2020 TRANSIT SYMPOSIUM

TRANSITIONS
TRANSITIONS
TRANSITIONS
TRANSITIONS

KERN COUNCIL of GOVERNMENTS

1970-2020
Program Update on Innovative Clean Transit Regulation and Zero-Emission Bus Deployment

TRANSITions 2020 Transit Symposium

February 27, 2020
OUTLINE

- Rollout Plan
- Joint Group
- ZEB Deployment Status and Technology Update
- Comprehensive Review
- Statewide Data Collection
- Useful Information and Resources
ZEB ROLLOUT PLAN—THE FIRST REQUIREMENT

- ICT regulation adopted December, 2018
- Requires all transit agencies to gradually transition to zero-emission
- First requirement is submission of a complete Rollout Plan
- Rollout Plans must be completed and approved by the transit agency’s governing body and submitted to CARB
  - July 1, 2020 for large transit agencies
  - July 1, 2023 for small transit agencies
A Rollout Plan must include **all** these 8 components (§2023.1(d)(1))

- A goal of full transition to ZEB by 2040
- Types of planned ZEB technology (BEB, FCEB, or both)
- Estimated timeline to modify infrastructure
- Estimated timeline of all future bus procurements
- Estimated timeline of any bus conversion to ZEB
- Plans on how to deploy ZEBs in disadvantages communities
- Estimated timeline and plans to train bus operators and maintenance staff
- Potential funding sources
ROLLOUT PLAN—A LIVING DOCUMENT

- Rollout Plan Guidance Document is available online
  - Mandatory information identified as “required” and by citing the code section
  - Supplemental information identified as “optional”
- Prepare the Rollout Plans based on best available information
- A Rollout Plan is a living document
  - Transit agencies may update their Rollout Plans in the future as see fit
  - CARB recommends resubmittal of any updated Rollout Plans
- CARB will post approved Rollout Plans online
ROLLOUT PLAN—LEVEL OF DETAILS

- Level of details need to show the planning effort required in the regulation
- Example 1: § 2023.1(d)(1)(F) on ZEBs in disadvantaged areas (DACs)
  - If no or all DAC area ➔ simply identify the situation
  - If mixed ➔ need to identify the deployment approach
  - There is no requirement to deploy ZEBs in DAC first
- Example 2: § 2023.1(d)(1)(C) on infrastructure schedule
  - May be identified along with ZEB deployment schedule
  - Estimated timeline is allowed
  - Planning deferred to future is considered incomplete
MAJOR COMPLIANCE MILESTONES IN THE NEAR FUTURE

- Rollout Plan for large transit agencies due: June 30, 2020
  - 3 large transit agencies in central valley: Golden Empire, FAX, SJ RTD
- First reporting deadline for all transit agencies: March 31, 2021
- Rollout Plan for small transit agencies due: June 30, 2023
- First ZEB purchase requirement for large transit agencies: 2023
Transit agencies may comply collectively

All members to meet at least one of these criteria:

- Being located in the same service area of a Metropolitan Planning Organization (MPO) or Regional Transportation Planning Organization
- Being located within the same air basin
- Being located within the same Air Quality Management District, Air Pollution Control District, or Air Resources District
- Share the use of infrastructure (no need to share ownership)

Are you eligible?
JOINT GROUP—HOW TO COMPLY COLLECTIVELY

- May jointly submit one Rollout Plan
- Collectively purchase the same total number of ZEBs annually as if each transit agency were complying individually
- If the largest transit agency is large, it must purchase at least the required minimum number of ZEBs as if it would have operated alone
- When requesting for exemption, explain why the requirement cannot be met by other members
- If a Joint Group fails to comply, each participating transit agency will be evaluated for compliance individually
JOINT GROUP—PROCEDURE

- Submit a request to CARB including all of the following:
  - A list of all participating transit agencies
  - A statement of intent from a responsible official for each participating transit agency
  - A proposed start and end dates of the Joint Group
  - A description on which eligibility criteria are met
- Submit the request at least one year before the Joint Group takes effect
- Notify CARB of any change in the membership along with transit agencies’ boards approving the changes
Deployed by transit agencies
- 298 ZEBs deployed
- Additional 483 ZEBs ordered
- 260+ ZEBs deployed by universities, private companies, etc.
- 40+ zero-emission school buses deployed
SYNCHRONIZATION & MULTIPLE RESOURCES NEEDED

Infrastructure Installation

Bus Procurement

Fuel Cost Management
ZEB TECHNOLOGY UPDATE—BATTERY ELECTRIC BUS (BEB)

- Easy to deploy one or two buses for pilot purpose
- Major infrastructure scale up may require significant lead time
- Factors for consideration
  - Bus procurement ➔ Range
  - Fuel cost management ➔ Energy use management
  - Infrastructure installation ➔ Power needs
- Infrastructure cost studies:
RANGE MANAGEMENT FOR BEB

- Factors affecting range
  - Terrain, use of HVAC, driving behavior, driving cycle, etc.

- Potential range mitigation
  - Route simulation or testing—know how range is affected by conditions of your routes
  - Increase fuel efficiency
    - Driver training
    - Reduce vehicle weight
  - Select suitable technologies
    - Battery size ➔ vehicle weight (therefore, fuel efficiency) and range
ENERGY COST FOR BEB

- Electricity cost formula is complicated
- How electricity cost is incurred
  - Electricity consumption
  - Electricity rate
  - Time of use
  - Demand charge (per meter based)
- Not a linear relationship
EXAMPLE OF ELECTRICITY COST (FOOTHILL TRANSIT)


1. On-Peak, Mid-Peak, and Off-Peak charge categories include respective costs for delivery and generation.
2. Rate structure changed from TOU-GS-1-A to TOU-EV-4 February 2016, introducing demand charges.
3. 'Taxes, Fees & Credits' category includes all remaining utility bill items (positive & negative charges).
Power needs: how much power is needed to charge buses and support other on-site needs

Design assumptions

- Everything is turned on at the same time
- Include both existing power usage (e.g. transit building electricity usage) and expected new power needs (e.g. charging 20 new BEBs)
EXAMPLES FOR POWER NEEDS TO CHARGE 200 BEBs

Fast Charging

- Example 1. Fast charging 200 BEBs at the 250 kW rate all at once
  - 250 kW x 200 = 50,000 kW = 50 MW
  - Infrastructure building could be expensive and time consuming
- Example 2. Fast charging 50 BEBs at the 250 kW rate each time
  - 250 kW x 50 = 12,500 kW = 12.5 MW
  - Infrastructure is less expensive
  - Fast charging makes 4 charging shifts possible

Slow Charging

- Example 3. Slow charging 200 BEBs at the 60 kW rate all at once
  - 60 kW x 200 = 12,000 kW = 12 MW
  - Infrastructure cost is similar to example 2
  - Slow charging is possible for 1 charging shift
- Example 4. Slow charging 100 BEBs at the 60 kW rate each time
  - 60 kW x 100 = 6,000 kW = 6 MW
  - Potentially least infrastructure cost
  - Slow charging 2 shifts may not work for morning peak hours
Equivalent range and fueling time to diesel and CNG technologies
Infrastructure cost may be challenging for a one- or two-bus pilot
Flexible range design
Easier large deployment
Long-term fuel price signal needed
FCEB DEPLOYMENT EXPERIENCE

- ZEBA program at AC Transit
  - Surpass DOE/DOT ultimate targets for fuel cell stack lifetime (25,000 hours)
  - In-house training program

- SunLine Transit
  - At least 9 generations of FCEB deployment
  - Showcase potential fuel cost parity with conventional counterparts
  - In-house training program available to all transit agencies

- 30 new FCEBs delivered to AC Transit, OCTA, and SunLine
INFRASTRUCTURE DEPLOYMENT FOR HYDROGEN PRODUCTION AND STORAGE

- **SunLine**
  - Largest electrolyzer station in the United States with 900 kg daily production
  - Potential public station in the future

- **AC Transit**
  - Emeryville Station – demonstrating solar electrolysis
  - Oakland Station – demonstrating biogas-fed stationary fuel cells

- **OCTA**
  - New station fueling capacity up to 50 buses (1,500 kg of H₂ within 8 hours)
  - Largest in the United States
  - $4.77 million on infrastructure
- Inform HD ZE policy and funding strategies
- Ensure transit service not adversely impacted
- Address program readiness
- One year before the first ZEB purchase requirement
- Complements annual updates to the Board
STATEWIDE DATA COLLECTION

- Supports comprehensive review and long-term technology evaluation
- Participation is voluntary and results will be public
- Anticipated work from participating transit agencies
  - ZEB and infrastructure specs upon vehicle deployment
  - Monthly data collection on ZEB performance and O&M costs
  - Conducting quality control of data before each monthly submittal
- Draft statewide data collection is available online
  - The template is not a form or required format
  - The template will be provided in an Excel format for easy data management
USEFUL INFORMATION AND RESOURCES (1)

- CARB 2020 Symposium and Showcase
  - March 23, 2020 at Crocker Museum, Sacramento
  - Free registration at http://california2030.org/carb-showcase/
  - Space is limited, priority given to transit agencies
- California Transit Association webinar series
  https://caltransit.org/events/webinars/
  - Battery Electric Bus webinar series
  - Fuel Cell Electric Bus webinar series
USEFUL INFORMATION AND RESOURCES (2)

- Innovative Clean Transit [https://ww2.arb.ca.gov/our-work/programs/innovative-clean-transit](https://ww2.arb.ca.gov/our-work/programs/innovative-clean-transit)

  - CARB Implementation Guidance Document
  - CARB Rollout Plan Guidance Document

- Contacts
  - Yachun Chow, Manager  [yachun.chow@arb.ca.gov](mailto:yachun.chow@arb.ca.gov)  (916) 322-7450
  - Shirin Barfjani, Lead Staff  [shirin.barfjani@arb.ca.gov](mailto:shirin.barfjani@arb.ca.gov)  (916) 445-6017
MTS’ Zero Emission Bus (ZEB) Pilot Project

Presented by Kyle Whatley, Zero Emissions Bus Project Specialist
February 27, 2020
MTS Overview

MTS provides transit for San Diego and surrounding cities, rural parts of the county, and to the international border – 3,240 total square miles

- Bus, Light Rail, Paratransit, Taxicab
- Bus: nearly 100 bus routes, 630 fixed route buses
- Light Rail: nearly 54 miles of Trolley right-of-way, over 130 cars
- 300,000 passengers daily, 86 million annually
- Bus remains a transit workhorse in San Diego
MTS’ Path to Clean Fuels

MTS remains committed to the clean fuel path. In 2002, MTS began converting the bus fleet to renewable Compressed Natural Gas (CNG), and continues to implement clean fuel solutions:

- **2016:** Propane vehicles purchased
- **2018:** Zero emission bus pilot commenced
- **2022:** Articulated sixty-foot electric bus pilot scheduled to begin

In addition, and in compliance with the ICT regulation, MTS is developing plans to purchase:

- **25%** zero emission buses by 2023
- **50%** zero emission buses by 2026
- **100%** zero emission buses by 2029
MTS ZEB Pilot & ZEB Study

- Pilot Assessment
- Pilot Program Design
- Pilot Implementation
- ZEB Roadmap
MTS ZEB Pilot Program

Key components being evaluated:

• Costs
  - Initial capital and construction - $12.5 million to date
  - Operating costs including fuel and maintenance, including battery replacement

• Operational Characteristics, Range and Fuel Efficiency
  - Validation testing finalized
  - 4 buses in-service

• Training for Employees and Emergency Response
  - Over 400 drivers trained
  - Over 50 maintenance staff trained
  - Multiple Fire and PD jurisdictions
Battery Electric Bus (BEB) Procurement

• New Flyer
  – Six (6) 40 ft. extended range BEB
  – 466 kWh of on-board storage (expected range 160 miles)
  – Arrived October 2019

• Gillig
  – Two (2) 40 ft. extended range BEB
  – 444 kWh of on-board storage (expected range 154 miles)
  – Arriving September 2020
Charging Infrastructure

**Phase I:**
Installation of six (6) chargers at the Imperial Avenue Division to support pilot project
- Construction Completed: July 2019

**Phase II:**
Installation of two (2) chargers at Kearny Mesa Division, South Bay and East County (Six (6) chargers total)
- Design completed: November 2019
- Construction expected completion: July 2020
ChargePoint CPE250

• Combined Charging System 1 (CCS 1) connector

• 62.5 kWh max output
  – Paired dispensers allow for 125 kWh output
Telematics Systems - Software

- Set parameters/notifications
- Maintenance & repair monitoring/notifications

- Real-time monitoring
- Extracting data
- Integration
TIRCP Iris Rapid (South Bay)

- Twelve (12) sixty-foot battery electric bus purchase
  - CA State Bid for bus purchase
- Charger infrastructure
  - Design: Long-term design (Scalable)
- SDG&E feasibility site assessment for power need
Challenges

- Infrastructure
- Constrained footprint
- Training
- New site
- Inexpensive CNG
- Expensive electricity
- Grid capacity
- Range limitations
- Funding
Operational Analysis

BEB Block Coverage

<table>
<thead>
<tr>
<th>Bus Type</th>
<th>2020</th>
<th>2030</th>
<th>2040</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cutaway</td>
<td>23%</td>
<td>39%</td>
<td>45%</td>
</tr>
<tr>
<td>40’</td>
<td>42%</td>
<td>74%</td>
<td>94%</td>
</tr>
<tr>
<td>45’</td>
<td>82%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>60’</td>
<td>48%</td>
<td>65%</td>
<td>76%</td>
</tr>
<tr>
<td>Total</td>
<td>41%</td>
<td>68%</td>
<td>84%</td>
</tr>
</tbody>
</table>

- Indicates that vehicles currently not commercially available; assumptions made based on vehicles that are currently in testing or development
- Only 45’ BEBs achieve 100% block coverage
- Cutaway service (on demand) creates significant challenges for BEB operations
- Assume 5% battery capacity (BEB) or fuel tank (FCEB) improvement every two years
## Potential Transition Costs

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>S1: BEB Depot Only</th>
<th>S2: BEB Depot + On-Route</th>
<th>S3: Mixed BEB and FCEB</th>
<th>S4: FCEB Only</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fleet</td>
<td>$832,469,000</td>
<td>$1,073,782,000</td>
<td>$1,095,205,000</td>
<td>$1,193,105,000</td>
<td>$1,474,318,000</td>
</tr>
<tr>
<td>Infrastructure</td>
<td>$</td>
<td>$122,394,000</td>
<td>$133,578,000</td>
<td>$167,004,000</td>
<td>$72,524,000</td>
</tr>
<tr>
<td>Fuel</td>
<td>$252,569,000</td>
<td>$295,811,000</td>
<td>$312,555,000</td>
<td>$322,762,000</td>
<td>$451,898,000</td>
</tr>
<tr>
<td>Maintenance</td>
<td>$762,263,000</td>
<td>$773,981,000</td>
<td>$783,033,000</td>
<td>$805,384,000</td>
<td>$812,484,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$1,847,301,000</strong></td>
<td><strong>$2,265,968,000</strong></td>
<td><strong>$2,324,371,000</strong></td>
<td><strong>$2,488,255,000</strong></td>
<td><strong>$2,811,224,000</strong></td>
</tr>
<tr>
<td>Incremental over Baseline</td>
<td>$418,667,000</td>
<td>$477,070,000</td>
<td>$640,954,000</td>
<td>$963,923,000</td>
<td></td>
</tr>
<tr>
<td><strong>ZEB % in 2040</strong></td>
<td>2%</td>
<td>77%</td>
<td>86%</td>
<td>94%</td>
<td>94%</td>
</tr>
</tbody>
</table>
Next Steps

• ZEB Pilot Ongoing
  – Collect & analyze data
  – Roadmap transition plan

• Assessment of Fuel Cell Options
  – Site analysis performed at the Kearny Mesa Division (fueling station)

• Evaluating Additional Funding Options

• Working with SDG&E

• Developing CARB Rollout Plan
Updates

For additional information and to follow our progress, visit MTS’ ZEB Project Website:

ABOUT FOOTHILL TRANSIT

- Pomona and San Gabriel Valleys of eastern Los Angeles County
- 327 sq. mi service area, 1.5 million residents
- 12 Million boarding's per year
- 36 local and express routes.
- 343 CNG buses, 33 electric buses.
THE Foothill Transit

MISSION

To be the premier public transit provider committed to:

SAFETY
COURTESY
QUALITY
RESPONSIVENESS
EFFICIENCY
INNOVATION
LOS ANGELES BASIN AIR QUALITY

- Poor air quality
- Large population base
- On-shore breeze pushes air inland
Foothill Transit is proud to introduce the world’s first heavy duty, fast charge, zero emissions electric bus.

Launching in Pomona, California September 3, 2010.

FOOTHILL TRANSIT ECOLINER 2010
CURRENT SERVICE

- 16 FAST CHARGE electric buses
- Line 291 – La Verne – Claremont – Pomona
- 7-min charge at Pomona Transit Center
- 8 buses at peak service
- In operation since 2010
ABOUT OUR CHARGING STATIONS

- One high power fast-charge station with two overhead chargers, sufficient to serve all buses

- Over 150,000 charge cycles to-date, and 1.8 million electric bus miles

- Located at Pomona Transit Center, a central hub with off-street flexibility, safety and security
CURRENT SERVICE

- 14 EXTENDED RANGE electric buses
- Line 280: Azusa – Covina – West Covina
  La Puente – Industry – Puente Hills Mall
- Overnight charging at Arcadia
  Maintenance and Operations Facility
- On-route charging available at Azusa
  Intermodal Transit Center (near Gold
  Line Station)
INITIAL CHARGING INFRASTRUCTURE
NEXT GENERATION CHARGING INFRASTRUCTURE
CURRENT CHALLENGE: INSTALLIN DEPOT CHARGERS
MAINTENANCE FACILITY CHARGING
ARCADIA IN-DEPOT CHARGING STATIONS
# SCE TIME OF USE EV8 RATES

<table>
<thead>
<tr>
<th>TOU Period</th>
<th>Weekdays Summer</th>
<th>Weekdays Winter</th>
<th>Weekends/Holidays Summer</th>
<th>Weekends/Holidays Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>On-Peak</td>
<td>4 p.m. – 9 p.m.</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Mid-Peak</td>
<td>N/A</td>
<td>4 p.m. – 9 p.m.</td>
<td>4 p.m. – 9 p.m.</td>
<td>4 p.m. – 9 p.m.</td>
</tr>
<tr>
<td>Off-Peak</td>
<td>All other hours</td>
<td>9 p.m. – 8 a.m.</td>
<td>All other hours</td>
<td>9 p.m. – 8 a.m.</td>
</tr>
<tr>
<td>Super Off-Peak</td>
<td>N/A</td>
<td>8 a.m. – 4 p.m.</td>
<td>N/A</td>
<td>8 a.m. – 4 p.m.</td>
</tr>
</tbody>
</table>
## SCE TIME OF USE EV8 RATES

<table>
<thead>
<tr>
<th>Timeframe</th>
<th>Rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summer Season On-Peak</td>
<td>$0.483</td>
</tr>
<tr>
<td>Mid-Peak</td>
<td>$0.245</td>
</tr>
<tr>
<td>Off-Peak</td>
<td>$0.119</td>
</tr>
<tr>
<td>Winter Season Mid-Peak</td>
<td>$0.284</td>
</tr>
<tr>
<td>Off-Peak</td>
<td>$0.133</td>
</tr>
<tr>
<td>Super Off-Peak</td>
<td>$0.0764</td>
</tr>
</tbody>
</table>

**Notes:**

- **Summer season starts 12 a.m. June 1 to 12 a.m. October 1**
- **Winter season starts 12 a.m. October 1 to 12 a.m. June 1**
ELECTRIC BUS MILESTONES

- **2010**: First 3 buses and fast charge station deployed.
- **2014**: 12 more fast charge buses deployed.
- **2016**: 2, 40 ft. fast charge buses deployed.
- **2017**: 14 extended range buses and charging facilities deployed.
- **2018**: 3 all-electric buses deployed.
- **2020**: Electric Double-decker deployed.
- **2022**: 20 Buses?
NEXT: ELECTRIC DOUBLE DECK BUS
RECOMMENDATIONS

Start small

Expect the unexpected

Electric power infrastructure is the key to success
THANK YOU

Doran J. Barnes | Executive Director
dbarnes@foothilltransit.org
Getting to Zero

Transitioning to a 100% Zero-Emission Bus Fleet

Kern Council of Governments
Transitions 2020
February 27, 2020
About CTE

- **Mission:** To advance clean, sustainable, innovative transportation and energy technologies
- **501(3)(c) non-profit** engineering and planning firm
- **Portfolio** - >$550 million
  - Research, demonstration, transition planning, deployment
  - **99 Active Projects** Totaling over **$300 million**
- Focused on **Zero-Emission** Technologies
- **National Presence**
  - Atlanta, Berkeley, Los Angeles, Minneapolis/St. Paul
61 CTE Members

Leadership Circle Members

Members
CTE Zero Emission Bus Projects

- ZEB Planning Projects
- ZEB Deployment Projects
Electric Drive Characteristics

Electric Bus efficiency (and range!) changes with local conditions and driving habits more than diesel and CNG buses.

Far more efficient, but the range of efficiency makes it more difficult to plan!
Different methods of storing energy require different deployment plans.

“Diesel Gallons” On Board

- **40’ Diesel Bus**: ~400 miles
- **40’ Battery Bus (450 kWh)**: ~120-200 miles
- **40’ Fuel Cell Electric Bus (1,188 kWh)**: ~300 miles

**U.S. Department of Energy**: 38 kWh is equivalent to 1 gallon of diesel

**But, considering efficiency:**

- **Fuel Cell Electric drive**: is 2 to 2.5 times as efficient as the internal combustion engine. 31 DGE can deliver range roughly equal to 75 gallons of diesel (depending on conditions).

- **Electric drive**: is 4 times as efficient as the internal combustion engine. 12 DGE can deliver range roughly equal to 48 gallons of diesel (depending on conditions).

Source: Center for Transportation & the Environment
Electric Drive Characteristics

Understanding how much of the battery is usable for service is critical for planning your deployment.

**New Battery**

- **Minimum Limit**
- **Reserve Limit**
- **Service Energy**
- **Maximum Limit**
- **Unusable Energy**

**Total Battery Capacity**
(also known as Nameplate or Advertised Capacity)
Electric Drive Characteristics

Understanding how much of the battery is usable for service is critical for planning your deployment.

Battery at End of Life*:

*as defined by battery warranty

Total battery capacity is less than original.
Factors Affecting Range

• Route characteristics: speed, stops, grade
• Ridership
• Weather - Climate
  • Heating and cooling. (Heat is no longer “free.”)
• Battery degradation
• Operator Driving Behavior
ZEB Technologies

Fuel Cell Electric Bus

Battery Electric Bus
## ZEB Challenges & Constraints

### BEB

- Currently, Range-limited. Expected to improve over time
- Operational complexity increases at scale
- Infrastructure may impede on parking spaces
- Greater redundancy and resiliency challenges
- Variability of electricity costs

### FCEB

- High cost of H2 to fuel buses
- Currently, higher incremental costs
ZEB Infrastructure Costs

- **FCEB**: High initial cost for H2 fueling stations can be leveraged over many buses in larger fleets.
- **BEB**: More equipment and infrastructure is needed to support larger fleets.
## ZEB Transition Scenarios

<table>
<thead>
<tr>
<th>Scenarios</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>Assumes continuing with current fleet composition</td>
</tr>
<tr>
<td>Depot-Charged BEB</td>
<td>May not reach 100% due to range limitations</td>
</tr>
<tr>
<td>Depot-Charged BEB w/additional BEBs</td>
<td>Split blocks and add more buses to overcome BEB range constraints to meet service requirements. May increase operating costs, demand for real estate for parking, etc.</td>
</tr>
<tr>
<td>Depot-Charged BEB w/on-route charging</td>
<td>Add on-route charging to overcome BEB range constraints to meet service requirements. May impact service schedules since on-route charge sessions cannot be skipped or shortened.</td>
</tr>
<tr>
<td>Depot-Charged BEB w/FCEBs</td>
<td>Deploy a mixed fleet of BEBs and FCEBs where BEBs are focused on shorter blocks and FCEBs are on longer blocks not possible with BEBs</td>
</tr>
<tr>
<td>FCEBs only</td>
<td>Likely meets all service requirements and has similar operational profile to current fleet</td>
</tr>
</tbody>
</table>
ZEB Transition Planning Approach

Goal: Consider challenges and constraints to evaluate the best scenario for the transit agency
ZEB Transition Planning Methodology

1. Planning & Initiation:
   - Action: Project planning & kickoff
   - Deliverable: finalize scope, approach, tasks, assignments, and timeline

2. Requirements & Data Collection:
   - Actions: Collect route, block, fleet, operational, maintenance, and facilities information, collect route data, conduct bus modeling & route simulation analysis
   - Deliverable: Complete package of data used to complete the assessments that complete the TCO assessment.
3. Service Assessment:
   • Implement results of route modeling to inform applicability of ZEB technologies.

4. Fleet Assessment:
   • Provide timeline & Costs for fleet transition and recommendations for suitable technologies.

5. Fuel Assessment:
   • Analyze fuel demands and project future fuel use/costs for a transitioning fleet.
6. Maintenance Assessment:
   • Analyze labor/material costs and mid-life overhaul costs over the transition period.

7. Facilities Assessment:
   • Identify electric/H2 fueling infrastructure requirements, infrastructure needs, design/construction, siting and utility requirements, and operational impact.
Infrastructure Challenges

**PARSE**

- **Price** and delivery of H2 on parity with conventional fuels. Also equipment maintenance cost reduction.

- **Area** of fueling footprint to refuel 50, 100, or 200 buses.

- **Renewables** for hydrogen production; **Resiliency** - Natural Disasters; Also **Redundancy** to ensure near 100% service reliability.

- **Speed** of refueling in the normal 8- to 10-hour night window; Also **Scalability** for future expansion.

- **Entry-Level Startup and Equity** (CapEX) needed to build at an affordable price, utilizing baseline components for future scale up.
8. TCO Assessment:
   • Summarizes cost impact analyses for the ZEB transition.

9. ZEB Transition Plan:
   • Develop a ZEB transition plan with capital project definitions and projected timelines.
2020 International ZEB Conference in Denver

For more information, please visit www.ZEBConference.com
AC Transit

D3 Richmond
D2 GO
D4 CMF
D6

Richmond
Oakland
San Mateo
San Francisco
Palo Alto

Hydrogen facility
Battery facility
What We’ve Learned...

20+ Years of ZEB Experience

- Over 3.2M zero emission miles
- FTA/DOE Targets:
  - 10 - Ultimate target 25K hours
  - 1 - over 32K hours
  - Reliability performance at or above diesel

- Planning & Stakeholder Engagement
- ZEB Procurement
  - Bus specs based on performance
- Infrastructure design & construction
- Sustainable maintenance practices
  - Advanced diagnostics & repairs
  - Fuel cell rehab - stack replacement
GreenRoad 2020

Side by Side Comparison of Technologies

- GreenRoad program will deploy BEB & FCEB in identical service
- True side-by-side comparison
  - Same agency
  - Same service environment
  - Same OEM
- Performance report
  - Capex
  - O&M

2019

Battery Electric Drive
(5) Xcelsior XE40
200 MILE RANGE

Fuel Cell Electric Drive
(10) Xcelsior XHE40
300 MILE RANGE

CARB
California Climate Investment
Federal Transit Administration
CTE
NREL
ZEB Fueling

Hydrogen Fueling Stations
EMERYVILLE & OAKLAND

Battery Bus Chargers
OAKLAND
GreenRoad University

5-week Program
• Basic P.M.I.
• Basic Diagnostics & Repair
• Advanced Diagnostics & Repair

Training Provided
• 513 Mechanics / 20,558 Hours
• Every Bus Operator

ZEB Safety & Familiarization
• High Voltage Battery
• Electric Drive Motor
• Fuel Cell Power Plant
• High Pressure Gaseous Fuel
ZEB Future

- Transition to a 100% ZEB fleet
  - ZEB Study
  - Clean Corridors Plan
  - Facilities Master Plan
  - 45 ZEB Deployment Plan

- Challenges and Risk
  - Funding gap
  - ZEB procurement and infrastructure construction
  - Utilities – PSPS, project delivery
  - Hydrogen fuel providers – redundancy
  - Rapidly evolving technology
Thank You!

Leading the way to a
ZERO EMISSION FUTURE.

For more information, please visit actransit.org
TRANSITIONS: USING ELECTRIC BUSES FOR INTERCOMMUNITY SERVICE

BOB NEATH
KERN TRANSIT
FEBRUARY 27, 2020
BYD MODEL K9 BATTERY ELECTRIC BUS
EDWARDS COMMUTER EXPRESS

• Bus will be based in Mojave
• Connects Tehachapi and Rosamond
• One AM and one PM trip
  • Other trip is a regular Route 100 trip
• Transfer to/from AVTA Route 747
• Returns to Mojave mid-day
• Approximate 80 mile round trip
METHODS FOR CHARGING A BATTERY ELECTRIC BUS

• Overnight charging
• Mid-day charging
• En route charging
• Regenerative braking
CHALLENGES KERN TRANSIT FACES
INTRODUCING BATTERY ELECTRIC BUSES

• Long routes (up to 200 miles round trip)
• Multiple routes utilize freeways (less regenerative braking)
• Steep grades (up to 6%) on SR 58 and Interstate 5
• Buses scheduled for multiple round trips each day (or quick fill up)
• Large service area - 8,000 square miles (NYC is 300 square miles)
POSSIBLE SOLUTIONS

• Additional buses
  • Remove from service for daytime charging
  • Split trips

• Place multiple charging stations throughout the County
  • Partnering with local agencies
  • County-wide bus purchasing strategy

• Scheduling changes
  • Eliminate “reverse commute” trips (AVTA commuter trip strategy)
  • Longer layovers

• Await technological developments
TRANSITIONS REQUIRE...

• Acceptance of the challenge
• Developing creative ideas
• Working through problems
• Resilience

THANK YOU!
California Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project

Hannah Hamilton
hhhamilton@calstart.org
What is HVIP?

- Streamlined, first-come-first-served “voucher” incentives – no proposal process
- Electric, fuel cell, ePTO
- Low-NOx natural gas (11.9L engine only)
- Trucks and buses

- New vehicles and retrofits
- Operating now for 10 years
- 7,500 + vouchers
- 1,000 fleets
Why Voucher Incentives?

• Point of purchase discount
  – Fleets get immediate discount at sale

• Dealers learn voucher system
  – Fewer complications for fleets

• Set-aside funding for each voucher
  – Price certainty at time of request
## Zero-Emission Transit Buses:

<table>
<thead>
<tr>
<th>Bus Length and Bus Type</th>
<th>Base Vehicle Incentive</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Outside Disadvantaged Community</td>
</tr>
<tr>
<td>20 ft – 24 ft</td>
<td>$80,000</td>
</tr>
<tr>
<td>25 ft – 29 ft</td>
<td>$90,000</td>
</tr>
<tr>
<td>30 ft – 39 ft</td>
<td>$120,000</td>
</tr>
<tr>
<td>40 ft – 59 ft</td>
<td>$150,000</td>
</tr>
<tr>
<td>≥ 40 ft. Double Decker Bus</td>
<td>$175,000</td>
</tr>
<tr>
<td>≥ 60 ft. Zero-Emission Battery-Electric Articulating Transit Bus</td>
<td>$175,000</td>
</tr>
<tr>
<td>≥ 40 ft. Hydrogen Fuel Cell Electric Bus</td>
<td>$300,000</td>
</tr>
</tbody>
</table>
HVIP Waitlist Status

• Waitlist for HVIP vouchers is ~$140 million

• Funds to cover the first ~$133 million are expected to be available from CARB as early as March (date TBA)

• Requests on the waitlist will not be reviewed or approved until funds are available

• **CARB closed the Waitlist to additional requests on Nov. 1, 2019** due to demand having exceeded the funds available for FY19-20
HVIP Waitlist Status

• No date has been provided yet for when the Waitlist will re-open

• Funds for **FY20-21** are expected to be appropriated by the Legislature in fall 2020

• The HVIP team suggests exploring other funding sources such as the Carl Moyer Memorial Air Quality Standards Attainment Program and Volkswagen Mitigation Trust

• Updates will be posted on [www.CaliforniaHVIP.org](http://www.CaliforniaHVIP.org) when available
HVIP Policy Changes

A number of policy changes went into effect 10/25/19 which will pertain to new requests when the waitlist re-opens (and those made 10/25 - 11/1/19)

• Limit of **200 voucher requests per fleet** per calendar year
• Stacking, or combining HVIP funding with other public programs, is allowed in a limited number of cases:
  – **Stacking is permitted with local incentive programs** as long as both programs are not paying for the same incremental costs.
  – Stacking with other **state incentives** such as Carl Moyer or AB 617 is only available for **public transit buses**, after max funds from non-HVIP program
  – Stacking is not permitted with Proposition 1B, VW Environmental Mitigation Trust, or California Energy Commission funds.
  – HVIP-funded vehicles may access **infrastructure** funded by any other funding sources.
Partial Sales and Use Tax Exemption

- **Assembly Bill 784** provides a partial sales and use tax exemption on purchases and leases of eligible zero-emission transit buses in California.

- As of **October 9, 2019** and through **December 31, 2023**.

- Purchasers must be city/county government, transportation/transit district, or other **public agency** providing public transit services.

- The bus must be **HVIP-eligible** (see catalogue at CaliforniaHVIP.org).

- The partial tax exemption applies **whether or not HVIP funding was used to purchase or lease the transit bus**.

- Purchases **do not** have to be made via an HVIP-eligible dealer or manufacturer in order to qualify.

- For more information and specific definitions, go to [www.CDTFA.ca.gov](http://www.CDTFA.ca.gov).
Other Programs and Resources

• Total Cost of Ownership Estimator
  – Visit CaliforniaHVIP.org/TCO

• Advanced Vehicle Technology and Infrastructure Funding Finder Tool
  – COMING SOON

• Clean Off-Road Equipment Voucher Incentive Project (CORE)
  – Visit CaliforniaCORE.org or email info@CaliforniaCORE.org

• Clean Mobility Options (CMO)
  – More info to come this afternoon!
Questions?

www.CaliforniaHVIP.org

HVIP’s Toll-Free Hotline
Available Mondays to Fridays, 9 a.m. – 5 p.m.
1-888-HVIP or 1-888-457-4847

or

Email us at: info@californiahvip.org
SCE is accelerating vehicle electrification across multiple sectors

- Medium- & Heavy-Duty
- Transit/School Buses
- Workplace & Public
- At Home Charging
Charge Ready Transport provides infrastructure for fleet electrification

- Approved total program budget of $356.4M
- Achieve minimum 870 sites with 8,490 electric vehicles procured or converted
- Covers cost of all infrastructure needed up to charging station
- Charging station rebates available for transit/school buses and sites in disadvantaged communities

Flowchart:
- Apply: 2-3 months
- Reserve Funding: 45 days
- Procurement: 6-9 months
- Design & Build: 1 month
- Rebate: AVAILABLE NOW

Energy for What’s Ahead™
Charge Ready Transport: Infrastructure for EV Trucks and Buses

- Medium-Duty Vehicles
- Heavy-Duty Vehicles
- Forklifts
- School Buses
- Transit Buses
- Port Cargo Trucks
- Airport Ground Support Equipment
- Transportation Refrigeration Units (TRU)
- Truck Stop Electrification (TSE)
Our Charge Ready Programs Cover the Cost to Build EV Charging Infrastructure

- SCE will cover cost of make-ready infrastructure and may offer a rebate to offset cost of procuring and installing charging stations
- Participant is responsible for procuring charging stations

Program covers costs associated with service drop, meter, panel, and circuit dedicated to EV charging.
SCE will advise customers throughout the process

Transportation Electrification Advisory Services
- Fleet Analysis Services
- Site Feasibility Studies
- Fueling calculation and Rate Analyses

Transportation Electrification Project Management
- Single Point of Contact for multi-site projects
- Dedicated project management group for EV charging projects
SCE will continue to develop new programs to spur EV adoption

AB1082 Schools

- **No-cost** or utility owned infrastructure to serve level 1 or level 2 EV charging
- Available to **K-12 Schools**
- **One-time rebate** (with the no-cost option) to offset the costs of charging stations

AB1083 Parks

- Utility owned infrastructure (for existing or new construction) to serve level 2 or DCFC EV charging
- Available to **California State parks and beaches**
Join us on this ride.

Traeger Cotten
Field Engineer
(559) 331-9715

Michele Marquette
Account Manager
(559) 685-3232
EV Fleet Program
PG&E will help you install EV make-ready infrastructure for medium- and heavy-duty fleets.

$236 million budget over 5 years from 2020–2024

700+ sites supporting 6,500 new EVs

Support conversion of commercial and public fleets to electric

Examples:
Delivery vehicles, school buses, transit buses, and more...
EV Fleet will target a diverse mix of medium- and heavy-duty vehicle types*

*Actual representation of vehicle types subject to vary based on program implementation, project costs, and market readiness
EV Fleet ownership—customer-owned

PG&E pays for infrastructure cost up to the customer meter

<p>| Charging equipment rebates for schools, transit agencies and disadvantaged communities |</p>
<table>
<thead>
<tr>
<th>EVSE power</th>
<th>Max. rebate amount**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 50 kW</td>
<td>$15,000 per charger</td>
</tr>
<tr>
<td>50.1 kW up to 150 kW</td>
<td>$25,000 per charger</td>
</tr>
<tr>
<td>150.1 kW and above</td>
<td>$42,000 per charger</td>
</tr>
</tbody>
</table>

**Customer-owned infrastructure**

Eligible for incentive up to capped amount based on vehicle sector

<table>
<thead>
<tr>
<th>Vehicle type</th>
<th>Per vehicle incentive cap*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transit buses and Class 8 trucks</td>
<td>$9,000 per vehicle</td>
</tr>
<tr>
<td>Transportation refrigeration units, truck stop electrification, ground support equipment and forklifts</td>
<td>$3,000 per vehicle</td>
</tr>
<tr>
<td>School buses, local delivery trucks, and other vehicles</td>
<td>$4,000 per vehicle</td>
</tr>
</tbody>
</table>

* Some exceptions may apply to customers who hold Primary Service with PG&E

** EVSE rebate amounts subject to change later in 2019 based upon EVSE RFQ. Rebate not to exceed 50% of charger equipment and installation costs. EVSE must meet minimum and standard requirements to be eligible for rebate

***Customer-owned eligibility at PG&E discretion based on project scope and associated costs

✝ Limited to 25 vehicles per site; sites with more vehicles to be considered on an individual basis
How to prepare

What we need from you

**Demonstrate commitment** to procurement of a minimum of 2 electric fleet vehicles

**Demonstrate long-term electrification growth plan and schedule of load increase**

**Provide data related to charger usage for a minimum of 5 years**

**Own or lease the property where chargers are installed, and operate and maintain vehicles and chargers for minimum of 10 years**
1. Has a **Paid Vehicle Invoice, Approved Vehicle Grant**, or provides a **Letter from their Board/Owner, City Council**

2. Has a **vehicle and electrification plan**

3. **Knows location** for charger placement (Map)

4. **Knows charger company, model and size** (KW) (Datasheet)

5. **Secured funding** for out of pocket cost. ie: Grants or Approved Budget

6. Has **leadership approval** for EV Fleet program participation
Commercial EV Rate Structure

Note: All rate values and proposals in this presentation are preliminary and should be considered directional. Rate proposals have not been approved by the CPUC.
PG&E has been approved to develop new commercial EV rate plans to support adoption of clean, electric vehicles.

The EV rates eliminate demand charges, instead using a monthly subscription pricing model to enable:

- More affordable charging
- Simpler pricing structures
- Improved certainty and budgeting

PG&E designed two rates specifically for fleets, fast charging, workplaces and multifamily dwellings and will create a new rate class* for Commercial EV (CEV) charging:

- **CEV-Small**
  - Charging installations up to 100 kW, e.g. smaller workplaces and multifamily sites

- **CEV-Large**
  - Charging installations over 100 kW, e.g. fleets, fast charging, and larger sites
  - Options for secondary and primary voltage service

* To enable new rates, EV charging must be separately metered from existing buildings and facilities.
1) Customers choose subscription level, based on charging needs.

2) Subscription remains consistent month-to-month.

3) Energy usage is billed based on time-of-day pricing (CEV-Large).

Subscription Charge

$95.56 / 50 kW connected charging

Customers that want to manage charging loads can opt for a lower subscription level.

If site charging power exceeds subscription, several customer communications are triggered.

An overage rate will take effect after the subscribed kW limit is reached. Each kW over the subscription will be charged at double the rate for the rest of the billing cycle.

Energy Charge

<table>
<thead>
<tr>
<th>Time</th>
<th>Off-peak</th>
<th>Super-off-peak</th>
<th>Peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midnight</td>
<td>12¢ / kWh</td>
<td>10¢ / kWh</td>
<td></td>
</tr>
<tr>
<td>9am</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2pm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4pm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 pm</td>
<td></td>
<td></td>
<td>33¢ / kWh</td>
</tr>
</tbody>
</table>

Charging is cheapest mid-day, when PG&E has higher levels of renewable energy generation.

Customers should avoid charging during peak hours from 4-9 p.m., when possible.

1) Values above represent CEV-Large, secondary voltage rates. CEV-Small rate has a lower subscription charge (~$12.41 per 10 kW connected charging).

All rate values in this presentation are preliminary and should be considered directional. Rate values have not been approved by the CPUC.
EV Fleet electrification process

**PRELIMINARY DESIGN (3–5 months)**

1. **SUBMIT EV FLEET APPLICATION**
   - Consult with your fleet OEM and/or electrical contractor to prepare and complete a PG&E EV Fleet program application [pge.com/evfleetapp](http://pge.com/evfleetapp)

2. **CUSTOMER INFRASTRUCTURE DESIGN**
   - Electrical contractor designs your charging system infrastructure behind-the-meter (BTM), which includes charging stations

3. **PG&E INITIAL DESIGN**
   - PG&E works with you and your electrical contractor on an optimal design
   - PG&E estimates how much electric capacity you’ll need (referred to as a capacity check)
   - PG&E surveys your site and provides initial design of your to-the-meter (TTM) infrastructure build-out

4. **PG&E ESTIMATE**
   - PG&E calculates the time, effort and cost of your build-out (referred to as rough order of magnitude, or ROM)

5. **SIGN CONTRACT**
   - All parties review and approve the proposal. Contract is signed

6. **CUSTOMER TASK**
   - Customer task

**FINAL DESIGN and EXECUTION (6–8 months)**

7. **CUSTOMER BEGINS BTM CONSTRUCTION PROCESS**
   - Submit/obtain permit from local jurisdiction

8. **PG&E TASK**
   - PG&E finalizes TTM design

9. **CUSTOMER BTM CONSTRUCTION**
   - Construct electrical infrastructure behind the utility meter
   - Install EVSE/charging equipment
   - Complete municipal inspection[s]

10. **PG&E TTM CONSTRUCTION**
    - PG&E constructs utility infrastructure, installs meter and makes any necessary transformer upgrades

11. **CUSTOMER TASK**
    - Customer task

12. **PG&E ISSUES QUALIFYING REBATES**
    - Ensure equipment is functioning as intended:
      - Test EVSE for voltage
      - Ensure connectivity to equipment manufacturer network

13. **PG&E TURNS ON SERVICE**
    - PG&E activates your service once inspections are complete

14. **CUSTOMER COMMISSIONS EVSE EQUIPMENT**
    - Complete commissioning and testing

15. **COMPLETE**
    - Complete process
Thank you!

Dean Kunesh
D1KB@pge.com
Overview of the Volkswagen Environmental Mitigation Trust

United States District Court
Northern District of California

IN RE: VOLKSWAGEN "CLEAN DIESEL" MARKETING, SALES PRACTICES, AND PRODUCTS LIABILITY LITIGATION

ORDER GRANTING THE UNITED STATES' MOTION TO ENTER PROPOSED AMENDED CONSENT DEED

This Order Returns To: United States of America v. Volkswagen AG et al., Case No. 16-cv-259 (S.D. Cal.)

In September 2015, Volkswagen publicly admitted it had secretly installed a defeat device—software designed to cheat emissions tests and deceive federal and state regulators—in certain Volkswagen- and Audi-branded turbocharged direct-injection (“TDI”) diesel engine vehicles. Litigation quickly followed, and hundreds of actions were subsequently consolidated in the above-captioned multidistrict litigation (“MDL”). One of those lawsuits is an action brought by the United States Department of Justice (“United States”) on behalf of the U.S. Environmental Protection Agency (“EPA”) for Violations of the Clean Air Act, 42 U.S.C. § 7401 et seq.

After four months of intensive negotiations under the supervision of a Court-appointed Settlement Master, the United States, the People of the State of California, and Volkswagen AG (“Volkswagen”), Audi AG, Volkswagen Group of America Inc. (“VWGA”), and Volkswagen Group of America Chattanooga Operations, LLC (“VW Chattanooga”) (collectively, “Volkswagen”) reached a Partial Consent Decree. The Consent Decree contains the following: Consent Decree.”
$65M to Replace Class 4-8 Transit and Shuttle Buses

Transit Buses

- Up to $180,000
  - For a new, commercially-available, battery-electric bus

- Up to $400,000
  - For a new, commercially-available, fuel-cell bus

Shuttle Buses

- Up to $160,000
  - To replace an eligible shuttle bus with new, commercially-available, zero-emission technology

✓ Total funding for this category is $130 million, with the initial $65 million increment available in 2020
✓ No more than 50% of available funds in each increment will be allocated to a single bus category
✓ Total cost per vehicle must not exceed 75% for non-government owned and 100% for government owned vehicles
✓ Stacking of VW funds with HVIP and other CARB funds not allowed
Zero-Emission Transit and Shuttle Buses

Key Points

- Open to public and private organizations
- First Come, First Served
- $130M Total Funding
  - $65M available in 2020
- 50% of funding to disadvantaged or low-income communities
Zero-Emission Transit and Shuttle Buses
Tentative Schedule

2019
- Q4 2019: Solicitation Open
- Q2/Q3 2019: Program Development

2020
- 2019-2023: Implementation & Reporting
- Q4-2019: Begin Awards and Contracting

2021
- Late 2021: Cycle 2 Program Development
Zero-Emission Transit, School, and Shuttle Buses

Overview

• Applications must be submitted electronically through the online portal at http://vwbusmoney.valleyair.org

• Requirements for Old Bus (to be replaced)
  • Internal combustion engine (gasoline, diesel, CNG, or propane)
  • GVWR 14,001 or greater (Class 4 – 8)
  • Transit and shuttle buses must be 2009 or older

• Requirements for the New Bus (replacement bus)
  • Must be zero-emission (hydrogen fuel cell and battery electric-powered)
  • Listed on HVIP Eligible Vehicle List at www.californiahvip.org/

• Funding Limitation
  • The maximum funding expenditures per Entity, as determined by Tax Identification Number, is $3,250,000

• Contract is required prior to beginning project, with three (3) year annual report

• Funds are disbursed upon verification of project completion (reimbursement)
<table>
<thead>
<tr>
<th>Category</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inspections</td>
<td>Make old and new engine / vehicle available for inspection</td>
</tr>
<tr>
<td>Operations</td>
<td>Operate the “grant-funded” engine / vehicle in accordance with the contract</td>
</tr>
<tr>
<td>Payment</td>
<td>Submit request for grant funds AFTER receiving award and completing project</td>
</tr>
<tr>
<td>Reporting</td>
<td>Submit annual reports for the term of the contract (expected 3 years)</td>
</tr>
<tr>
<td>Scrapping</td>
<td>Scrap an older engine / vehicle and replace it with the “grant-funded” engine / vehicle</td>
</tr>
</tbody>
</table>
Heavy Duty Alternative Fuel Infrastructure

- Open to public and private entities through a competitive Request for Proposals (RFP) process (Next RFP TBD)

- Eligible categories include
  - Alternative Fueling Station such as L/CNG Natural Gases and Hydrogen
  - Battery Charging Station - level 2 and higher to support heavy-duty vehicles

- **Maximum Percentage of Eligible Costs:** Not to exceed $1 million per project

<table>
<thead>
<tr>
<th>Maximum Percentage of Eligible Cost</th>
<th>Project Types</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 40%</td>
<td>Baseline maximum for all projects</td>
</tr>
<tr>
<td>Up to 50%</td>
<td>Publicly Accessible Projects</td>
</tr>
<tr>
<td>Up to 90%</td>
<td>Public School Buses – Battery Charging and Alternative Fueling</td>
</tr>
<tr>
<td>Up to 90%</td>
<td>Any Project Located at a Sensitive Receptor (schools, hospitals, and other locations)</td>
</tr>
<tr>
<td>+10%</td>
<td>Additional Incentive for Projects Primarily Fueling Class 7/8 Heavy Duty Trucks serving a Port, Railyard, or Freight Facility (not to exceed 100% of eligible project costs)</td>
</tr>
</tbody>
</table>
The San Joaquin Valley Air Pollution Control District (SJVAPCD) is currently accepting applications on a first-come, first-serve basis from valley public agencies and eligible community action agencies requesting funding for the purchase of new alternative-fuel vehicles.

Eligible vehicle must be a new electric, plug-in hybrid, or alternative fuel vehicle with a Gross Vehicle Weight Rating (GVWR) less than or equal to 14,000 pounds.

Law enforcement agencies may apply for pursuit-rated hybrid police vehicles.

Funding:
- $20,000 maximum for each new vehicle
- $100,000 maximum funding amount per calendar year per agency

For additional information please contact program staff at (559) 230-5800 or visit our website at [http://valleyair.org/grants/publicbenefit.htm](http://valleyair.org/grants/publicbenefit.htm)

A list of eligible on-road vehicles is available on our website.
Contact Information

**Questions regarding the Clean Vehicle Fueling Infrastructure Program:**

Call or email SJVAPCD Incentives Department:
Attn: David Lopez or Jocelyne Mejia
559-230-5800
grants@valleyair.org

- Ask for the Clean Vehicle Fueling Infrastructure Program Staff
- Sign up for SJVAPCD E-mail notifications at http://valleyair.org/lists/list.htm
Questions and Contact

Contact us at…

- http://vwbusmoney.valleyair.org
- Email General Inquiries to vwbusmoney@valleyair.org
- Sign Up for Updates at http://lists.valleyair.org/mailman/listinfo/vw_mitigation_trust_busmoney
- Call us at 1-833-Bus-Money
- Questions?
30 MILLION URBAN TRUCKS AND BUSES

20% of total greenhouse emissions

3.7M premature deaths due to urban air pollution

A GLOBAL CRISIS
that can only be addressed by ZERO EMISSIONS VEHICLES (ZEVs)

Sources: EPA (greenhouse emissions), World Health Organization (premature deaths) Lightning Systems
DRIVING ELECTRIFICATION

• Electrification brings:
  • Dramatic noise reduction (for both outside the vehicle and passengers)
  • Air Quality and human health
  • Climate change
  • More control and optionality around energy and resiliency
TRANSFORMING ESTABLISHED OEM TRUCKS AND BUSES INTO PREMIUM COMMERCIAL ELECTRIC VEHICLES

Focus on the Heart and Brain of Electrification

**EV POWERTRAIN**
High quality, integrated system that’s easy for upfitters to install

**EV SOFTWARE**
Advanced algorithms, controls, and integration

**EV ANALYTICS**
Actionable fleet intelligence

Engineered with custom and off-the-shelf components

Proprietary deep integration with OEM vehicle

Critical to fleet range and ROI
THE ESTABLISHED TECH PROVIDER FOR EV FLEETS

$55M Invested BY LEADING COMPANIES

+10 Years OF INDUSTRY EXPERIENCE

50+ Fleet Customers WORLDWIDE

UNPARALLELED ZEV CAPABILITIES
Engineering, Integration, and Commercialization of ZEV Technologies
# ELECTRIC POWERTRAINS FOR CLASS 3-8 VEHICLES

## Convert NEW Vehicles

<table>
<thead>
<tr>
<th>Class 3</th>
<th>Class 4</th>
<th>Class 5</th>
<th>Class 6</th>
<th>Class 7</th>
<th>Class 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRUCKS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ford Transit 350HD</td>
<td>Ford E-450</td>
<td>Ford F-59</td>
<td>GM 6500XD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BUSES</td>
<td></td>
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</tr>
</tbody>
</table>

## Repower EXISTING Vehicles

CARB Certified | Enabled and supported by [GM](https://www.gm.com) [Ford](https://www.ford.com) [QVM](https://www.qvm.com) and their dealer networks
WE’RE SETTING THE NEW STANDARD FOR FLEET VEHICLES

Impressive *PERFORMANCE* to Thrill Any Driver

- Faster Full Torque at 0 RPM
- Shorter Braking Distance
- Little Or No Noise
- Hill Hold and Creep
- Intuitive Controls

Smart and Economic *PERFORMANCE* to Please the CFO

- Top Efficiency in Every Class
  - Improved 400% over ICE
- Regen Braking Safety and Savings
- No Oil, No DEF
  - 70% Less Service
- Zero Emissions
  - Always in Compliance
- DC Fast-Charge
  - to Minimize Infrastructure
# BROAD APPLICABILITY:
## NEW AND EXISTING COMMERCIAL VEHICLES

**Convert NEW Vehicles**
- Shuttle buses
- Delivery/work trucks
- Short haul trucks

**Repower EXISTING Vehicles**
- Shuttle buses
- Transit buses
- Delivery/work trucks

<table>
<thead>
<tr>
<th>VEHICLES</th>
<th>ECONOMICS</th>
<th>UPFITTER LOCATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower vehicle TCO than gas or diesel</td>
<td>Up to 75% less expensive than new ZEV</td>
<td>Near OEM chassis plant</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Near customer deployment location</td>
</tr>
</tbody>
</table>

[lightningsystems.com]
LIGHTNING ANALYTICS
Accurate and Actionable Reports delivered by Fleet Experts

- INCREASE RANGE
- PREVENTATIVE MAINTENANCE
- DEDICATED FLEET EXPERTS
- IMPROVE DRIVER BEHAVIOR
- NO SECURITY RISKS
AI-ENABLED ANALYTICS HELP WITH FLEET AND DRIVER MANAGEMENT

- Increase range
- Optimize routes
- Reward/correct behavior

Secure, customizable reports that INTEGRATE with existing fleet management programs
LIGHTNING ANALYTICS PROVIDE DEEP EV INSIGHTS

50% Greater Efficiency
LS Class 3 Competitors
1.8 mi/kWh  1.2 mi/kWh
(official CARB test data)

Machine Learning Optimization:
• HVAC energy use
• Acceleration & Route
• Regenerative Braking
• Driver training

50 vehicle parameters at 1Hz = 260M DataPoints/veh/day
LIGHTNING SELECTS ONLY THE BEST BATTERIES

Premium battery cells
- High-quality 18650-type Li-ion cells from a major electronics OEM.
- The same cells are used in EVs from most major US and European car manufacturers.
- Nickel-Manganese-Cobalt (NMC) technology provides great range and reliability.
- Internal safety features prevent over-current conditions.

Thermal Management
- Batteries have an optimal operational temperature range for maximum range and performance.
- It also extends the battery’s operational life from just one year to seven years or more.
- Lightning’s thermal management system is one of the most sophisticated in the industry. It automatically...
  - cools to ambient temperatures (radiator)
  - cools below ambient temperatures (chiller)
  - heats above ambient temperatures (heater)

Battery Management
- Lightning Systems’ electric drivetrains incorporate sophisticated software and hardware controls at all levels.
- Battery controls manage state-of-charge including cell balancing.
- Supports AC charging and DC Fast Charge. (Most other vendors don’t offer DC Fast Charge.)
SELF-CONTAINED POWERTRAIN KIT

A Swap-In Replacement for the ICE

- The kits shown here are Ford Transit EV upfits.
- One sled carries the electric motor, the integrated transmission, the inverter and accessories such as power steering pump and AC compressor.
- Mounts in the vehicle on the existing engine mount points and mates with the driveshaft.
BENEFITS TO THE BOTTOM LINE AND BEYOND

Save on fuel & fueling time

Dramatically more vehicle uptime with no emission testing, no oil changes, no DPF maintenance

Zero emissions means cleaner air in communities you serve

Fewer parts and a well-engineered powertrain mean lower maintenance costs

Significant savings on operating costs

Regenerative braking dramatically reduces brake wear
BUY AMERICA and BUY AMERICAN
Federal funding requirements for preferring US-manufactured goods.

This program relates to **federally-funded transit projects**. The requirement is that a minimum of 65% of the components of the product must be produced in the USA. Our analysis for our E-450 conversion shows 83.3% domestic-produced components (by cost).

https://www.transit.dot.gov/buyamerica

This program relates to federal funding of **Airport Improvement Programs**. It asserts a preference for 100% American-sourced products; however, there are provisions for waivers if certain requirements are met. We meet the two requirements for one of the waiver provisions:
- At least 60% US-produced components
- Final assembly in the US

https://www.faa.gov/airports/aip/buy_american/
BATTERY ELECTRIC FORD TRANSIT 350HD

• Battery-electric vehicle
• Smooth, quick and quiet
• Best efficiency of any Class 3 van
• Elegant cabin integration with batteries fully under the floor
• 3rd party dynamometer-certified 120-mile range
• CARB and HVIP certified
• Ford eQVM certified: Ford vehicle warranty and matching Lightning powertrain warranty for complete coverage
• Installation, maintenance and service performed by certified partners
• LightningAnalytics gives insight into usage and efficiency
• Available New or Repower

66 MPGe
COMPELLING ECONOMICS
IMMEDIATE MONTHLY OPERATING SAVINGS AND ATTRACTIVE ROI VS. ICE

Delivery Truck (25.6K miles/year)
- Fuel
- Maint. & Other

$4.3K
2.9
7.7
$17.2K
ELECTRIC
ICE

Annual Operating Cost

ROI in California today

<table>
<thead>
<tr>
<th></th>
<th>Cargo</th>
<th>Passenger</th>
</tr>
</thead>
<tbody>
<tr>
<td>HVIP voucher/grant</td>
<td>$55,000</td>
<td>$80,000</td>
</tr>
<tr>
<td>Powertrain Price</td>
<td>$99,000</td>
<td>$99,000</td>
</tr>
<tr>
<td>NET price</td>
<td>$44,000</td>
<td>$19,000</td>
</tr>
<tr>
<td>Savings/year vs. ICE</td>
<td>$13,000</td>
<td>$15,000</td>
</tr>
<tr>
<td>ROI</td>
<td>3.4 years</td>
<td>1.3 years</td>
</tr>
</tbody>
</table>

• **+$13-15K** / Year in Savings per vehicle
• **ROI of 1.3 to 3.4** years with grant

* Maintenance includes: Labor cost of fueling, incremental insurance costs (for EV), oil change/inspection, and brake service.
BATTERY ELECTRIC FORD E-450

- Battery-electric vehicle
- Smooth, quick and quiet
- Elegant cabin integration with batteries fully under the floor
- Ford eQVM certified: Ford vehicle warranty and matching Lightning powertrain warranty for complete coverage
- Installation, maintenance and service performed by certified partners
- LightningAnalytics gives insight into usage and efficiency
- Available New or Repower
# LIGHTNING EV COST SAVINGS

Savings Analysis for Ford E-450 Shuttle

<table>
<thead>
<tr>
<th></th>
<th>Gasoline</th>
<th>Electric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Miles per year</td>
<td>32,850</td>
<td>32,850</td>
</tr>
<tr>
<td>Fuel economy (MPG and M/kWh)</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Cost of fuel ($/gallon and $/kWh)</td>
<td>3.95</td>
<td>0.15</td>
</tr>
<tr>
<td>Total brake and oil/inspection costs ($/Mile)</td>
<td>0.148</td>
<td>0.022</td>
</tr>
<tr>
<td>Fuel and maintenance cost per month</td>
<td>$2,207</td>
<td>$306</td>
</tr>
<tr>
<td>EV incremental lease price per month</td>
<td>$0</td>
<td>$518</td>
</tr>
<tr>
<td><strong>Total Cost per Month</strong></td>
<td><strong>$2,207</strong></td>
<td><strong>$824</strong></td>
</tr>
</tbody>
</table>

Lightning Electric Shuttles have a much lower TCO than Gasoline vans
CONSIDER REPOWERING: AN ALTERNATIVE TO BUYING NEW

REDUCE
vehicle & operating costs immediately while eliminating fuel use and harmful vehicle emissions

REUSE & RECYCLE
your legacy assets made green, extending vehicle life and eliminating additional waste

Repowers are eligible for CA HVIP vouchers and other grants through US
REPOWER: AN ALTERNATIVE TO BUYING NEW

- Repower existing fleet vehicles with Lightning’s cutting-edge ZEV powertrain
- Keep the bus you & your mechanics are familiar with
- Refurbish vehicles to upgrade to current safety & cosmetic standards
- Creates new ZEV vehicles that meet looming mandates
- Less expensive than a new bus
- Quick lead time (new ZEV vehicles have 18-24 month waiting list)
CITY BUS REPOWER POWERTRAIN CONFIGURATION
COMPELLING ECONOMICS: REPOWER EXISTING VEHICLES
$1B CALIFORNIA CITY BUS REPOWER OPPORTUNITY

Proven success in Repowering Transit Buses in Boulder, CO

Lightning Electric Repowered Bus

Lightning Systems
$390K
6 month delivery time

New Diesel
$500K

New Electric
$750K

New City Bus

• ICE buses serve 20 yrs, but need a new powertrain every 7 yrs
• California legislation mandates 100% EV by 2029 – in 10 years

• CA requires 1,500 E-buses/year for 10 years
• US E-bus manufacturers produce 400/year today
• Lightning provides a solution for half the price

lightningsystems.com
LIGHTNING SYSTEMS ENERGY SOLUTIONS
A COMPREHENSIVE SOLUTION TO CHARGING YOUR VEHICLES

• Charging the vehicles requires a comprehensive solution of both software and hardware to ensure economical and technical requirements are met
  • Lightning Systems offers a comprehensive range of charging stations (Level 2 AC, DC Fast Charge)
  • We have a partner that can help you implement EV charging from soup to nuts
  • We can provide a sophisticated charging management software solution
• Many agencies will benefit from distributed energy generation and looking beyond utilities
LIGHTNING SYSTEMS MOBILE VEHICLE BATTERY CHARGER
FOR MOBILE FAST CHARGING AND LOT CHARGING
LEVEL 2 IN—DCFC OUT
WHAT CAN WE DO TOGETHER TO DRIVE BROADER ADOPTION?

• City ZEV Zones
  • City councils can mandate zero emission vehicles in their cities and create revenue streams for noncompliance that can be used for transit agencies

• More microtransit
  • City of Porterville –12 new vans replacing one bus
  • Financing -- The transition from low capital acquisition cost and high operational costs to high capital acquisition and low operational cost can be accelerated through long term financing such as vehicle leasing, battery leasing, and vehicle as a service financing models
LET’S TALK ABOUT YOUR FLEET NEEDS
Speak with our experts about funding for vehicles and chargers

- Call: 1-800-223-0740
- Email: Info@lightningsystems.com
- Visit: 815 14th Street SW, Suite A100, Loveland, CO 80537
- Offices also in San Francisco & San Diego

Available NOW

Available NOW

Available NOW

Available NOW
Fleets Powered by Lightning

Tim Reeser
While the other guys are charging over $45,000 + for their program (ouch),
Fresno City College beats the other guys HANDS DOWN.

- An Associate’s Degree or Certificate of Achievement
- ASE Certification
- ASE Education Foundation Hands on Experience
- Contract Education/Fleet Training
Fresno City College costs $6000. With books. And lab fees. No, we’re not kidding. An Associate’s Degree of Applied Science, ASE Certification, and a REAL CAREER in a Dealership/Fleet.
Your Associates of Science degree transfers to...

With Fresno City College’s 2 plus 2 program, furthering your education is EASY.
We have many outlets for financial aid, including FAFSA, a government agency dedicated to scholarships and grants for college students. One application, MILLIONS in financial aid!
Internships?
A Job?
A Career?
Meet our industry partners...
TECS
(Technical Education College Support)
ELITE PROGRAM
Dual Enrollment with Local Area High Schools

- ASE Education Foundation – Tier 1 (Inspection, Maintenance, & Minor Repair - IMMR) for Local Area High Schools (Diesel)
- ASE Education Foundation – Tier 1 (Maintenance & Light Repair - MLR) for Local Area High Schools
- Create an Educational Pathway for Automotive/Diesel Technology High School students
Fresno City College

WE NEED YOUR PARTNERSHIP!

• Dual Enrollment with your Local Area High Schools and the FCC Automotive/Diesel Technology Program
• Create an Educational Pathway for Automotive/Diesel Technology High School students to the FCC Automotive/Diesel Technology Department
• Scholarships 501(c)3: Affinity Truck Center, Volvo/Mack, Central Valley: GM, FCA, Subaru, Toyota, Ford Dealers/Fleets
• Tool and Equipment Incentives: MDI 2, Snap-On, Matco
• On the Job Training => GM CoL => MIT => GM Boot Camp => GM START => GM ASEP
• Pay Plan for completion of GM Training Paths (Example: Fundamentals @ 45 Hours)
• GM ASEP Student = GM STS 80%-85%
Fresno City College

SPONSOR! SPONSOR! SPONSOR!

• Tool and Equipment Incentives: wiTECH, Laptops, Snap-On, Matco
• On the Job Training => DealerCONNECT, FCA Performance Institute
• Pay Plan for completion of FCA Levels
• Mopar CAP Student = Level 0, 1, *2, *3

(*Must be FCA Dealer Sponsored to acquire these Levels!)

Tool and Equipment Incentives: Scan Tools, Laptops, Snap-On, Matco
On the Job Training => OEM LMS (Learning Management System – Subaru, Toyota, Ford)
Pay Plan for completion of Levels
FCC Automotive Technology Student
Tool and Equipment Incentives: Scan Tools, Laptops, Snap-On, Matco

On the Job Training => OEM LMS (Learning Management System – Volvo/Mack)

Pay Plan for completion of Levels

FCC Diesel Technology Student
Fresno City College

CONTRACT EDUCATION

• Fleet Training
• SCRTTC (So. CA Regional Transit Training Consortium) Training
• ETP (Employment Training Panel) Training
• ATL (Advanced Transportation & Logistics)
• NAFTC (National Alternative Fuels Training Consortium) Training
• AFV (Diesel, LPG, CNG) Training
• ATV (HEC, BEV, PHEV) Training
• National Institute for Automotive Service Excellence (ASE) Training/Preparation
• Drivability and Emission Control Systems
• Electrical Diagnosis – Basic/Intermediate/Advanced
Coming June 2022
Fresno City College – West Fresno Campus
Fresno City College – Automotive/Diesel
Questions?
SunLine Operations – 350 Employees

Routes
- 14 fixed routes
- 1 express route
- 1 Riverside Commuter Link
- ADA Paratransit

Fleet
- 61 CNG
- 16 Electric Hydrogen Fuel Cell (2 in production)
- 4 Electric Battery BYD
- 39 CNG Paratransit Vehicles

Revenue Miles vs. Passenger Trips
- 4.3 million revenue miles
- 4.5 million passenger trips
What Do You Know About Power/Energy?
All Energy on Earth is from the Sun!

Sun Energy

Dead plant/animal life, heat, pressure (>100s of millions of years) – Fossil Fuels
- coal, oil, natural gas

Corn/Trees/Grass (months – years)
- ethanol, biogas, biomass

Hydro (weeks – months)
- evaporation, clouds, rain, lakes

Wind (days – weeks)
- wind turbine

Solar (instant)

“Energy sustainability requires conversion of resources at the same rate at which they are naturally replenished on earth without externalities”
Electricity Puzzle

- **Time of Use**: When you use it
- **Demand Charges**: The largest use in a period in a billing cycle
- **Cost Per Kilowatt Hour**: How much is power in your area and how much does it cost?
Energy Options for the Coachella Valley
Hydrogen Basics

- Most abundant element on earth
- Hydrogen makes up over 90% of all atoms in the universe
- Smallest atom and lightest of all chemical elements
- Hydrogen comes from water (H2O) and makes up 10% of the mass of the human body
- Odorless/tasteless/colorless
Hydrogen Benefits

- Used as rocket fuel/vehicle fuel
- Can be stored as liquid or gas
- Can be converted from liquid to gas and back again
- It can be converted into electricity
- Does not produce harmful emissions
- Renewable
- Fuel Efficient
Hydrogen Cost/Benefit

**PROCURE**
You can procure under long term, set priced contracts

**1 FOR 1**
Bus operations are 1 for 1 versus all-battery electric which require both capital, operational and labor cost increase

**LONGER RANGES**
Hydrogen Fuel Cell Buses offer longer ranges (up to 350) miles per fill versus battery electrics that range 120 to 160 per full charge

**FILL TIMES**
Range 15 to 20 minute fills versus in-route charging costs or long deport charge times

Normal fueling, cleaning, procedures through standard fuel lanes
SunLine’s Technology Contribution

- Operating H2 for more than 20 years
- Pioneered the electric drive
- Expanded the commercialization of H2 technology
SunLine’s Long History in Hydrogen

Leaders in Hydrogen Electric Fuel Cell Bus Technology for over two decades
SunLine will have 19 Electric Fuel Cell Buses in 2020
(Grant Submissions for up to 12 Additional Buses)
West Coast Center of Excellence
WEST COAST CENTER OF EXCELLENCE

- Training funded by FTA
- Infrastructure for Center partially funded by FTA
Completed Training Modules

- Advanced Technology Technician Training
- Procurement Insights for ZEB purchases
- Planning and executing ZEB’s in service
- Leadership, mission, value creation for a successful ZEB Program
SunLine has made a deep commitment to reducing environmental impacts while delivering world-class transit services.

Hydrogen Fuel Cell is tracking to be less costly to operate than all battery electric buses.

SunLine does not use any solid fuel to deliver transit to the Coachella Valley.

Zero emission technology works.

California’s Innovative Clean Transportation Rule is a game-changer for the clean fuels industry.
Thank You

tedwards@sunline.org
Clean Mobility Options Voucher Pilot

Program Overview

Bakersfield, CA
February 27, 2020
What are the goals of this program?

Improve access to clean mobility options that are safe, reliable, convenient, and affordable to communities throughout California.

- Increase mobility options in disadvantaged communities
- Reduce greenhouse gases and pollutants
- More zero-emission vehicles
- Local solutions that inform projects throughout the state
Funding Details - $20 million

Mobility Project Vouchers
- $19 million in mobility project vouchers available statewide
- At least $1 million of this set-aside for tribes
- Maximum Project Budget: $1 million per project

Needs Assessment Vouchers
- $1 million in community transportation needs assessment vouchers available statewide
- Maximum Project Budget: $50,000 per project
Eligibility Overview

Mobility Projects and Needs Assessments
- **Applicant:** Government entity, qualified nonprofit, or tribe
- **Project area:** Disadvantaged community *residents* (see next slide)

Mobility Projects
- **Experience:** 1+ year operating mobility services
- **Project model:** Zero-emission car-sharing, bicycle or scooter-sharing, carpooling/vanpooling, innovative transit, or ride-on-demand (i.e. Lyft)
- **Community need:** Based on community transportation needs survey that includes direct engagement with community residents
- **Financial Sustainability:** Must commit to 4 years of operations
Who Can Apply?

**Lead Applicants**
- Public agencies
- Nonprofit Organizations
- California-based Native American Tribes

**Sub-applicants**
- Any entity with lead applicant eligibility
- Public, private or nonprofit organizations
- Can include providers of mobility services, charging infrastructure, related infrastructure, community outreach, and technical services
Eligible Project Areas

- **CalEnviroScreen 3.0**
  Disadvantaged Communities (DACs)

- **Deed restricted affordable housing** within AB 1550 Low-Income Communities or DACs

- **Tribal Lands** within AB 1550 Low-Income Communities or DACs

See Eligible Project Area Reference Sheet:
http://www.cleanmobilityoptions.org/eligibility/
Types of Services

Eligible Project Models:

- Carsharing
- Carpooling/vanpooling
- Bikesharing/scooter-sharing
- Innovative transit service
- Ride-on-demand service
- Other transportation enhancements
  - Up to 10% of voucher budget
  - Transit subsidies, integration with multimodal payment cards, etc.

Transportation Enhancement Example:

VAMOS transit trip planning app, with information from multiple San Joaquin Valley transit agencies

vamosmobility.com
Resources and Technical Assistance

- **Website:** [www.cleanmobilityoptions.org](http://www.cleanmobilityoptions.org)

- **Application technical assistance**
  - Email request to [info@cleanmobilityoptions.org](mailto:info@cleanmobilityoptions.org)
  - Call *(626) 744-5670*

- **Application Toolkit - available on website**
  - Sample Needs Assessment Survey
  - **Clean Mobility Provider Directory:** [http://www.cleanmobilityoptions.org/directory/](http://www.cleanmobilityoptions.org/directory/)
  - Coming Soon: Project Design and Partnerships Guide

- **Mobility on Demand Learning Center**
  - Case studies and other materials on [www.learn.sharedusemobilitycenter.org](http://www.learn.sharedusemobilitycenter.org)
Thank you!
The San Joaquin Valley's Electric Carshare Service
The Míocar Team

● Our office is in Visalia, CA
● We handle all of our customer service in-house
● Our bilingual team is on call 24/7

Gloria Huerta
Richard Kosmacher
Javier Zepeda
Míocar Is Affordable & Easy to Use

$4/hour, $35/day, $.35/mile after 150 miles
Available Vehicles*

*vehicle mix may change to achieve better mile ranges and EV tech advances, prices decrease

Chevy Bolt
240 mile range

Chrysler Pacifica
Plug-in hybrid minivan
516 mile range

BMW i3
180 mile range
Current System

Launched July 2019:

- 27 vehicles
- 300 members
- 25,000 miles driven
- Over 600 reservations

Orosi, CA
Dinuba, CA
Visalia, CA
Wasco, CA
Arvin, CA
Lamont, CA
Stations can be in neighborhoods or community centers
Local Support & Community Design
Building Míocar is Cost-Effective and Customizable

- Can deliver new EV station equipment or leverage existing infrastructure
- Range of use cases possible:
  - Individual car sharing members
  - Business and institutional members
  - Professional drivers on ride-hailing or volunteer driver platforms
About the ARB’s Clean Mobility Options (CMO)

- **Eligible Areas**: Top 25% Disadvantaged Communities (CalEnviroScreen)
- **Eligible projects**: EV carsharing, on-demand transit, micro mobility (e.g., bike and scooter sharing), and other for **smaller communities**
- **Funding cap per applicant**: ~$1M
- **Total Funds**: $10 Million
- **Simple Application**: Basic demonstration of community support for project
- **Streamlined payments**: Direct payment to vendors
- **Administration**: Local agency or organization or through your MPO (not air district)
Miocar is a non-profit collaborative between San Joaquin Valley Partners. CMO Vouchers can be used to replicate this model:

- A $450,000 investment in a 15-car system, for example, will sustain your program for the first four years, with operating revenues rolled into ongoing costs.
  - Program can be scaled up or down to fit target communities. Some cities are working together on voucher applications.
  - Our team will work with you to size the program to maximize viability
- Any surpluses will be returned into program growth
- Miocar maintains fleet, insurance, and program’s hardware and software
Míocar is a social enterprise originating in the San Joaquin Valley with a mission of delivering affordable transportation options for all.

Building Míocar into your community transportation plan will be a long-lasting investment, leveraging local investment and coordinated planning efforts.

The Miocar team leans on our experience folding non-profit shared mobility programs into the backbone of local and regional transit service.
Míocar: Initial Research Results

Caroline Rodier, Ph.D.
Institute of Transportation Studies, UC Davis
TRANSITions 2020
February 26, 2020
UC Davis Mapping Tool for Possible EV Carsharing CMO Locations in the San Joaquin Valley

For more information contact Juan C Garcia Sanchez (or JC) at jcgarciasanchez@ucdavis.edu
Eligible DACs in and around Bakersfield by Level of Vehicle Insufficiency
Eligible DACs North of Bakersfield by Level of Vehicle Insufficiency
# Miocar Member Usage Data

<table>
<thead>
<tr>
<th>Since 9/19 Miocar Launch</th>
<th>Total</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reservations</td>
<td>458</td>
<td>5</td>
</tr>
<tr>
<td>Vehicle Miles Traveled</td>
<td>29,685</td>
<td>87</td>
</tr>
<tr>
<td>Reservation Hours</td>
<td>6,115</td>
<td>73</td>
</tr>
</tbody>
</table>
Active Miocar Users (Initial Survey with 20% response rate)

- Household Size
- Number of Household Adults
- Household Vehicles

Percentage distribution across household sizes:
- 25% for 0 households
- 25% for 1 household
- 20% for 2 households
- 15% for 3 households
- 25% for 4 households
- 15% for 5 households
- 10% for 6 households
Rate of Poverty among Active Miocar Users from Initial Survey (20% response rate)

<table>
<thead>
<tr>
<th>Federal Poverty Level</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 100%</td>
<td>35%</td>
</tr>
<tr>
<td>100%</td>
<td>35%</td>
</tr>
<tr>
<td>200%</td>
<td>29%</td>
</tr>
<tr>
<td>Response</td>
<td>Percentage</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>No</td>
<td>60%</td>
</tr>
<tr>
<td>Unsure</td>
<td>17%</td>
</tr>
<tr>
<td>Yes, using these modes:</td>
<td>24%</td>
</tr>
<tr>
<td><em>Driven my own car</em></td>
<td>70%</td>
</tr>
<tr>
<td><em>Got a ride from someone</em></td>
<td>10%</td>
</tr>
<tr>
<td><em>Rented a car</em></td>
<td>20%</td>
</tr>
</tbody>
</table>

Traveled to Reservation Destinations without Miocar? (after reservation survey)
## Primary Reservation Purpose: Miocar After Reservation Survey (30% members reporting)

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family/personal errands</td>
<td>38%</td>
</tr>
<tr>
<td>Work-related</td>
<td>29%</td>
</tr>
<tr>
<td>School</td>
<td>10%</td>
</tr>
<tr>
<td>Social/recreational</td>
<td>10%</td>
</tr>
<tr>
<td>Medical</td>
<td>7%</td>
</tr>
<tr>
<td>Other</td>
<td>5%</td>
</tr>
<tr>
<td>Shopping</td>
<td>2%</td>
</tr>
</tbody>
</table>
Share of travel that would **NOT** have been made by primary reservation purpose.

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family/personal errands</td>
<td>75%</td>
</tr>
<tr>
<td>Work-related</td>
<td>75%</td>
</tr>
<tr>
<td>Medical</td>
<td>70%</td>
</tr>
<tr>
<td>School</td>
<td>50%</td>
</tr>
<tr>
<td>Other</td>
<td>50%</td>
</tr>
<tr>
<td>Social/Recreational</td>
<td>25%</td>
</tr>
<tr>
<td>Shopping</td>
<td>0%</td>
</tr>
</tbody>
</table>
## Mode to Miocar Hub: After Reservation Survey (30% members reporting)

<table>
<thead>
<tr>
<th>Mode to Miocar Hub</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walk, Bike, or Other</td>
<td>44%</td>
</tr>
<tr>
<td>Private Vehicle</td>
<td>29%</td>
</tr>
<tr>
<td>Public Transit Bus</td>
<td>15%</td>
</tr>
<tr>
<td>Taxi, Uber, or Lyft</td>
<td>12%</td>
</tr>
</tbody>
</table>
Final After reservation questions...

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Average Number of People in the Vehicle</td>
<td>2.2</td>
</tr>
<tr>
<td>Average Service Rating (1-5)</td>
<td>4.1</td>
</tr>
</tbody>
</table>
Mission Statement

We make life better by connecting people to places one ride at a time.
What is Microtransit?

- On-demand, curb-to-curb shuttle service
- Platform
  - Dynamic routing
- User-Friendly App
  - Personalized ride-share experience
- Adapt to Bakersfield lifestyle changes
  - Identified a zone with under-performing routes
  - Pilot to serve low-density areas
RYDE Overview

- **Started April 2019**
  - Pilot ends after December 2020

- **Zone Profile**
  - 23 sq mi of the general SW area
  - Diverse Demographics (income, ethnicity)
  - Shopping, schools and universities, doctors offices, entertainment, etc.

- **Rides within the zone are $3.50**

- **Hours of Operation**
  - Mon - Fri 6 am - 11 pm
  - Sat & Sun 7 am - 7 pm

  **Closed Thanksgiving and Christmas Day**

- **Marketing and Outreach**
  - Traditional
  - Grassroots Outreach
• Milestones
  • Total Rides Booked since April: 22,118
  • Daily Boardings: January = 115; April = 35 (est. 70%)
  • Passengers per revenue hour: 1.9

• Booking RYDE
  • 54% - TransLoc App
  • 39% - Phone
  • 5% - Walk-up
  • 2% - Web

• Most Popular Time
  • 1 PM – 4 PM

• Popular Destinations
  • GET Transit Centers (CSUB, Southwest Transit Center, Northwest Promenade)
  • Shops at Riverwalk

• Average Trip Length
  • 4 mi

• Rider and Driver Feedback
Thank You!

TransLōc App

RYDEbakersfield.com