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Automotive Fuel Cell Cooperation
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Shell Hydrogen

Cal/EPA Air Resources Board
California Energy Commission
South Coast AQMD
National Automotive Center
U.S. Department of Energy
U.S. Department of Transportation
U.S. Environmental Protection Agency

AC Transit
Air Products and Chemicals, Inc.
CA Dept of Food and Agriculture
Powertech Labs
ISE Corporation
ITS-UC Davis
NFCRC-UC Irvine
Proxair
Proton Energy Systems, Inc.
Santa Clara VTA
SunLine Transit Agency
Ztek

December 19, 2008

California Energy Commission
Dockets Office, MS-4
Re: Docket No. 08-ALT-1
1516 Ninth Street
Sacramento, CA 95814-5512

Subject: AB118 funding for hydrogen (Docket No. 08-ALT-1)

Hydrogen is a low-carbon fuel produced in California and has demonstrated the ability to be a zero-carbon fuel produced from local, renewable resources. Fuel cell vehicles provide an electric-drive option that offers significantly lower emissions and improved fuel economy compared to conventional vehicles, while providing the performance and convenience drivers demand. The current and projected shortfall in California's hydrogen fueling infrastructure poses a threat to the success of hydrogen fuel cell vehicles. Existing stations primarily serve fleet vehicles, have limited accessibility and in many cases have already served their useful life and may soon be retired. California needs to invest in a customer-friendly, retail fuel station network to deliver this low-carbon fuel to early commercial fuel cell vehicles.

CaFCP recommends the California Energy Commission invest at least \$90 million from 2009-2013, including \$20 million in 2009, to build hydrogen stations and support further codes and standards development. Additional funds will be needed beginning in 2014 to support 2015-2017 vehicle deployments. CaFCP members or groups of members will make specific proposals to the CEC to fund projects in three general areas that support the transition of hydrogen fuel cell vehicles from today's demonstration programs to the early commercial market:

1. Build 20 to 40 hydrogen fuel stations in the greater Los Angeles area by 2014 to support early commercial fuel cell passenger vehicles.
2. Build several mixed-use hydrogen fuel stations to support buses and passenger vehicles.
3. Upgrade the West Sacramento hydrogen station to develop vehicle and fueling regulations, codes, and standards.

Funding support should be coordinated with existing programs, such as the California Hydrogen Highway Network, to maximize resource effectiveness and efficiency.

California has worked hard to establish itself as a leader in implementing hydrogen fuel cell vehicles. We have made good progress from the first vehicles tested by OEMs in 2000 through extensive fleet demonstrations, to the current launch of the pre-commercial market. The California Energy Commission has the opportunity to invest in hydrogen and fuel cell vehicles' transition to a commercial market. In fact, CEC's support will be essential for California to retain its leadership role.

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Background and progress to date

California Fuel Cell Partnership members have vehicles on the road today in fleet and early customer demonstration programs. Through 2007, the automakers have successfully operated more than 250 fuel cell vehicles that have driven more than 2 million miles. The vehicles fuel at 25 hydrogen fuel stations built and operated by industry and government. Through the DOE's Technology Validation program, some first-generation FCVs have shown 1,700 hours of real world durability, which indicates significant progress toward meeting the 2009 goal of 2,000 hours¹. Bench-scale durability has already exceeded the U.S. Department of Energy's 2015 goals². Current vehicles are close to meeting DOE's 2015 range target of 300 miles³. These demonstrations have proven that hydrogen fuel cell vehicles and transit buses will meet customer demands and provide significant environmental and energy benefits to meet California's goals.

The U.S. Department of Energy has invested approximately \$1.2 billion from 2004 through 2008 under the Hydrogen Fuel Initiative. Funds have been allocated for research and development of fuel cells and hydrogen, including fuel cell stacks, hydrogen storage, hydrogen production, safety codes and standards, manufacturing, systems analysis and technology validation. The DOE's Technology Validation Program provided funding for a number of the fuel cell vehicles and several of the hydrogen stations in California. Through the California Hydrogen Highway Network program, the State has authorized almost \$20 million to date to support hydrogen vehicles and fuel stations. Ten of California's hydrogen stations are part of the Hydrogen Highway Network, with three more to be built under an upcoming Request for Proposals. The California Hydrogen Highway Network program is funded through FY 08/09, at which time the California Legislature has indicated it expects further funding for hydrogen to come from AB 118 funds.

Meeting California's greenhouse gas emission reduction goals will be challenging, and will require a portfolio of transportation solutions. Hydrogen fuel cell vehicles can achieve dramatic greenhouse gas emission reductions, zero tailpipe emissions and petroleum independence in a vehicle that provides all the comfort, convenience and function that drivers expect. Although hydrogen and fuel cells may seem more challenging than plug-in hybrids or advanced biofuels, the rewards are much greater. Even using natural gas to produce hydrogen on-site at a fueling station, fuel cell vehicles reduce greenhouse gas emissions by 45 to 55%.⁴ New low- and zero-carbon methods of producing hydrogen, such as from biomass or wind, will yield even greater reductions. The industry has made good progress over the past decade, and we understand the challenges and the next steps that are needed to bring fuel cell vehicles and hydrogen fuel stations to the commercial market. This will take time, and it is essential that we take the next steps now to meet California's long-term goals.

¹ To 10% voltage degradation (http://www.nrel.gov/hydrogen/docs/cdp/cdp_1.ppt)

² 3M membrane electrode assembly with >7300 hour durability. 2015 goal is 5000 hours.

³ EPA certified Honda Clarity vehicle range at 280 miles (http://www.fueleconomy.gov/feg/fcv_sbs.shtml)

⁴ California Energy Commission CEC-600-2007-004-REV, August 2007

Next steps needed to move toward commercialization

CaFCP recommends AB 118 funds be directed at three specific project areas to address unique needs as identified by industry:

- build stations to support early passenger vehicle markets
- expand transit bus use
- establish regulations and standards needed for commercial success

Together these projects will strengthen the foundations of a successful commercial market. With a few well-placed stations in the Los Angeles market area, early adopters will have confidence that they can conveniently fuel their vehicles. An expanded transit program in the San Francisco area will pave the way for the next generation of zero-emission buses and will introduce hydrogen and fuel cells to hundreds of thousands of riders. It is essential to swiftly establish appropriate regulations and standards, such as those for fuel quality and dispensing, to enable a future market and encourage businesses to offer hydrogen as fuel.

1. Build hydrogen stations to support early commercial passenger vehicles

The Los Angeles area is a diverse market that includes many early adopters. While the area is geographically large, early markets will be concentrated in a handful of key communities. Placing early hydrogen fuel stations in these key communities will appropriately serve the first retail fuel cell vehicle customers, putting them within minutes of fuel. Several of the automakers plan to introduce thousands of fuel cell vehicles in the LA area beginning in 2012 to meet the California Air Resources Board's Zero-Emission Vehicle regulation.

It is essential to have a few well-placed, easily accessible retail stations in operation before the majority of vehicles are introduced. People will not lease or buy a vehicle that they can't fuel. CaFCP members have identified a crescent in the Los Angeles market area that generally includes Burbank, Santa Monica, Torrance and Orange County for the first 4-10 stations. Once established, the next wave of up to 10 stations can expand the fueling station infrastructure. The goal is to have 20-40 publicly accessible stations in the LA area by 2014. This will provide adequate fuel infrastructure for the thousands of vehicles that are expected to be introduced through 2014, and lay the groundwork for the tens of thousands of vehicles that are expected to be introduced in 2015 and beyond.

CaFCP is currently working with CALSTART to identify and engage teams that could each build 2-5 hydrogen stations in the Los Angeles area between now and 2014. A successful rollout of the first retail stations to support thousands of fuel cell vehicles will validate customer satisfaction with hydrogen fuel and demonstrate that fuel cell vehicles can meet and even exceed their highest expectations. Early market acceptance in the Los Angeles area will translate into quicker rollouts in other metropolitan areas in California and throughout the nation.

2. Support growing transit bus fleets

AC Transit has had great success with three 40-foot fuel cell transit buses, a fleet of 10 Hyundai passenger vehicles and a Chevron hydrogen station that makes hydrogen on-site from natural gas. Their bus fleet has demonstrated nearly twice the fuel economy of comparable diesel buses and highly reliable operation in regular revenue

service. Through their “HyRoad” campaign AC Transit is establishing itself as a Center of Excellence for hydrogen.

AC Transit is collaborating with Santa Clara VTA, San Francisco Muni, SamTrans and Golden Gate Transit to expand the fleet of fuel cell buses in the Bay Area. These buses represent the beginning of a transition to zero-emission buses as required by the California Air Resources Board under the ZBus regulations. By 2010, 13 new fuel cell buses will operate in San Francisco, San Jose, Berkeley, Oakland and other Bay Area communities to demonstrate fleet readiness and reliability similar to standard transit buses. A new hydrogen station in Emeryville will be part of the expanded transit program, providing buses and passenger vehicles with renewable hydrogen from solar power.

In Southern California, SunLine Transit, an early champion of hydrogen, is continuing to demonstrate fuel cell buses in operation and assist in development of bus fueling protocols. Of the 10 transit agencies in California that might deploy fuel cell buses to comply with the ZBus regulation, three are located in the greater Los Angeles region, including Los Angeles Metro Transit Authority, which has expressed interest in demonstrating fuel cell buses through their Advanced Technology Vehicle Center (ATVC).

Due to the potential for synergistic fueling applications for passenger and transit, the Bay Area offers an opportunity to deploy two or three additional hydrogen stations to create a model for mixed-use facilities that provide fuel to buses and passenger vehicles, and also encourage drivers to take public transit.

3. Regulation development and deployment

The hydrogen station in West Sacramento is the second oldest station in the state and remains the busiest hydrogen station in the world. With more than 14,000 fuelings since 2000, the station has served all of the OEM fuel cell passenger vehicles and transit buses. In addition to providing fuel to a variety of vehicles, the station has provided a wealth of data and lessons learned for the industry, local fire officials, national codes and standards developers, planning departments and regulators. However, it was built in 2000 and does not include the latest station technology that will be used in retail stations, such as 70 MPa fuel and more advanced compression, storage and dispensing equipment.

The station’s location and volume make it ideal for the California Department of Food and Agriculture’s (CDFA) Division of Measurement Standards to use as it develops and implements standards and testing procedures required for selling hydrogen as a retail fuel. To provide the most accurate and useful “laboratory” for developing codes and regulations, the station must be upgraded.

Hydrogen Fueling Station, Inc., the legal entity that owns and operates the West Sacramento hydrogen station, is in the process of developing a comprehensive proposal with CDFA to achieve a state-of-the-art fuel station to support new regulatory and code development and validation as well as provide fueling to the growing number of vehicles in the Sacramento area. In addition to providing a convenient and cost-effective way for the State to establish and prove out new standards for hydrogen fuel, HFS’ goal is to transition the station to a fully accessible

public station by 2012, further supporting commercialization efforts. The California Fuel Cell Partnership Steering Team has authorized funds to cost-share this upgrade.

Conclusion

According to studies by the National Research Council⁵ and the National Hydrogen Association⁶, we need electric-drive vehicles, including hydrogen fuel cell vehicles, to reach our air quality, energy independence and greenhouse gas reduction goals. Although the future will require a mix of different vehicle technologies, fuel cell vehicles are an essential part of the solution because they can provide people with zero-emission, zero-petroleum vehicles that fit their lifestyles. They are electric vehicles that don't require compromises.

The California Fuel Cell Partnership has published a vision document that describes the general concepts, actions and costs involved in moving from the demonstration projects of today to the early commercial market. The vision document was submitted to the CEC Docket 08-ALT-1 in July 2008. We are developing a more specific action plan that will describe this process in more detail. The action plan is expected to be available in spring 2009, at which time we will make it available to the California Energy Commission as further guidance in using AB 118 funds to best support hydrogen fuel cell vehicles' transition to an early commercial market.

Thank you for the opportunity to provide this information, and please contact me if you have questions or need further input.

Sincerely,



Catherine Dunwoody
Executive Director

⁵ Transitions to Alternative Transportation Technologies--A Focus on Hydrogen, 2008, http://www.nap.edu/catalog.php?record_id=12222

⁶ NHA Hydrogen Story, October 2008, <http://www.hydrogenassociation.org/webinar/23Oct08.asp>