

# California Hydrogen Highway Network CaH<sub>2</sub>Net – Summer 2009 Update

---

- ◆ **Hydrogen throughput to double by mid 2010**  
*Seven new public fueling stations will meet the needs of a growing number of fuel cell vehicle customers*
- ◆ **State and Federal Government Supporting Hydrogen**  
*State approves funding for more hydrogen infrastructure and US Congress passes appropriations bills to fund DOE hydrogen and fuel cell technologies*
- ◆ **Fuel Cell Vehicles Moving Closer to Commercialization**  
*Automakers continue to overcome challenges through advances made in fuel cell vehicle technology*

Publication of the California Air Resources Board  
Mobile Source Control Division  
Sustainable Transportation Technology Branch  
[www.hydrogenhighway.ca.gov](http://www.hydrogenhighway.ca.gov)



## **New Public Hydrogen Stations Will Double Statewide Throughput, Meet Driver Expectations, and Satisfy Renewable Hydrogen Goals**

On March 17, 2009, ARB announced their intent to award grants for four new hydrogen fueling stations, bringing the total of ARB co-funded stations to seven. The new stations, three in the Los Angeles area and one in the San Francisco Bay area, will meet many of the same criteria as the three stations awarded in June 2008:

- ◆ Provide hydrogen at 350 and 700 Bar pressures (5,000 and 10,000 psi)
- ◆ Easy access and convenient hours of operation
- ◆ Close to major freeway on/off ramps and in areas where original equipment manufacturers have committed to place FCVs.

### ***San Francisco Airport***

San Francisco Airport (SFO) was awarded \$1.7 million to build a hydrogen fueling facility just off Highway 101/Millbrae Avenue Exit and across the street from a compressed natural gas station. In addition to passenger cars, this station will provide hydrogen to hydrogen buses operated throughout the greater Bay Area. SFO is working with the Linde Group and Propel Fuels to build this station, a modular hydrogen storage, compression and dispensing plant designed and built by Linde, which is capable of dispensing 120 kilograms per day from delivered liquid hydrogen. SFO plans to open this station by Summer 2010.

### ***Shell Hydrogen – Newport Beach***

Shell Hydrogen was awarded \$1.7 million to add hydrogen dispensing to an existing fueling station on Jamboree Road, 2.3 miles from Highway 73. Up to 100 kilograms per day of hydrogen will be produced on site via natural gas reformation. The station will extend geographic coverage and capacity to FCV customers currently using National Fuel Cell Research Center's hydrogen station at UC Irvine, a strategy consistent with Shell Hydrogen's approach to building mini-networks of hydrogen fueling infrastructure.

### ***Mebtahi Station Services – Harbor City***

Mebtahi Station Services was awarded \$1.7 million to add hydrogen to their existing Chevron station on Western Avenue near Pacific Coast Highway. The station will be capable of delivering 100 kilograms per day.

### ***UCLA – Los Angeles***

University of California, Los Angeles (UCLA) was awarded \$1.7 million to build a hydrogen station at their transit facility on Veteran Avenue, less than one mile from Interstate 405 Wilshire Boulevard exit. Up to 140 kilograms per day of hydrogen will be produced on-site via natural gas reformation. South Coast Air Quality Management District is a project partner.

<b>Hydrogen Stations Co-Funded by State of California and under construction</b>			
Name/Location	State funding (millions)	Capacity (kg H2/day)	Percent Renewable H2
Air Products and Chemicals Hwy 405 in Fountain Valley	\$2.7	100	100%
CalState University, Los Angeles Hwy 10 at Hwy 710	\$2.7	60	100%
Mebtahi Station Services PCH (Hwy 1) in Harbor City	\$1.7	100	0%
Shell Newport Beach	\$1.7	100	0%
UCLA, SW corner of campus Hwy 405 in Westwood	\$1.7	140	0%
Alameda-Contra Costa Transit Hwy 80 in Emeryville	\$2.7	60	100%
San Francisco Airport Hwy 101 in San Bruno	\$1.7	100	0%
Statewide Totals	\$14.9	660	33%†

†Statewide average percent renewable hydrogen from state co-funded stations

Once operational, the seven state-funded stations will more than double the amount of hydrogen currently being dispensed for transportation in California while delivering 33 percent renewable hydrogen, a requirement for transportation hydrogen unique to California.

Contact: Mike Kashuba 916.323.5123

### **New Stations Support Fuel Cell Partnership Action Plan**

In January 2009, major auto companies shared their plans for deploying fuel cell passenger vehicles in Northern and Southern California. This information was incorporated into Hydrogen Fuel Cell Vehicle and Station Deployment Plan: A Strategy for Meeting the Challenge Ahead, prepared by the California Fuel Cell Partnership. According to their combined projections, the number of passenger FCVs deployed in Southern California will more than double each year between 2009 and 2017, when they expect the total to be over 41,000. In Northern California, they project 8,450 passenger vehicles by 2017. By 2017, an estimated 50 to 100 retail hydrogen stations - roughly 10 stations per year - will be needed to satisfy the demand created by the vehicle and bus deployments.

FCVs will be deployed in hydrogen communities to ensure that fuel supply matches the demand of early market customers. It also builds a body of knowledge essential to creating standard permitting practices and developing regulations necessary to sell hydrogen as a retail fuel.

Download the summary or the complete report from:  
<http://www.fuelcellpartnership.org/resources/print-materials>

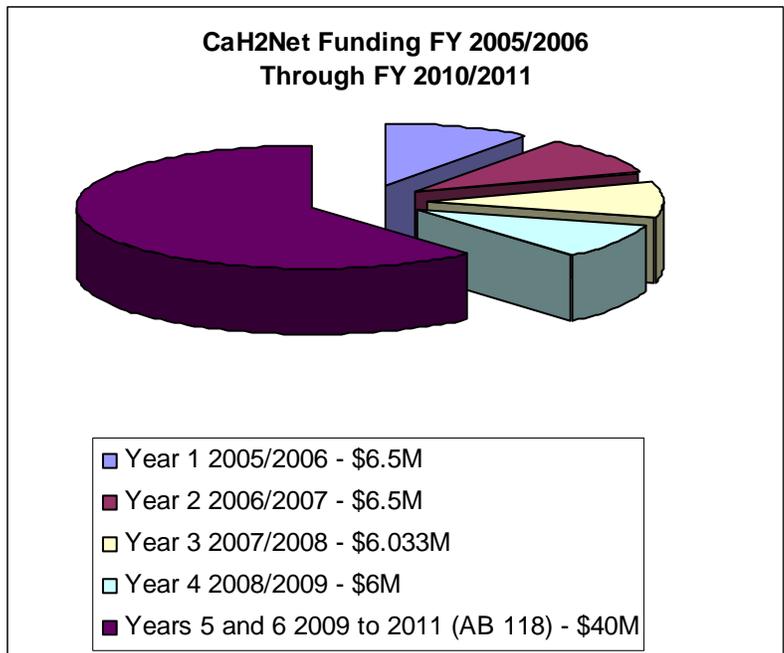


- Stations co-funded by State of California and under construction
- Stations currently in operation with access by all automakers

### More Hydrogen Station Funding Allocated from Assembly Bill 118

The California Energy Commission has adopted The Investment Plan for The Alternative and Renewable Fuels Vehicle Technology Program (AB -118, Núñez). It is intended to help develop and deploy alternative and renewable fuels and advanced transportation technologies. To meet these goals, the plan provides up to \$40 million to fund hydrogen fueling stations in California. This brings the state’s total 2005-2011 hydrogen investment to \$65 million. An interagency agreement between the California Energy Commission and the ARB is being prepared. Funds from this agreement will help add at least 11 new public access fueling stations in key California locations. The California Fuel Cell Partnership estimates that more than 700 hydrogen FCVs will be on the road by 2011, increasing to over 4,000 by 2014 and reaching about 50,000 vehicles by 2017.

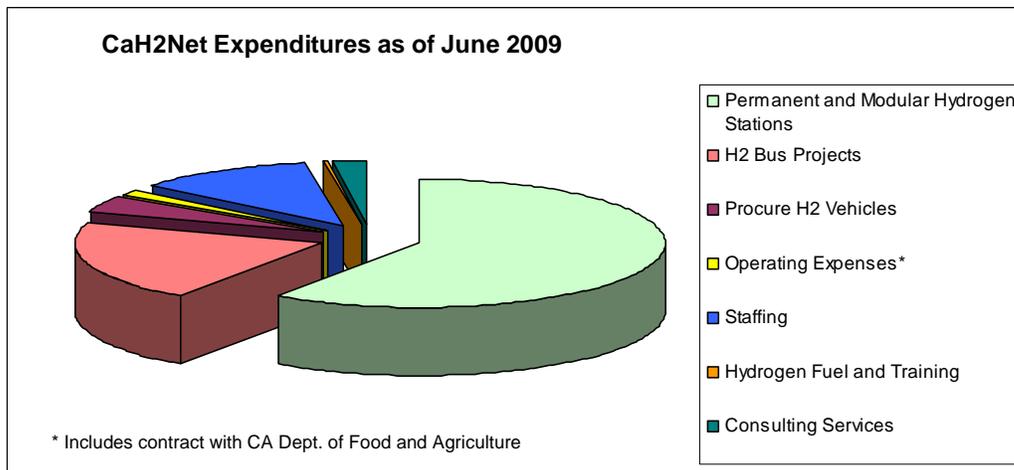
Contact: Mike Kashuba  
 916.323.5123



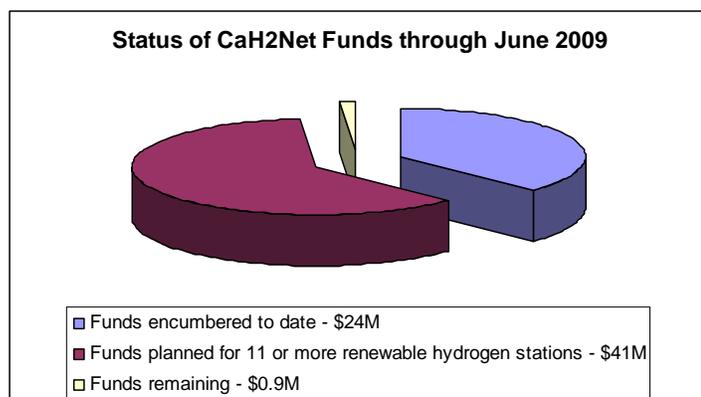
## CaH2Net Financial Snapshot

The graph below describes what the CaH2Net funds have been used for as of June 30, 2009:

- ◆ Developing permanent and temporary hydrogen fueling stations that are publicly accessible, meet the needs of a growing hydrogen vehicle fleet, and meet the environmental and renewable requirements of Senate Bill 1505.
- ◆ Deployment of hydrogen bus projects.
- ◆ The procurement of hydrogen vehicles and shuttle buses.
- ◆ Operating expenses including a contract with the California Department of Food and Agriculture to develop fuel specifications for hydrogen.
- ◆ Staffing.
- ◆ Supplying the State's FCVs with hydrogen fuel and provide training for vehicle refueling.
- ◆ Consulting services to assist the State with implementing infrastructure and demonstration targets identified in the Blueprint Plan; conduct targeted communication with environmental, industry, and public stakeholders; and assist with the development of education and communication materials.



To date, the State has encumbered over \$24 million of the CaH2Net funds. Another \$41 million will be awarded over the next two years for the installation of additional public hydrogen stations.



## **Congress Passes Appropriations for Hydrogen, Fuel Cells and Infrastructure**

Last May, hydrogen advocates from across the nation responded quickly to US Department of Energy (DOE) Secretary Chu's announcement to cut all hydrogen transportation related funding. Chu did not see the US transitioning to a hydrogen economy within the next 20 years and cited several barriers including infrastructure, development of long-lasting portable fuel cells, on-board hydrogen storage, and inefficiencies of producing hydrogen from water and natural gas.

The National Hydrogen Association (NHA) and US Fuel Cell Council issued the following joint statement: "Fuel cell vehicles (FCV) are not a science experiment. These are real vehicles with real marketability and real benefits. Hundreds of fuel cell vehicles have collectively logged millions of miles. Both the National Academy of Sciences and NHA's recent Energy Evolution report conclude that a portfolio of vehicle technologies is needed to achieve the nation's energy and environmental security goals and that hydrogen is essential to success. Hydrogen also advances the Obama Administration's goals of greener power generation and a smarter power grid."

ARB Chair Mary Nichols addressed Secretary Chu's concerns in a May 29, 2009, letter and offered the following key points:

1. While low-volume prototype vehicle costs are very high, fuel cell systems are fast approaching cost-competitiveness with advanced hybrid vehicles and are expected to be cheaper than plug-in hybrid electric vehicles when produced in volume.
2. Hydrogen from natural gas and used in an FCV can reduce greenhouse gas emissions by 63% compared to today's vehicles and 37% compared to natural gas vehicles. Hydrogen from cellulosic biomass can reduce emissions by nearly 90% compared to today's cars and 63% compared to plug-in hybrid vehicles using cellulosic ethanol and electricity from the national grid.
3. Hydrogen used in an FCV can be cost-competitive when produced in volume from a wide variety of low-carbon pathways including natural gas, biomass, renewable electricity, and coal with sequestration. Infrastructure costs can be minimized and customer fueling availability maximized through a coordinated roll-out of stations in concentrated regions.
4. While advances in hydrogen storage would be helpful, when designed into the vehicle, compressed hydrogen storage using tanks at pressures of 35 or 70 MPa are sufficient to safely provide adequate customer range, passenger, and cargo space.

Fortunately, the efforts of ARB, NHA members and others to encourage congress to restore critical funding for hydrogen were successful. In July, the House of Representatives passed their Energy and Water Development Appropriations Bill (HR. 3183), which includes \$153 million for DOE's Energy Efficiency and Renewable Energy (EERE) hydrogen and fuel cell program. Later in July, the Senate passed a similar appropriations bill (S. 1436), which includes \$190 million for EERE's hydrogen and fuel cell program.

The two versions will be considered by a Senate/House conference committee that will determine how to merge them into one bill. According to NHA, this will likely happen after congress returns from their August recess.

## Hydrogen Road Tour 2009 – From BC to BC in Nine Days

On May 26th the Hydrogen Road Tour 2009 kicked off at the United States Olympic Training Center in Chula Vista, California. The tour was organized by the California Air Resources Board, California Fuel Cell Partnership, National Hydrogen Association, United States Fuel Cell Council and Powertech Labs, Inc (on behalf of the British Columbia). The 1,700 mile journey to Vancouver, British Columbia, included stops in 28 cities, three states and two countries in nine days. The road tour made strategic stops to highlight where fuel cell passenger vehicles, fuel cell buses, fuel cell forklifts and hydrogen stations are entering early commercial markets. The public, media and elected officials were invited to test drive the vehicles and experience their range, performance and road readiness first hand.



Governor Schwarzenegger checks out the Volkswagen Tiguan FCV at Shell's hydrogen station in Santa Monica

### Statistics from the Tour:

- ◆ Total vehicle-miles traveled 22,474 miles (including tour, test drives, and errands)
- ◆ Total hydrogen dispensed: 385.4 kilograms
- ◆ Average mileage: 58.3 miles per kilogram
- ◆ Number of test drives: 1,558
- ◆ People reached: 2,742 in person (many more from media coverage)
- ◆ 3 US Congress representatives and 12 staffers
- ◆ 8 state/province elected officials and 8 staffers
- ◆ Number of website hits: 622,220 (excluding social media sites)

Visit [www.hydrogenroadtour.com](http://www.hydrogenroadtour.com)

Right - Fuel cell vehicles lining up at San Diego County Administration Center on first day of Road Tour



## **News Media and OEM Updates**

### ***FCVs to Coexist Among a Myriad of Green Technology Vehicles***

Gathered together at a hydrogen and fuel cells conference in Vancouver in early June 2009, car company executives said it is wrong to characterize their search for the low- or no-pollution vehicles of tomorrow as a battleground of technologies. No single technology will triumph in the pursuit of a "greener" auto industry. Instead, the future will include a mix of cars powered by electricity, hydrogen fuel cells and biofuels, according to the world's biggest car makers.

"This is not about picking some winner," said Andreas Truckenbrodt, Chief Executive of Automotive Fuel Cell Cooperation (AFCC), a company set up by Daimler AG and Ford Motor Company to research fuel cells for vehicles. "All these technologies have their value," he said, painting a picture of an auto industry in which combustion engines will share the road with plug-in electric vehicles and cars running on hydrogen.

With a finite amount of government and private funding for research, and potentially rich rewards for the technology that achieves widespread acceptance, competition among vehicle technology developers is inevitable.

Executives from General Motors, Toyota, Honda, and the Daimler-Ford venture, AFCC, peg 2015 as the date for commercialization of cars powered by fuel cells. "I was very pleased that here were four auto companies all saying pretty much the same thing about the state of readiness of the technology," said Lawrence Burns, Vice President of Research and Development at General Motors Corporation.

Critics of hydrogen FCVs say they will never be economically mass-produced and cite difficulties such as hydrogen production and storage, the high cost of the cars themselves and the massive cost of building a network of hydrogen fueling stations.

Automakers acknowledge that hurdles remain but say that they are working hard to overcome them. "Fuel cells work fine. The No. 1 focus is now on cost reductions, and we know how to get there," Truckenbrodt said. "Do you really think we would be spending billions if we were waiting for a miracle?"

*From Reuters article by Nicole Mordant, June 2, 2009*

### ***Honda***

At a press conference in April hosted by the New York International Auto Show and Mobil 1, the Honda FCX Clarity was named the 2009 World Green Car. The FCX Clarity was chosen from an initial entry list of 22 contenders nominated by 59 World Car jurors from 25 countries worldwide.

"The FCX Clarity is a symbol of the progress we have made with fuel cell vehicles and our commitment to developing vehicles that promote renewable

energy supplies and zero-emissions transportation," said Steve Center, Vice President, national Marketing Operations for American Honda.

The World Green Car awards were inaugurated in 2003, and officially launched in January 2004, to reflect the reality of the global marketplace, as well as to recognize and reward automotive excellence on an international scale.

On May 7, American Honda Motor Company, Incorporated, announced their sixth FCX Clarity lease customer, actress and environmental youth leader, Q'orianka Kilcher. Kilcher, winner of numerous environmental youth awards, is the world's youngest FCX Clarity owner at 19 years old.

"Since my first car was the Honda FCX, I am proud to say that I have never pumped a gallon of gasoline," said Kilcher. "As a young person, I feel it is my responsibility to always try my best to think about the consequences of my actions and choices as a consumer, and the impact they have on our planet."

Author and former CalEPA Secretary, Terry Tamminen, is the seventh FCX Clarity Lease customer.

*Honda Press Releases, April 9 and May 8, 2009*

### **Toyota**

Toyota plans to introduce a hydrogen fuel cell car by 2015, according to comments made by Vice President Masatami Takimoto in response to a question during a shareholders' meeting at Toyota headquarters.

In a conference session at SAE World Congress 2009 in January, Justin Ward, Advanced Powertrain Program Manager, Toyota said that while Toyota sees market opportunity for small electric vehicles (EV), the company finds that a fuel cell hybrid vehicle has the advantage in well-to-wheel efficiency even now. According to Ward, "We feel that there is a place for EVs in the future, but what is that place? It's pretty challenging for a full-range larger vehicle. We do see a market for the smaller, shorter range EVs. The key is to make sure your grid is clean. We don't talk much about it these days, but we are still working very, very strongly on fuel cell technology."

*Green Car Congress, June 23, 2009*

### **Mercedes-Benz**

Mercedes-Benz presented its concept BlueZERO at the North American Auto Show in Detroit last December. Based in a single vehicle architecture, this modular concept allows three models with different drive configurations:

- ◆ The BlueZERO E-Cell battery-electric with 125 mile range
- ◆ The BlueZERO F-Cell fuel cell electric with 250 mile range

- ◆ BlueZERO E-Cell battery-electric with internal combustion engine range extender

The three BlueZERO variations are based on the unique sandwich floor architecture introduced by Mercedes 10 years ago, initially in their A-Class then for the B-Class. Advantages of the modified construction include the positive effect of the major drive components on the centre of gravity, their space-saving design, and the fact that they are extremely well protected within the vehicle underbody.



Mercedes Blue Zero Concept Vehicle

"The flexible BlueZERO concept allows electromobility for every requirement and highlights the fact that Mercedes-Benz is the world's only car manufacturer to already have in place all the key technologies for electric cars offering full everyday practicality", says Dr. Dieter Zetsche, Chairman of the Board of Management of Daimler AG and Head of Mercedes-Benz Cars.

*Mercedes Press Release, December 15, 2008*

### ***Ford Motor Company***

As a follow up to Ford's recent decision to discontinue its FCV fleet demonstration program due in part to discontinued DOE funding, Ford provided the following comments to ARB:

"Ford remains committed to continuing to engage in core hydrogen fuel cell research and internal hydrogen fuel cell activities concentrating on fuel cell vehicle component research. However, we are allocating our resources for a greater focus on nearer term, more mature, higher volume and more affordable technologies including hybrid, plug-in hybrid and battery electric vehicles.

These technologies cannot only be seen as bridging technologies towards fuel cell vehicles until the infrastructure and required technical component breakthroughs are achieved, but will further stimulate the development of the electrical components that are also a crucial part of fuel cell vehicles. Ford will be well positioned to take advantage of them. We are proud of the performance of the demonstration hydrogen fuel cell vehicles we have tested on the roads, particularly our Focus Fuel Cell fleet which logged more than a million miles.

While hydrogen fuel cell technology holds promise to deliver reduced CO2 emissions and dependence on fossil fuels, challenges related to high costs and the lack of any hydrogen fueling infrastructure make adoption of the technology a long range prospect that may not be commercialized in affordable volumes for some time."

*John Viera, Director of Sustainable Business Strategies, Ford Motor Company, June 18, 2009.*