Los Angeles County
Metropolitan Transportation
Authority
One Gateway Plaza
3rd Floor Board Room
Los Angeles, CA

Metro

Board Report

File #: 2017-0232, **File Type:** Oral Report / Presentation **Agenda Number:** 26.

SYSTEM SAFETY, SECURITY AND OPERATIONS COMMITTEE
JUNE 15, 2017

SUBJECT: ORAL REPORT ON SYSTEM SAFETY, SECURITY AND OPERATIONS

RECEIVE oral report on System Safety, Security and Operations.

powered by Legistar™

ITEM 26

Strategic Planning for Metro's Transition to Zero Emission Buses

June 15, 2017

Metro

Requirements and Guidelines/Guiding Principles

- Continue to replace aging bus fleet (~200 Buses per Year)
- Upgrade current CNG buses to “Near Zero” Low NOx engines
- Maintain existing bus fleet in a “State of Good Repair”
- Improve Service Quality and Reliability
- Transition Metro Orange Line (MOL) to Zero Emission by 2020
- Transition Metro Silver Line (MSL) to Zero Emission by ~ 2021
- Goal of 100% Zero Emission Bus Fleet by 2030

Metro

Challenges to Transitioning to 100% Zero Emissions

1. ZEB Service Requirements: Long term, Metro will need ZE buses that meet/exceed Metro service and operating requirements:
    - 250+ miles range throughout 12 year vehicle life
    - Less than 31,000 lbs curb weight for 40' ZEB
    - 65mph Top speed; Ability to sustain 10% grade

    Impacts to capital and operating costs; may require replacement on greater than 1:1 ratio
2. Facilities and Infrastructure: ZEB program will requires up front investment in ZEB charging equipment and related infrastructure upgrades

    Impacts to ZEB deployment schedule; key pacing item
3. Technology: Known and unknown technology risks with ZEB operation, particularly with battery and propulsion system technologies.

    Impacts to capital and operating costs, reliability; implement risk mitigation strategies where practical
4. Funding: Additional funding needs to be identified for 100% ZEB program.

    Potential impacts to other projects, and/or degradation of service levels.

Metro

Strategic Approach – Two Phase Plan

Goal to achieve 100% ZE buses at 2030

Phase 1: Use service proven technology and products (e.g. En-route Charging)

- Award ZEB contracts for MOL and MSL.
- Upgrade to Near Zero CNG engines and RCNG
- Evaluate and mitigate issues that could impact service & operation.
- Develop ZEB Master Plan for fleet-wide operation

Key Milestone: ZEB Technology Assessment (2019-2020)

- "Go/No-Go" decision milestone on expanding use of ZEB fleet-wide at Metro in 2019-2020 (i.e. determine whether to move into Phase 2).

Phase 2:

- Continued assessment of technologies, mitigation strategies, cost, and schedules
- Take measured steps toward full implementation of 100% zero emission bus fleet for use throughout Metro's operating region.

Metro

Current Bus Contracts

Top Level Procurement Schedule (Bus Only)

Current Bus Contracts	FY17 Q1	FY17 Q2	FY17 Q3	FY17 Q4	FY18 Q1	FY18 Q2	FY18 Q3	FY18 Q4	FY19 Q1	FY19 Q2	FY19 Q3	FY19 Q4	FY20 Q1	FY20 Q2	FY20 Q3	FY20 Q4	FY21 Q1	FY21 Q2	FY21 Q3	FY21 Q4	FY22 Q1	FY22 Q2	FY22 Q3	FY22 Q4	FY23 Q1	FY23 Q2	FY23 Q3	FY23 Q4
ZEB Implementation Phase:	**Phase 1** (MOL & MSL Electrificaton) & ZEB Technology Assessment																**Phase 2** - ZEB Assessment and Expansion of ZEB Program to Rapid and Local Lines											
CNG 40’ Procurement (Group A)	Soliciation and Award				Design, engineering, material sourcing								Delivery 295 Buses				**Options (Up to 305 Buses)**											
CNG 60’ Procurement (Group B)	Soliciation and Award				Design, engineering, material sourcing								Delivery 65 Buses				**Options (Up to 335 Buses)**											
ZEB 40’ Bus Procurement (Group C, MSL)	Soliciation and Award				Design, engineering, material sourcing								Delivery 60 40' ZE Buses								**Options (Up to 40 Buses)**							
ZEB 60’ Bus Procurement (Group D, MOL)	Soliciation and Award				Design, engineering, material sourcing								Delivery 60' ZEB's 35 Buses								**Remaining 60' ZEB Options (Up to 65 Buses)**							
New Flyer Low-No Grant (MOL) Five 60' ZEB Contract	Soliciation and Award								Delivery (5 Buses)																			
BYD Five 60' ZEB Contract (MOL) Five 60' ZEB Contract	Soliciation and Award								Delivery (5 Buses)																			

Metro

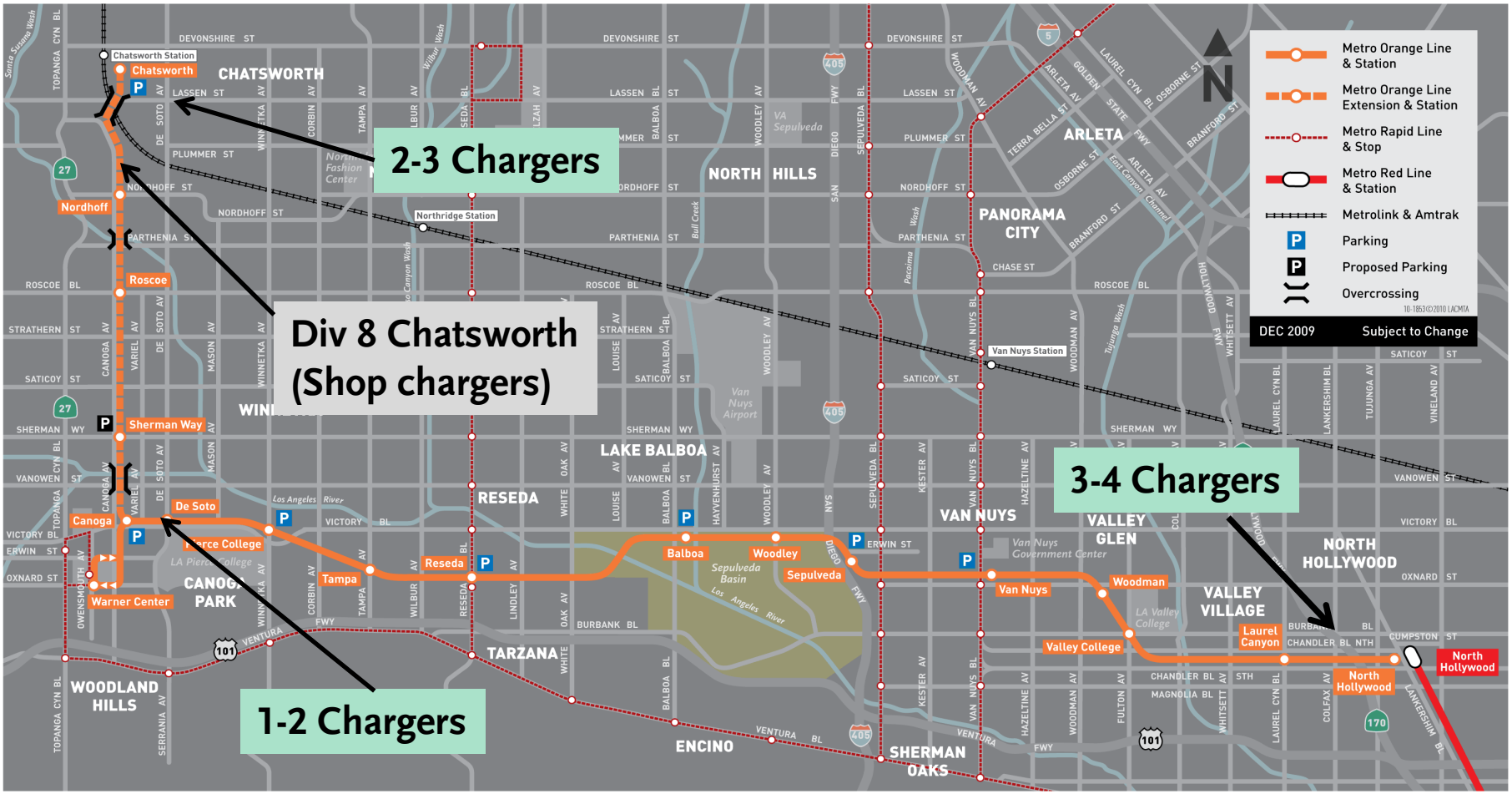
ZEB – Phase 1 – Key Program Elements

- **Phase 1 ZEB (2017-2020)**
  - Upgrade CNG fleet to Low NOx engines and RCNG
  - Continue to operate and maintain CNG fleet in "State of Good Repair"
  - Start MOL and MSL operation using limited range ZE battery electric buses and "En-Route" charging
    - Install opportunity charging on the ROW of BRT Lines (901, 910, 950)
    - Continuous daily operation (no breaks for midday charging)
    - Maximize use of mature ZEB technologies that are commercially available, "Off-the-shelf" hardware
  - By 2020, Open Metro Orange Line BRT (45 x 60' ZE buses)
  - By ~ 2021, Open Metro Silver Line BRT (60 x 40' ZE buses)
  - Develop "Master Plan" for fleet-wide ZEB implementation, and establish ZEB investment priorities and goals for Local and Rapid Lines (160+ lines, 2300 buses)

Metro Orange Line ZEB Program

Metro

Metro Orange Line



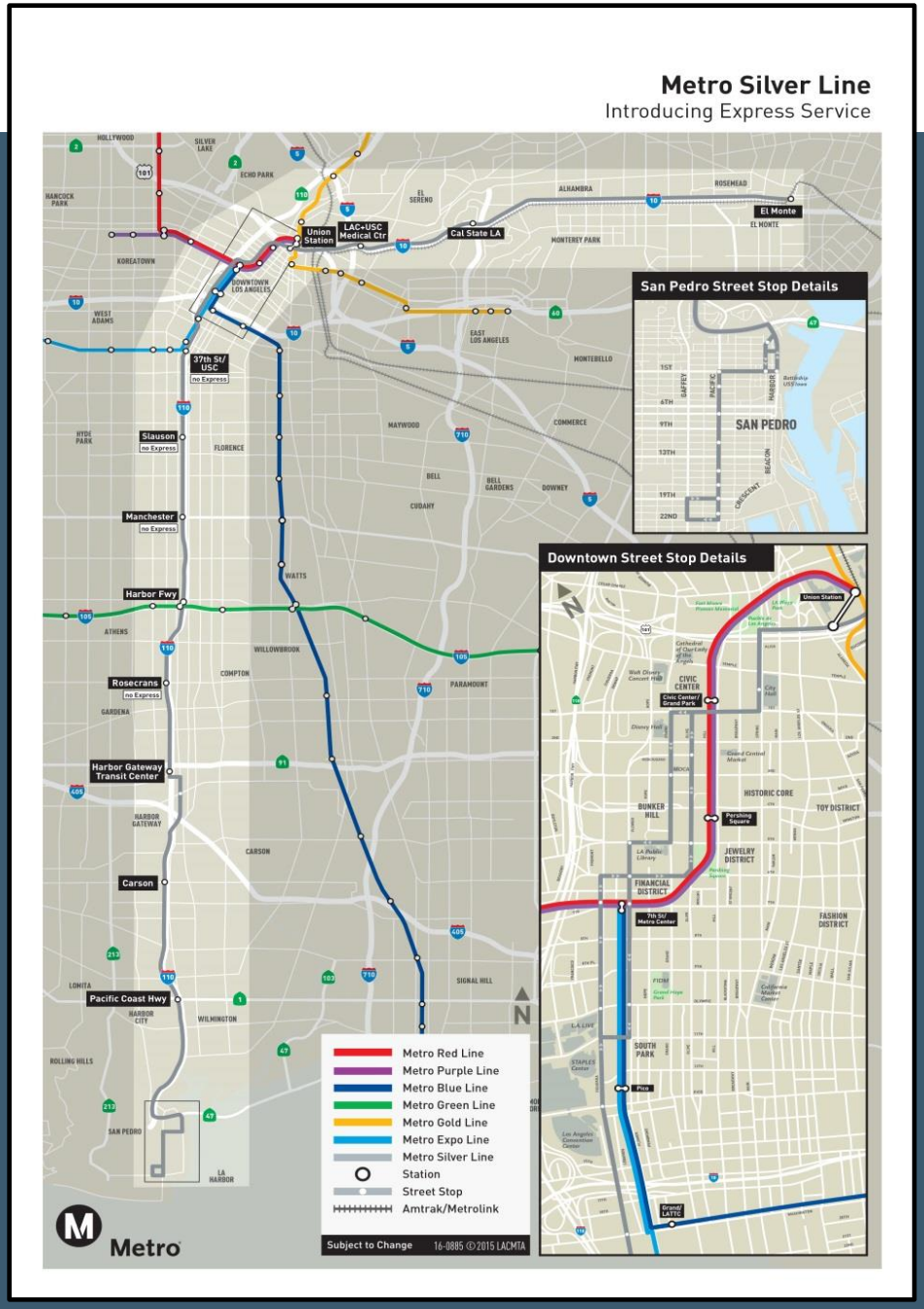
Metro

Metro Silver Line ZEB Program

Metro

Metro Silver Line

- 29 mile ROW
- Longer distances (1-5 miles) between stations
- Mostly HOT lane operation with 65 mph top speed
- Use of 60 x 40' ZEB's on this corridor.
- Potential opportunity charging locations in El Monte, Harbor Transit Center, and Carson (D18)



Metro

ZEB Phase 1 - ZEB Master Planning

Develop comprehensive plans for deploying ZEB's on Metro Local and Rapid bus routes (i.e. Phase 2 of Metro's ZEB program).

Master plan elements include:

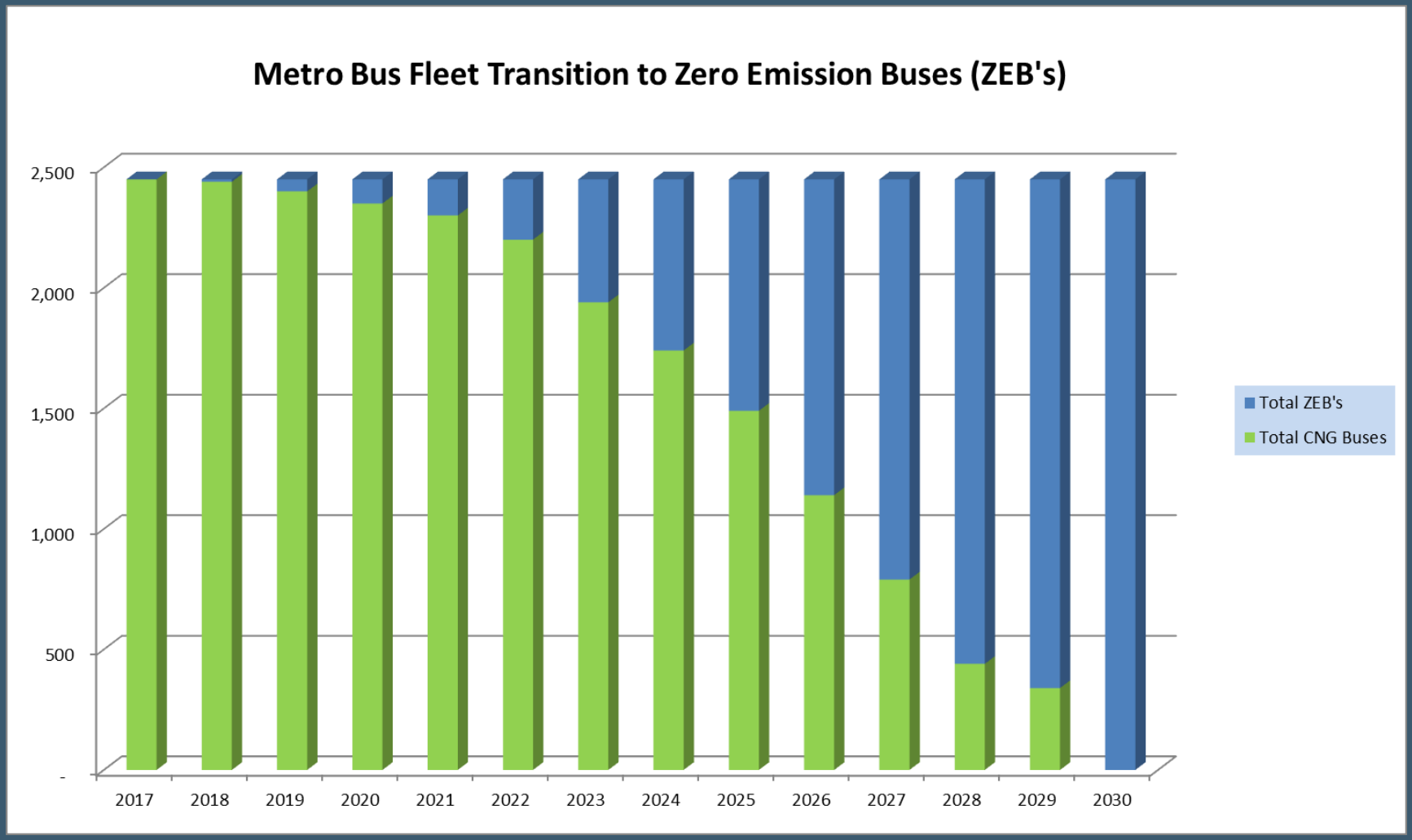
- **Life-Cycle and Technology Configurations, Costs**
- **Utilities and Infrastructure Requirements**
- **Operating Considerations**
- **Material Sourcing Strategies and End of Life Recycling/Reuse**
- **ZEB Program Funding**

Metro

ZEB – Phase 2

Metro

Metro's Transition to 100% ZEB



Metro

CARB's goal is that by 2040 only ZEB's are in service.
LA Metro's 2030 ZEB plan would be ten years ahead of CARB goals.

ZEB – Phase 2 – Key Program Elements

- **Phase 2 - ZEB Program** (2020-2030)
  - Infrastructure: Solicit engineering and design services for installing electric charging infrastructure at all Metro bus operating locations.
  - Utilities: Coordinate with PUC, SCE and DWP to ensure support for ZEB programs, new power drops. Negotiate ZEB rate structures.
  - Range: Phase 2 will require new longer range 40' and 60' ZE buses that are capable of delivering at least 250 miles in Metro service, and meet seating, axle weight and other operating requirements.
  - Charging: Optimize operating assignments around overnight depot charging with minimal breaks for midday or opportunity charging.
  - Procurement: Strategies and alternate lease structures to help Metro reduce transition costs and mitigate technology and operating risks (e.g. battery leases).
  - Funding: Funding source evaluation and trade-offs

Metro