ITEM 24

Electric Bus Program Update

Metro

Operations, Safety, and Customer Experience Committee
September 19, 2019

Current Background & Timeline

- **January 2019**
  - ✓ Provided Preliminary update to Board Staff to demonstrate need for procurement actions

- **July 2019**
  - ✓ Provided Metro Board with a Zero Emission Bus (ZEB) Master Plan update
  - ✓ Evaluated opportunities to expedite transition
    - Bundle division conversions to single procurements
    - Acquire or lease additional operating space

- **September 2019**
  - ✓ Refined cost estimates, infrastructure phasing schedule, and procurement strategies
  - ✓ Procurement Decision (exercising select contract Options)

- **Spring 2020**
  - Provide Metro Board with a ZEB Master Plan update
  - New Bus Procurement Decision – Fleet Mix TBD
    - Delivery beginning in 2023

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Transition to ZEB Operations – 2017 Guiding Principles

- Continue to replace aging bus fleet (~200 Buses per Year)
  - Status: 465 buses ordered in 2017 and 350 buses to be delivered in 2019
- Upgrade current CNG buses to "Near-Zero" Low NOx engines
  - Status: On target, 223 buses upgraded to-date at Mid-life
- Maintain existing bus fleet in a State of Good Repair
  - Status: Fleet age is increasing
    - Need to replace additional 369 buses by 2022
- Improve Service Quality and Reliability
  - Status: New Buses placed into service in 2019
- Transition Metro Orange Line to Zero-Emission by 2020
  - Status: On Target for Completion
- Transition Metro Silver Line to Zero-Emission by ~2021
  - Status: On Target for Completion
- Goal of 100% Zero-Emission Bus Fleet by 2030
  - Status: Master Plan addresses implementation roadmap

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Bus Fleet Requirements & Availability

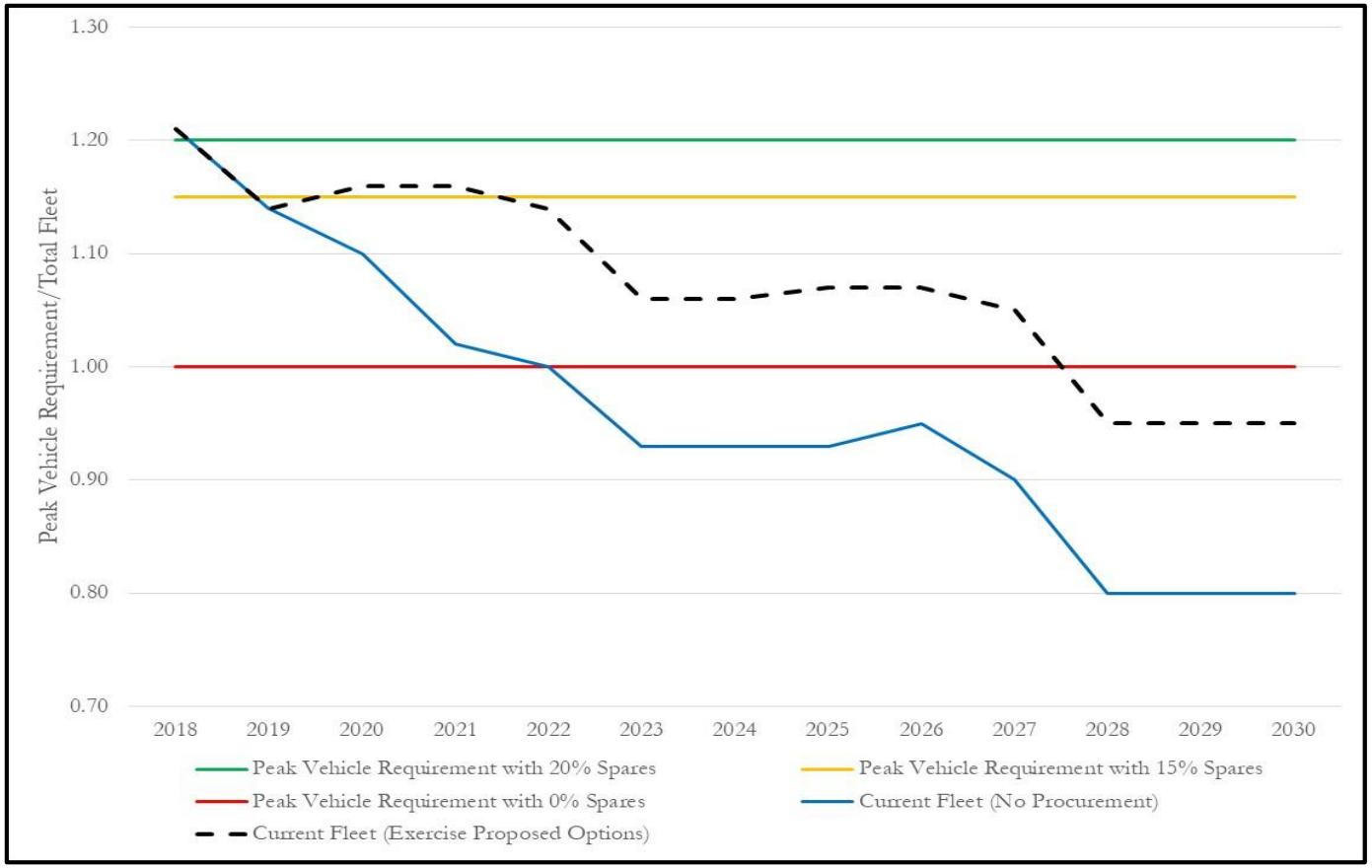
Fleet Planning Parameters

Peak Vehicle Requirement
2,300+ buses (scheduled service + spares)
1,900+ buses (scheduled service only)

Spare Ratio
FTA requirement: ≤20%
Metro policy: 15% - 20%

Bus Retirement Age
FTA requirement: 12 years
Metro Policy: 15-18 years

Metro Bus Fleet Age & Spare Ratio Forecasts



- 834 additional buses needed by 2022 to meet current service levels with exceeding FTA spare ratio and age requirements
- 465 buses on order (~350 buses to be delivered in 2019)
- 369 Options Buses to Exercise

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Bus Procurement Approach

Background

- New CNGs operate cleaner than existing fleet
  - ~98% Reduction in NOx, ~50% reduction in PM, ~55% reduction in CO vs. oldest fleet
- New CNG are more reliable than existing fleet
  - Newest fleet is 3 times more mechanically reliable than older fleet
- Metro's 60 ft. Electric Bus has a range of 50-60 miles
  - Requires En-Route Charging or larger battery pack to deploy
  - Review by Spring 2020 if option buses and route lengths can be configured for optimum operations
- Zero Emission Bus deployment requires charging infrastructure
  - Division 9 and 8 have only 40 ft. buses remaining to be electrified
    - 40 ft. option buses can be deployed at 8 and 9
    - Deployment will be based on availability of charging infrastructure

Recommendation

- Metro staff recommends to exercise the following options:
  1. Exercise Option for 259 CNG 40 ft. Buses from Eldorado
  2. Exercise Option for 70 CNG 60 ft. Buses from New Flyer
  3. Exercise Option for 40 Electric 40 ft. Buses from BYD

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ZEB Master Plan – Infrastructure Overview

- Key Limitation to Electric Bus Deployment is Charging Infrastructure and Space

1. **Charging Infrastructure**
   - Limited grid capacity at divisions
     - Limits number of ZEBs that can be assigned
     - Long lead times for utilities to implement necessary grid upgrades
     - Working with SCE & LADWP to optimize schedule
   - Fleet Mix impacts Division needs
     - CNG vs. Battery:
       CNG facility unable to be de-commissioned with CNG buses in operation
     - 40 ft. vs. 60 ft. bus
       Impacts Facility design; Charging Interface would have to accommodate different length buses
   - Battery and Charging Technology is still evolving

2. **Space**
   - Minimize service impacts while electrifying divisions
   - More Space allows for quicker solution
   - Mitigations:
     - Utilize En-Route Charging – less infrastructure at divisions
     - Optimize Existing Parking Layouts
     - Temporary parking space

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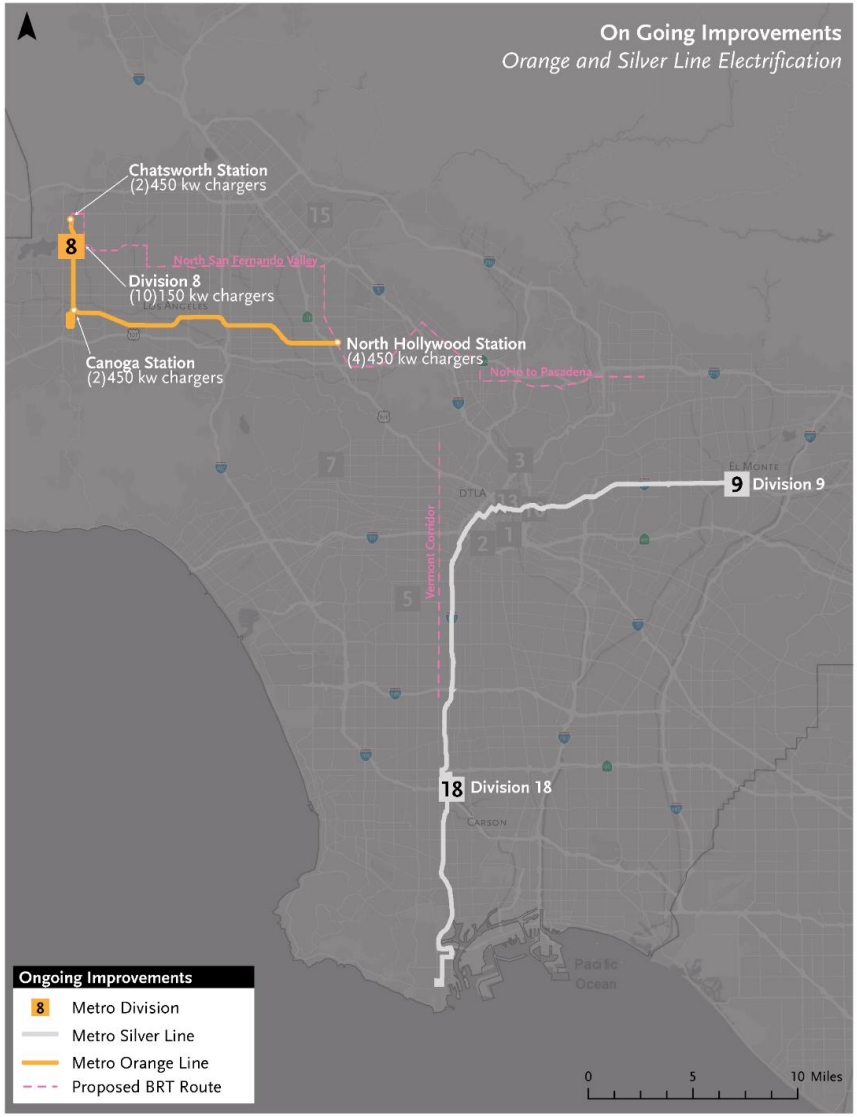
ZEB Master Plan - Phases

- **Phase 1: Near-Term Activities (2020 – 2021)**
  - ✓ Orange Line Electrification
    - Charging Infrastructure & Vehicles
  - ✓ Silver Line Electrification
    - Charging Infrastructure & Vehicles
  - ✓ Upgrade Near-Zero CNG Engines to RCNG at mid-life
  - ✓ Refine & Develop Master Plan Details
    - Division Operations and Parking Patterns
    - Fleet Mix (40 ft vs. 60 ft, CNG vs. Battery)
    - En-Route Charging Analysis & Optimization
    - Space Optimization
    - Refine DAC (Disadvantage Community) Options
- **Phases 2/3: Long-Term Activities (2022 – 2030+)**
  - Conversion of Divisions from CNG to Battery Charging
  - Procurement of Vehicles



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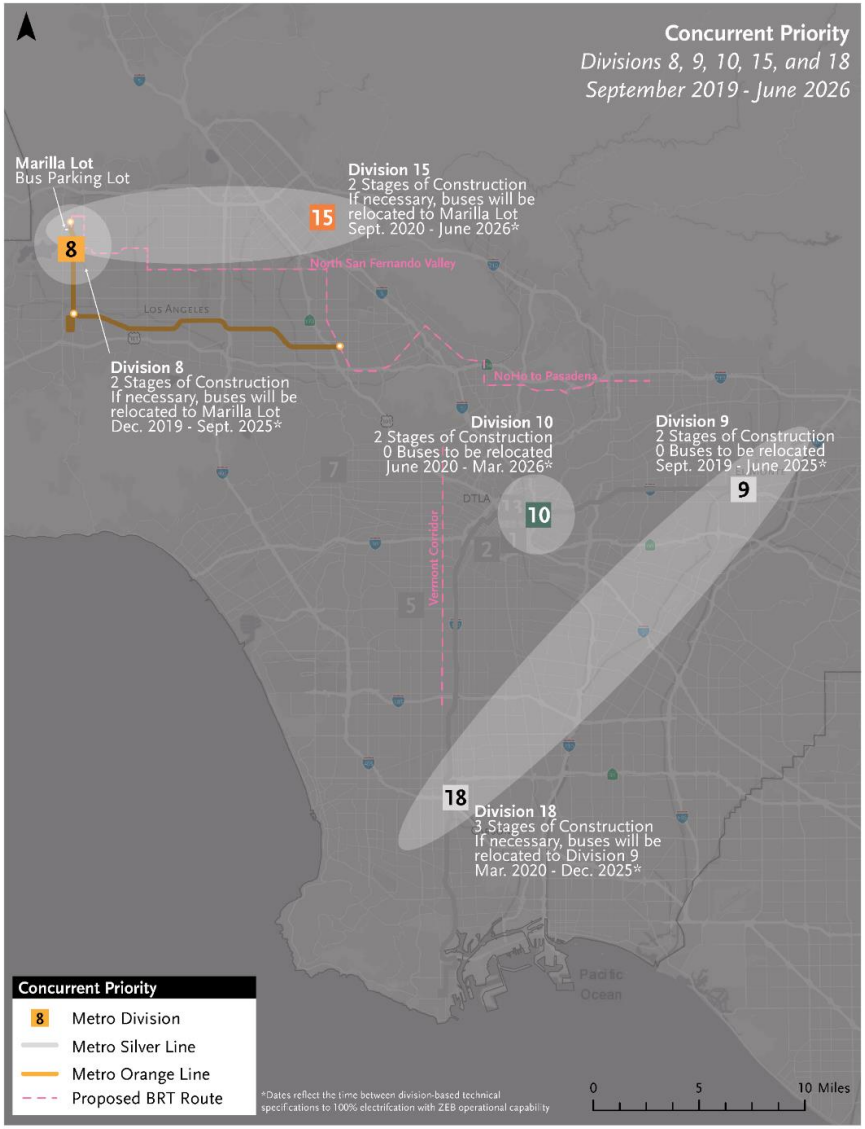
ZEB Master Plan – Phasing Maps

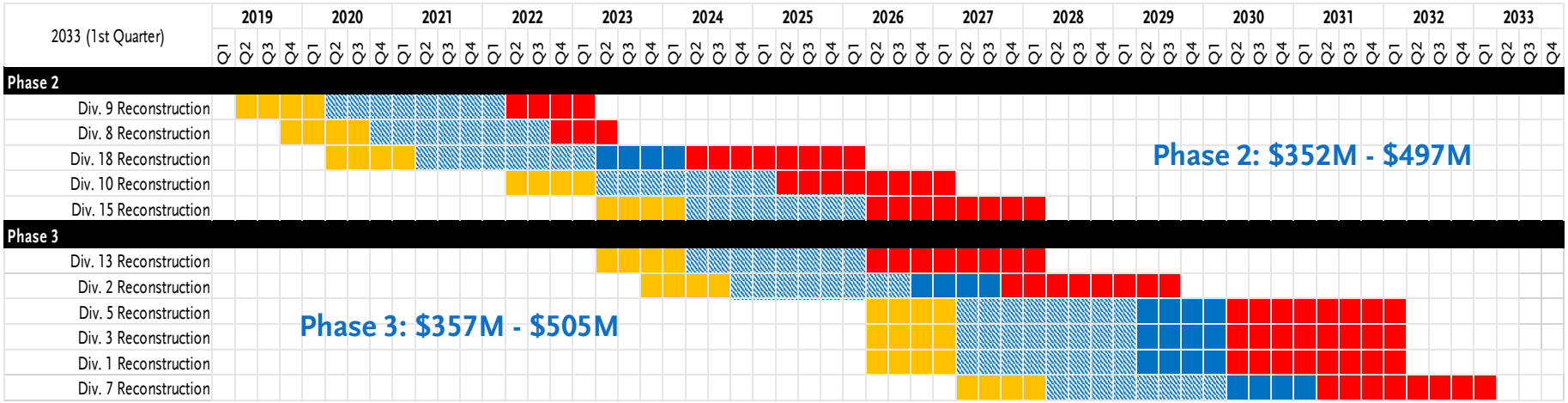


Phase 2: Independent divisions

Phase 3: Dependent divisions

ZEB Master Plan - Phasing Schedule

Construction Completed in Q4 2031; Electrification Completed in Q1 2033



- Spec. Development & Procurement (12 Months)
- Division Electrification (Staged Construction) (24 – 36 Months)
- Design and Utility Agreements/Approval (24 Months)
- Utility Upgrades and Construction (24 Months)

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ZEB Master Plan – Costs & Funding

- Capital Expenditures
  - Preliminary Capital Cost Estimates ($1.1 Billion – $1.5 Billion more than CNG)
    - ~$700 Million to ~$1 Billion in Infrastructure costs
    - ~$400 Million in additional vehicle costs

- Operating Expenditures
  - Utility Rates and resulting costs are under revision
  - Design Impacts
    - Battery Life & Maintenance
    - Maintenance Activities
    - CMF: Re-purposing from CNG to ZEB
    - Workforce (Training, Job Descriptions)

- Funding Challenge
  - Need of $1.1 - $1.5 Billion vs. Funding Available
  - Funding Opportunities
    - SCE Charge Ready Transport
    - California HVIP Program
    - VW Mitigation Trust
    - Public-Private Partnership (P3) for buses and/or charging equipment

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