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09-7-6

Alameda-Contra Costa Transit District

Rick Fernandez, General Manager

July 22, 2009

California Air Resources Board  
1001 "I" Street  
P.O. Box 2815  
Sacramento, CA 95812

**Re: July 23, 2009 Public Hearing on Zero Emission Bus Regulation**

Dear Members of the Board:

Thank you for this opportunity to comment on proposed changes to the Zero Emission Bus Regulation. AC Transit is one of the largest public bus operators in California. We serve over 67 million passengers each year and have 634 buses in our active fleet.

AC Transit successfully implemented a three-bus Zero Emission Bus demonstration in partnership with Golden Gate Bridge Highway and Transportation District (GGBHTD), which launched in November 2005. We are currently partnering with the largest bus operators in the San Francisco Bay Area, including Santa Clara Valley Transportation Authority (VTA), GGBHTD, San Mateo County Transit District (SamTrans), and San Francisco Metropolitan Transportation Authority (Muni), on an advanced zero emission bus demonstration – Zero Emission Bay Area (ZEBA) -- that will entail 12 hydrogen-fuel cell hybrid buses and two hydrogen stations with a daily fueling capacity of more than 400 kilograms.

The advanced demonstration was to be operational in January 2009 which would have provided ARB staff six months of data to inform the ARB Board about the future direction of the 15% purchase rule. Unfortunately unanticipated delays in securing agreements between ZEBA partners, acquiring the necessary funding, and resolving technical issues with our fuel cell provider and battery suppliers have pushed back the launch date until June 2010. Given the delay and the preliminary information known to date, we offer the following comments on a proposed direction for amendments to the ZEB Regulation.

**Performance**

The preliminary data from the first hydrogen demonstration project are quite promising. As of today we have logged more than 182,000 miles of service on our three buses since early 2006, and we have carried in excess of 500,000 passengers. All three buses are scheduled in regular service, Monday through Friday, for a period of 14 to 18 continuous hours, and two buses operate in service on weekends.

Fuel economy continues to exceed our control fleet of diesel buses by nearly 70%, even though the fuel cell buses are 8,000 pounds heavier. A survey of our passengers shows overwhelming support in favor of the technology, with an 84% positive rating among nearly 500 respondents. Of particular benefit to the local community has been the noticeable reduction in noise levels as a result of the nearly silent electric propulsion system.

To date we have produced and dispensed nearly 46,000 kilograms of hydrogen without a single safety incident, and although our hydrogen is produced using steam methane reformation, a GREET analysis of our well-to-wheel emissions documents a 43% net reduction in CO<sub>2</sub> emissions compared to a diesel bus.

But challenges remain. The cost of vehicles is still extraordinarily high, at approximately \$2.5 million per bus, and the cost of building a fueling station that will fuel six buses is estimated to be from \$6 million to \$7 million. At least another \$1 million to \$2 million is needed to retrofit or build a hydrogen-safe maintenance bay to service the needs of up to 20 buses. We have been paying approximately \$6 per kilogram for fuel, but this number is artificially low because our fueling partner, Chevron, has absorbed all maintenance and service costs related to the operation of the station. It's possible that we may have to pay as much as \$10 per kilogram once we build our own station.

While fuel cell durability is steadily improving, with warranty hours increasing from 4,000 hours in our existing fleet, to as much as 10,000 hours in the Advanced Demonstration fleet, an operating life of 20,000 to 25,000 hours is essential to match the half-life of a standard transit bus.

Clearly, our biggest challenge to date has been the reliability of the onboard energy storage system. Nearly 50% of our downtime has been associated with difficulties operating the traction batteries and related difficulties with the hybrid power control system. These problems are being addressed in the design of the new buses for the Advanced Demonstration project, as we pursue a primary goal in this next phase of development of substantially improving vehicle reliability.

### **Advanced Demonstration**

Our new fleet of 12 buses will feature major improvements over the existing fleet in the following ways:

1. A three ton reduction in weight.
2. Lighter, more efficient, and more reliable and durable energy storage system, featuring heavy-duty lithium-ion batteries.
3. Systems integration by the bus manufacturer, as opposed to using a third-party integrator, resulting in easier to maintain components and networks and improved reliability and durability.
4. Enhanced control system featuring a unique dynamic interface developed by the bus OEM that more efficiently manages drive, fuel cell, and accessory systems.
5. Better weight distribution throughout the bus to improve on-the-road vehicle performance, ride and handling.
6. Lighter, smaller, and more efficiently designed cooling systems and onboard hydrogen storage system.
7. Better optimization of interior space by proper distribution of components that takes advantage of the uniqueness of fuel cell and all-electric technology to make a better vehicle for passengers, and not just a diesel bus powered by hydrogen.

Our two new stations under development are intended to demonstrate faster fueling, equivalent to the five to seven minutes to refuel diesel buses; a greener well-to-tank footprint, utilizing solar electrolysis

to generate a share of our fuel requirements; scalability, to support expanded fleets of 25 to 50 buses; enhanced energy efficiencies over older technology; and capital cost reductions.

Our prototype bus is going through road testing at the factory and is expected to be delivered to AC Transit in early September, with service to commence within 30 days after its arrival. The remaining 11 buses will be delivered monthly, with the 12<sup>th</sup> bus expected in June 2010. Our new Emeryville hydrogen station, which will also feature public access 350 Bar and 700 Bar fueling for light-duty vehicles, is expected to be online in April or May 2010, and the new Oakland station, which replaces our existing Chevron station, should be operational in the fourth quarter of 2010.

### **Cost**

The ZEBA demonstration project is expected to cost \$49 million. To date, AC Transit has raised just over \$41 million, of which \$26 million has come from Bay Area regional transit program funds. Dramatic cuts in state funding have greatly curtailed critically needed funding to bridge the gap in the ZEBA funding shortfall. While the bus procurement is fully funded and under contract, and the Emeryville station is fully funded and partially under contract, we must still raise another \$8 million to cover the cost of our Oakland station and hydrogen maintenance bay upgrades. We have applied for several federal Stimulus grants under the DOE Clean Cities and DOT/FTA Tigger solicitations, but it is questionable that hydrogen projects will be scored high enough to receive the funding we've requested. Announcements are expected in early September. In the meantime, we and our regional transit agency partners are working closely with the Bay Area's Metropolitan Transportation Commission to find other sources of funding, should we fail to receive these additional grants.

### **Recommendations**

With regard to the ARB acting on modifications to the existing ZEB regulation, based on our experience to date, we would recommend the following actions:

1. Delay the 2011 and 2012 purchase requirements indefinitely until sufficient findings can be made from the Bay Area's Advanced Demonstration project to make a determination of next steps.
2. Observe the Advanced Demonstration project for a minimum period of 12 months, or longer, in order to make definitive findings to decide if and when the purchase requirement should be implemented. An evaluation period of more than 12 months may be necessary to not only demonstrate strong performance and enhanced reliability, but to show evidence of the durability of the major propulsion system modules, including fuel cells, batteries, and hybrid-drive components.
3. Following a preliminary six-month evaluation of the Advanced Demonstration and an analysis of the market position of bus and component system manufacturers, adopt decision-making metrics or "triggers" that reflect true market readiness. These should at least include thresholds in the following categories: cost of procurement of vehicles and infrastructure; cost of fuel; replacement cost of key drive-system modules (fuel cells, batteries, hybrid-drive components) over a minimum 12-year life of the vehicle; reliability of batteries, fuel cells, and hybrid-drive components, as measured by two key transit industry metrics – miles between road calls and

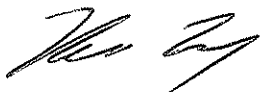
availability for daily service; and durability of batteries, fuel cells, and hybrid-drive components, as measure by warranty periods.

4. Upon adoption of a purchase requirement, provide a two- or three-year "ramp-up" period to account for the long lead times necessary to procure vehicles and infrastructure. A three-year period is not unreasonable given the time it takes to secure capital, develop specifications unique to each transit property, manage the procurement process, and build vehicles and infrastructure.
5. And finally, with respect to deployment of new technology – fuel cell or otherwise – consider the need to fund any incremental costs associated with replacing existing fleets. Without additional funding from either the state or the federal government to cover the marginal costs associated with new technology, it will be nearly impossible for transit agencies to make one-for-one replacements of existing technology and maintain current levels of service. Our systems are already struggling because of the failing economy and state funding cuts. AC Transit is facing significant budgetary shortfalls in FYs 2010 and 2011, forcing us to cut our service by as much as 15%. Dedicating scarce transit funds to implement the ZEB rule at the cost of displacing transit riders is likely to offset any gains realized from the zero emission technology.

AC Transit appreciates this opportunity to provide comments on the ZEB rule. We encourage ARB staff to continue to look at this issue broadly so that the cost of technology advances associated with the ZEB rule will not result in the downsizing of transit operations and a corresponding reduction in transit ridership.

Please contact my staff, Jaimie Levin at 510-891-7244 (jlevin@actransit.org), or Kate Miller at (510) 891-4859 (kmiller@actransit.org), should you have any questions or require additional information.

Sincerely,



Rick Fernandez  
General Manager  
AC Transit

RF/jl/clt

cc: Tom Cackette and Gerhard Achtelik/ARB  
AC Transit Board of Directors  
Kate Miller  
Jaimie Levin