Good morning! Thank you, councilmember Smith. I am Linda Urata, a regional planner for Kern COG, the San Joaquin Valley Clean Cities Coordinator, and your hostess for today. Thank you for attending Kern COG’s TRANSITions 2019 Transit Symposium. First, some housekeeping items. Exits, Vendors, Vehicles, Restrooms, Breaks.

Technology over the past decade has developed to where zero emission transit buses – battery electric and fuel cell – are becoming an option in Central California for transit fleets of all sizes.

Kern COG understands that the primary mission of transit agencies is to move people from one place to another safely and efficiently. Today, that may mean:

- with the convenience of a phone app that will pick someone up where they want and take them where they want, without having to walk more than a hundred feet or so on either end of the trip;
- serving people with special needs whether they be elderly, students, having some disability under ADA, or completing their trip by scooter or bicycle;
- keeping the cost of the trip very affordable;
- meeting fare-box requirements;
- training drivers and customer service reps;
- recruiting and retaining qualified maintenance technicians;
- called into service during emergencies or special events;
- connecting to inter-regional transit and last-mile options;
- reducing emissions from vehicles;
• supporting community events;
• managing a business office, which includes writing grants and writing reports;
• balancing a rise in minimum wage with a decrease in ridership;
• forming new partnerships; (much more that I am forgetting or unaware of) and
• Transitioning your fleet to a new fuel technology. Next thing you know, you will be operating buses that drive themselves and talk to the cars and traffic signals around them!

Now before you all run for the doors, because you are reminded of the pile of work facing you, allow me to give you a reason to stay!

Both environmental and cultural forces are at work, and transit agencies are faced with changing how they do business.

Each of us is aware of the poor air quality in the region and the need for increased efforts to meet air quality standards. AB617 calls for efforts to improve air quality at the local level. New voices and experienced champions are calling for a move toward zero-emission vehicles. The California Air Resources Board is answering that call, and important to you here today, having passed the Innovative Clean Transit (or ICT) regulation in December 2018. CARB also is interested in listening to the challenges, garnering resources, sharing information, offering grants, and providing assistance to transit agencies throughout this transition. You will not only hear from CARB today, but I invite you to ask questions and express concerns,
and to keep the phone numbers and emails that you find for Shirin and Yachun on that last slide!

Transitioning to zero emission and low greenhouse gas emitting transportation will help the entire region meet our air quality goals for what transportation planners call “Conformity”. Therefore, even if your fleet does not fall under the new ICT regulation, we hope that you consider reducing emissions from your transit fleet.

As I recall, Kern COG was one of the first MPOs in the State to award Congestion Mitigation for Air Quality (CMAQ) funding for the purchase of natural gas transit buses and the installation of CNG infrastructure for transit.

Culturally, transit agencies acknowledge that individuals are increasingly moving toward new ways to get around without driving their own cars. The MPOs (aren’t you glad Bob Smith told you what that stands for? I am!) The MPOs partnered with Dr. Caroline Rodier, a researcher at the UC Davis Institute of Transportation, to study last-mile transit in rural parts of the San Joaquin Valley. You will hear an update about two pilot programs [Valley Go and Valley Flex] in the Central Valley funded by CARB and led by Dr. Rodier in partnership with several MPOs, transit agencies, low-income housing, Sigala Inc., and the San Joaquin Valley Air Pollution Control District. As a member of the team, I can say it has been an interesting year so far. I believe that the experience from this project will enlighten us all.

To gain some insight into the considerations of moving your transit fleet to either battery electric or hydrogen fuel cell or for smaller transit fleets not encompassed
in the Innovative Clean Transit Rule to find out more about renewable natural gas, our zero emission bus transit panel will provide some basic considerations. These gentlemen bring many years of experience and passion to their work and to today’s presentations.

We’ve lined up a great variety of presentations on finding money to help with a transit transition. Federal, State, and local agencies, public utilities, have funding opportunities such as grants and incentives for vehicles, infrastructure, training, and shared mobility. Others who could not travel here today sent information on aggregate purchasing and pricing information. So during the breaks or before you leave, be sure to visit the vendor room to pick up more information.

Additionally, you will hear from the San Joaquin Valley Electric Vehicle Partnership on their efforts to develop the market for zero emission transportation in the Central Valley, Eastern Kern County, and Mariposa County. By hosting events throughout the year, the SJV EVP provides opportunities to hear from program managers, experienced fleets, and new technologies.

Our hometown transit, Golden Empire Transit has a fleet of 90 compressed natural gas buses equipped with wheelchair lifts and bike racks. GET offers 16 routes, which operate 7 days a week and transport more than 6 million passengers each year with its fixed route buses. In addition, GET operates 21 compressed natural gas GET-A-Lift buses. For those of you who may not know, GET-A-Lift is a paratransit service for eligible riders who have a disability that prevents them from making some or all of their trips on fixed route buses.
Several of these paratransit shuttles will be pressed into a new service called RYDE. Presently, individuals are choosing new private Transportation Network Services such as Uber and Lyft, and asking for the same type of service from public transit. Today, you will hear from GET about a new service using the GET-A-Lift buses, a micro-transit pilot in the southwest part of Bakersfield.

Unfortunately, missing from today’s presentations is a lot of solid operations data. Each technology is different. Each application is different. In short – your mileage may vary. As more information emerges, the SJVEVP, CARB, Original Equipment Manufacturers, the US Department of Energy, and others will be working to share that information with the transit agencies. Also missing today are sessions on training needs. CARB held a zero emission bus technology showcase and symposium earlier this month. There was a lot of fabulous information with regards to training. We will share a link to the CARB website where the presentations will be posted and provide you with an overview during today’s wrap-up.

We DO have Jack Hall with us today to tell us about GoMentum, an autonomous vehicle and connected vehicle testing ground in Concord, California.

By now you may have noticed the centerpieces, bus transformers, chocolate kisses, and butterflies. And if you don’t think chocolate kisses bring about change, you are forgetting about the boost to your mood and energy levels! Yeah- you thought I was going to say waistline, didn’t you?
As a graduate of UCLA, I am sworn to quote John Wooden when speaking in public. One of my favorite Wooden quotes, is that “things work out best for those who make the best of the ways things work out”. I hope that today you learn a few ways to make a transit transition work for you, your agency, and the public you serve.

Thank you.

Now let’s get started.
Innovative Clean Transit Regulation

Kern Council of Governments' TRANSITions 2019 Transit Symposium

Bakersfield, California
February 26, 2019
OVERVIEW

- Innovative Clean Transit regulation
- Comprehensive review
- Funding opportunities
- Next steps
ELEMENTS OF INNOVATIVE CLEAN TRANSIT REGULATION

- Applicability
- Zero Emission Bus (ZEB) Rollout Plan
- ZEB purchase requirements
  - Flexibility, exemptions, and credits
- Low-NOx engines and renewable fuels
- Annual reporting and record keeping
APPLICABILITY AND PURCHASE DEFINITION

- Applies to all transit agencies that own, operate, or lease buses with gross vehicle weight rating (GVWR) > 14,000 lbs.
  - Include standard, articulated, over-the-road, double-decker, and cutaway buses
- Does not apply to:
  - Caltrans, Caltrain, Amtrak, or school districts
  - Vehicles operate on rails, trolleybuses, or school buses
- Purchase means when a transit identifies and commits funds to execute a Notice to Proceed, or to sign a lease or a purchase agreement with a bus manufacture to begin with production of a bus
REQUIREMENTS DIFFER BY FLEET SIZE

A Large Transit Agency
- Serves other areas with populations >200,000
- Has >100 buses* during peak operation
- Operates in South Coast or San Joaquin Valley
- Has >65 buses* during peak operation

A Small Transit Agency

All other transit agencies

* Includes all buses with a GVWR >14,000 lbs., but excludes demand response
ZEB ROLLOUT PLAN

- An individual transit agency plan on how to transition to a zero emission bus fleet by 2040
- Approved by the transit agency’s board of directors and submitted to CARB
  - July 1, 2020 for large transit agencies
  - July 1, 2023 for small transit agencies
- Helps inform funding plans and utility planning, and engage general public
- Non-binding and expected to change
REQUIRED ROLLOUT PLAN COMPONENTS

- Plan for full transition to ZEBs by 2040 (considering minimum bus useful life)
- Planned bus purchase schedule
- Identify types of ZEB technologies planning to deploy
  - Both battery electric (on-route or depot) or fuel cell electric are eligible
- Infrastructure build out schedule, location and type
- Workforce training (planner, technician, driver, etc.)
- Describe how planned ZEBs would serve disadvantaged communities
- Identify potential funding sources
ZEB PURCHASE SCHEDULE

- Allows buses to have their minimum useful life
- 2023 requirement discharged if 850 ZEBs purchased by 12/31/2020
- 2024 requirement discharged again if 1,250 ZEBs purchased by 12/31/2021
- Early ZEB purchases count towards future compliance
- Retain newly purchased ZEBs for at least 5 years, starting January 1, 2023

<table>
<thead>
<tr>
<th>Year</th>
<th>ZEB Percentage of Total New Bus Purchases</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Large Transit Agency</td>
</tr>
<tr>
<td>2023</td>
<td>25%</td>
</tr>
<tr>
<td>2024</td>
<td>25%</td>
</tr>
<tr>
<td>2025</td>
<td>25%</td>
</tr>
<tr>
<td>2026</td>
<td>50%</td>
</tr>
<tr>
<td>2027</td>
<td>50%</td>
</tr>
<tr>
<td>2028</td>
<td>50%</td>
</tr>
<tr>
<td>2029 &amp; after</td>
<td>100%</td>
</tr>
</tbody>
</table>
LATE PHASE-IN FOR LESS COMMON BUS TYPES

- Purchase of zero-emission cutaway, over-the-road, double decker, and articulated buses
  - Starts on or after January 1, 2026
  - When bus type passes Altoona testing
- Voluntary early ZEB purchases of these types will still count towards compliance
Bonus credits do not count towards ZEB purchase discharge threshold

Bonus credits count towards future obligations and extends funding eligibility

- BEB and FCEB bonus credits expire on 12/31/2028
- Electric trolleybus bonus credits expire by 12/31/2024
- Bonus credits may be used in a Joint Group situation but not transferrable

<table>
<thead>
<tr>
<th>Technology</th>
<th>In Service</th>
<th>Bonus Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>FCEB</td>
<td>Between January 1, 2018 and January 1, 2023</td>
<td>+1</td>
</tr>
<tr>
<td>FCEB</td>
<td>Prior to January 1, 2018</td>
<td>+2</td>
</tr>
<tr>
<td>BEB</td>
<td>Prior to January 1, 2018</td>
<td>+1</td>
</tr>
<tr>
<td>Electric Trolleybus</td>
<td>Between January 1, 2018 and December 31, 2019</td>
<td>+1/10</td>
</tr>
</tbody>
</table>

FCEB= Fuel Cell Electric Bus; BEB= Battery Electric Bus
Zero-emission car sharing, vanpool, micro-transit, active transportation

- Vehicles with GVWR ≤14,000 lbs., scooters, or bicycles

May be used in lieu of ZEB purchases

Transit agency must track zero-emission passenger miles for each eligible vehicle

- Large Transit Agency: 320,000 Passenger Miles
- Small Transit Agency: 180,000 Passenger Miles

Miles from bike sharing programs receive a 3X multiplier
Required number of ZEBs calculated based on percentage of new bus purchased each year

- Round to nearest whole number

Meet the required number of ZEBs with any combination of the following:

1. Bonus credits
2. Zero-emission mobility credits
3. Existing ZEBs in the fleet
   - Include ZEBs from previous purchases exceeding the required number of ZEBs, leased ZEBs, and buses converted from conventional technologies to ZEBs
4. New ZEB purchase

Items (1), (2), and (3) can only be used once and must be used first before item (4) is being counted towards compliance calculation
**TRANSIT AGENCIES MAY COMPLY JOINTLY (OPTIONAL)**

- **Eligibility to form a ZEB Joint Group**
  - All members must share the use of infrastructure, or
  - Be within the same Metropolitan Planning Organization, Regional Transportation Planning Organization, Air District, or Air Basin

- **Compliance requirements**
  - Submit the request one year before the Joint Group takes effect
  - Comply with individual ZEB purchase requirements collectively (including bonus credits)
  - If the largest member is a large transit agency it must meet its minimum number of ZEBs required
  - Exemptions apply only if ZEB purchase requirements cannot be met by whole group
  - May submit one rollout plan as a ZEB Joint Group
EXEMPTIONS TO SAFEGUARD AGAINST UNCERTAINTIES

- Ensure transit service not adversely affected
- Address circumstances beyond transit agency’s control
- Tailor to individual transit agency’s special situations
- Request must be submitted to CARB by November 30th of each year
- Approved exemptions from ZEB purchases valid until the next bus purchase
  - For the approved year, a transit agency can purchase conventional buses with internal combustion engines instead
EXEMPTION FOR FINANCIAL HARDSHIP

- Cannot offset incremental capital costs of all available ZEBs and associated infrastructure
  - Must demonstrate transit agency not able to secure sufficient funding and not able to obtain financing for remaining incremental cost

- Cannot offset incremental managed net electricity cost
  - Show estimated electricity costs for applicable utility rates and charging strategy
  - Possible financial sources such as Low Carbon Fuel Standard (LCFS) credit value must be considered
  - Compare to same combustion engine bus type and use case in the fleet

- Transit agency has publicly declared a fiscal emergency
  - Provide copy of Board Resolution following a public hearing
EXEMPTION FOR ZEB INFRASTRUCTURE DELAYS

- Infrastructure not ready within 2 years of initial ZEB purchase or in time to operate ZEBs
  - Purchase of new rights-of-way or construction of new facilities, change of general contractor
  - Delays in construction permits or utilities’ power supply, natural disaster, and more

- Supporting documentation
  - Letter from Board of directors and the related 3rd party explaining reasons
EXEMPTION IF NEEDED BUS TYPE IS NOT AVAILABLE

- For the bus type (with the applicable weight class identified) intended to purchase:
  - Has not passed Altoona testing
  - Does not meet Americans with Disabilities Act (ADA) requirements
  - Would create conflicts with other laws/regulations

- Supporting documentation:
  - Summary of all bus body-types with their Gross Vehicle Weight Rating (GVWR) and chassis information
  - Current fleet information showing any available ZEB that would meet the ZEB purchase requirements has already been purchased
  - Reasons why existing same type of ZEBs are not available for purchase
EXEMPTION FOR ZEBS INSUFFICIENT DAILY MILEAGE

- None of the available depot charging BEBs can meet the daily mileage needs of any similar bus type in the fleet
  - Exemption applies even if on-route charging or FCEBs are available

- Supporting documentation
  - Explanation why an exemption is needed
  - Current monthly data report to show daily usage for existing buses
  - Request for proposal and the resulting bid showing BEB battery capacity
  - Empirical data on BEBs on daily assignment, if available
    - If not available, CARB calculates energy use per mile from Orange County Bus Cycle

- Exemption granted if supported by empirical data or if daily mileage >80% of bus range (using largest available battery pack)
EXEMPTION FOR GRADEABILITY

- Available ZEBs cannot meet gradeability of equivalent internal combustion engine bus
- Gradeability requirements cannot be met by any other equivalent bus in the fleet
- Supporting documentation
  - Topography information for applicable route or block
  - Performance data of current conventional buses of same type
  - Any other relevant empirical data
  - RFP and the resulting bid showing required gradeability and minimum sustained speed
LOW-NOX ENGINES & RENEWABLE FUELS REQUIREMENTS

- Low-NOx engine purchases begin January 1, 2020
  - Applies to all transit agencies
  - Excludes buses dispatched from NOx exempt areas
  - Does not require switching fuel types
- Low-NOx engine (or paired with hybrid propulsion)
  - Must be commercially available for 2 years
  - Must be certified to lowest level of NOx
- Renewable fuels when fuel contracts are renewed beginning January 1, 2020
  - Excludes small transit agencies
REPORTING AND RECORD KEEPING REQUIREMENTS

- Initial reporting starts in 2021 for all transit agencies
- Every transit agency must report annually by March 31st each year
  - Information on agency, bus purchases, fuels purchases
  - Individual bus, engine and propulsion system information
  - Total annual zero-emission passenger mile if using the mobility option
- Every transit agency must retain records of information reported for 3 years after bus retirement or contract expiration
  - Records of Notices to Proceed and related bus purchase contracts, lease, and conversion
  - Records of Low-NOx engine purchases
  - All fuel purchase contracts (large transit agencies)
  - Record of zero-emission passenger miles if using the mobility option
COMPREHENSIVE REVIEW

- Identify status of ZEB technology
- Evaluate over 20 different metrics
- Evaluate real-world data and experience
- Help formulate appropriate policies and funding strategies
- Continued coordination with transits, OEMs, utilities, and other state agencies
- One year before the first ZEB purchase requirement
- Complements annual updates to the Board
### SIGNIFICANT INCENTIVES AVAILABLE

<table>
<thead>
<tr>
<th>Program</th>
<th>Description</th>
<th>Fiscal Year</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>HVIP</td>
<td>Low NOx engines, ZEVs, advanced technology, &amp; infrastructure</td>
<td>FY 18-19</td>
<td>$125 M</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VW</td>
<td>Zero-emission transit, school, &amp; shuttle bus replacements</td>
<td></td>
<td>$130 M</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carl Moyer</td>
<td>Cleaner engines &amp; ZEVs up to $80,000/bus plus fueling infrastructure</td>
<td>FY 18-19</td>
<td>$79 M</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AB 617</td>
<td>Engine replacement &amp; infrastructure in DAC</td>
<td>FY 18-19</td>
<td>$245 M</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LCTOP</td>
<td>Expanded bus or rail services, &amp; multimodal facilities</td>
<td>FY 17-18</td>
<td>$146 M</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TIRCP</td>
<td>Rail, bus, ferry transit improvements</td>
<td>FY 17-18</td>
<td>$291 M</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Utility Programs</td>
<td>Charging infrastructure service upgrades and electricity rates (SB350)</td>
<td></td>
<td>&gt;$575 M</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LCFS</td>
<td>Credits for using low carbon transportation fuels</td>
<td></td>
<td>~$10,000/bus/yr</td>
</tr>
</tbody>
</table>

Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP) and Low NOx Engine Incentives

$125 million for FY 18-19 (first come first served)

- New bus purchase: ZEBs only
- Low NOx engine: repower only

Infrastructure voucher enhancement

- Up to $30,000 per charger for BEB
- Up to $100,000 per FCEB with purchase of 5 or more

More Information available at:
https://www.arb.ca.gov/msprog/aqip/fundplan/proposed_1819_funding_plan.pdf

<table>
<thead>
<tr>
<th>Category</th>
<th>Base Amount*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low NOx Engine Repower</td>
<td>$50,000</td>
</tr>
<tr>
<td>Zero Emission Bus (20 ft – 24 ft)</td>
<td>$80,000</td>
</tr>
<tr>
<td>Zero Emission Bus (25 ft – 29 ft)</td>
<td>$90,000</td>
</tr>
<tr>
<td>Zero Emission Bus (30 ft – 39 ft)</td>
<td>$120,000</td>
</tr>
<tr>
<td>Battery Electric Bus (40 ft – 59 ft)</td>
<td>$150,000</td>
</tr>
<tr>
<td>Battery Electric Bus (60 ft)</td>
<td>$175,000</td>
</tr>
<tr>
<td>Double Decker Bus (40 ft)</td>
<td>$175,000</td>
</tr>
<tr>
<td>Fuel Cell Electric Bus (≥ 40 ft)**</td>
<td>$300,000</td>
</tr>
</tbody>
</table>

*Up to $15,000 more for use in a disadvantaged community
VW MITIGATION TRUST FUNDING FOR TRANSIT

- $130 million for transit, school, and shuttle buses
  - Released in two equal allocations for $65 million each
  - Up to 50 percent of each allocation for transit buses
  - Both battery and fuel cell electric transit buses are eligible
  - Requires scrapping old vehicle
- Administered statewide on a first come, first served basis by the San Joaquin Valley Air Pollution Control District
  - Workgroup meetings anticipated in spring 2019
  - Application period anticipated late spring/early summer 2019
- More information available at: https://ww2.arb.ca.gov/our-work/programs/volkswagen-environmental-mitigation-trust-california
LOW CARBON FUEL STANDARD (LCFS)

- Originally adopted in 2009, last amended in 2018
- Reduce carbon intensity (CI) of transportation fuel pool by at least 20% by 2030
- Transit agencies can opt-into LCFS to generate credits for using lower-carbon fuels
  - Credits do not expire, have monetary value and can be traded in the LCFS market
- Starting 2019, transit agencies that own hydrogen fueling infrastructure can also generate credits
## APPROXIMATE CREDIT REVENUE FOR TRANSIT BUSES IN 2019

<table>
<thead>
<tr>
<th>Bus Fuel Type</th>
<th>Example CI* (gCO₂e/ MJ)</th>
<th>Fuel Efficiency</th>
<th>Credit Revenue Per Mile (LCFS credit value $200)</th>
<th>Annual Credit Value (based on an annual mileage of 40,000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BEB Using Grid Electricity</td>
<td>95</td>
<td>0.5 mile/kWh</td>
<td>$0.54</td>
<td>$21,649</td>
</tr>
<tr>
<td>BEB Using On-site Solar Electricity</td>
<td>0</td>
<td>0.5 mile/kWh</td>
<td>$0.68</td>
<td>$27,121</td>
</tr>
<tr>
<td>FCEB Using Hydrogen From Generic Lookup Table Pathway</td>
<td>120</td>
<td>6.5 mile/kg</td>
<td>$0.22</td>
<td>$8,702</td>
</tr>
<tr>
<td>FCEB Using Hydrogen From Electrolysis Through Zero-CI Electricity</td>
<td>10</td>
<td>6.5 mile/kg</td>
<td>$0.62</td>
<td>$24,949</td>
</tr>
</tbody>
</table>

*CI*s shown here are for illustration purpose and subject to changes.
CONTINUED EFFORTS

- Technology Showcase and Symposium in Sacramento on February 6-7, 2019
  - A joint effort amongst CARB, the Antelope Valley Transit Authority (AVTA), and the California Transit Association (CTA)
  - Presented latest advances and funding opportunities
  - Recording and presentations available at http://www.zebtechsymposium.com/presentations.php
- Work with transit agencies on implementation
- Monitor status of ZEB technology
- Report to the Board annually
- Conduct a comprehensive review in early 2020s
CONTACT INFORMATION

- Innovative Clean Transit [https://arb.ca.gov/msprog/ict/ict.htm](https://arb.ca.gov/msprog/ict/ict.htm)
- 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
Ecosystem of Shared Mobility Services in the San Joaquin Valley

Caroline Rodier, Ph.D., University of California, Davis

Institute of Transportation Studies and National Center for Sustainable Transportation
Cycle of Rural Auto Dependence
Two Pilots

Valley GO

Valley FLEX
Valley GO

• **What**: EV carsharing and ride-hailing service

• **Where**: At six affordable housing complexes in Tulare and Kern counties
<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>JOIN</td>
<td>Application Eligibility: age, driver's license, payment method</td>
</tr>
<tr>
<td>2.</td>
<td>RESERVE</td>
<td>In advance or on-demand: Via smartphone app, website, or phone</td>
</tr>
<tr>
<td>3.</td>
<td>UNLOCK CAR</td>
<td>Use key card or smartphone app</td>
</tr>
<tr>
<td>4.</td>
<td>DRIVE CAR</td>
<td>To desired destinations</td>
</tr>
<tr>
<td>5.</td>
<td>RETURN</td>
<td>And park at original pick up location</td>
</tr>
</tbody>
</table>
## Initial Communities

### Affordable Housing Locations in Phase 1

<table>
<thead>
<tr>
<th>Complex</th>
<th>Address</th>
<th>Units</th>
<th>Cars</th>
<th>County</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sierra Village</td>
<td>1375 N Crawford Ave, Dinuba</td>
<td>44</td>
<td>2</td>
<td>Tulare</td>
</tr>
<tr>
<td>Highland Gardens</td>
<td>2423 N Highland St, Visalia</td>
<td>36</td>
<td>2</td>
<td>Tulare</td>
</tr>
<tr>
<td>Sandcreek</td>
<td>41020 Road 124, Orosi</td>
<td>60</td>
<td>2</td>
<td>Tulare</td>
</tr>
<tr>
<td>Caliente Creek</td>
<td>909 Meyer Street, Arvin</td>
<td>46</td>
<td>2</td>
<td>Kern</td>
</tr>
<tr>
<td>Sunrise Villa</td>
<td>1600 Poplar Avenue, Wasco</td>
<td>44</td>
<td>3</td>
<td>Kern</td>
</tr>
<tr>
<td>Rosaleda Village</td>
<td>650 N Maple St, Wasco</td>
<td>226</td>
<td>2</td>
<td>Kern</td>
</tr>
</tbody>
</table>
Valley GO Implementation Timeline

**PHASE 1**
- Feb 2019: 20 EV charging stations, 6 sites
- Mar 2019: Carshare (soft launch), 2 EVs

**PHASE 2**
- Jul 2019: Carshare (hard launch), 16 EVs, 34 EV charging stations, 200 users
- Sep 2019: Pilot end, 24 EVs, 400 users
- Mar 2020: Ride-hail viable, then add service
Valley GO Partners

• ARB, Kern COG and TCAG (funders and program partners)
• SJVAPCD and Sigala, Inc. (grant administrators)
• UC Davis (implementation management and research evaluator)
• Self-Help Enterprises (EV site host, engagement and marketing)
• Kern County and City of Wasco housing authorities (EV site hosts)
• CalVans (fleet owner, maintenance and insurance)
• Mobility Development Group (carsharing operations)
• Rural Development Center at Fresno State (marketing)
Valley FLEX

Volunteer Ridehailing
Like Uber and Lyft but volunteer drivers reimbursed for round trip driving expenses

Smartphone Transit App
Like Google transit directions but includes demand responsive access service
Volunteer Ridehailing: Partnership with MOVE Stanislaus

- Rural disadvantaged communities
- Can’t get there by transit
- Automate administration and dispatch
- Lower costs and maximize service
Smart Phone Transit Options App (Stanislaus and San Joaquin Counties)
Valley FLEX Implementation Timeline

**PHASE 1**
- Soft launch: Mar 2019
- Volunteer ride-hailing: Jul 2019
- App hard launch: May 2019

**PHASE 2**
- Hard launch: Mar 2020
- Ride-hailing reservation in app: Nov 2019

Pilot end: Mar 2020
Valley FLEX Partners

• ARB, SJCOG and StanCOG (funders and program partners)
• SJVAPCD and Sigala, Inc. (grant administrators)
• UC Davis (implementation management and research evaluator)
• MOVE Stanislaus (volunteer ride-hailing program development)
  • Technology: Mobility Development Group and VTC
• San Joaquin and Stanislaus transit agencies (app integration)
  • Technology: DemandTrans, Trillium, Kyyti and SUMC
• Fresno State, MOVE Stanislaus and SUMC (engagement and marketing)
• Thank you!

• Questions?

• Contact:
  • Caroline Rodier, Researcher, ITS-Davis, cjrodier@ucdavis.edu
  • Jeffery Song, Post-Doctoral Researcher, ITS-Davis, jwksong@ucdavis.edu

@NCST_Research - https://twitter.com/NCST_Research
@ITS_UCDavis - https://twitter.com/ITS_UCDavis
Self-Help Enterprises
Service Area
Location Significance
Marketing and Outreach

- Mechanics Taking place
- Information
- Marketing plan relative to the community
- Methods & Deliverables
- Research Evaluation

- Humanity ....
Success through Humanity

► We will listen to what you care about.

► And .. This will help you with that.
We launch, grow and operate carshare, bikeshare, ride-sharing and volunteer networks in mid-sized cities and rural communities.
Our technical experience:

• Planning for long-term program continuity
• facilitating participation of community-based organizations in program design
• EV Carshare and ride-hailing
• Development of tech-enabled Volunteer Transportation
• EVSE construction in association with carshare programs
• Flexible and Electric bikesharing
• Integration of wheelchair accessible vehicles (WAVs)
• Design of Mobility Hubs
• Fundraising/grantwriting for these programs
Valley Go Sites

- Highland Gardens - Visalia
- Sierra Village - Dinuba
- Sand Creek - Orosi
- Caliente Creek - Arvin
- Sunrise Villa - Wasco
- Rosalita Village - Wasco
Thank You

Richard Kosmacher, General Manager

Richard@mobilitydevelopment.org
www.mobilitydevelopment.org
Bill Williams – Director Commercial Sales
California’s Bus Fleet Will Be 100 Percent Electric by 2040

Any new public transit bus purchased in California by 2029 must be a 100 percent electric vehicle, according to a new unanimous vote by the California Air Resources Board, the state’s clean air agency. It is the first statewide policy in the United States to require an entire vehicle class go electric, the Union of Concerned Scientists wrote.
THE TRANSIT MARKET IS RAPIDLY SHIFTING TO EV

2010–2014
- Tech Proven
- Small Orders
- Safety
- Reliability

2015–2016
- Full Route Adoption
- Revenue Service
- 1,000,000 miles
- Mainstream Financing

2017–2018
- Fleet Replacement Begins
- Price Parity to Hybrid
- 10% Penetration
- Best Practices Developed

PROTERRA PRICE
- $1.2M
- $800K
- $700K

UNIT SALES

EV Evangelists

Early Adopters

Early Majority
THE TRANSIT MARKET IS RAPIDLY SHIFTING TO EV

- Moving toward widespread industry adoption

- Purchase barriers eliminated due to:
  - Improved range
  - Charging standardization
  - Sharp decline in battery costs
  - Service-proven performance

Battery Electric Buses: North American Annual Sales and Deliveries

Source: CTE Center for Transportation and the Environment
Transportation is now the largest source of emissions of all energy sectors in the nation, responsible for more than **28% of greenhouse gas emissions**.

Smog from buses and other vehicles drives up asthma rates across the country, with **children under 18 and low income communities bearing the burden**.

In addition to providing invaluable public health and **environmental benefits**, ZEBs are cheaper to maintain and cost less than diesel and compressed natural gas alternatives over the vehicle’s lifetime.

At the beginning of 2018, **only 300 battery electric buses** were on US streets. The two leading manufacturers in the US market – BYD and Proterra – report **total sales of almost 1,300 buses** through 2018, **an overall 30% increase** in ZEB deliveries.

Additionally, commitments from **California** and major transit hubs, including New York City and Seattle, to go 100% electric with their bus fleets have led to **estimates that electric buses will make up one third of the national fleet by 2045**.
OVERHEAD CHARGING
Keep your Catalyst buses rolling with easy depot or on-the-road charging, made simple by industry-standard SAE J3105 overhead systems.

- Charge on the road for longer routes or enable 24/7 circulator operations
- Low maintenance costs and high availability
- Compatible with roof-mounted pantographs as well as inverted pantograph systems, offered by Schunk and other suppliers

PLUG IN CHARGING
Regardless of your fleet size, powering up your Proterra buses at the depot is as easy as plugging in a standard J1772-CCS Type 1 charger.

- Universal chargers are offered by Proterra and other suppliers
- Catalyst vehicles can be configured with two charge ports for flexibility at the depot
- Electric buses, utility vehicles and cars can share the same standardized chargers
Proterra works closely with customer to recommend the appropriate charging solution for fleets and facilities planning for scale as the demand for charging increases.

Proterra technologies enable:
- Efficient charge speed
- Dynamic power sharing
- Driver-friendly stations
- Cost-effective operations
- Universal compatibility
- Serviceability
- Low maintenance costs
- High availability

Our experts provide counsel on:
- Site layout
- Energy management
- Real-time energy monitoring
- Site configurations
Proterra’s approach is to work with you to identify the most efficient, most cost-effective way to electrify your high-priority routes. From riding your routes to structuring a financing package, we take a consultative approach and support you throughout the entire process.
✓ We will provide a GPS device to track each of your routes

✓ We will have the data evaluated

✓ We will have a route analysis to present

✓ We will also present a TCO, compared to existing or newer Propane, CNG, Fuel-Cell or Diesel fleet

✓ This will include infrastructure recommendations
**ROUTE SIMULATION RESULTS** – Proterra Catalyst® 35ft

<table>
<thead>
<tr>
<th>Route Information</th>
<th>E2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Route Name</td>
<td>Long Term Parking</td>
</tr>
<tr>
<td>Distance</td>
<td>2.2 miles</td>
</tr>
<tr>
<td>Duration</td>
<td>14 minutes</td>
</tr>
<tr>
<td>Average Speed</td>
<td>10 mph</td>
</tr>
<tr>
<td>Maximum Speed</td>
<td>40 mph</td>
</tr>
<tr>
<td>Maximum Grade</td>
<td>8.0%</td>
</tr>
</tbody>
</table>

**Average Day Results**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger Count</td>
<td>29</td>
</tr>
<tr>
<td>Ambient Temperature</td>
<td>70 °F</td>
</tr>
<tr>
<td>Efficiency</td>
<td>2.113 kWh/mi</td>
</tr>
<tr>
<td>MPGe</td>
<td>17.8</td>
</tr>
<tr>
<td>Total Energy Consumed</td>
<td>4.65 kWh</td>
</tr>
<tr>
<td>Estimated range with 1 full charge</td>
<td>166 miles</td>
</tr>
<tr>
<td>System Energy Recaptured by Regen</td>
<td>29%</td>
</tr>
<tr>
<td>1 Lap Final SOC</td>
<td>98%</td>
</tr>
</tbody>
</table>

**Environmental and Operating Impact**

**Hot Day**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger Count</td>
<td>29</td>
</tr>
<tr>
<td>Ambient Temperature</td>
<td>93 °F</td>
</tr>
<tr>
<td>Efficiency</td>
<td>2.561 kWh/mi</td>
</tr>
<tr>
<td>MPGe</td>
<td>14.7</td>
</tr>
<tr>
<td>Estimated range with 1 full charge</td>
<td>137 miles</td>
</tr>
</tbody>
</table>

**Cold Day**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger Count</td>
<td>29</td>
</tr>
<tr>
<td>Ambient Temperature</td>
<td>34 °F</td>
</tr>
<tr>
<td>Efficiency</td>
<td>2.936 kWh/mi</td>
</tr>
<tr>
<td>MPGe</td>
<td>12.8</td>
</tr>
<tr>
<td>Estimated range with 1 full charge</td>
<td>120 miles</td>
</tr>
</tbody>
</table>
### Route Information

<table>
<thead>
<tr>
<th></th>
<th>E2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Route Name</strong></td>
<td>South Auburn</td>
</tr>
<tr>
<td><strong>Distance</strong></td>
<td>8.2 miles</td>
</tr>
<tr>
<td><strong>Duration</strong></td>
<td>30 minutes</td>
</tr>
<tr>
<td><strong>Average Speed</strong></td>
<td>16 mph</td>
</tr>
<tr>
<td><strong>Maximum Speed</strong></td>
<td>41 mph</td>
</tr>
<tr>
<td><strong>Maximum Grade</strong></td>
<td>3%</td>
</tr>
</tbody>
</table>

### Average Day Results

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Passenger Count</strong></td>
<td>40</td>
</tr>
<tr>
<td><strong>Ambient Temperature</strong></td>
<td>62°F</td>
</tr>
<tr>
<td><strong>Efficiency</strong></td>
<td>MPGe</td>
</tr>
<tr>
<td><strong>Total Energy Consumed</strong></td>
<td>1.907 kWh/mi</td>
</tr>
<tr>
<td><strong>Estimated range with 1 full charge</strong></td>
<td>184 miles</td>
</tr>
<tr>
<td><strong>System Energy Recaptured by Regen</strong></td>
<td>25%</td>
</tr>
<tr>
<td><strong>1 Lap Final SOC</strong></td>
<td>95%</td>
</tr>
<tr>
<td><strong>Estimated 1 Lap Recharge Time (On-route charger)</strong></td>
<td>TBD</td>
</tr>
</tbody>
</table>

### Environmental and Operating Impact

#### Hot Day

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Passenger Count</strong></td>
<td>40</td>
</tr>
<tr>
<td><strong>Ambient Temperature</strong></td>
<td>91°F</td>
</tr>
<tr>
<td><strong>Efficiency</strong></td>
<td>MPGe</td>
</tr>
<tr>
<td><strong>Total Energy Consumed</strong></td>
<td>2.183 kWh/mi</td>
</tr>
<tr>
<td><strong>Estimated range with 1 full charge</strong></td>
<td>161 miles</td>
</tr>
</tbody>
</table>

#### Cold Day

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Passenger Count</strong></td>
<td>40</td>
</tr>
<tr>
<td><strong>Ambient Temperature</strong></td>
<td>28°F</td>
</tr>
<tr>
<td><strong>Efficiency</strong></td>
<td>MPGe</td>
</tr>
<tr>
<td><strong>Total Energy Consumed</strong></td>
<td>2.399 kWh/mi</td>
</tr>
<tr>
<td><strong>Estimated range with 1 full charge</strong></td>
<td>146 miles</td>
</tr>
</tbody>
</table>
## ROUTE SIMULATION RESULTS – Proterra Catalyst®

**ROUTE INFORMATION**

<table>
<thead>
<tr>
<th>Route</th>
<th>Distance</th>
<th>Duration</th>
<th>Average Speed</th>
<th>Maximum Speed</th>
<th>Maximum Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>E2</td>
<td>17 miles</td>
<td>75 minutes</td>
<td>13.6 mph</td>
<td>46 mph</td>
<td>0.5%</td>
</tr>
<tr>
<td>E2MAX</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Average Day Results

<table>
<thead>
<tr>
<th></th>
<th>E2 – DuoPower 35FT</th>
<th>E2MAX-DuoPower 40FT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger Count</td>
<td>29</td>
<td>40</td>
</tr>
<tr>
<td>Ambient Temperature</td>
<td>64°F</td>
<td>64°F</td>
</tr>
<tr>
<td>Efficiency</td>
<td>1.852 kWh/mi</td>
<td>1.991 kWh/mi</td>
</tr>
<tr>
<td>MPGe</td>
<td>20.3</td>
<td>18.9</td>
</tr>
<tr>
<td>Total Energy Consumed</td>
<td>31.5 kWh</td>
<td>33.8 kWh</td>
</tr>
<tr>
<td>Estimated range with 1 full charge</td>
<td>190 miles</td>
<td>265 miles</td>
</tr>
<tr>
<td>System Energy Recaptured by Regen</td>
<td>38%</td>
<td>38%</td>
</tr>
<tr>
<td>1 Lap Final SOC</td>
<td>90.5%</td>
<td>93%</td>
</tr>
<tr>
<td>Estimated 1 Lap Recharge Time (On-route charger)</td>
<td>TBD</td>
<td>TBD</td>
</tr>
</tbody>
</table>

### Environmental and Operating Impact

#### Hot Day

<table>
<thead>
<tr>
<th></th>
<th>E2 – DuoPower 35FT</th>
<th>E2MAX-DuoPower 40FT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger Count</td>
<td>29</td>
<td>40</td>
</tr>
<tr>
<td>Ambient Temperature</td>
<td>99°F</td>
<td>99°F</td>
</tr>
<tr>
<td>Efficiency</td>
<td>2.349 kWh/mi</td>
<td>2.446 kWh/mi</td>
</tr>
<tr>
<td>MPGe</td>
<td>16.0</td>
<td>15.4</td>
</tr>
<tr>
<td>Estimated range with 1 full charge</td>
<td>150 miles</td>
<td>216 miles</td>
</tr>
</tbody>
</table>

#### Cold Day

<table>
<thead>
<tr>
<th></th>
<th>E2 – DuoPower 35FT</th>
<th>E2MAX-DuoPower 40FT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger Count</td>
<td>29</td>
<td>40</td>
</tr>
<tr>
<td>Ambient Temperature</td>
<td>35°F</td>
<td>35°F</td>
</tr>
<tr>
<td>Efficiency</td>
<td>2.617 kWh/mi</td>
<td>2.992 kWh/mi</td>
</tr>
<tr>
<td>MPGe</td>
<td>14.3</td>
<td>12.6</td>
</tr>
<tr>
<td>Estimated range with 1 full charge</td>
<td>134 miles</td>
<td>176 miles</td>
</tr>
</tbody>
</table>
### EXAMPLE - TOTAL COST OF OWNERSHIP FLEET OF 12 - 35’ BUS

#### 12-Year Total Cost of Ownership

<table>
<thead>
<tr>
<th></th>
<th>Diesel</th>
<th>35’ Catalyst FC</th>
<th>35’ Catalyst XR+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost (in $)</td>
<td>$7,055,000</td>
<td>$3,312,000</td>
<td>$3,312,000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ELECTRIC vs. Diesel</th>
<th>vs. 35’ ELECTRIC FC BUS</th>
<th>vs. 35’ ELECTRIC E2 BUS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
LIFETIME DIESEL EMISSIONS PREVENTED PER FLEET IS EQUAL TO PLANTING 661,000 TREES
HISTORICAL FUEL PRICES

Diesel, CNG and Electricity Historical Prices

- CNG Average
- CNG: U.S. Price Sold to Commercial Customers $/DGE
- Diesel Average
- Diesel: West Coast No 2 Diesel Retail Prices $/Gallon
- Diesel: East Coast No 2 Diesel Retail Prices $/Gallon
- Electricity: U.S. Commercial $/KWh
THANK YOU.

Bill Williams
DIRECTOR COMMERCIAL SALES
Fuel Cell Electric Buses – Transitioning to Zero Emissions

Kern COG’s 2019 Transit Symposium
February 26, 2019
About CTE

• **Mission:** To advance clean, sustainable, innovative transportation and energy technologies

• **501(3)(c) non-profit** engineering and planning firm

• **Portfolio - $500 million**
  – Research, demonstration, deployment
  – **95 Active Projects** Totaling over **$300 million**

• Focused on **Zero Emission** Technologies

• **National Presence**
  Atlanta, Berkeley, Los Angeles, St. Paul
CTE Members

Leadership Circle Members

Members
Zero-Emission Projects
Class 8 Fuel Cell Trucks

• Specifications
  – 85 kW Fuel Cell
  – 100 kWh Battery
  – 420 kW (560 HP) Motor
  – 30 kg Hydrogen Storage
  – Plug-in Capable

• Performance
  – 80,000 lbs GVWR
  – 150-Mile Range
  – 65 mph Top Speed
  – Power: Maintains 30 MPH on 6% Grade
  – Torque: Enough to Start on 20% Grade
  – Port of Los Angeles – June 2018

https://www.todaystrucking.com/focus-kenworth-zero-emissions-cargo-transport/
UPS Class 6 Step-Van

• **Specifications**
  - 33 kW Fuel Cell
  - 49 kWh Battery
  - 9.8 kg Hydrogen Storage

• **Performance**
  - 125-Mile Range
  - 65 mph Top Speed
  - West Sacramento – Fall 2018
  - SCQAMD - 2019

2 x H2 storage tanks (9.8 kg @ 350 bar)
4 x Li-Ion battery pods (12.2 kWh each), 650 Vdc HV system

switch reluctance traction motor and controller

skid mounted 33 kW FC stack and BOP

independent thermal management systems for FC and traction components
Hyster–Yale Top Loader

Electric Top Loader with Wireless Charging and Fuel Cell Range Extender

Approximate Size and Weight of ETL

<table>
<thead>
<tr>
<th>Descriptor</th>
<th>Weight/Measurement*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight without Load</td>
<td>181,000 lbs.</td>
</tr>
<tr>
<td>Front Axle Loading with Load</td>
<td>230,000 lbs.</td>
</tr>
<tr>
<td>Overall Length</td>
<td>35 feet</td>
</tr>
<tr>
<td>Overall Width Over Drive Tires</td>
<td>16 feet</td>
</tr>
</tbody>
</table>

*Based on Hyster Yale Diesel H1150HD-CH, 6-high Top Loader
Shell Hydrogen

• Largest Fuel Retailer in the World

• 4 Existing Light-duty Stations (southern CA)

• 2017 California Energy Commission Award for 7 New Stations (northern CA)

• 2018 California Energy Commission Award for Heavy-Duty Truck Fueling Station (1,000 kg/day) with 100% Renewable Hydrogen (Port of Long Beach)

• 2018 CARB ZANZEFF Freight Facilities – Two 1,000 kg/day truck fueling stations at Port of LA and Ontario Airport (350 and 700 Bar Fueling)
U.S. ZEB Annual Awards/Deliveries

[Graph showing the number of awards and deliveries from 2009 to 2018, with a significant increase starting in 2016.]
ZEB Awards & Sales
ZEB Deliveries

[Map of the United States with states colored to represent ZEB Deliveries.]

Legend:
- 0: Off-color
- <10: Light green
- 10 - 100: Medium green
- 100 - 500: Dark green
ZEB OEMs
FCEB Advantages

- **250-300 miles** Proven range
- Significant reduction in vehicle weight (carry more passengers)
- Rapid refueling speeds (6 to 10 minutes)
- 1:1 replacement of conventional vehicles
Worldwide Acceptance

FUEL CELL BUSES WORLDWIDE

Over 10 million miles of proven service worldwide, 3 million miles at AC Transit and over 1 million at SunLine Transit.
U.S. Fuel Cell Electric Buses

Fuel Cell Transit Buses in the United States

- **Illinois**: 2
  - Planned: 2 Buses
    - Champaign-Urbana

- **Michigan**: 2
  - Current: 2 Buses
    - Flint

- **Massachusetts**: 1
  - Current: 1 Bus
    - Boston

- **Ohio**: 12
  - Current: 6 Buses
    - Canton, Columbus
  - Planned: 6 Buses
    - Canton

- **California**: 54
  - Current: 25 Buses
    - San Francisco Bay Area (13), Thousand Palms (10), Santa Ana (1), Irvine (1)
  - Planned: 29 Buses
    - Oakland (11), Santa Ana (10), Thousand Palms (8)

Source: DOE and NREL
CTE Fuel Cell Electric Bus Projects

• AC Transit Expanded Service (13 Buses)
• OCTA Demonstration (1 ElDorado Bus)
• CUMTD Articulated Buses (2 Buses)
• AC Transit ZEB Study/ZEB Corridor (BEB/FCEB)
• San Diego ZEB Study (BEB/FCEB)
• LA Metro ZEB Study
• Spokane Transit and Shasta Regional Transportation ZEB Studies
<table>
<thead>
<tr>
<th>Bus</th>
<th>FUEL CELL HOURS</th>
<th>JAN Miles @ 9 MPH</th>
<th>Vehicle Miles Life to Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>FC4</td>
<td>24,839</td>
<td>3,047</td>
<td>234,804</td>
</tr>
<tr>
<td>FC5</td>
<td>24,999</td>
<td>4,179</td>
<td>237,070</td>
</tr>
<tr>
<td>FC6</td>
<td>24,889</td>
<td>3,588</td>
<td>200,962</td>
</tr>
<tr>
<td>FC7</td>
<td><strong>31,676</strong></td>
<td>2,960</td>
<td>219,373</td>
</tr>
<tr>
<td>FC8</td>
<td>23,607</td>
<td>674</td>
<td>166,517</td>
</tr>
<tr>
<td>FC9</td>
<td>24,266</td>
<td>2,954</td>
<td>208,795</td>
</tr>
<tr>
<td>FC10</td>
<td>26,826</td>
<td>2,316</td>
<td>242,063</td>
</tr>
<tr>
<td>FC11</td>
<td>27,440</td>
<td>3,354</td>
<td>239,646</td>
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<tr>
<td>FC12*</td>
<td>*2999</td>
<td>3,006</td>
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<td>16,628</td>
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<td>FC14</td>
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<td>235,853</td>
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<td>2,702</td>
<td>194,872</td>
</tr>
<tr>
<td>FC16</td>
<td>27,579</td>
<td>2,608</td>
<td>218,957</td>
</tr>
<tr>
<td>TOTALS</td>
<td>303,693</td>
<td>38,746</td>
<td><strong>2,789,769</strong></td>
</tr>
<tr>
<td>Average</td>
<td>23,547</td>
<td>2,980</td>
<td><strong>214,598</strong></td>
</tr>
</tbody>
</table>

NOTE: FC7 and FC12 fuel cells were manufactured by UTC in 2003, 14 years ago with an expected EOL of 5,000 hours. The other 11 fuel cells were manufactured by UTC in 2008 and 2009.

* LDV Station converted to Linde commercial station as of September 2018. AC Transit stopped commercial station as of 5/2018.
* Fuel Cell Changed on FC12 11/21/18 with 25,969 hrs logged.
FCEBCC and Next Steps

• Fuel Cell Electric Bus Commercialization Consortium (FCEBCC)
  o $45 million
  o 20 Buses
  o Two Stations
  o Facility Upgrades

• Next Step
  100-Bus Initiative
100-Bus Initiative

**NEED**
Transit agencies will need both Battery-Electric and Fuel Cell Electric Buses (FCEBs) to meet the California Air Resources Board goal of 100% zero emission buses by 2040.

**OBJECTIVE**
Drive down the capital cost of North American FCEBs to the point where they are commercially viable for transit properties seeking zero-emission solutions — $850,000/bus.

**ACTION**
Four or more transit agencies in northern and southern California, purchasing up to 25 FCEBs each, and installing hydrogen fueling stations and facility upgrades where needed.

---

**Driving Price Down**

- **2009**: Fuel Cell Bus for 2010 Winter Olympics • 20 buses
  - $2,000,000

- **2016**: Fuel Cell Bus for 2017 AQIP Program • 25 buses
  - $1,235,000

- **2019**: Fuel Cell Bus Target for 100 Fuel Cell Bus Order
  - $850,000

Source: New Flyer Industries
The Elephant in The Room

How to Scale Refueling Stations?
The Challenge for 100% ZEB Deployment

Infrastructure and Scalability

Effort and Cost

Fleet Size

FCEB

BEB
H₂ 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 five- to seven-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.
Fueling Station Evolution

60’ x 30’ (50-Bus Capacity)

Parallel Fueling

12- to 15-Bus Capacity; Expand to 30 Buses

Underground LH2 Tanks and Pumps
CARB Innovative Clean Transit Regulation

- **Full transition** to zero-emission buses by **2040**
- **2023**, 25% of the total number of new bus purchases in each calendar year must be zero-emission buses
- **2026**, 50% of the total number of new bus purchases in each calendar year must be zero-emission buses
- **2029**, 100% new bus purchases must be zero-emission buses
- Purchased new buses **delivered within two years** from the initial date of a Notice to Proceed
- **Rollout Plans** by large transit agencies (100 or more buses) by **July 1, 2020**
International ZEB Conference in San Francisco
September 26 an 27, 2019

Jaimie Levin
Director of West Coast Operations
Center for Transportation & the Environment
(510) 851-0625
Jaimie@cte.tv
Zero Emission Transit Experience

February 26, 2019
The Love’s Family of Companies

- Founded 1964, headquarters in Oklahoma City
- 470 travel stops in 41 states, 22k employees
- 24-hour access to fuel, restaurant offerings, convenience store products
- Network of hotels and storage locations

- Headquartered with Love’s in Oklahoma City
- 765 trucks – fueled by CNG, biodiesel, renewable diesel
- Delivery of fuel and other products to Love’s stores nationwide

- Headquartered in Houston, offices in Phoenix and OKC as well
- Commodity supply, trading, and logistics
- Supply Love’s with gasoline, diesel, ethanol, DEF, biodiesel, renewable diesel
- Extensive experience in RFS and LCFS renewable fuel programs

- Headquartered in Houston
- Alternative fuels service provider: CNG, Hydrogen, and EV Charging
- Design/Build, Operations & Maintenance, Retail Fuel Supply, Renewable Natural Gas
- 20+ years experience in CNG
- On-site power generation, Solar Installation, Energy Storage Solutions

- Headquartered in Oklahoma City
- Quick lube, inspection, and preventative maintenance services to heavy-duty trucks
- 52 nationwide service stations and 25+ years experience
Trillium – Who we are

- Trillium provides turn-key solutions for **EV Charging**, **CNG**, and **Hydrogen Fueling**
  - Design/Build Services
  - Operations & Maintenance
  - Retail Fueling
  - **Renewables**: Solar and Renewable Natural Gas
- Trillium owns or operates **220 stations** nationwide
Fleet operations and fueling experience are critical for transition to zero emission.
How to make the transition?

Combined EV/CNG station – Placentia CA – planned Q3 2019

Battery Electric Bus and Fuel Cell Electric Bus

Zero Emission Solutions

Managing “fuel” costs and sustaining transit operations are critical to electrification of California fleets.
Key Considerations

- **How can I take control of my infrastructure and power costs?**
  - Plan for scalability
  - Balance future-proofing versus overbuilding
  - Protection against rate changes and phased-in demand charges
- **Do I have to recalibrate my fueling window?**
  - Optimize TOU and demand charges by changing rollout / charging times
  - Use on-site generation assets and utility alternatives to maintain current operations schedule, mitigate costs
- **Renewable options**
  - On-site solar, Renewable Natural Gas, Renewable PPAs
- **Additional revenue streams**
  - LCFS and RFS renewable credits
  - Demand response
  - Utility cost offsets
- **Private Capital**
  - Fixed forward Hydrogen / Electricity costs, financed infrastructure
Delivering Energy is Costly

Hydrogen
• Compressed or liquid delivered H2 brings logistical risks and exorbitant costs
• On-site production via SMR or electrolysis
• Ammonia delivery systems

Electricity
• Utility rates come with uncertainty... future operating cost risk
• Immediate Challenges - transformer upgrades, infrastructure needs, grid reliability
• Long Term Challenges - phased in demand charges, utility recovery of capital, rate structure overhaul

The Utility is not the only option for power.


Credit: EIA, Nov 2017
On-site Power Generation

The Challenge:
Reliable, Reasonably Priced Power for BEB Fleets
• High power costs obstruct electrification of transit fleets
• Uncertainty of future rates, cost recovery adjustments
• Reliability, grid stability concerns at scale
• Specialty rates and phased in demand charges only delay the problem
• Pace of adoption is slow as a result

A Solution:
• On-site, natural gas power generation delivering clean power to EV Chargers
• Emissions compliant, and creates an additional pathway for RNG
  • Lower potential CI scores than grid, solar, or wind
• Scalable – add or upgrade generators with growth of BEB fleet
• Small footprint and versatile implementation
• Redundancy that eliminates blackout risk
• Cost savings versus utility, and certainty of those costs, facilitates fleet electrification. Clear forward costs = capital and operational planning.
Renewable Natural Gas → Power Generation
Renewable Natural Gas → Power Generation
Solar → EV and Electrolysis

- Net metering programs allow generation during the day and “usage” at night
- Additional LCFS credit generation when paired with EV chargers
- Investment Tax Credit (ITC) allows 30% capital cost to be used against tax liability
- Providers can sell an array outright or finance via PPA
- Zero emission energy production

However...
- Demand charges remain
- TOU rates can affect value of net metering
- Significant rooftop / canopy space or excess real estate

![Solar Array at Love’s in Santa Nella, CA](image)

![Small scale Electrolyzer – H2 production](image)
Energy Storage

- Incorporating energy storage with on-site generation (renewable natural gas, solar) can improve operating costs significantly
  - Displaces additional generation units, reduces maintenance/fuel costs
  - Further mitigates demand charge risks
- ITC applies to solar + storage, reducing capital cost
- Ability to leverage asset during non-fueling times for demand response programs
- **Peak Shaving**: provides flexibility of operations, fueling during peak periods without the cost
- However, *standalone energy storage still exposed* to utility rate risks
  - Phased-out incentive rates
  - Future TOU changes
  - Rate-based infrastructure programs
Conclusions

Zero Emission solutions will not be one-size fits all

- Transit operations, budgets, and needs will be unique
- Assessing options with utility (and beyond utility) key to managing costs and effectively transitioning, scaling fleet
- Numerous tools at your disposal, and many solutions will combine aspects of on-site generation, storage, solar, and utility

Utility partnerships are important

- But should not dictate when or how you manage your rollout schedule
- Start with assumption that it is possible to maintain operations, by utilizing assets that complement utility connection

Identify the savings and revenue opportunities

- Grant funding opportunities, but also...
- Demand response programs
- LCFS and prospective eRIN revenue from renewable natural gas
- Private Capital
- And ability to leverage existing CNG infrastructure for on-site power generation
Alex Agrons
General Manager – Strategic Initiatives
Office: (713) 332-4800
Email: Alex.Agrons@Loves.com
Houston, TX
Testing and Deployment of Automated Vehicles

Jack Hall

Intelligent Transportation Systems CV/AV Program Manager
Contra Costa Transportation Authority
February 26, 2019
Contra Costa County, California

**Location**
Eastern suburb of the San Francisco Bay Area

**Population**
1 Million+

**Thriving Commerce**
Businesses headquartered in Contra Costa County include:

- DASER PERMANENTE
- BIO-RAD
- BevMo!
- Round Table
- John Muir Health
- Chevron

**Diverse**
Demographically, economically and geographically
Who We Are

- CCTA is a public agency formed by voters in 1988 to manage the county’s transportation sales tax program and to lead transportation planning efforts.
- We are responsible for maintaining and improving the county’s transportation system by delivering critical transportation infrastructure projects to safely and efficiently get people where they need to go.
- Managing entity of autonomous vehicle (AV) testing site: GoMentum Station.
What We Do

**PEDESTRIAN**
Make improvements to sidewalks, crosswalks, trails, and paths

**LOCAL STREETS**
Smooth traffic flow on major roads and invest in improvements such as repairing potholes and road surfaces

**BUSES**
Invest in a reliable, comfortable and convenient bus network

**SAFE ROUTES TO SCHOOLS**
Focus on programs and projects aimed at bicycle and pedestrian safety for K-12 students

**FERRIES**
Expand the Bay Area ferry system by looking to ferries as an alternate commute method between West County and San Francisco

**BICYCLE**
Invest in safe routes and infrastructure improvements for bicyclists

**BART**
Improve BART service and stations, extend routes and increase parking at stations

**HIGHWAYS**
Complete Contra Costa's highway system, and improve air quality and noise protection along these corridors

**CARPOOL/RIDESHARE**
Implement programs to reduce traffic congestion by encouraging carpooling and ridesharing

**PROGRAMS FOR SENIORS AND PEOPLE WITH DISABILITIES**
Enhance transit options to improve mobility for seniors and people with disabilities
What We Heard
Testing a Solution
Searched the World for the Perfect SAV
We’ve Celebrated Many “Firsts”
Needed a Forklift to Uncrate Vehicle
Safe Testing in Controlled Environment

November 2016
Testing @ GoMentum Station

March 2017
Testing @ Bishop Ranch
Vehicle Storage

Charging
Parking Lot within Business Park
Launch on Public Roads

March 6, 2018
First Test on Public Roads
@ Bishop Ranch
SAVs: Link to the Future of Transportation
Smart Mobility

- Connected Shared Autonomous Vehicle
- Charging Stations
- First Mile/Last Mile
- Data Center
- CV/AV
- DSRC
- I-680, I-80, SR-4 ICM/ATM
Shuttle Service within Bishop Ranch
Shuttle Service with Local Traffic
Phase III – Implementation

Completing Mass Transit via SAV* Shuttles in 2020

* SAV = Shared Autonomous Vehicle
Redefining Mobility

21st Century Transportation

- Economic Growth & Job Creation
- Efficient Mobility
- Enhanced Safety
- Healthier Environments
Over 5000 acres with 2100 acres available for testing
PAVED ROADS

• Over 20 miles of paved roadways including a 7-mile long spine road for high speed testing

• Additional roadway improvements based on Master Plan
TUNNELS

Two 1400-ft. long tunnels ideal for testing guidance, sensors & communications technologies
Freeway underpasses and variable roadway geometrics
Several parking lots for testing by multiple users
We Are a Global AVPG

GoMentum Station is an International Entity
GoMentum Station is Multimodal
Key AM Partners
Testing at GoMentum Station
HONDA Research Institute
Questions and Answers
• Transportation Development Act
• Local Transportation Fund (LTF) – may be used for public transit projects or streets and roads projects. LTF funding requires an annual unmet transit needs a public hearing and a farebox ratio of 10% for rural operators and 20% for urbanized operators.
• State Transit Assistance (STA) – may only be used for public transit operations and capital projects. STA does require qualification criteria on a sliding scale.
• Federal Transit Administration (FTA)
• Section 5307 – Urbanized Transit Operators – May be used for operations and capital projects.
• Section 5310 – Elderly and Disabled Transit Operators – May be used for operations and capital projects. There are approximately 11 eligible agencies that may be eligible for 5310 funding for a funding pot that is between $1 million and $1.2 million.
• Section 5311 – Rural Transit Operators. On an annual basis, nine Kern County transit operators share $1.4 million resulting in about 30% of all operating costs. Operators may also use the FTA 5311 program of projects to compete for Congestion Mitigation Air Quality Improvement funds (CMAQ) for projects that improve air quality.
• Section 5339(c )- Low or No Emission Vehicle Program – May be used to purchasing or lease low-or-no-emission buses; acquiring low-or-no-emission buses with a leased power source; constructing or leasing facilities and related equipment (including intelligent technology software) for low-or-no-emission buses; and
for constructing new public transportation facilities to accommodate low-or-no emission buses; rehabilitating or improving existing public transportation facilities to accommodate low-or-no-emission buses.

- The grant application for this program is detailed and data-driven. Although time-consuming at the administrative level, the City of Arvin was able to secure over $2 million dollars from this program and became the only California transit operator to qualify.

**Strategy and Planning**

Using a combination of FTA Section 5311 and CMAQ funds

I recommend using CMAQ funds through the 5311 program of projects. The CMAQ call for projects is a highly competitive program within the region. You may have to consider this program as a funding source in FY 2019-120 or outer years. Although the CMAQ program is decided locally, Caltrans become the CMAQ administer once the project has been entered by the transit operator in the 5311 regional program of projects or POP.

Given that the actual funds may take two to three fiscal years to be received, I recommend infrastructure projects for the 5311 CMAQ project. Examples might include Solar panels, solar converters and batteries, electric vehicle chargers and the supporting cables and equipment. The operator may also consider hydrogen projects rather than going electric. Both types of fueling require high-cost and would be better suited for a onetime-capital investment.

Purchasing electric or hydrogen vehicles may be better suited for annual funds that can be reserved for you to two or three years such
as Caltrans’ State of Good Repair, Low Carbon Transit Operators Program, or TDA.

Since I mentioned the State of Good Repair and Low Carbon Transit Operators Program funding, let’s talk about these programs. Caltrans’ State of Good Repair or SGR funds the Kern Region with about $1.2 million each year and adds an additional $6.7 million dollars’ worth of STA funds to the Kern Region. Last year, Kern COG’s TTAC members recommended that every other year, Kern COG removes half of the annual regional apportionment and divides the regional money by 5 resulting in about $100,000 extra dollars to five individual Kern County operators. This distribution allows a smaller transit operator the ability to fund a project that would not otherwise be fundable by the normal population-based apportionment.

Low Carbon Transit Operator Program apportions approximately $1.2 million per year. Between SGR and LCTOP, even rural transit operators should be able to begin purchasing low or no emission vehicles within a period of four to five years. Remember, replacing gasoline-fueled vehicles with electric or hydrogen-fueled vehicle often is not a one-to-one replacement. Electric or hydrogen-fueled vehicles may have half the range of a gasoline-fueled vehicle. So, obviously, that comparison should be a part of your transition financial plan.

Now above and beyond the State and Federal funding programs I have discussed with you, there are always new and emerging funding streams that may enhance your Transitions funding strategy. The new and emerging funding streams are being monitored by Kern COG staff and as they become available and uses may be
defined for public transit, we will contact your agency and include you as a regional partner.
Bill Williams – Co-Founder, Chairman and Project Clean Air Board of Directors
EPA National Ambient Air Quality Standard
2015 Standard of 70 ppb for Ozone
Today, more than 90% of those areas have air quality that meet the standards.
Here's the full top ten list of the most polluted U.S. cities by ozone, according to a report by the American Lung Association.

1. Los Angeles-Long Beach, CA
2. Bakersfield, CA*
3. Visalia-Porterville-Hanford, CA
4. Fresno-Madera, CA
5. Sacramento-Roseville, CA
6. San Diego-Carlsbad, CA
7. Modesto-Merced, CA
8. Phoenix-Mesa-Scottsdale, AZ
9. Redding-Red Bluff, CA
10. New York-Newark, NY-NJ-CT-PA

*Bakersfield ranked worst for short-term particle pollution in a list that featured several other California cities, including San Francisco, Fresno, Long Beach and Los Angeles.
Why Does It Matter?
San Joaquin Valley Faces Unique Challenges
Climate and Geography Contribute to Pollution

• Hot, dry summers with stagnant winds
• Surrounding mountains and meteorology create ideal conditions for air pollution formation and retention
• Pollution follows the wind pattern and generally flows from north to south
• I-5 and Hwy 99 (major transportation arteries) run all the way through the Valley
• High rate of population growth
• Chronic poverty and unemployment rates
Vehicles now account for the majority of the Valley’s smog problem.

Major reductions in vehicle emissions will be essential. Alternative fuels are key for the Valley to meet air quality standards.
EPA’s Estimated Air Quality Health Benefits

Benefits of meeting the standards in California add to the nationwide benefits after 2025, with the value of the additional benefits estimated at $1.2 to $2.1 billion annually after 2025. This includes the value of avoiding harmful health effects, including:

- 120 to 220 premature deaths
- 160,000 asthma attacks among children
- 120,000 days when kids miss school
- 5,300 missed work days
- 380 asthma-related emergency room visits

*SJV Population approximately 4,000,000 people!*
Electric Vehicle Infrastructure:
– Charge Up! Program
  • Incentives for EV chargers
  • Funds up to $6,000 per Level 2 EV charger and up to $25,000 for Level 3 DCFC
  • Awarded funding for over 400 EV chargers at $2.6 million to date
Incentives for Clean Air Vehicles:

- **Drive Clean in the San Joaquin**
  
  - **Replace:** Funding up to $9,500 to replace a 1999 or older high polluting car with a clean air vehicle.
  
  - Replaced over 1,600 vehicles with a total of $23 million to date.

  - **Rebate:** Funding up to $3,000 to purchase or lease of a new vehicle.
  
  - The District issued over 8,000 rebates for a total of over $21.5 million in incentives to date.

Grants & Incentives Website:

http://valleyair.org/grants/
Electric Vehicles in Kern County

- **Current:**
  - Vehicles: 1,365 rebates; 1,824 vehicles
  - Charging stations: Level 1: 30+
    - Level 2: 98
    - DC Fast Charging: 18

- **2025 Goal:** CEC EV Infrastructure Projection (EVI-Pro) Model
  - Vehicles: 14,872
  - Level 2 Workplace: 528
  - Level 2 Public: 614
  - DC Fast Charging: 222
  - Charging Spaces: 4,000
2 City of Selma, and 12 more locations of Solar Powered EV Charging Stations
EVENTS AND TRAINING
All about Electric Vehicles

Talent Pipeline RICO CEC Grant:

- 40 teachers trained from 22 schools in Kern, Tulare, and Fresno Counties

- Day-camps June-August 2016 reached 600 students at 3 summer day camps in Arvin, Bakersfield, and Sanger

- 27 Dealerships received Dealership Toolkits

- First Responder Training – Adopted for nationwide program
Fresno

Event Details:

• National Drive Electric Week
• September 12, 2015
• Fashion Fair Mall
• 10AM to 3PM

• 11 EVs available for test drives
• 150 total test drives
• 31 EVs present for EV tailgate party

• Live radio remote by Spanish station 92.1FM KONDO (partially sponsored by NRG)
• Fresno Bee ads sponsored by the Air District
• Notable Vendors: NRG, PACE, Center for Sustainable Energy, the Air District

• eLion’s 100% electric bus and a mobile solar generator in attendance
Event Details:
• EV Week
• October 4, 2015
• Valley Plaza Mall
• 10AM to 5PM

• 9 EVs available for test drives
• 50-75 test drives
• Live radio remote by country station 107.9FM KUZZ
• Notable vendors: Blue Sky Partners, Kern Green, Kern Transit, Center for Sustainable Energy, CommuteKern
ELECTRIC VEHICLES IN THE SJV
IKEA’s EV Yard Tractor

• IKEA’s first zero-emission, all-electric truck was able to save 4,800 gallons of diesel fuel as well as reduce 1.3 tons of nitrogen oxides (NOx), 0.04 tons of particulates (PM) and 68 tons of carbon emissions (CO₂) during a year-long demonstration project at the company’s Tejon Distribution Center.

• The vehicle logged more than 13,000 miles in its first year and currently is operating at a rate of 15,000 miles per year, with the cost of energy for the electric tractor less than 3 cents per mile, compared to more than 75 cents per mile for a diesel tractor.

• IKEA’s 1.8 megawatt rooftop solar system provided about 90 percent of the power needed to charge the vehicle. The electric version also saves more than $6,000 per year in maintenance costs.

• IKEA now is getting a second yard tractor as well.
STOCKTON — San Joaquin Regional Transit District has been named the 2018 Outstanding Public Transportation System Achievement Award winner by the American Public Transportation Association.
YOSEMITE NATIONAL PARK

Yosemite National Park, CA
Yosemite is the first U.S. National Park to permanently add zero-emission buses to its shuttle fleet.

https://www.nps.gov/yose/index.htm
UPS deployed 100 all-electric EVI delivery vans that are reducing greenhouse gas emissions and air pollution, and helping to protect the environment and public health.
California’s Bus Fleet Will Be 100 Percent Electric by 2040

Any new public transit bus purchased in California by 2029 must be a 100 percent electric vehicle, according to a new unanimous vote by the California Air Resources Board, the state’s clean air agency. It is the first statewide policy in the United States to require an entire vehicle class go electric, the Union of Concerned Scientists wrote.
The Valley Air District encourages interested applicants to review the following funding opportunities that are currently available to help reduce the out-of-pocket costs to purchase and install EV chargers. Applicants may be able to stack funds between these programs and Charge Up for maximum savings.

Fresno County Incentive Project
Eligible Charge Up! applicants who plan to install EV chargers in Fresno County may also qualify for incentives through the Fresno County Incentive Project (FCIP). FCIP offers rebates up to $4,000 for a single port EV charger and up to $7,000 for a dual port EV charger.

PG&E
PG&E’s Electric Vehicle Charge Network is a program to install 7,500 EV chargers at workplaces and multi-unit dwellings between 2018-2020. This turnkey program covers logistics (e.g., construction, permitting) and infrastructure costs all the way to the charger, as well as a portion of the charger cost. Either the site or PG&E can own the chargers, and preferred segments have higher incentive levels (multi-unit dwellings, disadvantaged communities).

Charge Ready
To support California’s zero-emission policies, the Charge Ready Program is deploying infrastructure to serve qualified electric vehicle (EV) charging stations throughout our service territory. You can visit SCE’s map of charging station projects to track their progress. To explore other ways to install charging stations at your site, please visit our EV for Business website for more information.
Other Possible Funding Sources

Low Carbon Fuel Standard Credits
For electricity used as a transportation fuel, you may be eligible to generate LCFS credits if you:
• Operate public charging stations
• Host private access EV charging at a business or workplace
• Operate a fleet of electric vehicles (including electric forklifts)

Kern County EIR Air Mitigation Fund
• Established by Kern County Zoning Ordinance with funds paid by oil and gas companies to drill wells in Kern County
• Kern County and the San Joaquin Valley Air Pollution Control District will manage the fund
• Application process to be developed
• Variety of pollution-reduction projects to be funded in the future, including electric vehicle infrastructure
Contact Information:
Bill Williams
Project Clean Air
4949 Buckley Way, Suite 206
Bakersfield, CA 93309
Phone: (661) 847-9756
Email: projectcleanairprograms@gmail.com
Mission Statement

We make life better by connecting people to places one ride at a time.
Purpose of Transit

Ensure a world where accessibility, mobility, & spontaneity are achievable for every rider & transit fulfills its promise to be:

A BRIDGE connecting individuals with opportunities
A CHOICE towards social & environmental responsibility
A COMMITMENT to inclusivity & providing access for all
A CHANCE to create new, meaningful connections & interactions
Overview

• Starting Sunday April 7, 2019
• On-demand, curb-to-curb shuttle service
• 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
What is Microtransit?

- **Key Concepts**
  - Flexible, on-demand service
  - Zone based
  - Less expensive than a fixed route
  - Replace under-performing routes
  - Personalized ride-hail experience with a dedicated fleet

- **Technology Tools**
  - Microtransit Platform
    - Service Boundaries
    - Dynamic routing
    - Analytics
  - User-friendly Apps
    - Hailing
    - Navigation
    - Payment
Ryde Zone

- Route 47
  - Walmart Panama/Truxtun
- Route 61
  - Stine Harris/ BC
  - South of Rosedale Hwy
- Transit Hubs
  - CSUB
  - SWTC
  - Walmart Panama
  - Walmart Rosedale
FAQ’s

➤ How is Ryde different from other rideshare services?

➤ How can I book a Ryde?

➤ How long will I have to wait for my Ryde?

➤ How do I connect outside of the zone?
Mobility on Demand
User-Friendly App

Your transit dashboard

Flexible trip planning

On-demand ride booking

Nearby stop locator
Driver-Friendly
Conclusion

• Ridership has declined for the past decade
• Service Area grown
• Bakersfield lifestyle has changed
• Reconsider business model
  • Acting in the public interest: efficient, equitable and effective
• No Plans for Service Changes today
  • GET team review options in the study
  • Engage GET Employees and the Community
Enjoy your Ryde!

We make life better by connecting people to places one ride at a time.

www.RYDEbakersfield.com
Bus Voucher Incentives

Tarah Campi
Program Manager, CALSTART
626-744-5628
info@californiahvip.org

TRANSITions Symposium
February 2019
What is HVIP?

Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project

- **First-come, first-served vouchers** – Immediate discount at sale
- **Dealers learn voucher system** – Fewer complications for fleets
- **Set aside funding for each voucher** – Price certainty at time of request
- New and retrofits; electric, hybrid, fuel cell, EPTO, Low-NOx natural gas
- 6,500 + vouchers, 1,000 fleets, 9 years
## Zero-Emission Transit Bus Voucher Amounts

<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>
## Zero-Emission Shuttle Bus Voucher Amounts

<table>
<thead>
<tr>
<th>GVWR (lbs)</th>
<th>Base Vehicle Incentive Outside Disadvantaged Community</th>
<th>Base Vehicle Incentive In Disadvantaged Community</th>
</tr>
</thead>
<tbody>
<tr>
<td>8,501 – 10,000</td>
<td>$25,000</td>
<td>$30,000</td>
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<td>10,001 – 14,000</td>
<td>$50,000</td>
<td>$55,000</td>
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<tr>
<td>14,001 – 19,500</td>
<td>$80,000</td>
<td>$90,000</td>
</tr>
<tr>
<td>19,501 – 26,000</td>
<td>$90,000</td>
<td>$100,000</td>
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<tr>
<td>26,001-33,000</td>
<td>$120,000</td>
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<tr>
<td>&gt;33,000</td>
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<td>$165,000</td>
</tr>
</tbody>
</table>
# Zero-Emission School Bus Voucher Amounts

<table>
<thead>
<tr>
<th>GVWR (lbs)</th>
<th>Base Vehicle Incentive Outside Disadvantaged Community</th>
<th>In Disadvantaged Community</th>
</tr>
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<tbody>
<tr>
<td>5,001 – 8,500</td>
<td>$25,000</td>
<td>$30,000</td>
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<tr>
<td>8,501 – 10,000</td>
<td>$30,000</td>
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<tr>
<td>10,001 – 14,000</td>
<td>$55,000</td>
<td>$60,000</td>
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<tr>
<td>14,001 – 16,000</td>
<td>$90,000</td>
<td>$100,000</td>
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<tr>
<td>16,001 – 26,000</td>
<td>$150,000</td>
<td>$160,000</td>
</tr>
<tr>
<td>26,001 – 29,000</td>
<td>$175,000</td>
<td>$190,000</td>
</tr>
<tr>
<td>&gt;29,000</td>
<td>$220,000</td>
<td>$235,000</td>
</tr>
</tbody>
</table>
Low Nox School Bus

Bluebird

8.9L Engine

Voucher Amount: $45,000

A-Z Bus Sales

Repowered transit buses with 8.9L engines are also eligible:

Cummins Westport

$45,000 Voucher Amount
Examples of Eligible Vehicles

Lion Bus
BYD
Phoenix
Motiv
Orange EV
Chanje
Motiv
Lightning Systems
GreenPower
BYD
Motiv
Proterra
BYD
Motiv Power Systems
Blue Bird
Complete Coach Works
Gillig
Workhorse
Zenith Motors
New Flyer Industries
Motiv

www.californiahvip.org

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Infrastructure Voucher Enhancements

• Electric Vehicle Supply Equipment (EVSE): Up to $30,000 per battery electric vehicle voucher
  - Covers hardware costs, load management software, energy storage
  - Does not cover labor or utility upgrade costs

• H2 infrastructure: Up to $100,000 for equipment cost for each fuel cell vehicle voucher; covers real costs of equipment
  - Must have at least 5 vehicle vouchers
  - Infrastructure cost can’t be already covered by another grant
  - Approved on a case-by-case basis by CARB/CALSTART
Transition to Zero
Supporting Planning & Adoption of Zero-Emission Buses

TRANSITIONS 2019
February 26, 2019
Traeger Cotten, PE
(559) 331-9715
Transportation Electrification Advisory Services

SCE will assist Transit Agencies with the following:

- Provide rate analysis, forecasting, GHG savings calculations
- Facilitate the application process, provide technical requirements, and address easement issues
- Work with Service Planning on siting and infrastructure issues
- Provide engineering resources to address technical concerns
- Support in meeting new ICT regulation ZEB Rollout Plans
SCE’s ZEB Rollout Plan Support includes:

- Estimated schedules for construction of facilities and infrastructure upgrades for bus charging
- Provide information on available funding from our infrastructure programs to support electric buses
- Estimate electricity costs and LCFS credits to assist you in comparing fueling costs
- Develop suggestions for a phased-in approach to ZEB procurement and infrastructure deployment to avoid interruptions to your operations
2019 changes to EV Rates

- TOU-EV-7, TOU-EV-8, and TOU-EV-9 will be available March 1st, 2019
- No demand charges in 2019 through 2023; Demand charges phased in from 2024 through 2028
- Will maintain lower demand charges than current EV rates ongoing
- The new on-peak time period is from 4 PM to 9 PM
Charging Infrastructure Programs

SCE’s Charge Ready programs support the expansion of electric vehicle charging at homes, workplaces, schools and public places, as well as fleet and industrial vehicle charging for public agencies and private industry.

Charge Ready Transport

This program will help grow the transportation electrification market over a five-year period by installing electric infrastructure at customer sites to support charging plug-in buses, medium- and heavy-duty trucks, forklifts and other non-road cargo handling equipment.
Charge Ready Transport

• CPUC approved total program budget of $356.4M

• Total budget should achieve a minimum of 870 make-ready installations by 2024 with 8,490 electric vehicles procured or converted.
  - Minimum 15% for transit agencies

• Charging station rebates are available for transit buses and sites located in Disadvantaged Communities.

• Program will launch in Q2 2019
Charge Ready Transport Program Overview

SCE will deploy make-ready infrastructure up to the interconnection point with charging equipment.

Participants can select from a list of approved charging equipment.

Customer ownership option on customer side infrastructure is available.

Charging equipment rebate available to transit agencies, school bus operators, and sites located in disadvantaged communities.
Defining Make-Ready Infrastructure

- Standalone charging station model

Program covers costs associated with service drop, meter, panel, and circuit dedicated to EV charging. Make-ready ends at interconnection point with customer charging equipment providing AC service.
SCE Bus Transit Workshop 3/1

Friday, March 1, 2019
8:30 to 11:30 a.m.
2244 Walnut Grove Avenue,
Rosemead, CA 91770

RSVP Here:
https://pluggedincustomers.sce.com/c/r/TransitiontoZero

Questions? Contact ChargeReadyBus@sce.com.

This event is open to transit agencies and cities operating transit buses only.
Summary of Make-Ready Programs

<table>
<thead>
<tr>
<th>All Programs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year</td>
</tr>
<tr>
<td>$23.3 Million</td>
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<tr>
<td>$23.3 Million</td>
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<tr>
<td>$760 Million</td>
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<tr>
<td>$365 Million</td>
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<tr>
<td>$16.5 Million</td>
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<tr>
<td>$9.9 Million</td>
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<tr>
<td>$9.9 Million</td>
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</tbody>
</table>

* PFM - Petition For Modification (Charge Ready Bridge Funding)

** PRP - Priority Review Pilots:
1. Charge Ready Home Installation Rebate
2. Charge Ready | Transit Bus
3. Port of Long Beach Projects
   1) Gantry LB
   2) Container Movers LB
4. Charge Ready DC Fast Charge

Items in these swim lanes are filed but not approved and could be substantially altered or not offered
Before we depart today, I want to share a few things I heard when CARB hosted a ZEB Technology Showcase and Symposium in Sacramento earlier this month. Show of hands, did anyone attend in person? On their computers? Thank you.

Scaling up a zero emission fleet increases the cost per bus for Battery Electric Buses. While for Fuel Cell (Hydrogen) buses, the up-front costs are expensive but the cost per bus goes down over time.

An experienced fleet manager noted that buying the buses was the easy part. The transition required commitment from his board of directors AND everyone in the organization was impacted.

- Route planning – one fleet reported having to now run through a hub to get an extra charge and finish the run.
- Bus service hours
- Grant Writing – how to tell your story changed
- Training for purchasing departments – how to write a bid sheet!
- Maintenance Changes – From scheduled maintenance (no more oil changes) to new Maintenance Bay equipment
- Marketing Team Engaged – get everyone in-house and the public in support of the change
- Customers, Customer service reps, Dispatchers
- Rebranding the buses
Training – [We could do 4 hours on training]

Auxiliary Systems

Electric Drive and Fueling Systems for Operators (e.g. learning new equivalencies – if you have 4 kWh left, how many miles is that with the AC running, in stop and go versus an express route, flat versus hilly; docking to a charging station is different from pulling up to a CNG or Diesel station; accelerating and braking changes, missed opportunities to charge, cool or heat bus while still plugged in before leaving the yard)

Even the bus cleaners required some training

There is help now and more help coming.

OEMs will help with some of the training

There will certainly be more webinars, events, and expos in the Central Valley and throughout the State.

For instance, SunLine is expanding West Coast Center of Excellence in Zero Emission Technology through a Federal grant and will soon open a training center at their Palm Springs location that operates CNG, BEV and Fuel Cell buses. They are hosting a workshop next week.

ETP receives $3 million / year from the California Energy Commission to offer all sorts of training

Clean Cities and other clean transportation nonprofits will keep its members alerted to opportunities.
EV Infrastructure Training Program (EVITP.org) Provides training for EV installers, typically electricians.

SCRTTC (formerly College of the Desert) offers training: safety, basic preventive maintenance, fuel cell diagnostics and management systems, mentor-training.

I think that is enough on training! You get the idea.

Telemetrics becomes more important – understanding how your bus is operating, how each driver is performing. AVTA has an EPIC grant from the CEC to learn if offering incentives to operators will help optimize their speed-profile performance.

You will have to think of the questions you need answered. You will have to communicate those questions to others. Will the experience in the San Joaquin Valley be different because our service and boardings, weather and terrain are different? Possibly. Where do you turn for solutions?

Every challenge has a solution and this process helps down the road.

We hope today provided a way for you to get started. Presentations will be posted next week. And now for the final prizes!

If you have both candy and a transformer, your table has two prizes.

Susanne – Please choose a number between 1 and 31.

The person or people at the table, with a birthday closest to Susanne’s number win a centerpiece. If you won a prize earlier, do not forget to see the vendor to collect your prize.