ZERO EMISSION BUS TECHNOLOGY SUMMIT
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EBUS WAS FOUNDED IN 1998 IN DOWNEY, CA TO DEVELOP ELECTRIC BUS TECHNOLOGY.

THE COMPANY BECAME THE PIONEER IN 22 FOOT ELECTRIC BUSES.

THE FIRST AND BIGGEST ORDER WAS FOR 20 BUSES FOR THE 2000 DNC IN LOS ANGELES

THIS CLASS OF ELECTRIC BUS ARE SANTA BARBARA, CA AND CHATTANOOGA, TN.

EACH CITY HAS OPERATED ABOUT A DOZEN ELECTRIC BUSES CONTINOUSLY SINCE 2001, WHICH HAVE PROVEN TO BE DURABLE AND RELIABLE.

TO DATE, EBUS HAS MANUFACTURED ABOUT 100 ELECTRIC BUSES.

WHERE ARE WE AT TODAY?

To put things in perspective, there are currently NO 40 foot battery electric buses in revenue service in California.

- Yes, there are battery electric buses (40 foot HD Urban Buses, as defined by ARB) that can be ordered, probably from all the companies represented on this panel.
- At today's prices ($800K), in the absence of a ZEB purchase mandate or 100% FTA TIGGER funding or similar grants, there is almost no demand.

PROTOTYPE EBUS FAST-CHARGE ELECTRIC BUS

Ebus has rebuilt a low floor Gillig 40 foot bus into a ZBUS.

Ebus electric propulsion system consists of:

Ebus proprietary 350 peak HP Oil-cooled traction motor integrated with an Allison transmission.

Liquid-cooled traction inverter

Advanced liquid-cooled Nickel Manganese Cobalt 89 kWh battery system. The cells (320 total) are manufactured in Midland, MI by Dow Kokam LLC. Fast-charge capable.

Individual electric drive of all accessories.

EBUS GAMMA 320 kWh AUTOMATED FAST-CHARGE STATION

AUTOMATED CONNECTION – THE DRIVER STOPS IN FRONT OF THE CHARGER.

THE CHARGER DEPLOYS AUTOMATICALLY WITHOUT THE DRIVER LEAVING HIS SEAT.

U.L. APPROVED.

AT THE STARTING LINE. AN ARB PURCHASE MANDATE COULD CREATE A HEALTHY MARKET IN 2016 AND BEYOND.

Ebus is investing in a brand new 40 foot composite bus body optimized for electric propulsion for introduction at the end of 2014.

The weight of the composite body will be 6,000 pounds less than a standard steel bus, a huge advantage for an electric bus.

BATTERIES UNDER THE RAISED REAR FLOOR FOR LOW C.G.

The batteries are liquid-cooled to allow a very fast charge rate.

The connection to the fast-charge station is automatic – the driver can remain in his seat.

For some routes, fast-charging can work very well. The Gamma fast-charge station can charge at 4 kWh per minute.

The bus can stay on the route an unlimited length of time if layovers are used for periodic fast-charging.

CONFIGURATION HAS 355 kWh BATTERY – ENOUGH FOR 100 – 150 MILES RANGE.

The battery is 4 times the size of the one in the fast-charge bus and very heavy, which could conflict with California's new rear axle weight limit law.

Six hours to fully charge.

Potentially very expensive to replace.

All the batteries are under the floor, in the rear or on the roof – no intrusion in the passenger space.

AVAILABILITY AND DELIVERY SCHEDULE

- ANY REASONABLY SIZED ORDER COULD BE MET IN 12 TO 18 MONTHS, SAME AS WHAT IS TYPICAL IN THE TRANSIT INDUSTRY TODAY.
- FOR UNEXPECTEDLY LARGE ORDERS WE WOULD HAVE TO SCALE UP, WITH APPROPRIATE LEAD TIMES. NOT OUR BIGGEST WORRY TODAY.

TECHNOLOGY AND PERFORMANCE ENHANCEMENTS IN THE NEXT 2 TO 5 YEARS

- LIGHTER BUS BODIES AND IMPROVED BATTERY TECHNOLOGY
- LOWER PRICES, HOPEFULLY
- LONGER TERM, THE FUEL CELL BUS IS PROBABLY THE BEST ANSWER, ESPECIALLY IF HYDROGEN CAN BE PRODUCED RENEWABLY UTILIZING WIND OR SOLAR.

LA METRO'S LONG TERM ZBUS GOAL TO OPERATE 230 – 280 MILES

- THIS CAN BE ACHIEVED EVEN WITH TODAY'S BATTERY TECHNOLOGY WITH FAST-CHARGE STATIONS IN STRATEGIC LOCATIONS, ALTHOUGH LAYOVER TIME COULD BE AN ISSUE.
- THE WILSHIRE ROUTE, 16 MILES FROM DOWNTOWN LA TO SANTA MONICA, IS VERY "DOABLE" EVEN TODAY IF FAST-CHARGING DOWNTOWN BEFORE EACH ROUNDTRIP.
- FAST-CHARGE STATIONS CAN BE MADE EVEN MORE POWERFUL AND FASTER BY UTILIZING INTERMEDIATE STORAGE TO PROTECT THE GRID.

THANK YOU.

- QUESTIONS?