# Transportation Electrification in the Commercial Space

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# About the California Trucking Association

- Established in 1934
- At 1800 members, largest State trade association representing trucking in United States. Part of the American Trucking Associations federation.
- Members include both large and small fleets, avg. of 20 trucks

# Background

- In 2015, NPR Planet Money declared "truck driver" most common job in California
- ~550,000 commercial vehicles registered in CA
- ~1.5 million commercial vehicles registered in other states to operate in CA
- Most trucks owned by small businesses:
  - ~50% of total trucks owned by fleets of 3 or fewer trucks.
  - 80% of total trucks owned by fleets w/ less than 50 trucks

# Vehicle Types and Uses

Diverse vehicle types and duty cycle demands



## Vehicle Types and Uses

| Truck Class  | Population | Vehicle Miles<br>Traveled | Fuel Consumption |
|--------------|------------|---------------------------|------------------|
| Class 2b – 6 | 46.1%      | 27.5%                     | 18.9%            |
| Class 7 - 8  | 53.9%      | 72.5%                     | 81.1%            |

Source: EMFAC2014, 2016 Annual Statewide Inventory

## **Policy and Regulatory Drivers**

- California Sustainable Freight Action Plan
  - 100,000 zero-emission capable freight vehicles & equipment by 2030
    - Includes all freight equipment i.e. trucks, cargo-handling equipment, forklifts, TRUs, cranes, locomotives, etc.
- Draft 2016 Statewide Ozone SIP
  - 26,000 ZEV Class 2b-6/7 trucks (Last Mile Delivery)
  - Plug-in refrigerated trailers, population not yet quantified
  - Other: 6k transit buses, 7k forklifts, 600 GSE,

## **Electric-Drive Capable Truck Demonstrations**

## Advanced Technology Trucks and Buses in the US

| Vehicle Type                           | In Service         | On Order  |
|--|--------------------|-----------|
| Battery-Electric Bus                   | ~240 (109 in CA)   | 188 in CA |
| Battery-Electric Delivery Van/Step Van | 500-1000           | ~40       |
| Battery-Electric Drayage Truck         | ~10                | ~25       |
| Battery-Electric Yard Tractor          | ~10                | ~60       |
| Electric Trolley Bus                   | 578 (301 in CA)    | ?         |
| ePTO Systems                           | 1000+ (215+ in CA) | ?         |
| Fuel-Cell Electric Bus                 | ~36 (20 in CA)     | 35 in CA  |
| Fuel-Cell Electric Truck               | ~2                 | 37        |
| Plug-in Hybrid Delivery Van            | ~60                | ~340      |

Source: ARB Staff Presentation, 11/1/2016 Advanced Clean Trucks Workshop

## Interface with Utilities to Date

- Existing demonstration/deployment has been small-scale and typically limited to prevent cost-prohibitive utility upgrades
- Broader deployment will necessitate coordination with utilities

## **Forecasting Commercial Vehicle Demand**

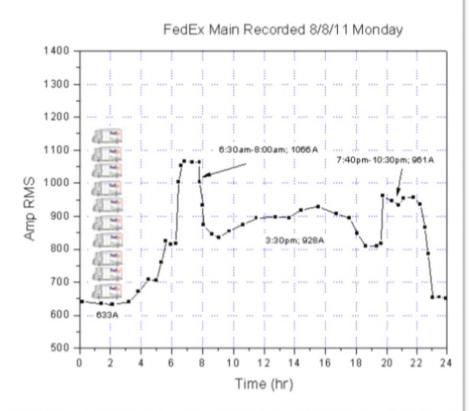
Table 1: Different levels of truck and bus electrification

| Truck & Bus<br>Electrification<br>Technology | Example                                       | Average<br>Peak Demand | Battery Size      |
|--|---|------------------------|-------------------|
| Short Range PHEV                             | Volvo PHEV Class 8 Drayage Truck              | 10 kW                  | 10 kWh            |
| Work Truck<br>PHEV                           | Odyne Advanced Diesel PHEV Truck              | 3.3 kW                 | 14/28 kWh         |
| Long Range PHEV                              | Efficient Drivetrain PHEV/CNG Class 4 Truck   | up to 6.6 kW           | 40 kWh            |
| Short Range BEV                              | Proterra Fast Charge Catalyst                 | 280 to 380 kW*         | 53 kWh<br>131 kWh |
| Mid Range BEV                                | d Range BEV Transpower Electric Drayage Drive |                        | 215 kWh           |
| Long Range BEV                               | ong Range BEV BYD 40-ft Electric Transit Bus  |                        | 324 kWh           |

Source: CALSTART, Electric Truck & Bus Grid Integration Opportunities, Challenges & Recommendations - 2015

# Illustrative Example

- EVs add significant load
- Graph depicts the electrical load in amps during a typical day at a 120van station
- Charging just 10 EVs during "off peak" will increase the "off peak" load to "peak" or higher level, that could result in:
  - Additional infrastructure costs besides just EVSEs
  - Additional "demand" rate charges



• Source: FedEx Express, *Electrification Coalition Electric Vehicle Webinar* - 2011

## Issues to Consider

- CTA's members in the Last Mile Delivery space support the advancement of electric drive capable commercial vehicles
- Need coordination between utilities, fuel/charging providers, fleets, manufacturers and State
- Develop freight equipment electrification charging scenarios
- Role of demand and time of use charges in encouraging or discouraging adoption