig Gronich, John Garbak
Education	Solicitation: Late Summer 2003 Contact: Christy Cooper
FutureGen	Contact: Fossil Energy and the National Energy Technology Lab (NETL) Contact: Lowell Miller

Fuel Cell Technology

Key Activity	FY 03	FY 04		'05 Comments
Interior Appropriations in $ Millions				
Transportation Systems	**$7.3**	**$6.2**		Emphasis on balance of plant systems components such as air compressors, blowers, heat exchangers, sensors, and APU's
Distributed Generation Sys.	**$5.5**	**$7.5**		System durability issues, fuel processor integration and balance of plant component development
Stack Component R&D	**$12.6**	**$14.9**		Emphasize basic membrane materials Work advanced catalysts/non-precious Metal catalystsmaterials/manufacturing.
Fuel Processor R&D	**$20.9**	**$24.7**		
Technology Validation	**$0**	**$1.8**		Increase supports vehicle test and Evaluation program.
Technical Support	**$0.2**	**$0.4**		
TOTAL	**$46.7**	**$55.5**		

Hydrogen Technology

Key Activity	FY 03	FY 04		'05 Comments
Energy & Water Appropriations in $ Millions				
Hydrogen Production & Delivery*	**$11.2**	**$11.8**		Distributed natural gas reformers, and separation technologies, more emphasis on renewable production.
Hydrogen Storage	**$6.1**	**$11.3**		Critical path technology! Research on advanced concepts such as conducting polymers and nanostructured materials.
Infrastructure Validation	**$5.7**	**$10.1**		Supports hydrogen refueling stations in support for controlled fleet demonstration project.
Safety, Codes & Standards, Utilization	**$4.5**	**$4.8**		Develops critical engineering data for C&S and hydrogen safety.
Education and Cross-Cutting Analyses	**$1.4**	**$2.0**		Implements national campaign to communicate hydrogen benefits and barriers. Includes cross-cutting life cycle analysis.
TOTAL	**$28.9**	**$40.0**		

* *EERE program activities (excludes FE and NE for FY 2004 and FY 2005)*