Hydrogen Fuel Cell Vehicles and Stations: Moving toward an early market

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Executive Director

Vehicles Coming

- GM: “We don't need any more breakthroughs to bring the [fuel cell] cars into the commercial market by 2015."
  Press conference, August, 2009
- Toyota: Technology available and affordable for customers within the next half dozen years
  Akio Toyoda, President, Toyota Motor Corporation, August 2009
- Hyundai: Will produce FCVs within 2-3 years
  Press release, August 14, 2009
- Honda: Lease about 200 cars (most in SoCal), aims to have FCVs in showrooms by 2015
  Reuters, September 8, 2009
- Daimler: At least 100 B-Class in CA (in early 2010) as fast as infrastructure allows, showroom by 2015
  Board member Weber comments at Frankfurt Auto Show Sept 2009

Fuel Cell Vehicles

Zero tailpipe pollution

Reduce GHGs

Sustainable, domestic fuel

Vehicles people want to drive

Passenger Vehicles

Transit Buses

Hydrogen Stations

Demonstration Phase Wrapping Up

- 300 passenger cars and buses; 2.8 million miles
- Building retail stations
- Community outreach
- Codes and standards
- Preparing for H_2 retail sales
- Leased vehicles & serial production

Next Step: Early Commercial Markets

- Vehicles are coming in 2014
  - 3,400 passenger FCVs in Southern CA
  - Up to 60 buses and over 800 LDVs in Northern CA
- Stations must meet customer demand
  - 7 new Hydrogen Highway stations online in 2010
  - $40M AB118 funding for additional stations
- Preparing for retail hydrogen sales by 2011
  - Standards and certification procedures being developed by Dept. Food and Ag, Division of Measurement Standards, in Sacramento

CaFCP Action Plan

46 Stations	Santa Monica, Irvine, Torrance, Newport Beach, San Francisco, Sacramento
3 Focus Areas	Passenger vehicles Transit buses Regulations, Codes & Standards
4 Years	Funding 2009-2012 Stations begin operation 2009-2014
$180 Million	Industry and government investment

Infrastructure in Stages

Vehicle cost & durability

- Fuel cell costs on target to meet goal
  - Reduced 75% from $275/kW to $73/kW (US DOE)
- Toyota: First FCVs will be priced “shockingly low” (Press release, August 8, 2009)
- Nearly 2,000 hours demonstrated durability (US DOE)
- GM: 5th gen is smaller, >50% less platinum, 120Kmi durability (Press release, August 18, 2009)

Current Chevy Equinox fuel cell system

GM’s next generation fuel cell system

FCV fuel economy

www.fueleconomy.gov

Find and Compare Cars | Gas Mileage Tips | Gasoline Prices | Your MPG Will Vary | Why is Fuel Economy Important? | Your MPG | **Hybrids, Diesels, Alt Fuels, Etc.** | Tax Incentives | Extreme MPG

U.S. Department of Energy | Print the Fuel Economy Guide | U.S. Environmental Protection Agency

- Hybrid Vehicles
- Diesel Vehicles & Fuels
- Flex-Fuel Vehicles
- Alternative Fuels
- Energy Requirements
- Energy Efficient Technologies
- Electric Vehicles
- Fuel Cell Vehicles
  - Current Models
  - Benefits
  - How They Work
  - News & Info
  - Challenges
  - Fuel Cell Links

Fuel Cell Vehicles

	2007-2008 Chevy Equinox FC	2008 Honda FCX Clarity	2009 Toyota FCHV-adv
			
Fuel Economy			
City (miles/kg)[1]	43	77	TBD
Highway (miles/kg)[1]	48	67	TBD
Range	190	280	TBD
Vehicle Characteristics			
Vehicle Class	Sport Utility Vehicle	Midsize Car	Sport Utility Vehicle
Fuel Type	Hydrogen	Hydrogen	Hydrogen
Motor	93kW(Continuous) Generator[1]	DC Brushless 100kW[1]	AC Induction 90kW[1]
Type of Fuel Cell	Proton Exchange Membrane	Proton Exchange Membrane	Proton Exchange Membrane
Energy Storage Device	250V Ni-MH	288V Lithium Ion	274V Ni-MH
Availability	California, New York	Southern California[2]	TBD

[1] kW - kilowatts; V - Volts; kg - kilogram

[2] The Honda FCX Clarity will be leased to private individuals in select Southern California areas.

Honda's FCX Web Site

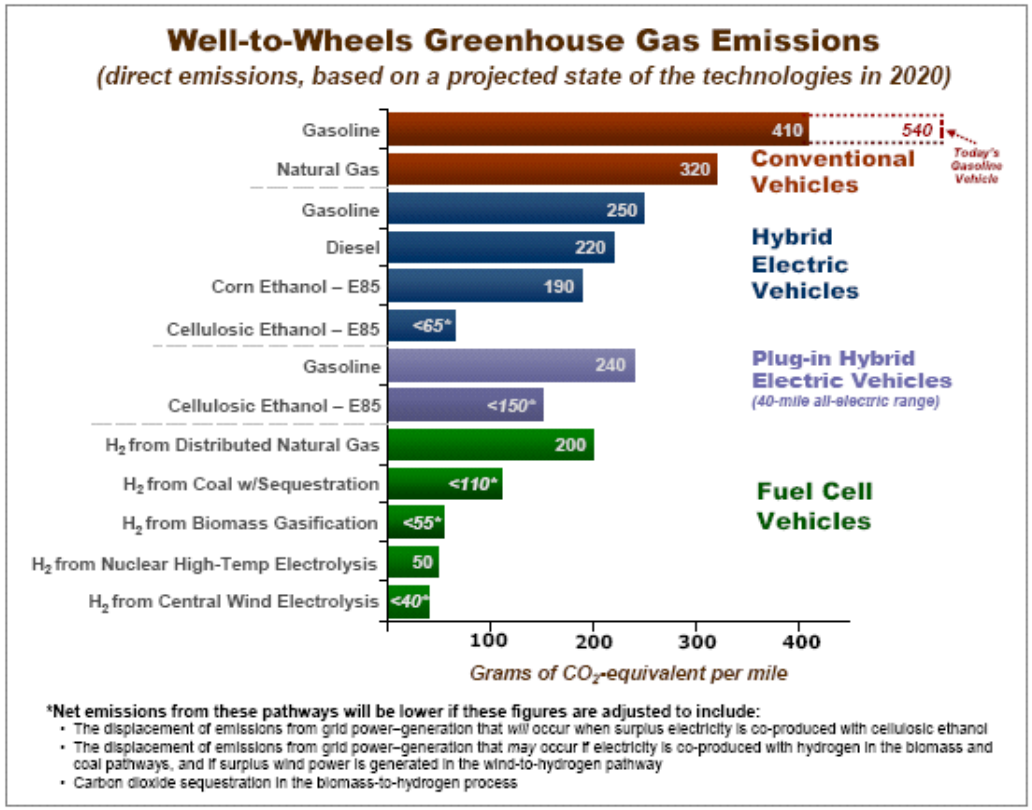
Toyota FCHV-adv Highlander real-world tests: 68.3 miles/kg and 431 mi range (US DOE)

Fueling with hydrogen

- Met $2-3/kg goal for H_2 from distributed natural gas reformation (US DOE)
- Well-to-tank, H_2 from natural gas is 70% efficient
- Fueling takes minutes

FCVs reduce GHGs

US Department of Energy



CARB LCFS Well-to-Wheels GHG

(based on fuel carbon intensity)

Pathway	gCO2 per mJ	% reduction
H2 (onsite from natural gas and 33% renewable)	33.09	65%
Electricity (CA marginal)	34.90	64%
Electricity (average California mix)	41.37	57%
Gasoline	95.85	0%


Hydrogen
水素
Hydrogène
Водород
Wasserstoff
Idrogeno
Hidrogeno
FCV
HYDROGEN

Questions or Comments?

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