Welcome

Zero Emission Bus Public Workshop
will begin shortly.

El taller público sobre autobuses de cero emisiones comenzará en breve.
Introductions & Roles
Workshop Flow

• Presentation provided in English and Spanish

• How to submit/ask questions
  • Submit a question through the Q&A icon
  • Raise your virtual hand - MTS will call/unmute you to ask question

• Polls will be conducted during presentation to collect feedback
Workshop Flow

• **Four presentation sections:**
  - MTS Electric Bus Pilot Update
  - MTS Draft Transition Plan
  - Greenhouse Gas Emission Benefit Study
  - Implementation in Disadvantaged Communities

• There will be a question and answer time period at the end of each section (please keep questions to appropriate sections)

• Additional final question and answer session at the end of the presentation
Opening Remarks

Nathan Fletcher
MTS Board Chair
San Diego County Supervisor,
District 4
Opening Summary of Zero Emissions Bus Activities to Date

Sharon Cooney
MTS Chief Executive Officer
Poll

What comes to mind first when you hear “zero emissions bus fleet?”

A. Cleaner air/GHG reductions
B. Adopting the latest transit technologies
C. Quieter rides
D. Healthier communities
Poll

Prior to COVID-19, how often did you ride MTS?

A. Never (non-rider or more than one year since riding)
B. Rarely (once or twice a year, special events only)
C. Occasionally (once or twice a month)
D. Semi-Frequently (once or twice a week)
E. Very Frequently (three or more times a week)
Poll

How would you describe your level of knowledge about zero-emissions vehicles such as electric buses?

A. Very knowledgeable
B. Somewhat knowledgeable
C. Not very knowledgeable
D. Not at all knowledgeable
Zero Emission Bus (ZEB) Pilot Project Overview/Update
Why Convert Bus Fleet to Zero Emissions?

• Protects the environment/reduces emissions
• Helps the region meet climate action goals
• California Air Resources Board Innovative Clean Transit Regulation
• Technology is improving
MTS Pilot Project Background

• First ZEBs on MTS Routes: December 2019
• Eight (8) battery electric buses purchased for pilot:
  • 6 in service
  • 2 arriving Soon

• 12 chargers installed or planned for installation:
  • 6 chargers in July 2019 (Imperial Avenue Division)
  • 6 chargers in August 2020
    • Two each at South Bay, East County, Kearny Mesa
ZEB Pilot Project Cost

- **Total Pilot Budget:** $12.4 million
- **8 Electric Buses:** $950,000 per bus
  - MTS Current Natural Gas Bus: $540,000 per bus
- **Pilot Project Charging Infrastructure:** $2.1 million
  - 12 depot chargers
  - Design/Construction
- **Training:** $100,000
Electric Bus Performance To-Date

Service Schedule
• 17 out of 95 routes
  • All out of Imperial Avenue Division
• 11 more routes in near future
  • Rotating to South Bay, East County as charging infrastructure becomes available

Performance
• Range = 148 miles
• Cost Per Mile = $0.94
• Availability = 82%
• Reliability = 99%
• Passenger/Operator Feedback = Positive
• Environmental Benefit = GHG analysis
Zero Emission Bus (ZEB) Pilot Program

Q&A
Poll

What parts of the region would you like to see MTS prioritize ZEB rollout?

A. Around schools and universities
B. Beach communities
C. Disadvantaged communities
D. East County
E. High-ridership routes
F. Mid-City San Diego
G. South County
Draft Zero Emission Bus Transition Plan
Draft ZEB Transition Plan

Elements

- Infrastructure
- Cost
- Vehicles
- Workforce Development
Infrastructure
Charging Infrastructure Plan

• Gantry structures at each division
• Overhead pantograph dispensers
• Super Off-Peak or Off-Peak, overnight charging

• 1 bus per dispenser
• 2 dispensers per charger
• 2 buses per charger
• Charge management system
South Bay Division Layout

• New Electric Rapid bus route between Otay Mesa and Imperial Beach (Iris Rapid)
• Twelve (12) sixty-foot battery electric bus purchase
• Overhead charger infrastructure progress:
  • Charger facility planning: DONE
  • Operating plan finalized: DONE
  • Engineering/Design: October 2020 – March 2021
  • Construction September 2021 – March 2022
• SDG&E feasibility site assessment for power need
Imperial Ave Division Layout

<table>
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<tr>
<th>Bus Length (ft)</th>
<th>All Buses</th>
<th>BEBs in 2040</th>
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<tr>
<td>60</td>
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<tr>
<td><strong>Totals</strong></td>
<td><strong>155</strong></td>
<td><strong>129</strong></td>
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Site constraints
Transition Costs
TOTAL TRANSITION COSTS
2020-2040

Baseline

- Maintenance: 42%
- Fuel: 14%
- Infrastructure: 44%

Mixed
Battery Electric Bus & Fuel Cell Electric Bus

- Maintenance: 32%
- Fuel: 13%
- Infrastructure: 7%
- Fleet: 48%
Vehicle Transition
Current MTS Fleet

Standard 40’ Bus
- Electric
- CNG/RNG (Near-Zero)

“Over the Road” 45’ Bus
- Propane
- Gasoline/Diesel (phasing out)

Articulated 60’ Bus

Minibus/Paratransit: 22’ – 32’
ZEB Transition Pathways

In 2018, partnered with the Center for Transportation and the Environment (CTE)
Prioritizing MTS’ Transition Based on Technology

- Electric buses can meet 49% of the route schedules

- Hurdles to manage:
  - Altoona tested bus types
    - Allows Federal funds to be used
  - Meets range requirements
  - Infrastructure / Construction
  - Cost

- Depot charging assumptions by 2040:
  - 94% - 40’ Battery Electric
  - 76% - 60” Battery Electric
  - 100% - 45’ (Commuter) Battery Electric
  - 45% - Minibus/Paratransit Battery Electric
Minibus/Paratransit Considerations

- Very limited commercially available options
- Significant range limitation
- Cost / Service Life: Seven (7) year vehicle
- Demand response

**Emission Benefits of Propane:**
- Reduction in emissions: 61%
Fleet Composition through Transition

The graph shows the composition of different types of buses from 2019 to 2040. The types include Gasoline, CNG, Propane, Electric, Hydrogen, and Hydrogen Cutaway. The bars represent the number of buses for each year, with colors indicating the type of fuel or technology used.
Annual Vehicle Purchases

Last Natural Gas Bus Purchased

- Gasoline
- CNG
- Propane
- Electric
- Hydrogen
- Hydrogen Cutaway
Workforce Development
Workforce Development

CARB Regulation Requirements

- MTS has a State Accredited training program to develop mechanics
- Administered by MTS and local community colleges
- Content developed with the International Brotherhood of Electrical Workers
- Four (4) year program

Maintenance Training modules include:

- High-voltage safety
- Power and Battery Systems
- Preventive and reactive repair procedures

Staff and Regional Partner Training:

- Bus Operators
- First Responder
- Cleaners and Body Shop
- Facilities and Management

**Construction and repair of high voltage of the infrastructure will require Electric Vehicle Infrastructure Training Program (EVITP) certification**
Peer Transit Agency Review
What are other transit agencies doing?

**LA Metro - 2200 bus fleet:**
- In 2016, committed to 100% ZEB by 2030
- In 2019, amended procurement plans to include CNG buses to bridge the gap
- Over 600 CNG buses have been authorized

**Foothill Transit - 376 bus fleet:**
- In 2016, committed to 100% ZEB by 2030
- Originally implemented BEB’s with overhead (In-route) charging
- In 2020, original plans amended to reflect purchase and placement of depot charging
- Currently evaluating hydrogen fuel cell buses for transition
What are other transit agencies doing?

Antelope Valley Transit Authority - 88 bus fleet:
- In 2016, committed to 100% ZEB by 2018
- To date, roughly 50% are ZEB’s – remainder fleet Diesel/ Diesel Hybrid
- Operating yard is approximately 16 acres

North County Transit District - 152 bus fleet:
- Consultant on board to help develop transition plan
- Currently no ZEB’s on order
- Early data indicates a mix fleet approach with BEB first
Main Considerations for Transition
Main Considerations

- Infrastructure
- Constrained footprint
- New site (estimate $185M)
- Grid capacity/Redundancy
- Range limitations
- Funding
- Minibuses/Paratransit services
Zero Emission Bus (ZEB) Draft Transition Plan

Q&A
Poll

What do you think about a 20-year conversion path for 800 buses?

A. I think it should happen quicker than 20 years, regardless of cost
B. I think it should happen quicker than 20 years, as long as cost does not impact service levels
C. I think it should take longer than 20 years
D. I think this is a good timeline
Greenhouse Gas Emission Benefit Study
San Diego Greenhouse Gas Inventory

- The total San Diego regional emissions were estimated at **23.82** million MTCO2e
- Heavy duty trucks and vehicles = **1.89** (5%) MTCO2e

GHG Benefits – 2040 Transition

- Current Transition Plan Proposal
GHG Benefits – Early Adoption 25%

- Infrastructure timeline
- Bus Production Schedule
GHG Benefits - Transition by 2030

- Infrastructure can’t meet timeline
- No viable Minibus options
- Bus Range Limitations (One for One)
- Funding unknowns
- GHG Increase
GHG Benefits - Comparison
Greenhouse Gas Emission Benefit Study

Q&A
Poll

After seeing the difference in GHG emissions for three different scenarios, I think the best plan is:

A. The 25% early adoption rollout, with 20-year full transition
B. The 10-year full transition plan, no matter what
C. The 10-year full transition plan, as long as service levels are not impacted
D. The 20-year full transition plan, as-is
Connecting with Disadvantaged Communities
ZEB Deployment Proposal

- Prioritize deployment in communities with high pollution burden and vulnerable population characteristics
- Utilize SB 535 disadvantaged communities (DACs) identified through CalEnviroScreen 3.0
- Identify bus routes with at least one stop in an SB 535 DAC
SB 535
Disadvantaged Communities

Central El Cajon

Chollas Creek

East/Central Downtown

Barrio Logan

National City

Lincoln Park

Chula Vista Bayfront

Western San Ysidro

San Diego Detail
ZEB Deployment

MTS Bus Network Map
All routes, all bus types

- **Green Lines** = DAC Routes
  (at least one stop in an SB 535 DAC)

- **Red Lines** = Non-DAC Routes
  (no stops in an SB 535 DAC)
### ZEB Deployment

- Four divisions for 40’/60’ buses
  - Imperial Ave. (Downtown)
  - Kearny Mesa
  - South Bay (Chula Vista)
  - East County (El Cajon)

- Divisions require charging infrastructure
  - Prioritize charging infrastructure
  - How many DAC-serving routes operate from each division?
DAC Routes by Division

Imperial Ave./Kearny Mesa

South Bay

East County
## DAC Routes by Division

### IMPERIAL AVE. / KEARNY MESA

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### EAST COUNTY

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### Totals (40' + 60' Buses)

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<th>ECD</th>
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<tr>
<td>DAC Routes</td>
<td>15</td>
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<tr>
<td>Percentage of DAC Routes</td>
<td>57.7%</td>
<td>69.0%</td>
<td>41.2%</td>
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### Excluding “end-of-line” DAC Routes

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<td>Percentage of DAC Routes</td>
<td>11.5%</td>
<td>37.9%</td>
<td>11.8%</td>
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### DAC Routes at End-of-Line only

- DACs at end-of-line only.
- DACs on major route segments.

### MTS quiet clean electric
ZEB Deployment Plan

• Proposed Charging Infrastructure Priority
  1. South Bay
  2. Imperial Ave.
  3. Kearny Mesa
  4. East County

• Proposed Route Assignment Priority
  – Buses assigned on a daily basis: “Ready lanes” for CNG buses and BEBs
  – BEBs prioritized to routes in disadvantaged communities
    • DAC route listing kept updated for Operations Divisions (route changes, ridership, CalEnviroscreen updates)
  – Bus assignment tracking for accountability
  – Constraints
    • Range limitations vs. route block lengths
    • Bus types & availability (40’ vs. 60’)
    • 60’ BEB buses purchased specifically for Iris Rapid (non-DAC route) per grant requirements
    • Other considerations: interlines mix DAC and non-DAC routes; standbys and unplanned events require flexibility
Connecting with Disadvantaged Communities

Q&A
Poll

How important is it to you that deployment of zero-emission buses in Disadvantaged Communities (DACs) are prioritized over other areas?

A. Very important
B. Somewhat important
C. Somewhat not important
D. Not important at all
Poll

As an initial reaction do you think MTS is on the right track with this 20-year/2040 transition plan?

A. Very much on the right track
B. Somewhat on the right track
C. Somewhat on the wrong track
D. Very much on the wrong track
Anticipated Next Steps

- ZEB Pilot ongoing (8 buses)
- Working with SDG&E
  - SB 350 Program
- Early fleet transition (Iris Rapid – 12 sixty-foot buses)
- South Bay facility charging design & construction
- Secure additional funding for ZEB transition costs
- Share public workshop results with MTS Board
- Submit CARB Transition Plan
Final Comments
Thank You!