



ZEB Master Plan Update

Advanced Transit
Vehicle Consortium (ATVC)
Board Briefing

March 2023

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California Innovative Clean Transit (ICT) Regulation

- Adopted in December 2018
- Requires all public transit agencies to gradually transition to a 100 percent zero-emission bus (ZEB) fleet.
- Beginning in 2029, 100% of new purchases by transit agencies must be ZEBs, with a goal for full transition by 2040.
- A ZEB Rollout Plan is required from each transit agency, approved by its Board, to show how it is planning to achieve a full transition to zero-emission technologies by 2040.

Source: California Air Resources Board

Metro's ZEB Board Resolution

File #: 2017-
0525

REVISED
REGULAR BOARD MEETING
JULY 27, 2017

Motion by:

**DIRECTORS BONIN, GARCETTI, NAJARIAN, HAHN and SOLIS
AS AMENDED BY SOLIS, KUEHL and BARGER**

FRIENDLY AMENDMENT BY FASANA

July 27, 2017

Strategic Plan for Metro's Transition to Zero Emission Buses

LA Metro has developed a comprehensive plan to deliver a complete transition to zero emission electric buses by 2030. The transition plan is contingent on two primary factors: continuous advancements in electric bus technology (which must increase range, reduce bus weights, reduce charging times, extend battery life cycles), as well as a drop in prices as the technology develops.

G Line Electrification

- January 2021 – Start of 100% Electrified Service
- 40 New Flyer Xcelsior artics (320kWh battery capacity)
- 3 million miles accumulated
- En-Route Charging
 - Opportunity chargers deployed at 3 locations on route
 - Four 450kWh and four 600kWh Siemens opportunity “fast” chargers
- Depot Charging
 - Ten 150kWh depot chargers also installed at D8



J Line Service

Infrastructure In Progress – completion by Fall 2025:

- Design anticipate to be completed April 2023, construction complete by Fall 2025.
 - El Monte Transit Center (EMTC):
 - 4 Opportunity (450kWh) chargers
 - Division 9:
 - 125 depot chargers (40 x 150kWh chargers for 120 parking spots)
 - 3 “Fuel Lane” rapid chargers (450 kWh) + 2 portable units
 - Harbor Gateway Transit Center (HGTC):
 - 5 Opportunity chargers
 - Construction starts in April 2023, provisions for charging masts complete by Fall 2023
 - Division 18:
 - 71 depot chargers for 223 parking spots
 - 5 rapid chargers
 - 60% Design completed, anticipate Design Build procurement to be issued Summer 2023

J Line Service - Buses

Ordered:

- 100 40-foot Buses Ordered from BYD (K9M)
- 5 60-foot Articulated Buses Ordered from BYD (K11M)

Deployed:

- 4 40-foot BEBs (BYD K9M) currently in service
- 1 40-foot BEB (BYD K9M) scheduled for deployment Summer 2023
- 5 60-foot BEBs (BYD K11M) articulated buses scheduled for deployment Summer 2023

Pending Delivery

- 95 40-foot BEBs (BYD K9MD) scheduled for delivery Winter 2023 through Winter 2024



J Line Service

Temporary Chargers – 2023 through 2025

- Acquisition planning for temporary chargers under development
 - Target deployment date Fall 2023
- Limited Service Currently Underway
 - 4 40-foot BYD K9M buses
- Projected Service
 - 1 additional 40-foot BYD K9M bus by Summer 2023
 - 5 60-foot BYD K11M buses by Summer 2023
 - 95 additional 40-foot BYD K9MD buses starting delivery in Winter 2023 to Winter 2024



Other Accomplishments

- 145 BEBs ordered: one of largest BEB procurements to date in CA/USA.
- 44 BEBs in service, and by end of 2023, largest BEB fleet in US
- In January 2023, the Metro Board authorized RFP for procurement of up to 1,000 more BEBs and associated charging infrastructure
- \$413.1 million in additional ZEB-related federal and state grant funding to date, including one of the largest Low-Emission/No-Emission grants in this federal program's history (\$104.1 million awarded in 2022)
- Significant investments in workforce development including \$4.96 million in grant funding for training
- Incorporate Manufacturing careers policy and advanced BEB training for operators and maintainers

Funding Secured to Date

GRANT TYPE	AMOUNT	PURPOSE	SCHEDULE			
			Original Award	Allocate By	Award a Contract by	Fully Spent By
STIP-RIP	19,132,000	buses & charging infrastructure	12/19/2019	6/30/2023	12/30/2023	12/30/2026
STIP-RIP	17,096,000	buses		6/30/2023	6/30/2024	6/30/2027
STP-RIP	500,000	charging infrastructure		6/30/2024	12/31/2024	12/31/2027
STIP-RIP	40,749,000	buses		6/30/2025	12/31/2025	12/31/2028
CRRSAA-STIP	38,189,000	charging infrastructure		6/30/2023	12/31/2023	12/31/2026
TIRCP	159,100,000	Div 9/18/J Line buses & charging infrastructure	7/7/2022	6/30/2025	12/31/2025	12/31/2028
LCTOP	39,098,039	Charging Infrastructure	7/1/2020			
FTA LoNo	104,200,000	Div 9/18 buses & charging infrastructure. \$4.96 mil. workforce development set-aside at post-completion.	8/15/2022	9/30/2025		
ALL GRANTS	413,064,039					

Technology Lessons Learned



Technology Still Nascent – And Expensive

- ZEBs and Charging Equipment sensitive to heat/overtemperature
- Diagnostic tools for failure investigations not mature



Technical Support Is Not Local

- Most expertise is abroad
- Response times are long



Electric Grid Is Fragile

- Risk of black/brown-outs during high energy usage
- Utilities under pressure

**Technical
Challenges
to Meeting
2030 Goal**

Challenges

- Performance
- Utility/Grid
- Costs



Performance Challenges

- Range issues from still immature technology, requiring more buses or opportunity chargers
- Potential cost overruns due to earlier adoption (more buses, more infrastructure)

Performance
in 2020's
remains
insufficiently
developed

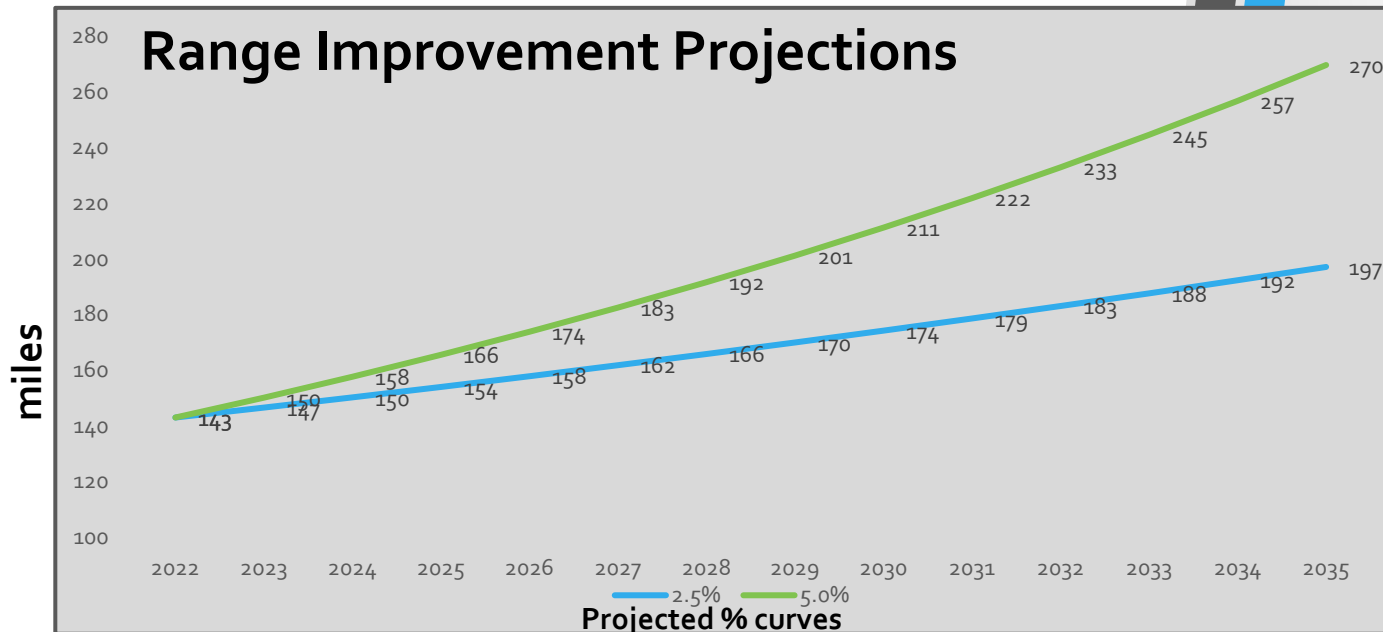


Performance Challenges

Technology Advancement in relation to a 2035 Transition:

- As BEB range improves, Metro will come close to parity with CNG – resulting in fewer opportunity chargers
- 2035 allows for more time for needed LADWP/SCE improvements
- Supply chain, labor and technical support issues should abate by 2035

Post-2030
Technology
Improvement
Trends Affords
Future Program
Opportunities



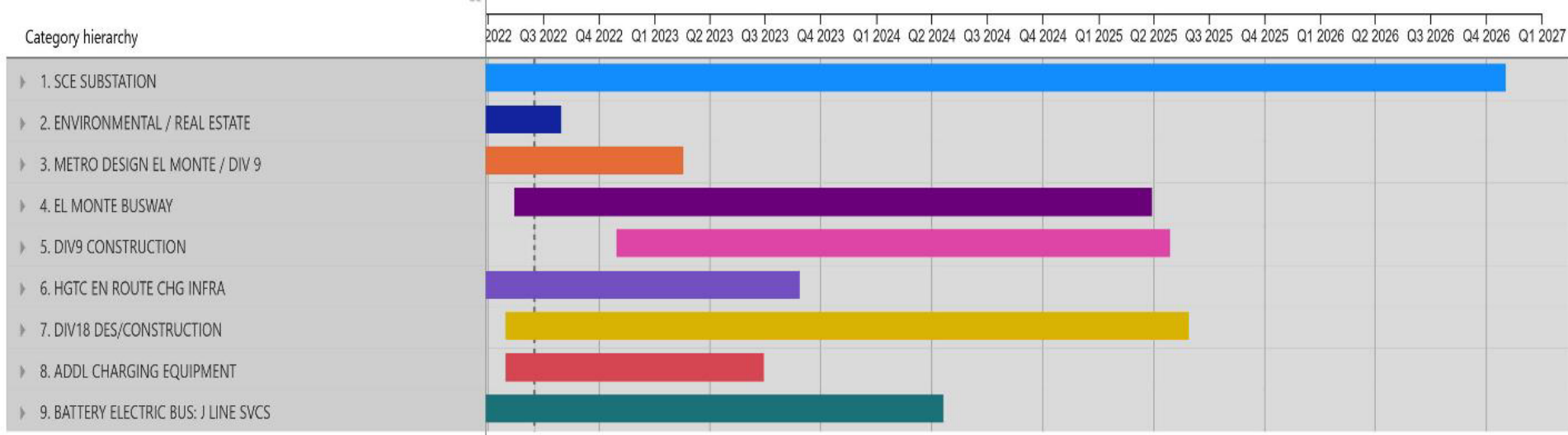
Utility/Grid Challenges

- Grid Capacity is limited, additional capacity requires 3-7 years
- Grid is fragile – frequent brown/blackouts, resilience strategies under development

Utility / Grid Improvements

Draft Concept Plan: J Line (Silverline) Infrastructure and Bus Delivery

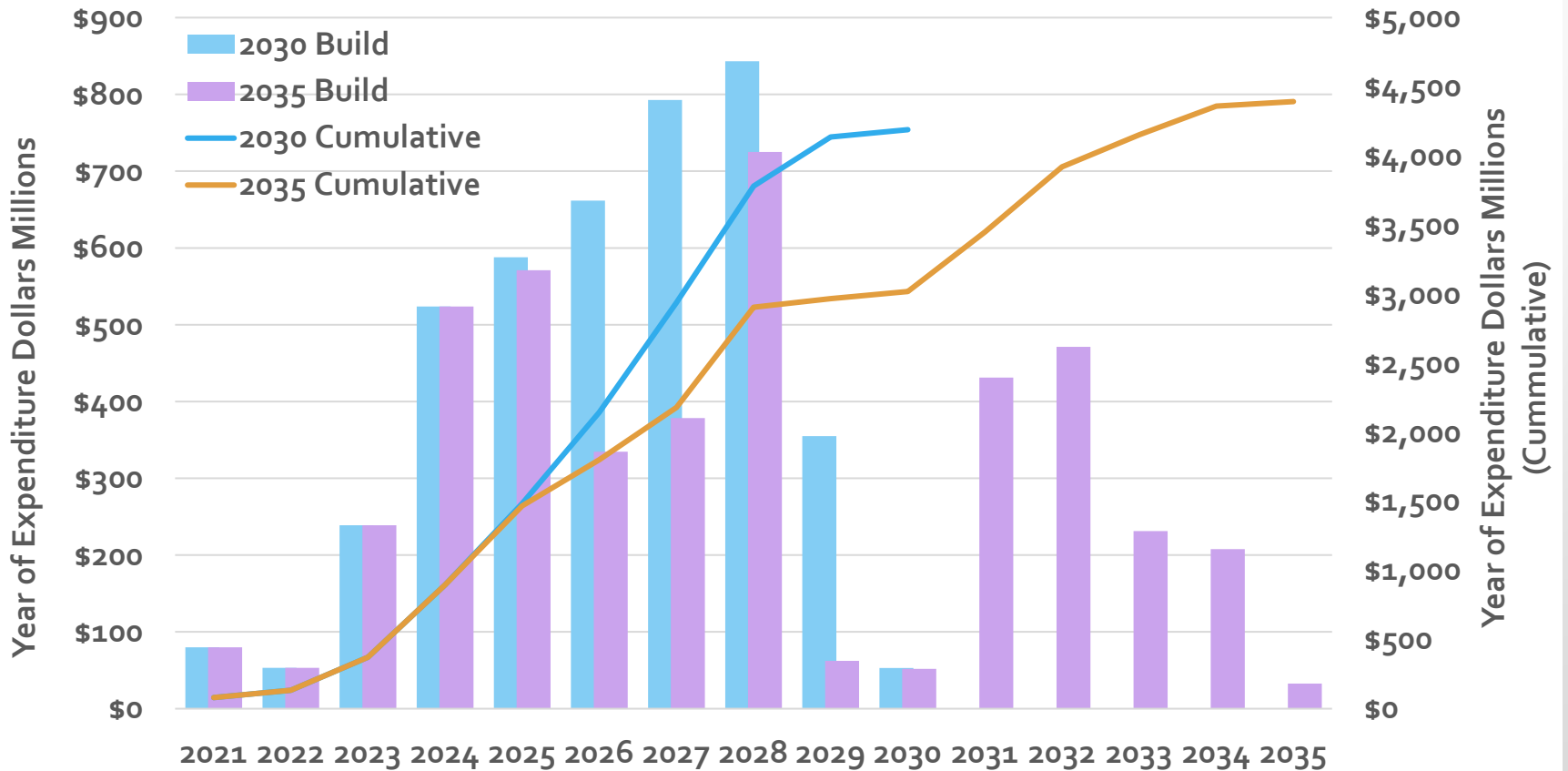
Legend: 1. SCE SUBSTATION 2. ENVIRONMENTAL / REAL ESTATE 3. METRO DESIGN EL MONTE / DIV 9 4. EL MONTE BUSWAY 5. DIV9 CONSTRUCTION 6. HGTC EN ROUTE CHG INFRA 7. DIV18 DES/CONSTRUCTION 8. ADDL CHARGING EQUIPMENT 9. BATTERY ELECTRIC BUS: J LINE SVCS



Cost Challenges

2030 and 2035 – Cashflow Differences

Capital Costs



Cost Challenges

Annual Capital Costs – 2030 versus 2035

Program Capital Expenditures (YOE millions)	2030 Goal	2035 Goal
Vehicle Purchase Price	\$2,996	\$3,145
Modifications & Contingency	\$363	\$381
Charging/Fueling Infrastructure	\$830	\$867
Total Capital Costs	\$4,189	\$4,392
Average Annual Capital Costs	\$598	\$366

Summary

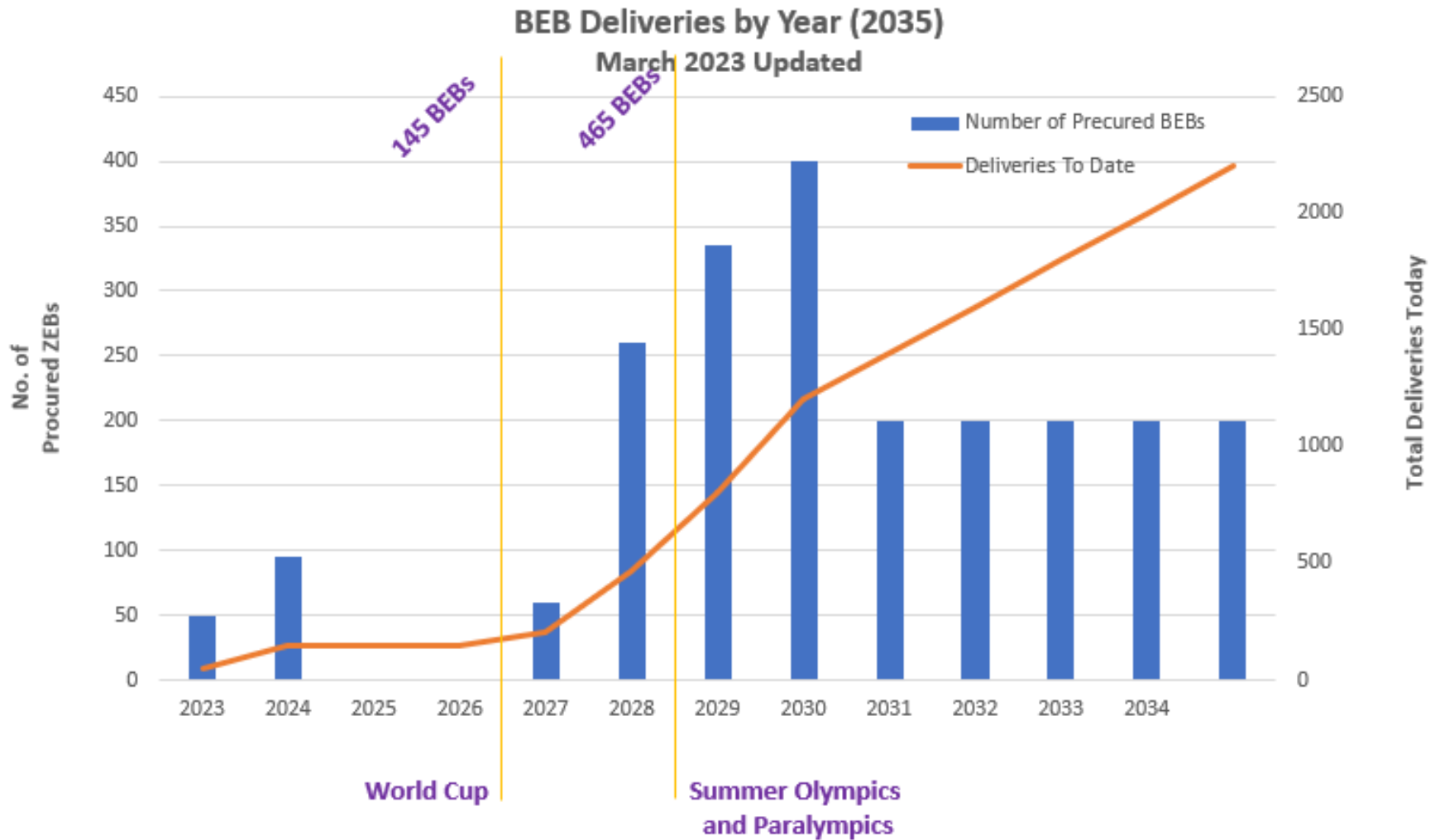
An additional five transition years:

- Gives utilities additional upgrades time to ensure Metro has needed grid capacity and reliability at divisions
- Better capitalizes on technological advancement
 - Potential cost savings due to a reduced need for infrastructure
 - Savings could be as high as \$119 million based on preliminary analysis
- Lower average annual capital cost



Summary

Summary



- Worldcup estimate of Bus availability is 145 Buses
- Olympics estimate of Bus Availability is 365-465 Buses



NEXT STEPS

- New Solicitation for ZEB's & Chargers
- Collaboration with OSI on Alternative Delivery Method



DISCUSSION

Questions?