

Federal Hydrogen Initiatives State and Regional Opportunities

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Strategies for the New Economy

Key Federal Government Renewable Energy Initiatives

- Energy Policy Act of 2005
 - \$4B for hydrogen/fuel cell R&D and demonstrations
- President's Hydrogen Fuel Initiative/FreedomCar
 - \$1.2B over five years
 - Hydrogen-powered fuel cells for transportation/electricity generation
 - Hydrogen-powered vehicles
- President's Advanced Energy Initiative
 - Hydrogen fuel-cells
- Energy Independence and Security Act of 2007
- ARPAe (America COMPETES Act)

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Opportunity for States and Regions

- New state/regional economic development opportunities with alternative energy hubs
 - Create high quality jobs
 - Economic development, capital retention, new sources of income
 - Centers of excellence attract global capital and business
 - Participate in next big global industry

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Support for Alternative Energy Hub Development

- Basic and applied research, research centers
- Technology development and demonstration
- Public infrastructure/economic development facilities (business incubators and eco-industrial development)
- Technical and planning assistance
- Linking universities to economic development
- Selling to the government (purchasing preferences)
- STEM education/energy industry worker training

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Vision for the Hydrogen Economy

An economy whose energy infrastructure uses hydrogen as the primary energy carrier.

“Today we have a hydrocarbon economy. Tomorrow we will have weaned ourselves from carbon and will live in a “hydrogen economy.” In the hydrogen economy... America will enjoy a secure, clean, and prosperous energy sector that will continue for generations to come. American consumers will have access to hydrogen energy to the same extent that they have access to gasoline, natural gas, and electricity today. It will be produced cleanly, with near-zero net carbon emissions, and it will be transported and used safely. It will be the ‘fuel of choice’ for American businesses and consumers. America’s hydrogen energy industries will be the world’s leaders in hydrogen-related equipment, products, and services.”

—*National Vision for America’s Transition to a Hydrogen Economy*

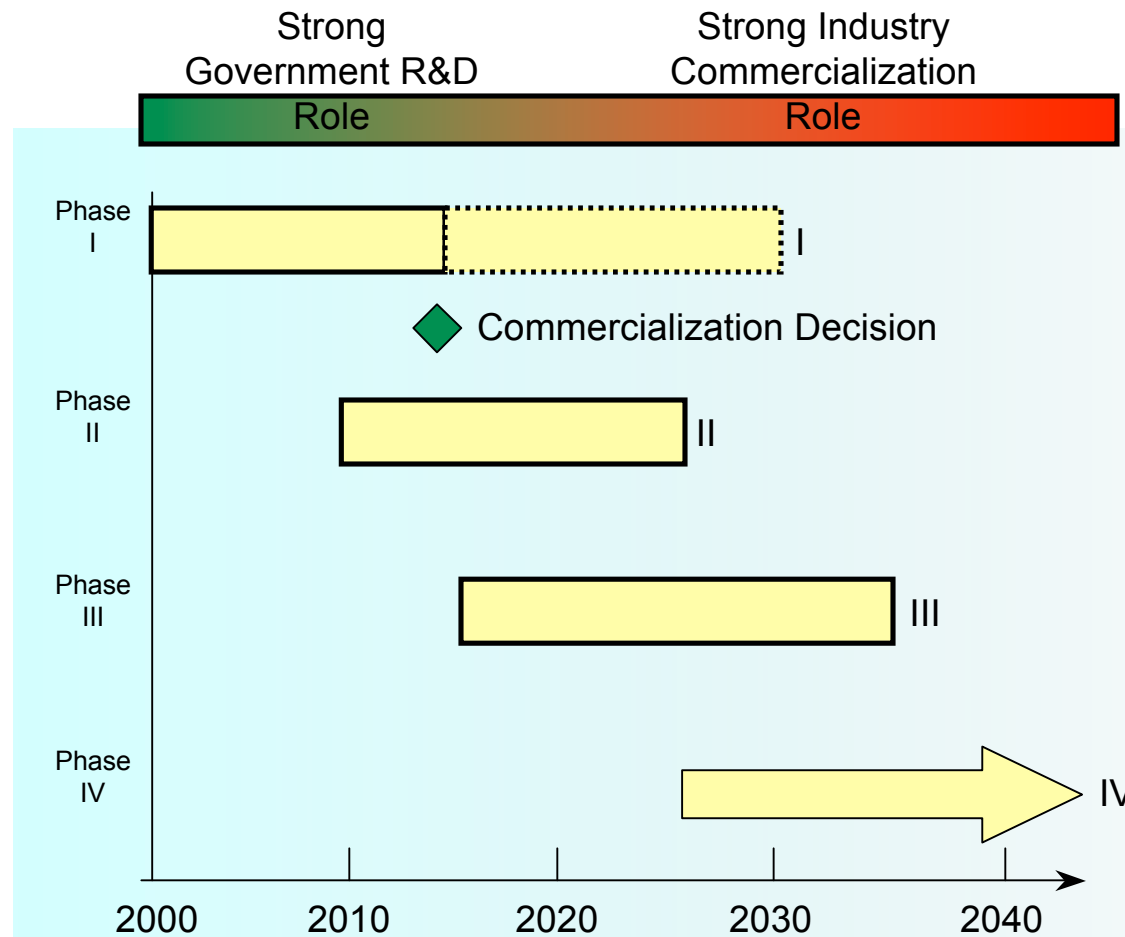
U.S. Department of Energy

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Transition to a Hydrogen Economy

- **Phase I: Progress in Technologies, Policies & Markets**
- **Phase II: Transition to the Marketplace**
- **Phase III: Expansion of Markets & Infrastructure**
- **Phase IV: Realization of the Hydrogen Vision**

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Hydrogen Economy Timeline

First Commercial Fuel Cell Vehicle?

DOE: 2020

GM: 2010

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Challenges to Achieving a Hydrogen Economy

- Hydrogen production
 - Hydrogen distribution
 - Hydrogen storage
 - Fuel cells
 - durability, reliability, manufacturability, ability to recycle
 - Infrastructure cost
 - Service infrastructure
 - facilities, tools, trained technicians
 - Consumer acceptance/learning
 - Safety, codes and standards
- Technical and Cost

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Hydrogen Fuel Initiative FY 09 Budget Request

DOE/EERE - Hydrogen	\$146M
DOE/EERE - Vehicle Technologies	\$ 31M
DOE/Nuclear Energy	\$ 16M
DOE/Fossil Energy	\$ 11M
DOE/Office of Science	\$ 60M
Department of Transportation	\$ 1M
Total	\$ 267M

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DOE/EERE Hydrogen Funding

(in millions)

FY07

FY08

FY09

Hydrogen Production and Delivery	33.7	39.6	0
Hydrogen Storage	33.7	43.5	59.2
Fuel Cell Stack Components	37.1	43.6	62.7
Technology Validation	39.4	29.7	0
Transportation Fuel Cell Systems	7.3	7.9	6.6
Distributed Energy Fuel Cells Systems	7.2	7.3	10.0
Fuel Processor R&D	3.9	2.9	0
Safety/Codes and Standards	13.4	15.8	0
Education	1.9	3.8	0
Systems Analysis	9.6	11.3	7.7
Manufacturing	1.9	4.9	0
TOTAL, Hydrogen Technology	189.5	211.0	146.2

Current Program Highlights

- Basic hydrogen research (Office of Science)
- Priority: hydrogen storage/fuel cells
 - Centers of Excellence (materials R&D)
 - Competitively selected independent projects
- Priority: demonstrating hydrogen fuel cell vehicles
 - Hydrogen fleet and infrastructure demonstration and validation
- Operation of fueling stations for fuel cell vehicles
- Development/demonstration of distributed energy fuel cell systems

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Funding Opportunities

- FY 08 new competitively-selected Engineering Center of Excellence (\$1.5M)
 - Engineering models, analysis, data for systems and component design
 - Thermal management
- FY 09 solicitation for materials concepts for hydrogen storage (\$5.8M)
- Heavy earmarking

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DOE Innovative Technologies Loan Guarantee Program

- Early commercial projects that avoid, reduce or sequester air pollutants or greenhouse gas emissions and “employ new technologies”
- Eligible applicants: private firms, partnerships, associations, societies, joint ventures, state and local governments
- Loan guarantee pool: *\$7 billion for FY 08*
- Covers up to 100% of eligible project costs and 80% of loan amount; no award ceiling
- Eligible costs: Property acquisition or lease, engineering, architectural, construction, legal, bond and insurance fees, cost of equipment, etc.
- Does NOT support pilot or demonstration projects

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Other Funding Sources

- DOE SBIR (Phase 1 \$100K, Phase 2 \$750k)
- DOD/DARPA
- National Science Foundation
 - Energy for Sustainability
 - STEM education/curricula development
- DOC: Technology Innovation Program
- DOC: Economic Development Administration
 - Public infrastructure/economic development facilities (business incubators and eco-industrial development)
 - Technical and planning assistance
 - Assistance in economic development strategy planning
 - Support for linking universities to economic development
- Labor Department
 - Employee training (energy sector a priority)

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Key Elements of an Alternative Energy Economic Development Strategy

- Benchmarking against other states/regions
- Research and technology development
- Technology transfer and commercialization
- Infrastructure investment
- Business assistance for start-up, expansion
- Recruitment: research top guns, businesses
- Workforce training
- Procurement/purchasing preferences

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Key Elements of an Alternative Energy Economic Development Strategy

- Financing (Federal, State, Private Seed and VC)
- Develop Federal R&D funding plan:
 - Competitive opportunities
 - Building relationships with program managers
 - Congressionally-directed funding to fill gaps
 - Shape funding agenda and policy environment
- Establish funding opportunity monitoring capability
- Seek state funding pool for matching Federal funds

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Case Study

Kettering University Center for Fuel Cell Systems & Powertrain Integration

- Developed Strategy
- Built Alliances
- Sought Funding from Multiple Sources:
 - Federal, State, Private
 - R&D
 - Construction
 - Economic Development
 - Education
 - Congressionally-directed funding

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*"We need the windmills to power the government offices
that file for federal grants that fund the windmills!"*

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