

Heavy Duty Vehicles

Transit Bus Demonstration Projects



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Highlighted Projects

- Advanced Technology Fuel Cell Bus to be demonstrated at Sunline Transit Authority
- Battery Electric Bus being developed for Los Angeles Metropolitan Transportation Authority
- Natural Gas Hybrid-Electric Bus demonstrated at San Diego Metropolitan Transit System

Advanced Technology Fuel Cell Bus

- New Flyer Industries bus
- ISE Thundervolt drive system
- Ballard Power Systems fuel cell
- Dynetek Hydrogen storage tanks
- Valance lithium battery



Performance

- Average fuel economy: 7 mi/kg hydrogen
- Range: 310 miles +
- Top speed: 65 mph
- Low exterior noise levels: 76 dBA and below

Progress and Status

- Final testing was completed 4th quarter 2009
- AQMD contract was extended to complete demonstration at Sunline Transit
- Delivery to Sunline will occur in the 1st quarter 2010

Cost Share

Advanced Technology Fuel Cell Bus Project

	Amount	Percent
AQMD	\$325 K	26%
Partners	\$950 K	74%
Total	\$1.3 M	100%

Battery Electric Bus Project

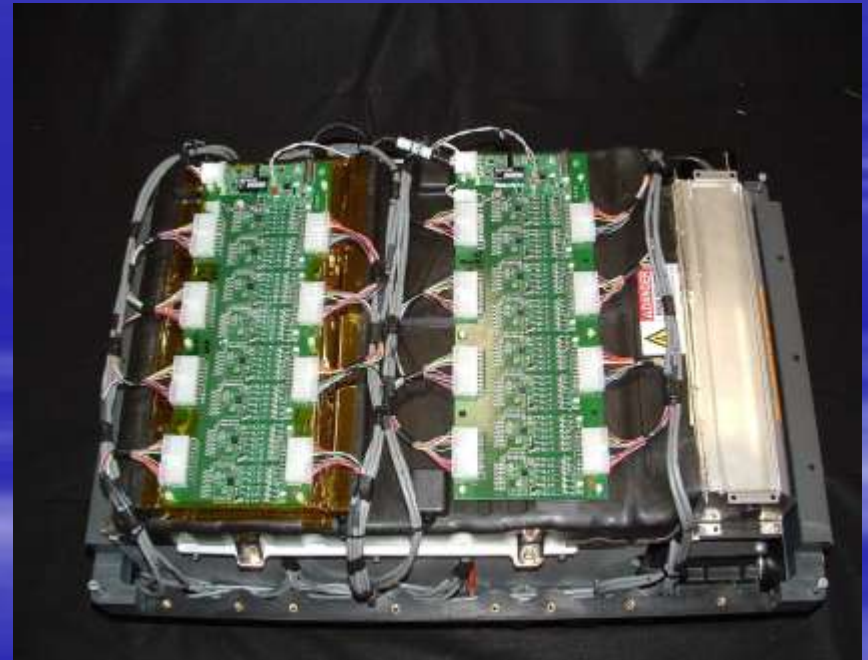
- North American Bus Industries (NABI) Bus
- ISE Electric Drive System
- Lithium Battery



Battery Testing

- Battery development continues to be focused on testing of the 60 Ah cells and the design of the cassettes and the modules
- Following testing of the smaller system development and scaling to the larger system will proceed

Lithium – Graphite/NiCoMnO₂ Battery



Progress and Status

- New HVAC is being designed for the Battery Bus by Thermoking which will provide a dual compressor rear mounted electric HVAC system
- This system is able to operate in the conventional air conditioning mode or in heat pump mode to provide warm air to the passenger compartment
- The system will also provide cooling for the batteries using remote evaporators

Cost Share

Battery Electric Bus Project

	AMOUNT	PERCENT
AQMD	\$290 K	13%
Partners	\$1.9 M	87%
TOTAL	\$2.3 M	100%

Natural Gas Hybrid-Electric Bus

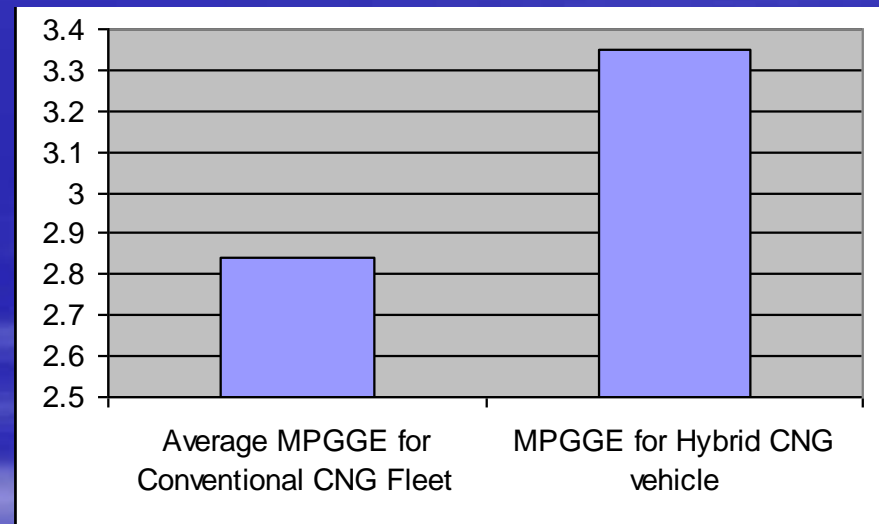
- Transit agencies in the south coast region that have invested in CNG infrastructure wanted to lower their operating costs and reduce fleet emissions
- So ISE developed a series CNG hybrid drive system based on their proven gasoline hybrid design



Demonstration & Results

- CNG hybrid bus entered into revenue service at San Diego MTS for one year
- Performance was evaluated and compared to conventional CNG bus
- Vehicle demonstrated a 18% improvement in fuel economy over a conventional CNG vehicle

Fuel Economy Comparison



Commercialization Applications

- This project has direct commercialization potential in replacing conventional CNG vehicles in transit service leading to increased fuel economy, lower emissions and ultimately decreased vehicle operating costs.

Cost Share

Natural Gas Hybrid-Electric Bus Project

	AMOUNT	PERCENT
AQMD	\$150 K	17%
Partners	\$750 K	83%
TOTAL	\$900 K	100%