

H2L3: Hydrogen Learning for Local Leaders



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Technology Transition
Corporation
June 10, 2010

ED014

Overview

Timeline

- Start - October 2008
- Complete - August 2011
- Completion - 50%

Budget

- Total project funding
 - DOE share - \$393,400
 - Contractor share - \$42,687 (14%)
- Funding for FY09
 - \$208,834
- Funding for FY10
 - \$95,000

Barriers

Barriers addressed

- A. Lack of readily available, objective and technically accurate information
- B. Mixed messages
- C. Disconnect between H2 information and dissemination networks
- D. Lack of educated trainers and training opportunities

Partners

- Public Technology Institute (PTI)
- Schatz Energy Research Center, Humboldt State University
- TTC, *Project lead*

Objectives - Relevance

Period Addressed: June 2009-June 2010

Objective: Curriculum Development

- Create presentation materials tailored to effectively communicate with state and local government leaders...Relate hydrogen to their interests and spheres of responsibility.

Relevance

- Narrows gap in hydrogen understanding -- makes it available and meaningful for officials making real decisions that affect hydrogen technology deployment
 - Addresses Barrier A *Lack of information resources*
- Provides a perspective for local leaders to understand how hydrogen is part of an energy portfolio
 - Addresses Barrier B *Mixed messages*

Objectives - Relevance

Period Addressed: June 2009-June 2010

Objective: Dissemination Path

- Establish pathways for working with national associations of state and local officials as route for disseminating information about hydrogen....Set pattern for on-going information flow.

Relevance

- Connects hydrogen information with existing dissemination networks through PTI and NASEO
 - Addresses Barrier C *Disconnect with dissemination networks*
- Establishes venues for in-person training opportunities for state and local officials, including train-the-trainer programs.
 - Addresses Barrier D *Lack of trainers and opportunities*

Objectives - Relevance

Period Addressed: June 2009-June 2010

Objective: National Venue

- Launch learning sessions by conducting initial workshops for local and state officials at national gatherings....Achieve nationwide reach

Relevance

- Efficient framework for spreading information to nationwide audience
- Information tailored to be useful for state and local decision makers
- Forges links with on-going dissemination networks
- Lays ground work for on-going training opportunities
 - Addresses Barriers A,B,C,D

H2L3's Guiding Approach...

Communicate with state & local officials by
working with them,
not talking “at” them

“Working With” Approach	Status
Advisory Council of State and Local Officials to provide input to curriculum	✓ done
Arrange workshops at national meetings of state and local officials	✓ done
Peer presenters of case study at workshops	✓ done
Participant feedback	✓ done

Accomplishments

Core Curriculum	<ul style="list-style-type: none">• Comprehensive, basic presentation developed to communicate with audiences of state and local officials• Curriculum trimmed or modified to tailor further for specific audiences as needed
Advisory Committee of Local & State Officials	<ul style="list-style-type: none">• Local: Public Technology Institute members• State: National Association of State Energy Officials members• Review and input for curriculum
Peer Presenter	<ul style="list-style-type: none">• Local case study of hydrogen projects presented by audience peer as part of curriculum
Hydrogen 101 Workshops	<ul style="list-style-type: none">• Workshops (3) launched at annual national meetings of Public Technology Institute and NASEO annual conference

Accomplishments

<p>U.S. Market Report: Hydrogen and Fuel Cells</p>	<ul style="list-style-type: none">• Completed aggressive schedule of research covering 57 different sectors of the hydrogen and fuel cell industries.• Peer reviewed, endorsed by NHA, Published• www.hydrogenassociation.org/marketreport
<p>Hydrogen Learning for Local Leaders Breakfast @ NHA Conference w/ CaFCP</p>	<ul style="list-style-type: none">• Informal networking breakfast targeted to southern CA local leaders• Used an unconventional, non-presentation based approach by mingling experts with local leaders to create intimate conversations• Very successful. Allowed questions to emerge organically and multiple future opportunities.
<p>Hydrogen Business Solutions Forum @ NHA Conference</p>	<ul style="list-style-type: none">• Peer-to-peer series of presentations presented by current users of fuel cells for current and potential users of fuel cells.• www.hydrogenconference.org/h2fcForum.asp

Accomplishments

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<p>Hydrogen Student Design Contest</p>	<ul style="list-style-type: none">•challenged teams of university students from around the world to plan and design the basic elements of a hydrogen community in Santa Monica, CA.•32 teams registered, 12 submitted designs•3 winning teams presented designs at NHA Hydrogen Conference and Expo in Long Beach, CA•1 winning team will present at WHEC in Essen, Germany

Hydrogen Production

Estimated Common Hydrogen Prices (scf)

	Liquid H2 Pricing (ccf)	
Volume Range (scf/mo)	East	West
100,000-300,000	\$1.65	\$2.40
300,001 – 600,000	\$1.50	\$2.20
600,000 – 1MM	\$1.35	\$1.90
1MM+	\$1.15	\$1.65

	Common Sales Volume (scf/mo)
Liquid H2	300,000-500,000
Gaseous H2	50,000-70,000

	Gaseous H2 Pricing (ccf)	
Volume Range (scf/mo)	East	West
50,000-100,000	\$4.35	\$4.65
100,001 – 200,000	\$4.15	\$4.45
200,001-300,000	\$3.95	\$4.25

Capacity of large tube trailer:
70,000 scf

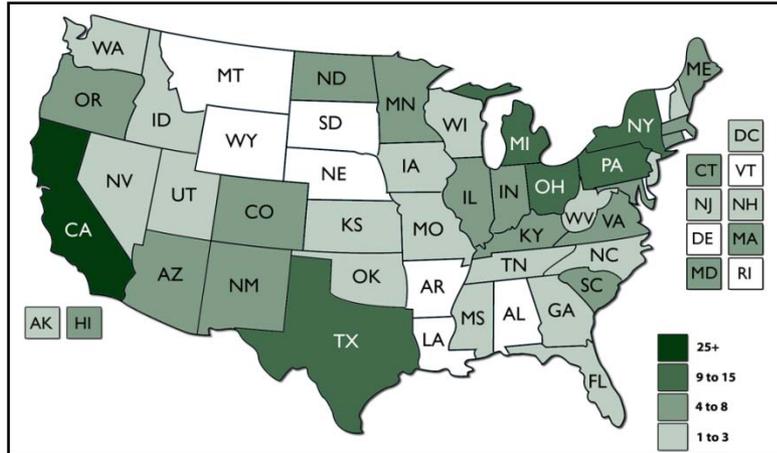
Capacity of liquid H2 trailer
1.2 million scf

Notes: Data based on estimates derived from industry. Includes delivery costs. Does not include equipment rental costs. scf: standard cubic feet; hscf: hundred standard cubic feet

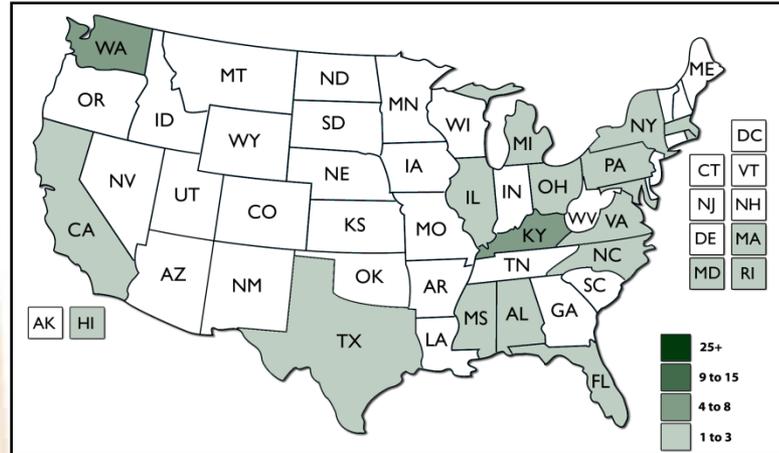
Electrolyzers and Reformers

2002-2008

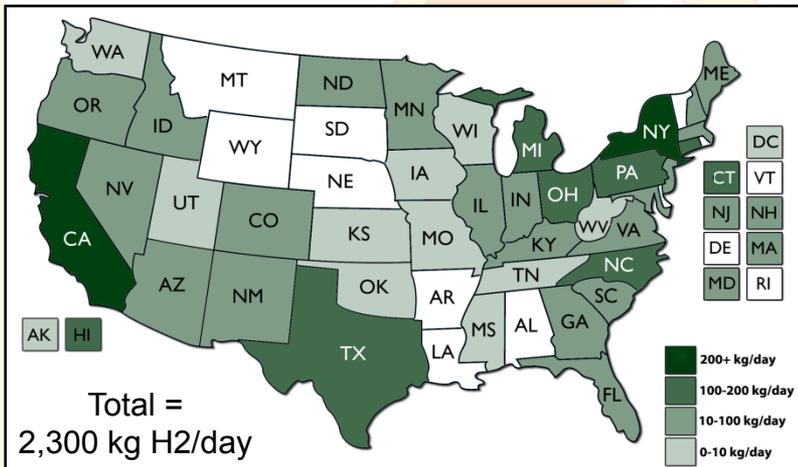
Electrolyzers: Installed Units



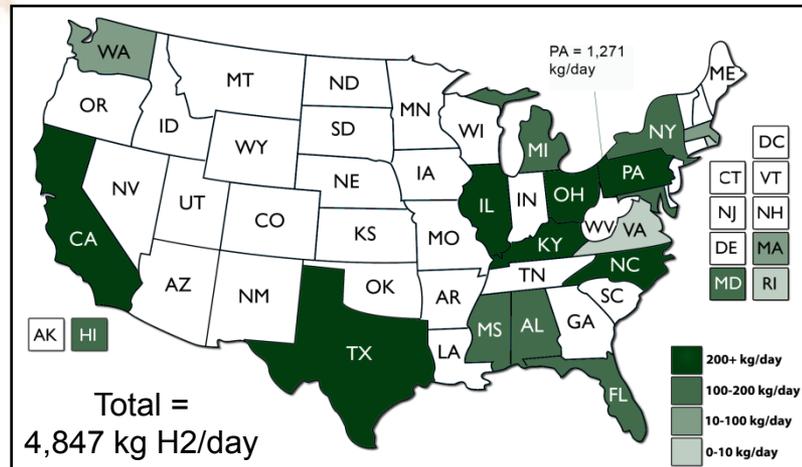
Reformers: Installed Units



Electrolyzers: Installed Capacity



Reformers: Installed Capacity



Light-duty Hydrogen Vehicles

2008

Category	<u>Projections</u>
Vehicles on the Road	210 vehicles
Miles Driven	1,100,000 miles
Hydrogen Used	26,000 kg
Hydrogen Fuelings	11,000 fuelings
Drivers	8,700 drivers
Employees (FTEs, US-only)	800+ employees

Some '08 averages:

44 miles/kg is the average fuel economy for vehicles in operation

5,400 miles were traveled per vehicle

51 fuelings completed per vehicle

120 kilograms of hydrogen dispensed per vehicle

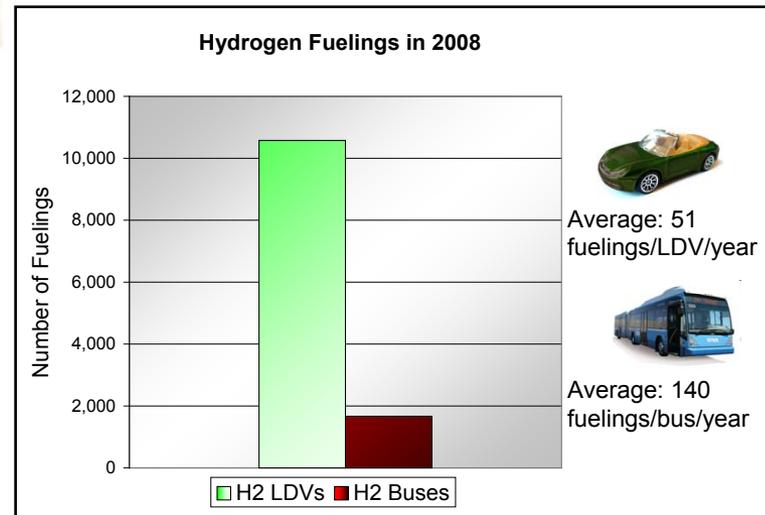
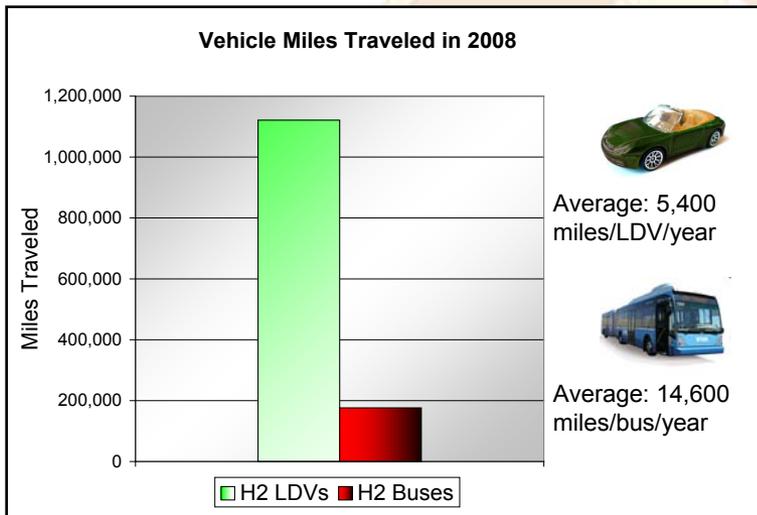
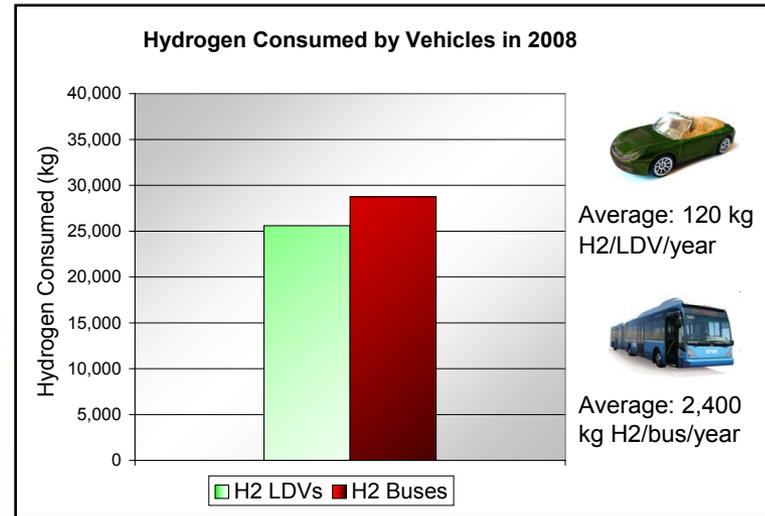
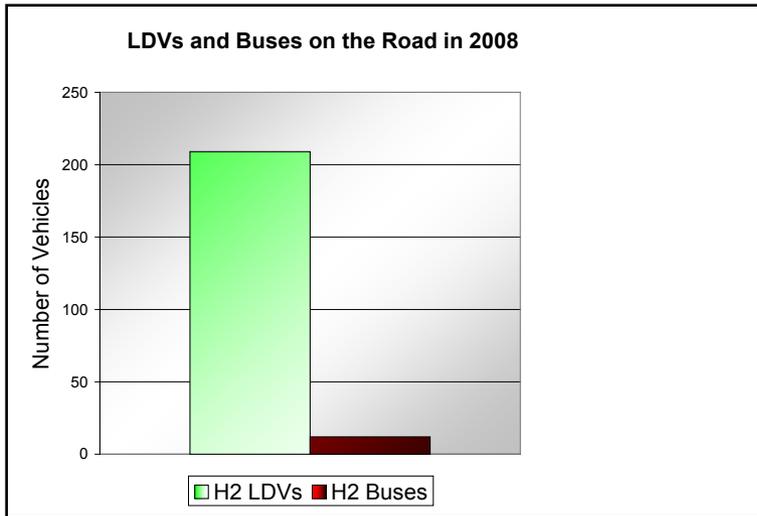
42 drivers drove each vehicle

130 miles were driven per driver

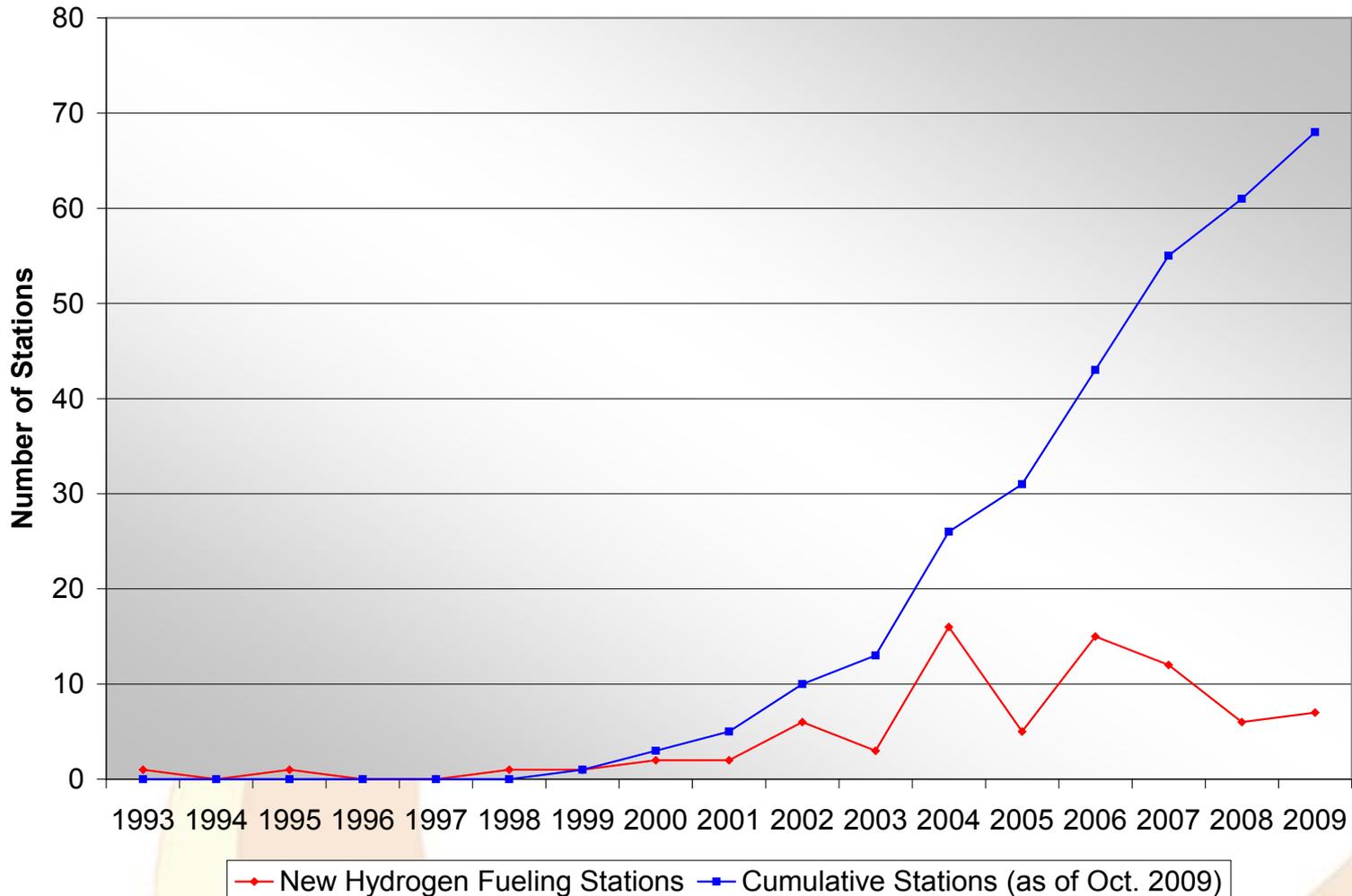
2.4 kg/fueling

Notes: Includes data on ICE and fuel cell vehicles. Includes liquid and gaseous hydrogen fuelings. Some vehicles entered operation partway through 2008. Term light-duty used to indicate vehicle classes 1-2, or up to 10,000 lbs by GVW. This data is rounded to two significant digits. The averages were calculated from the raw data set and may therefore differ slightly from the rounded data in the table.

Light-duty - Heavy-duty Hydrogen Vehicle Comparisons 2008



New and Cumulative Hydrogen Fueling Stations

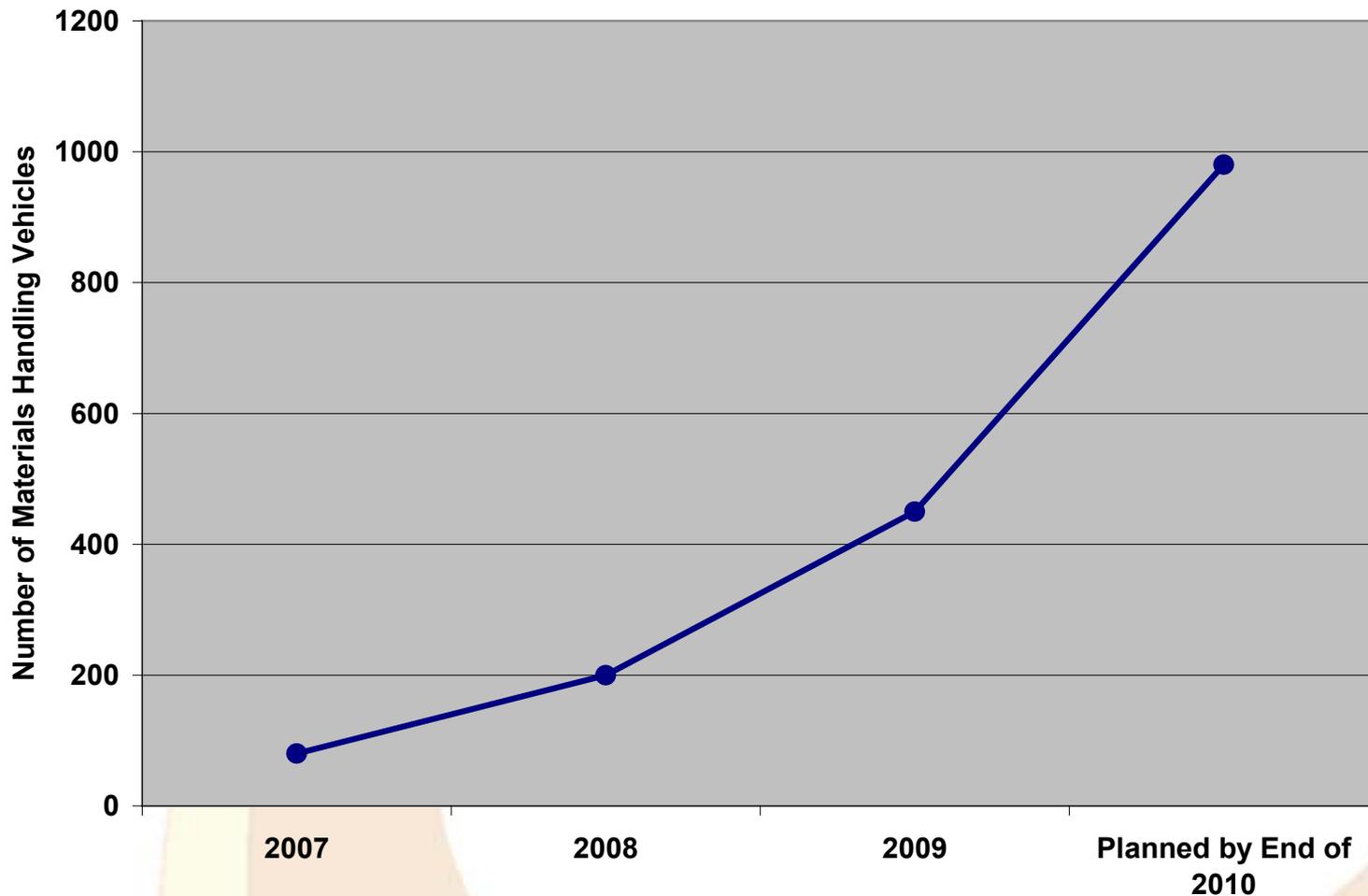


As of 31 October, 2009

Hydrogen Materials Handling Vehicles

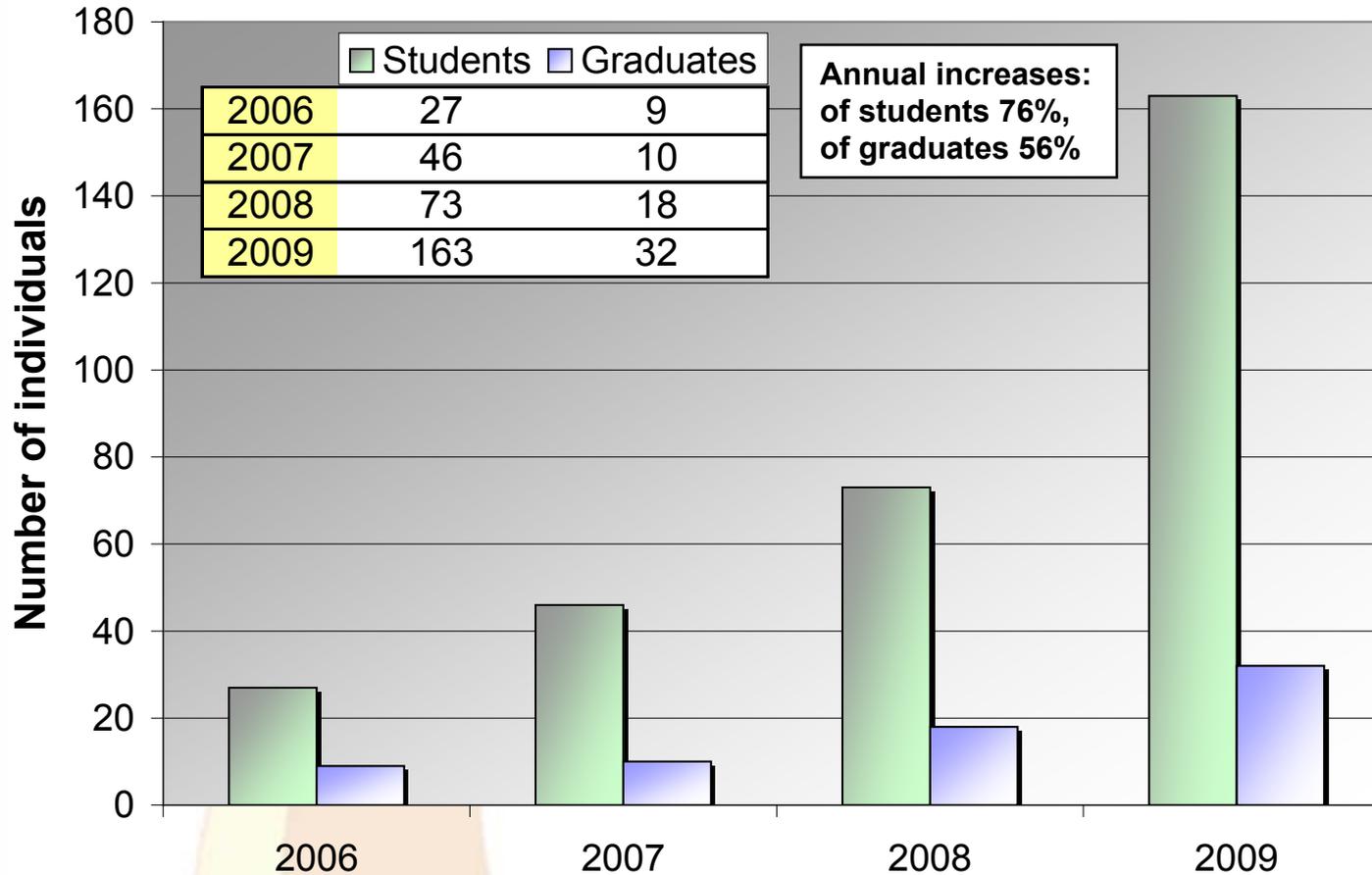
Total Installed Vehicle Base

United States, 2007-2009 and Known Planned Vehicles



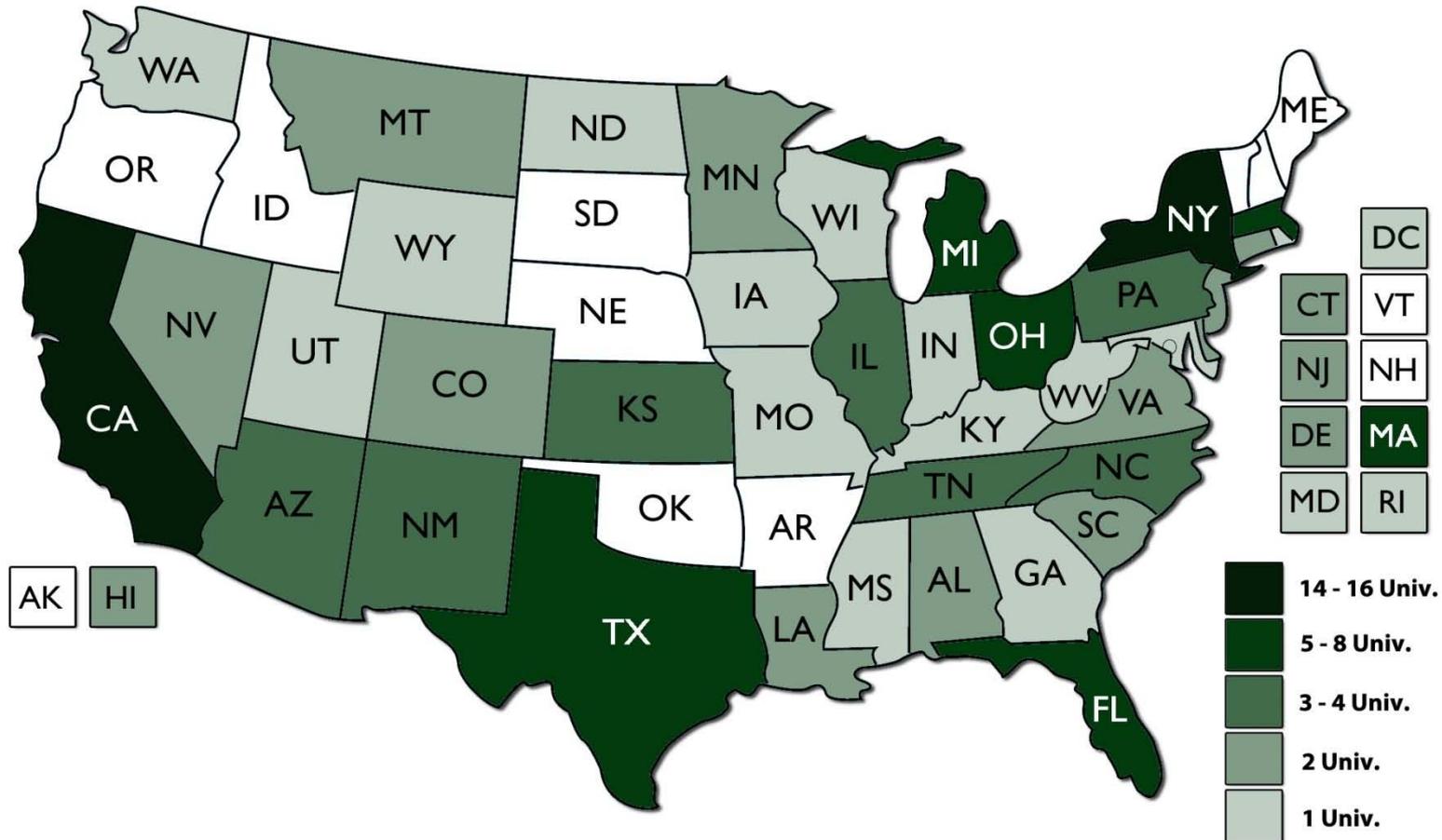
Students and Graduates

Hydrogen/Fuel Cell-Related Degrees



Educational Institutions

Offering Courses in Hydrogen/Fuel Cell-Technology
(excluding community colleges) Aggregated Per State



Sources: TTC, U.S. Dept. of Energy – EERE, Fuel Cells 2000

U.S. Hydrogen and Fuel Cell Employment Data

2008

Hydrogen Jobs in the U.S. (2008) by Category

Merchant Hydrogen Production	2,300
Electrolyzer and Reformer Industry	527
Automobile Industry	800
Stationary and Materials Handling Fuel Cell Manufacturing*	850
University	2,300
Total Jobs for Specific Categories Included in Report	6,777

*Includes PEM fuel cells for stationary and materials handling applications only; does not include portable, military, or other transportation applications.

Note that table includes data from sectors of hydrogen economy covered in this report only, and the total figure is in no way representative of the entire U.S. hydrogen employment in 2008 as multiple significant categories are excluded from cover, such as various components manufacturers, consultancy, etc.

Hydrogen Learning for Local Leaders

Monday, May 3, 2010

Hyatt Regency Long Beach

7:30am-9:00am

Coffee and networking at 7:30am, breakfast at 8:00am



You are invited to a private breakfast for Southern California local leaders, co-hosted by the California Fuel Cell Partnership and the US Department of Energy. Learn more about the role that fuel cells and hydrogen can play in your community.

Please RSVP by April 30th to bcarranza@cafcop.org



For more information visit, www.cafcp.org/localbreakfast

Hydrogen Business Solutions Forum

- Info to be added
- Event was on May 3

2010 Hydrogen Student Design Contest

- 2010 Contest: Design a hydrogen community in Santa Monica, CA.
- one scalable hydrogen fueling station; renewable hydrogen sources; and customers for early market hydrogen applications.
- United States, Canada, Bangladesh and Ukraine
- Grand Prize: Missouri University of Science and Technology
- HM: University of Waterloo and the National University of Kyiv (Ukraine)
- www.HydrogenContest.org



Collaborations

- Partners
 - Schatz Energy Research Center - primary developer and presenter of workshop curriculum
 - Public Technology Institute - liaison with national organizations representing local and state officials, arranging workshop opportunities
 - Technology Transition Corporation - project coordinator, liaison with hydrogen industry, through its clients: National Hydrogen Association (NHA), Hydrogen Education Foundation (HEF) and Partnership for Advancing the Transition to Hydrogen (PATH)
- Other Collaborators
 - National Association of State Energy Officials (NASEO) - participation on curriculum advisory committee and liaison with state government officials

Future Work

FY 10

- Two Hydrogen 101 workshops at annual meetings of organizations representing state and/or local officials
- Webinar workshops (two in 18 months)
 - PTI, May 18
 - Green Energy Leaders Webinar & Networking, May 26
- Follow-up from Local Leaders breakfast: Peer Presenters
 - Expanding the web to colleagues of the local leaders who came to the May 3 event. Original attendees can present to colleagues
- Posting presentations for further use/outreach from the Biz Solutions Forum
- Survey participants for feedback and leads development

Photo from PTI Local Government Energy Assurance Workshop



Future Work

FY 11

- Two Hydrogen 101 workshops at annual meetings of organizations representing state and/or local officials
- Webinar workshops (two in 18 months)
- Survey participants for feedback and leads development
- *Photo from PTI workshop with Peer Presenter Rick Sikes, City of Santa Monica Fleet Superintendent*



Project Summary

Relevance

Supplies local and state decision makers with information about hydrogen that relates to their interests and responsibilities

Approach

Work with national organizations representing state and local officials -- builds credibility and communicates through their existing dissemination networks

When possible, DO “Work with local leaders,” DON’T “talk at them”

Accomplishments and Progress

Relationships built with national organizations, workshops launched, reports published, new creative approaches developed and utilized with success

Thank you

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