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# HTAC 2010 Annual Report on the State of the Industry

Review of Preliminary HTAC  
Inputs and Discussion

*HTAC Meeting – October 14-15, 2010*

# HTAC Annual Report

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- Request sent to HTAC members on 09/19/10 for inputs to Annual Report
  - » Received >90 observations from 9 HTAC members
  - » All raw input is included in the briefing book (see table)
- Today's agenda:
  - » Add additional comments and identify key themes
  - » Select highest-priority items to include in the Annual Report

# HTAC Annual Report Organization

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## 2010 Report Outline -- *use same as last year (below)?*

- Introductory paragraph
- Commercial Deployments in 2010
  - » Power Generation and Electric Grid Support
  - » Combined Heat and Power
  - » Back-up and Remote Power Generation
  - » Material Handling Equipment
- Technology Developments in 2010
  - » Hydrogen Infrastructure (*and/or in Commercial Deployment section?*)
  - » Energy Storage
  - » Fuel Cell Vehicles (Cars and Buses) (+ *Trains, Boats and Planes?*)
  - » Technical and Economic Analysis
- Research Progress in 2010
  - » Fuel Cells
  - » Hydrogen Production and Distribution
  - » Hydrogen Storage
- Financial Climate in 2010
  - » Positive and Negative Indicators
- Closing paragraph

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# HTAC INPUTS

# Key Reports

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- European McKinsey Report (Not yet published/public)
- NRC Report: “Review of the Research Program of the FreedomCar and Fuel Partnership”
- NHA “Hydrogen and Fuel Cells: The U.S. Market Report”
- Fuel Cells U.K. “Accelerating Commercialization of Fuel Cells in the UK”
- Fuel Cells 2000 “The Business Case for Fuel Cells” and “State of the States: Fuel Cells in America“
- DOE: “Pathways to Commercial Success”, “Molten Carbonate and Phosphoric Acid Stationary Fuel Cells: Overview and Gap Analysis”, “2009 Fuel Cell Technologies Market Report” (coming soon )
- CaFCP 2010 Progress Report

# Product Introductions and Events

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## Infrastructure Initiatives/Developments

Bottom line: Continued/measured deployment of infrastructure coordinated with vehicle roll-out

- Learning from CaFCP/IPHE/NREL fueling station Focus Group
- GM and “The Gas Company” Oahu program
- SunHydro Station at Proton in CT
- APCI “compression-less hydrogen fueling station”
- Nine (9) ARB funded stations opening in 2010/2011
- CEC solicitation for up to \$22M to fund 10-15 stations

# Product Introductions and Events (continued)

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## **Commercial Deployments (Stationary/Non-automotive)**

Bottom line: Shift from demonstration activities to commercial adoption, especially for material handling and backup power

- Composite bullet on grocery store apps: Albertson's 400 kW CHP fuel cell system in San Diego, Whole Foods for CCHP
- Fuel cell systems in New York residential multi-family
- Coca-Cola: 40 class 1 forklifts, 5 Bloom Energy Servers
- Composite bullet on material handling apps: GENCO: 35 GenDrive units; US Foodservice: 40 OorjaPac DMFC; Walmart Canada: 60-75 forklifts from Crown/Plug/Ballard; etc.
- ARRA: 206/276 fuel cell forklifts delivered/ordered; 24 cell tower back-up systems, 75 portable handheld power generators

# Fuel Cell Technology Research, Development & Demo

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Bottom-line: Continued development of existing and new fuel cell applications resulting in higher durability and lower costs

- Highlights of DOD's RD&D: DLA funded fuel cell-battery hybrid locomotive system; ERDC/CERL fuel cell/high pressure PEM electrolyzer for Silent Camp; ONR demo of 10-kW tactical electric power systems; ONR fuel cells for UAV's and UUVs
- Toyota cold start capability at -30C
- Non-PGM catalyst by LANL improved performance by 100x
- Demonstrated durable MEA with low-PGM meeting DOE targets
- Estimated high-volume costs of PEMFC system at \$51/KW
- Reduced cost of diffusion layer by 53% through mfg R&D
- Demo 25% FC cost reduction from 3-layer MEA mfg process



# Vehicle Deployment

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Bottom line: Continued roll-out of next generation vehicles and accumulation of experience (miles, fills, etc.). Target date for commercial deployment continues to be around 2015

- Demonstrated real-world durability exceeds 2,500 hours
- Hyundai announces vehicle intro in 2012 (500) and 2015 (10,000/year) less than \$50K/vehicle
- Toyota “plans to come to market in 2015” “around \$50,000”
- Ford’s 30FCV’s reach 1.3M miles
- VW HyPower complete high<sub>a</sub> altitude, cold weather testing
- GM reiterates intent to intro commercial vehicle by 2015
- AC Transit buses pass 5,000 hours in real world service
- City of Burbank plug-in fuel cell bus received

# Vehicle Deployment (continued)

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Summary of significant milestones, including:

- Fuel cell durability - 2,500 hours projected (nearly 75K miles)
- Over 2.8 million miles traveled
- Over 106 thousand total vehicle hours driven
- Fuel cell efficiency 53-59%
- Vehicle Range: > 250 miles
- Over 150,000 kg- H<sub>2</sub> produced or dispensed
- 152 fuel cell vehicles and 24 hydrogen fueling stations have reported data to the project

# Safety Codes & Standards

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Bottom line: ???

- South Carolina uniform HFC permitting process
- National Conference of Weights and Measures adopted standardized hydrogen definition, dispenser labeling, and advertising.
- Safety R&D to support NFPA 2: Hydrogen Code Document

# Major Policy Activity

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Bottom-line: ???

- Federal funding for H2/FC (FY11 budget request or approp)
- Section 1302: Investment Credit
- California Low Carbon Fuel Standard Regulations adopted
- California Zero Emission Vehicle program development
- CEC proposes to fund up to \$13M in 2011/2012 Investment Plan
- European policy bullet?
- Others?

# New Entrants/Corporate Initiatives

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- Bloom Energy
- Others?

# Setbacks

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Bottom line: ???

- No actions on H2 from Clean Energy ministers meeting
- UltraCell shutdown Dayton Ohio mfg plant
- Others?

# Some Potential Annual Report Themes

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- Hydrogen and fuel cells as an integral part of a portfolio of strategies to meet our energy and environmental goals.
- Strong movement among OEMs around the world towards electrification and hybridization of vehicle platforms, which may be synergistic with advances in FCV platforms.
- Continued consensus among major national and international automotive OEMs around a 2015 date for FCV commercialization.
- Continued progress on vehicle and infrastructure technology results in lower costs, greater durability.

# Some Potential Annual Report Themes (continued)

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- Increasing government-industry collaboration on developing H2 fueling infrastructure.
- International activity is increasing: major players in fuel cells and hydrogen include Japan, Germany, United Kingdom, China, South Korea, and India.
- Federal R&D and purchasing (DOE and DOD) do make a difference; e.g., this has led to lower costs for fuel cell forklifts and sales are rapidly expanding to different commercial facilities.



# Next Steps

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- Incorporate feedback from meeting
- Produce draft report for review by Policy & Planning Subcommittee
- Produce and distribute draft for full HTAC review by end of January
- Final review at February HTAC meeting
- Finalize report in early March 2011