

Transportation Electrification in the Commercial Space

Chris Shimoda, Policy Director | California Trucking Association |
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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 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

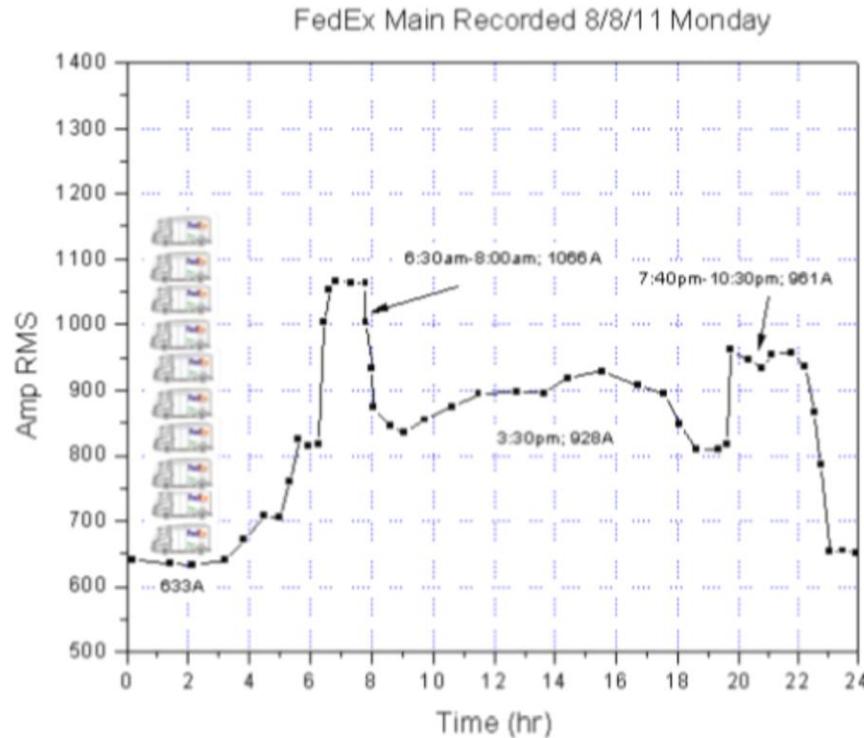
Table 1: Different levels of truck and bus electrification

Truck & Bus Electrification Technology	Example	Average Peak Demand	Battery Size
Short Range PHEV	Volvo PHEV Class 8 Drayage Truck	10 kW	10 kWh
Work Truck 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 131 kWh
Mid Range BEV	Transpower Electric Drayage Drive	70 kW	215 kWh
Long Range BEV	BYD 40-ft Electric Transit Bus	Option 1 - 80 kW Option 2 - 200 kW	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 120-van 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