

Hydrogen and Fuel Cell Early Markets

NASEO Fall Meeting
September 12, 2007



SESSION OVERVIEW

I. DOE Perspective

- What are the early markets?
- DOE activities

II. State Panel

- Hawaii
- Ohio
- New York

III. Wrap up, Discussion, Q&A

Hydrogen and Fuel Cell Early Markets – DOE Perspective



DOE Hydrogen Program

Patrick Davis

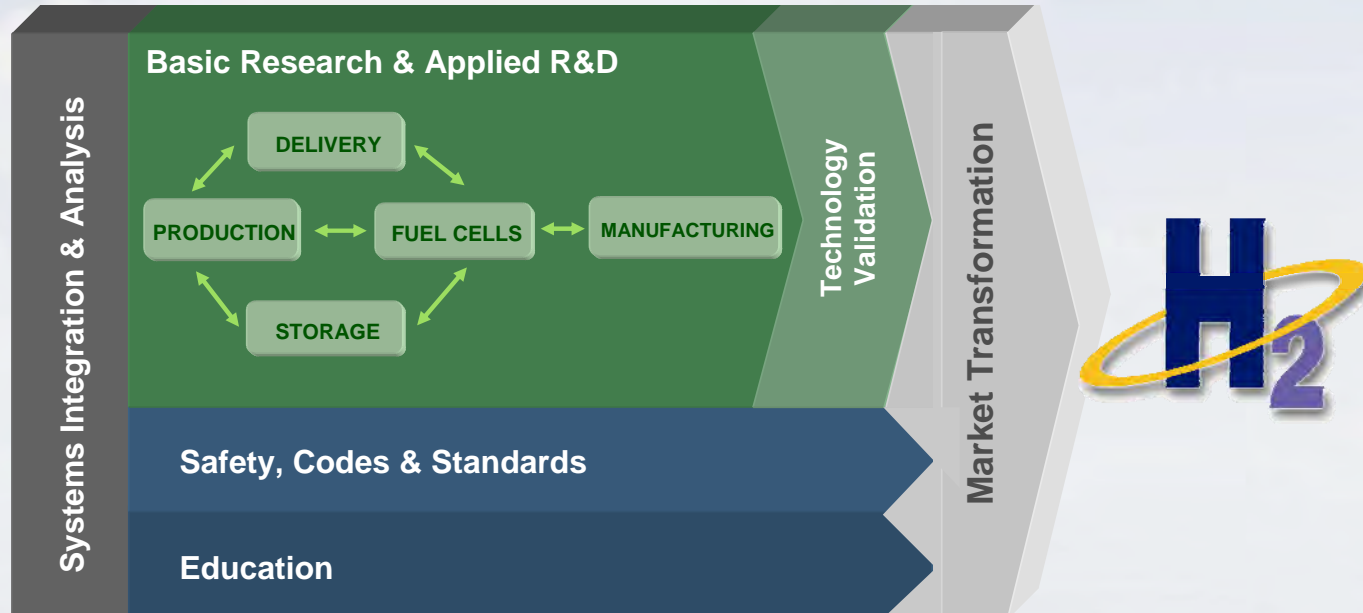
*U.S. Department of Energy
Office of Energy Efficiency and
Renewable Energy*





ABOUT THE PROGRAM

Key activities



Market Transformation

Facilitate deployment of commercially available fuel cells in early market applications for which there is a business case.



ABOUT THE PROGRAM

Market Transformation Strategy

- **Work with other Federal agencies, state and local governments, and industry to facilitate deployment**
- **Initiate integrated renewable hydrogen projects with states and industry**
- **Educate and inform safety and code officials, potential end-users, state/local government representatives, and investors**



Maintain core R&D program – fuel cells, hydrogen storage, hydrogen production and delivery, manufacturing



EARLY MARKETS

A report completed for DOE by Battelle Memorial Institute assesses and identifies key early markets for PEM fuel cell systems.

See:

www.eere.energy.gov/hydrogenandfuelcells/fc_publications.html



Identification and Characterization of Near-Term Direct Hydrogen Proton Exchange Membrane Fuel Cell Markets



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Battelle
The Business of Innovation

What Are the “Early Markets?”

- Material handling equipment (forklifts) and specialty vehicles (ground service equipment)
- Back-up power (telecommunications, utilities, financial institutions)
- Prime power (on and off-grid)
- Portable power (first response and military applications)

Find Commercially Available

Hydrogen and Fuel Cell Products –

U.S. Fuel Cell Council: www.usfcc.com

National Hydrogen Association: www.hydrogenassociation.org



EARLY MARKETS

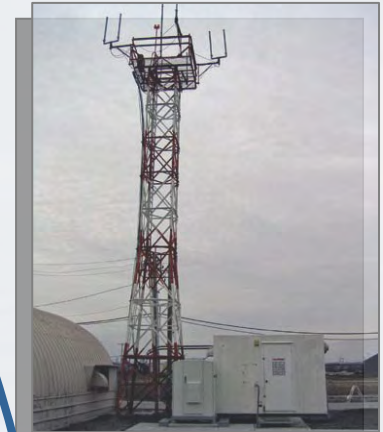
Focus: Backup Power

Fuel cells for backup power:

- Provide longer continuous run time, greater durability than batteries
- Require less maintenance than generators
- Offer cost savings over batteries and generators

Fuel cell technology is cost-competitive today...

	OUTDOOR INSTALLATIONS			INDOOR INSTALLATIONS		
	BATTERY/ GENERATOR	PEM FUEL CELL WITHOUT TAX INCENTIVE	PEM FUEL CELL WITH TAX INCENTIVE	BATTERY ONLY	PEM FUEL CELL WITHOUT TAX INCENTIVE	PEM FUEL CELL WITH TAX INCENTIVE
8-hour run time				\$19,037	\$14,023	\$12,136
52-hour run time	\$61,082	\$61,326	\$56,609			
72-hour run time	\$47,318	\$33,901	\$32,014			
176-hour run time	\$75,575	\$100,209	\$95,491			



A 1-kW fuel cell system has been providing power for this FAA radio tower near Chicago for more than 3 years.

Photo courtesy of ReliOn

Source: Battelle Memorial Institute

* Additional cost for PEMFCs at 176-hour run time is due primarily to the cost of hydrogen storage



EARLY MARKETS

Focus: Material Handling Equipment

Fuel cells for material handling equipment:

- Allow for rapid refueling – much faster than changing out or recharging batteries
- Provide constant power – without voltage drop
- Eliminate the need for space for battery storage and chargers

Fuel cell technology is cost-competitive today...

	3kW PEM FUEL CELL PAIRED WITH INTEGRAL NiMH BATTERY, FOR PALLET TRUCKS*		
	BATTERY-POWERED (2 batteries per truck)	PEM FUEL CELL-POWERED, WITHOUT INCENTIVE	PEM FUEL CELL-POWERED, WITH INCENTIVE
Net Present Value of Capital Costs	\$17,654	\$23,835	\$21,004
Net Present Value of O&M Costs (including the cost of fuel)	\$127,539	\$52,241	\$52,241
Net Present Value of Total Costs of System	\$145,193	\$76,075	\$73,245

Source: Battelle Memorial Institute



Photos courtesy of East Penn Mfg. and Nuvera

East Penn Manufacturing converted all 10 of its electric reach trucks at its Topton, PA distribution center to fuel cell power, in partnership with Nuvera Fuel Cells.





Bimonthly Calls for States & State/Regional Initiatives

Hosted by DOE, National Hydrogen Association, and Clean Energy Group

- **What:** Brief presentation from expert on a topic of interest – e.g., forklifts as an early market application; questions and discussion
 - *Annual in-person meeting at NHA Annual Hydrogen Conference (next in Sacramento, CA – March 30-April 3, 2008)*
- **When:** 2nd Wednesday of every other month, 12pm EST (45min – 1hour)
 - *Expert presentation = 20 min; remaining time = Q&A and discussion*
- **For more information:** www.eere.energy.gov/hydrogenandfuelcells/states
 - *Find previous speaker presentations, information about upcoming calls*
 - *Next call: TODAY (12pm EST, 301-903-9192) – Topic: A Case Study: Connecticut*

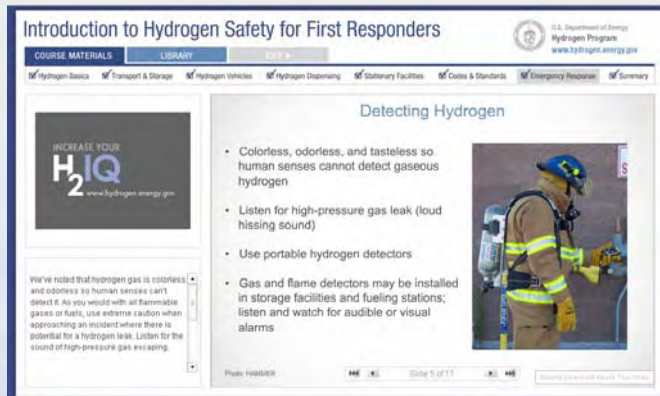


DOE Activities Information Resources

Visit www.hydrogen.energy.gov or call the DOE Information Center at [877-EEERE-INFO/877-337-3473](tel:877-EEERE-INFO/877-337-3473) for copies of DOE hydrogen and fuel cell information resources



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FOR MORE INFORMATION

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