



ISE CORPORATION

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Paul R. Scott

07-5-3

May 24-25, 2007
www.isecorp.com

22 May, 2007

Dr. Robert Sawyer, Chairman
California Air Resources Board
Sacramento, CA

Regarding proposed funding for Hydrogen Buses

Dear Dr. Sawyer:

As I believe you know, ISE has supported development of hydrogen buses and now has a well developed reputation for world leadership in hybrid electric drive trains as applied to zero and near-zero emission vehicles. We are enthusiastic about supporting ARB initiatives in these areas, and are near to announcing international agreements for supply of California developed hydrogen bus technology to various cities around the world.

Further, we have teamed with SunLine Transit in developing the HHICE technology that can make possible hydrogen fueled buses at competitive pricing. Our HHICE equipped bus has been in every day transit service now for over two years and is proving to be a very good pre-commercial product. We strongly suggest that the ARB continue to support the commercialization of this technology. To enable this, SunLine Transit submitted a proposal in response to this AFIP solicitation to develop a commercial version of the HHICE bus. This will provide a cost effective hydrogen powered transit bus capable of rigorous transit service, not a flashy marketing demonstration. This technology will be developed in California and sold around the world.

We are concerned that some projects being pursued by staff are more focused on marketing events (not commercial products) and are using California tax dollars to fund out of state efforts. For instance, we have recently been informed of the staff recommendations regarding a hydrogen fueled bus to be produced by a company in Colorado that has never built a vehicle before, and has no hydrogen experience. Specific concerns are as follows:

1. The subject proposal is to fund an out of state firm, in preference to the SunLine proposal which would support the hydrogen bus technology in California,
2. The subject proposal is to fund a firm which proposes to build a high technology composite bus body, but has never built a bus. The Board may be aware of the experiences of major transit authorities, such as the Los Angeles Metropolitan Transit Authority, in introduction of vehicles of such complexity. To our understanding many years and many millions of dollars were expended before the composite bus performed to the satisfaction of the LAMTA.
3. The subject proposal is to fund a firm which proposes to build a hybrid electric bus, but has never built a hybrid drive train,
4. The subject proposal bus is purportedly a "plug-in hybrid", a well marketed concept offering promise for vehicles which commute 10-20 miles per day but decidedly inappropriate for a transit route of (typically) three hundred miles or more. The excess battery capacity (weight) will detract from the performance, as it is carried through the route.



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5. It is proposed that the customer will end up with an experimental bus which has not been subjected to the federally mandated Altoona testing, and is not rated as a 12 year bus (the standard of the transit industry),
6. The Staff proposal is to fund this bus to use a fuel cell of limited warranty, whereas the standard of the industry warranty is for 12,000 hours/ 5 years.
7. Staff informs us that there is no warranty plan for the vehicle batteries.
8. The staff proposal indicates that the bus will use "Alternano lithium battery technology". Staff was not aware (as it has not been public) that ISE and the firm Altairnano have a joint development agreement by which ISE has exclusive rights to the use of the Altairnano battery technology for bus applications.

It is important to fund zero and near zero emission buses, but it is even more important that those buses serve well in regular revenue service, for many years after delivery. The time for short term demonstrations of hydrogen buses is past, as three California agencies use them in daily service, the CUTE program buses have accumulated over a million miles, and internationally it is recognized that near-commercial deployments of tens of buses are appropriate.

ISE is currently in negotiation with two major (outside of USA) entities for fuel cell bus fleets, where the customer is getting:

- Fuel cells with 5 year, 12,000 hour warranties,
- Buses fabricated by firms with established transit reputation, firms whose buses have passed all the standard testing, such a Altoona, and which have proven capability for 12 year operation in daily service,
- A proven hybrid electric drive system, with millions of miles of on the road transit experience,
- A turn-key contract such that all parts and service are warranted over a five year period, with agreed on assurances that the buses will be in daily service.

This is available from a California firm – which hereby implores reconsideration of a staff recommendation which, by all indications, will at best result in a bus with a very limited life.

ISE prime focus is to provide the best, most reliable zero and near zero emission technology for transit applications. We are a California corporation, we employ in California, and we will provide the best value in public transit vehicles. We support ARB objectives, and we look forward to continued support from the Air Resources Board.

Yours truly,

Paul B. Scott, Chief Scientific Officer

cc: Ron Roberts

07-5-3
Paul Scott

Comments on Staff Proposed Funding of "Plug-in Hybrid Transit Bus"

Paul B. Scott, Chief Scientific Officer

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ISE Provides Hybrid Electric Buses

Diesel Hybrid Bus



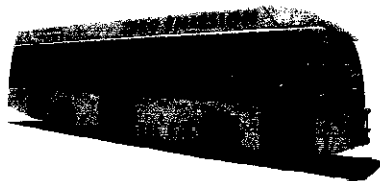
Highest fuel economy of any commercially-available heavy-duty vehicle drive system

Gasoline Hybrid Bus



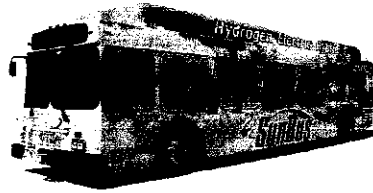
First ARB-certified bus hybrid drive system; now in high rate production (100 in 2005)

Fuel Cell Bus



*Four fuel cell buses used in revenue service in California; one in Connecticut
Total nearly 80,000 miles*

Hydrogen Hybrid Bus

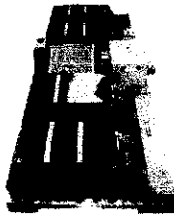
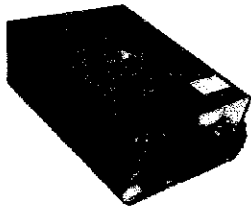


Lower cost near-zero emission alternative to fuel cell buses; started revenue service in December 2004 - over 54,000 mi in



**ENERGY STORAGE SUBSYSTEM
components circa 2006**

Zebra ZEBRA Battery	Caterpillar V-C 2000 Battery	Trane T-1071 Microprocessor
<ul style="list-style-type: none"> • 53kWh usable energy • 95kW charge and discharge power • -35°C to 50°C operating temperature • Expected life 2.5-5 year • 1 year warranty • Experience is disappointing, Zebra failures are a key cause of fuel cell bus road calls 	<ul style="list-style-type: none"> • 25kWh battery system • 340kW, power rating 10 seconds • -10 °C to 55°C operating temperature, liquid cooling • Expected life 4-6 years • 2 year standard warranty (extended warranty available) • Cycle life decreases with duty cycle depth • Reliability improving 	<ul style="list-style-type: none"> • 0.5kWh usable energy • 200 kW charge and discharge power • -35°C to 65°C operating temperature • 2 year standard warranty (extended warranty available) • Lifetime is cycle independent • 94% average efficiency • An ISE product



**Concerns with Staff Proposed funding of a
“plug-in hybrid transit bus” pg 1 of 3:**

1. Staff proposes to fund an out of state firm, in preference to proposals which would support the California development of hydrogen bus technology,
2. Project Description refers to “Alternano lithium battery technology”, however ... ISE has a joint program of battery development with Altairnano, with considerable investment, and an exclusive agreement regarding use of their batteries for buses among other heavy duty applications.
3. Staff proposes to fund hybrid bus development by a firm that has never built a hybrid bus drive train,



**Concerns with Staff Proposed funding –
pg. 2 of 3:**

- Staff proposes funding development of a new design composite bus, by a firm which has never built a bus. Experience has shown the development of a composite bus (without hybrid, without fuel cell) is a multi-year, multi-million dollar enterprise.
- The subject proposal bus is described as a “plug-in hybrid”, a well marketed concept offering promise for vehicles which commute 10-20 miles per day but decidedly inappropriate for a transit route of (typically) a hundred miles or more. The excess battery capacity (weight) will detract from the performance, as it is carried through the route (One presumes it will not be recharged hour by hour.)



**Concerns with Staff Proposed funding –
pg. 3 of 3:**

- It is proposed that the customer (Burbank) will end up with an experimental bus which has not been subjected to the federally mandated Altoona testing, and is not rated as a 12 year bus (the standard of the transit industry),
- The Staff proposal is to fund this bus to use a fuel cell of limited warranty, whereas the standard of the industry warranty is for 12,000 hours/ 5 years.



Transit professionals are looking, not to novel ideas and new developments, but to “pre-commercial deployment” of fuel cell buses:

- Warranties of 5 years, 12000 hours for the fuel cell,
- Proven hybrid drive systems, with millions of miles on the road,
- Buses which have passed Altoona testing, fabricated by one of the world class coach manufacturers
- Turn-key contracts with parts and service warranties, periods up to 5 to 7 years, and fiduciary assurances that buses will be in daily service



We urge....

- That the recommendation of funding of a “Battery dominant, fuel cell, plug-in hybrid transit bus” be rejected,
- That ARB staff be given support to do appropriate “due diligence” such that consideration of these complex technologies goes deeper than the reading and rating of an attractive proposal,
- That California firms be given first chance at California monies.

