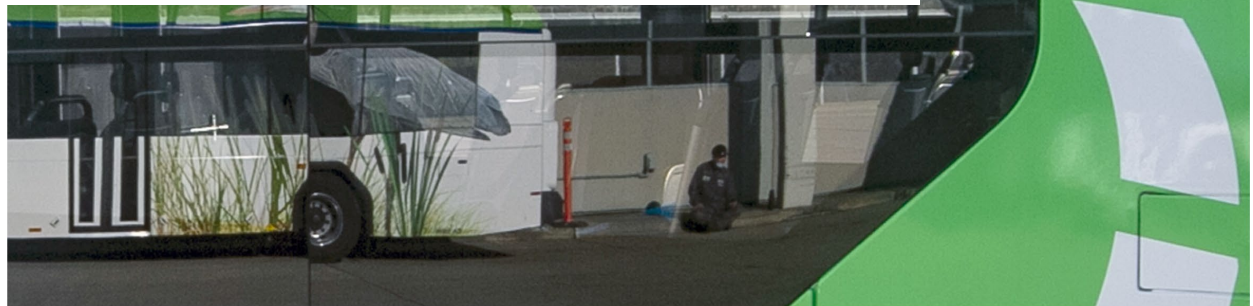




AC Transit ZEB Programs

Sal Llamas – Chief Operating Officer
April 17, 2023



OVERVIEW



Bus Division



Battery Electric



H2 Fuel Cell



Administrative



7 Elected Board Members
1.5M people in service area
364 square miles
128 lines (18 transbay)
16.7M annual service miles
2,200+ FTE's
7 facilities (4 bus-3 support)
637 buses (58 ZEBs)

ZERO EMISSION



- Leader in advancing ZE technology since 2000
- Implemented one of the nation's most comprehensive ZEB programs
- Started with H2 electric bus technology and expanded to include battery electric buses.



Over 5M ZE miles, eliminating 12,830+ metric tons of CO2

Leading the way to a **ZERO EMISSION FUTURE.**

ZEB HYDROGEN



ZEB BATTERY



- **Fueling capacity 78 (D2 & D4)**
- **Expand to 130 at D4 & D6**
- **Increasing capacity to 325**

- **Charging capacity 6 (D4)**
- **Expand to 50 at D4 & 26 D2**
- **Increasing capacity to 82**

ZEB 5X5 STUDY

ZERO EMISSION TRANSIT BUS TECHNOLOGY ANALYSIS

World's first comparison
of BEB & FCEB



5 different bus types:
diesel, diesel hybrid, BEB,
FCEB, legacy FCEB



Same routes from the
same division using the
same Bus Operator pool



Same key performance
indicators



*Stanford University's Precourt
Institute of Energy*



ZEB 5X5 STUDY Vol. 4



Figure 1: 5x5 Vehicle Matrix

FLEET	DIESEL (BASELINE)	DIESEL HYBRID	FUEL CELL ELECTRIC (FCEB)	BATTERY ELECTRIC (BEB)	LEGACY FUEL CELL
Series Grouping	1600	1550	7000	8000	FC
Technology Type	Diesel	Hybrid	Fuel Cell	Battery	Fuel Cell
Bus Qty	5	5	5	5	5
Manufacturer	Gillig	Gillig	New Flyer	New Flyer	Van Hool
Year	2018	2016	2019	2019	2010
Length	40'	40'	40'	40'	40'
Data Summary (January 2022 – June 2022)					
Fleet Mileage	92,128	54,660	88,188	59,549	34,533
Life-to-Date Mileage	757,363	1,235,654	452,103	272,046	1,423,925
Cost/Mile	\$2.29	\$3.11	\$2.52	\$1.61	\$4.15
Cost/Mile (w/credits)	\$2.25	\$3.00	\$2.20	\$0.53	\$4.11
Emissions (CO2 Metric Tons)	235	106	0	0	0
Fleet Availability	89%	51%	78%	66%	57%
Reliability (MBCRC)	10,236	5,466	6,299	59,549	3,139
MPG (DGE)	4.0	5.3	7.9	17.7	5.5

Cost per Mile

- H2 \$2.52
- BEB \$1.61
- Diesel \$2.29

Fuel Cost

- H2 \$8.42/Kg
- BEB \$0.214/kWh
- Diesel \$3.92/Gal

Fleet Availability

- H2 78%
- BEB 66%
- Diesel 89%



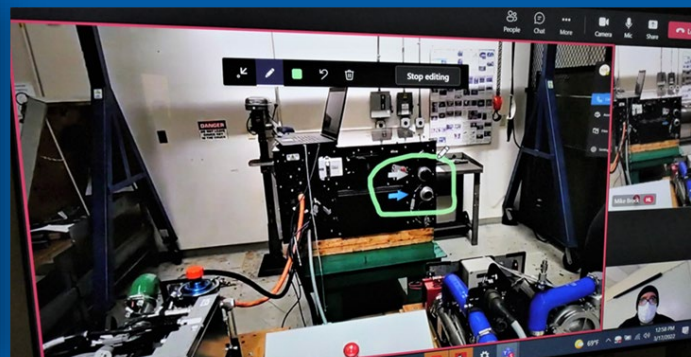
WORKFORCE DEVELOPMENT



- ❑ Safety & Familiarization
- ❑ Advanced Diagnostics
- ❑ Approx. 318 hours of ZEB specific training

Mechanic Development

FCEB-BEB Coursework	Hours
Orientation and PPE/High Voltage	8
Energy Storage System	40
Power Train Technology	40
Fuel Cell	30
5-Week Technical Training Program	200



LESSONS LEARNED



Get to know what you don't know

- Route analysis – block, trip, distance, vehicle type, duty cycle, topography
- Facility – bus servicing process, maintenance buildings, station location
- Workforce training – who, where & how (add funding)
- Technology partners – bus & infrastructure OEMs, consulting firms
- Emergency response – OEMs, first responders, LE & other regulators
- Cost analysis – do your homework, reach out to agencies/associations

ZEB Transition Plan – Guiding Principles

- Replace per TAM Plan performance targets
- Prioritize ZEB deployments per Clean Corridors Plan
- Procure ZEBs based on vehicle & infrastructure capabilities to meet service requirements
- Procure ZEB technology that is most efficient & sustainable to operate

QUESTIONS?



THANK YOU!

