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ZERO-EMISSION FLEET TRANSITIONING AND ELECTRIC VEHICLE CHARGING

City and County Engineers Association

March 7, 2024

Kimley»Horn

Agenda

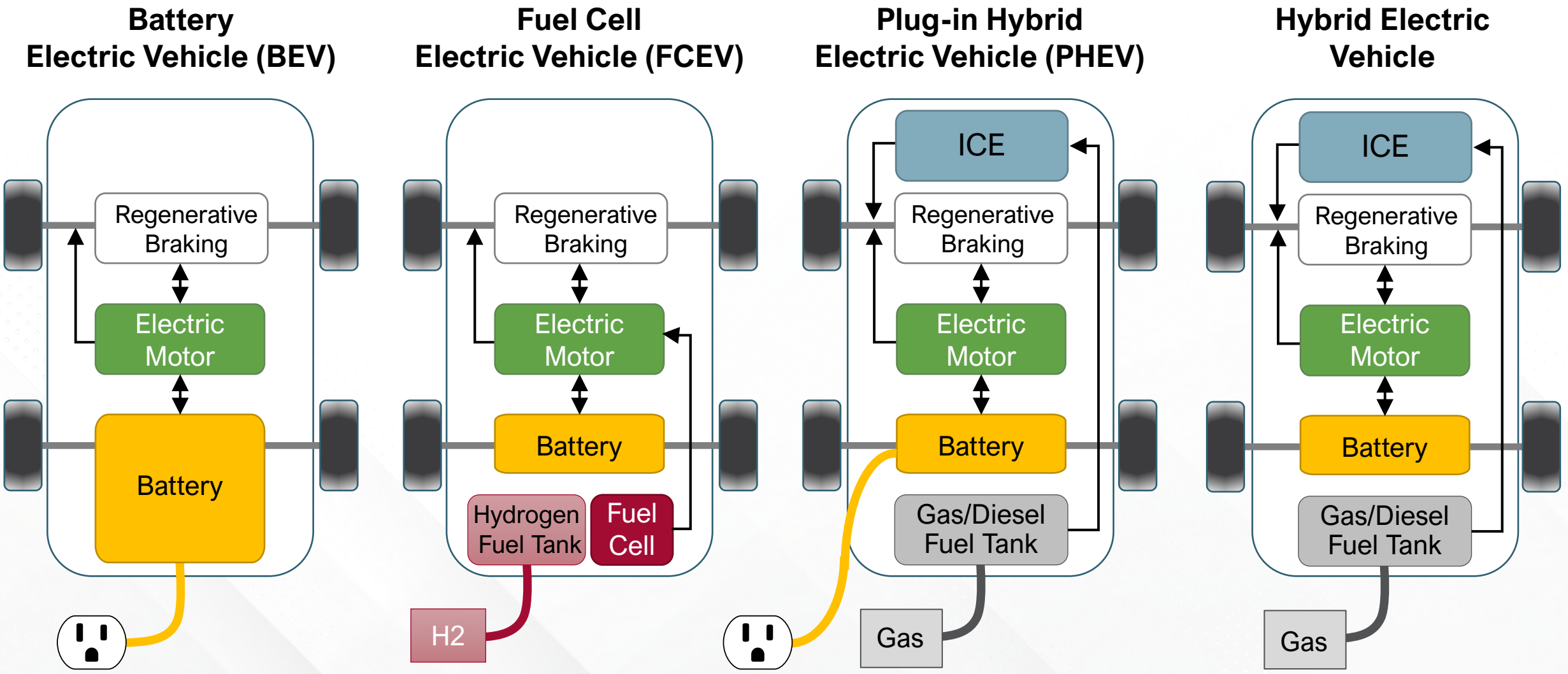
5 minutes	**THE BASICS:** Vehicle Types EV Charging Hydrogen Refueling
10 minutes	**PUBLIC CHARGING:** Overview Infrastructure Siting Business Models
10 minutes	**FLEET ELECTRIFICATION:** Overview Advanced Clean Fleet Rules Current State of ZEV Options
5 minutes	**FUNDING:** Types Sources
15 minutes	**Q&A**

The Basics:

Vehicles, Charging, and Refueling

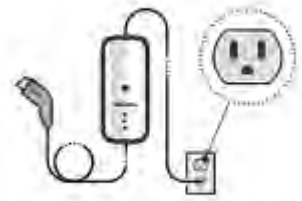
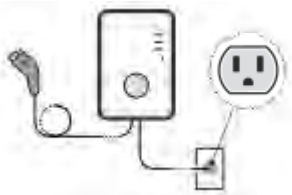
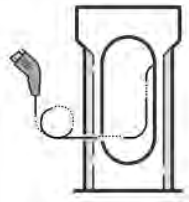
THE BASICS

Vehicle Types



THE BASICS

EV Charger Types

	Level 1	Level 2	Level 3 / DCFC
			
Voltage	120 Volt (AC)	Residential: 240 Volt (AC) Commercial: 208 Volt (AC)	480 Volt (DC)
Connector	 J1772 Tesla/NACS	 J1772 Tesla/NACS	 CCS CHAdeMO Tesla/NACS
Speed	~2-5 miles/1 hour (~ 2 kW)	~25 miles/1 hour (~3-22 kW)	~100-300+ miles/30 minutes (~50-400+ kW LDV, 1+ MW HDV)
Applications	Residential	Residential, Public, Fleet	Public, Fleet

THE BASICS

EV Charger Types

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	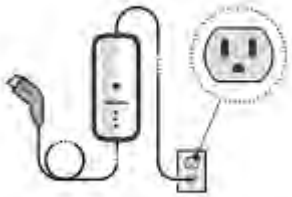	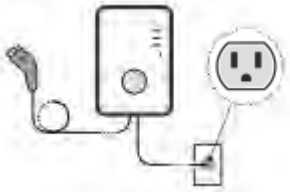	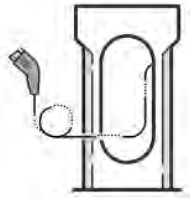
Location Types	• Single-/multi-family homes	• Single-/multi-family homes • Workplaces • Public sites w/longer dwell times • Fleets w/LDV, mixed fleet w/longer dwell times	• Workplaces • Public sites w/shorter dwell times (e.g., travel plazas) • Fleets w/M/HDV, shorter dwell times (e.g., transit)
Cost (w/out incentives)	• **Charger Cost:** $0-300 w/existing 120V outlet (most EVs come w/L1 charger) • **Installation:** $500-1,800+ if no existing outlet	• **Res. Charger Cost:** $300-800+ w/existing 240V outlet • **Res. Installation:** $300-$5,000+ • **Comm. Charger Cost:** $1,200-3,000+ w/existing 208V outlet • **Comm. Installation:** ~$1,200+	• **Charger Cost**: varies based on speed, configuration, software, etc. – ~$50,000-$250,000+ • **Installation:** ~$10,000-150,000+

THE BASICS

Hydrogen Refueling

Hydrogen vs. Electric

Benefits	Drawbacks

• Scalability
• Requires less electricity
• FCEVs are lighter than BEVs
  ▫ Important for freight applications
	• Few public refueling stations (~65 in US, nearly all in CA)
	• Delivery is costly
	• On-site infrastructure is costly
	  ▫ Mobile refueler: $5M+ (serves ~10 vehicles)
	  ▫ Liquid storage and dispensing system: $10M+
	  ▫ Generation and dispensing system: $15M+
	• Production typically relies on natural gas
	• Limited current feasibility
	  ▫ Mostly M/HDV for transit, supply chain operations
	  ▫ Few LDV options in US (2 models)

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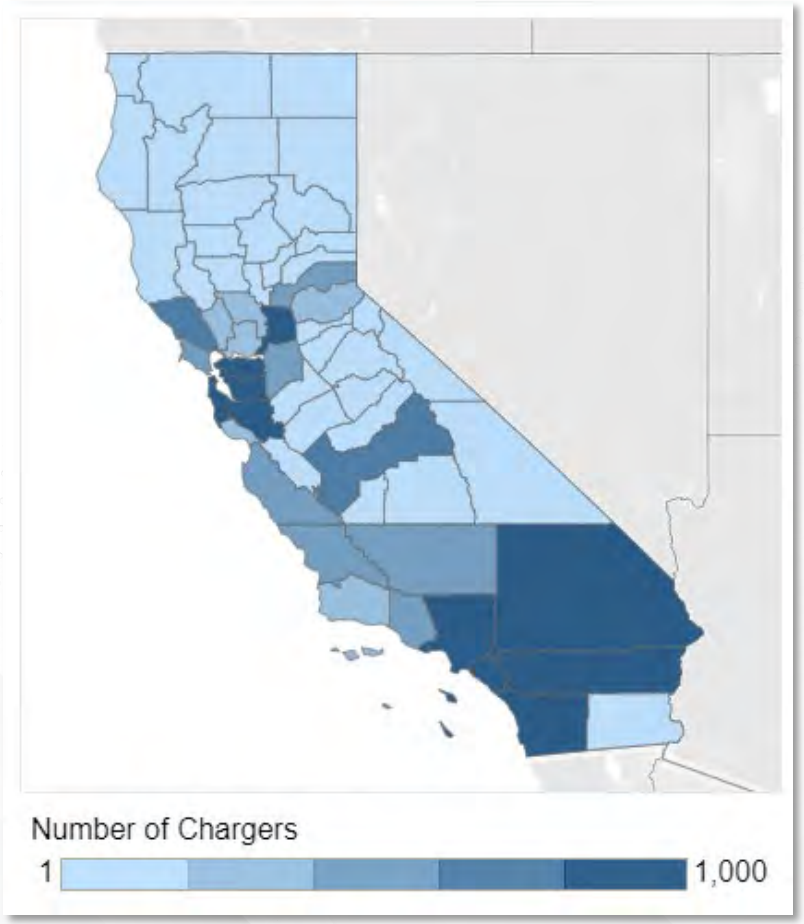
Public Charging

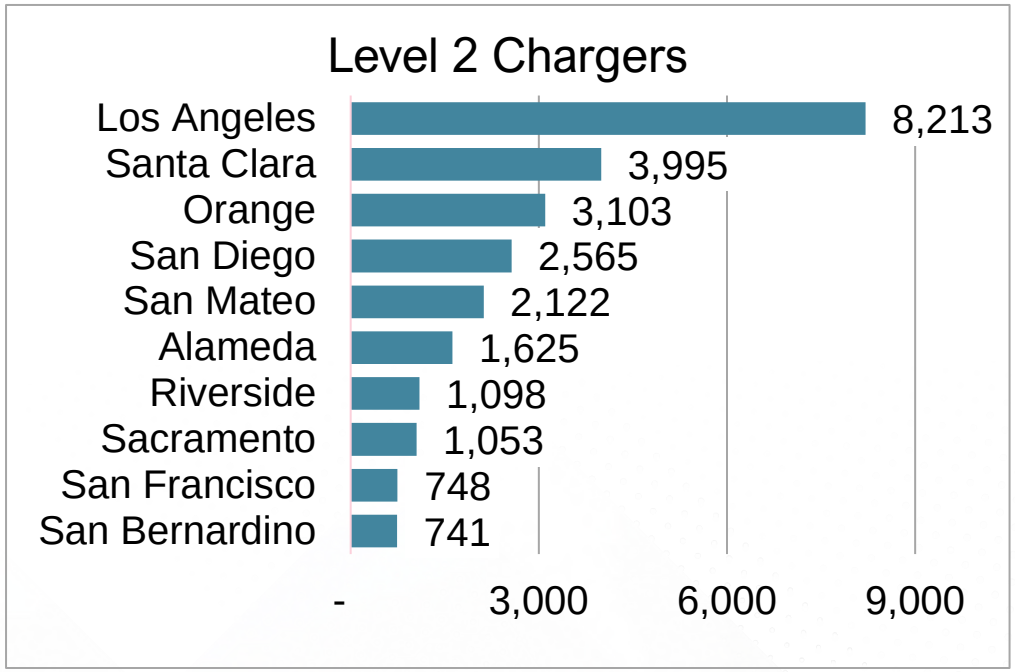
PUBLIC CHARGING

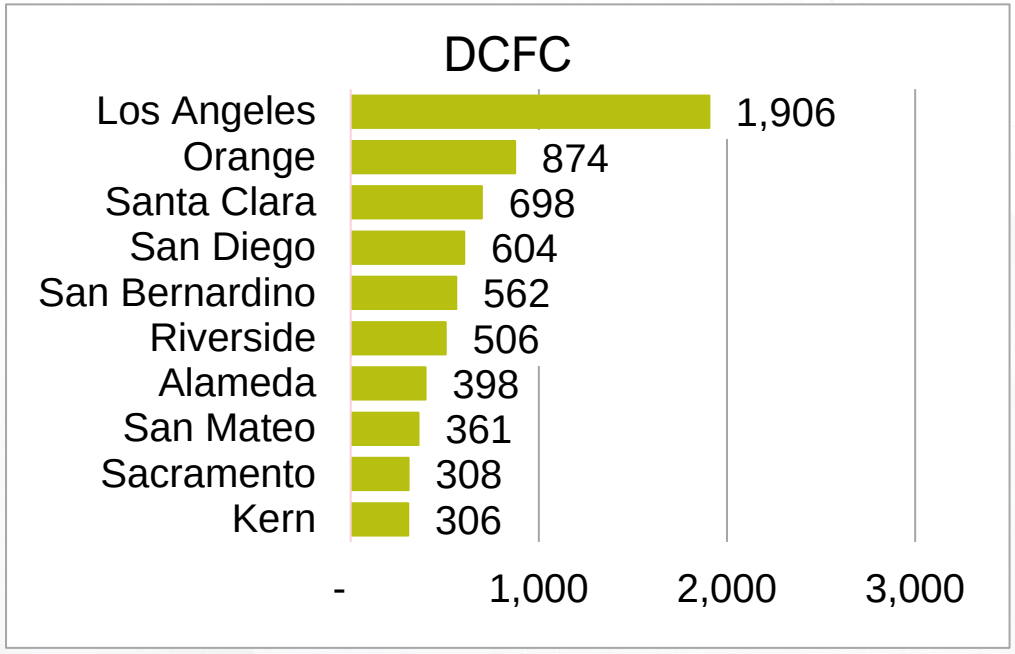
Overview

Public Level 2 and DCFC Saturation in California



Counties with Highest Quantities of Chargers in California





PUBLIC CHARGING

Infrastructure Siting

- Establish clear objectives for your public charger deployments
- These objectives should dictate your siting strategy

Objective	Maximize Utilization	Serve Residents of Multi-Unit Dwellings	Provide City- or County-wide Coverage
Relevant Site Types	• High-traffic areas • Travel destinations • Travel corridors	• Public sites in areas w/high MUD density (e.g., parks) • MUD-adjacent ROW	• Broad range of site types including destinations, travel corridors, and more

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PUBLIC CHARGING

Business Models

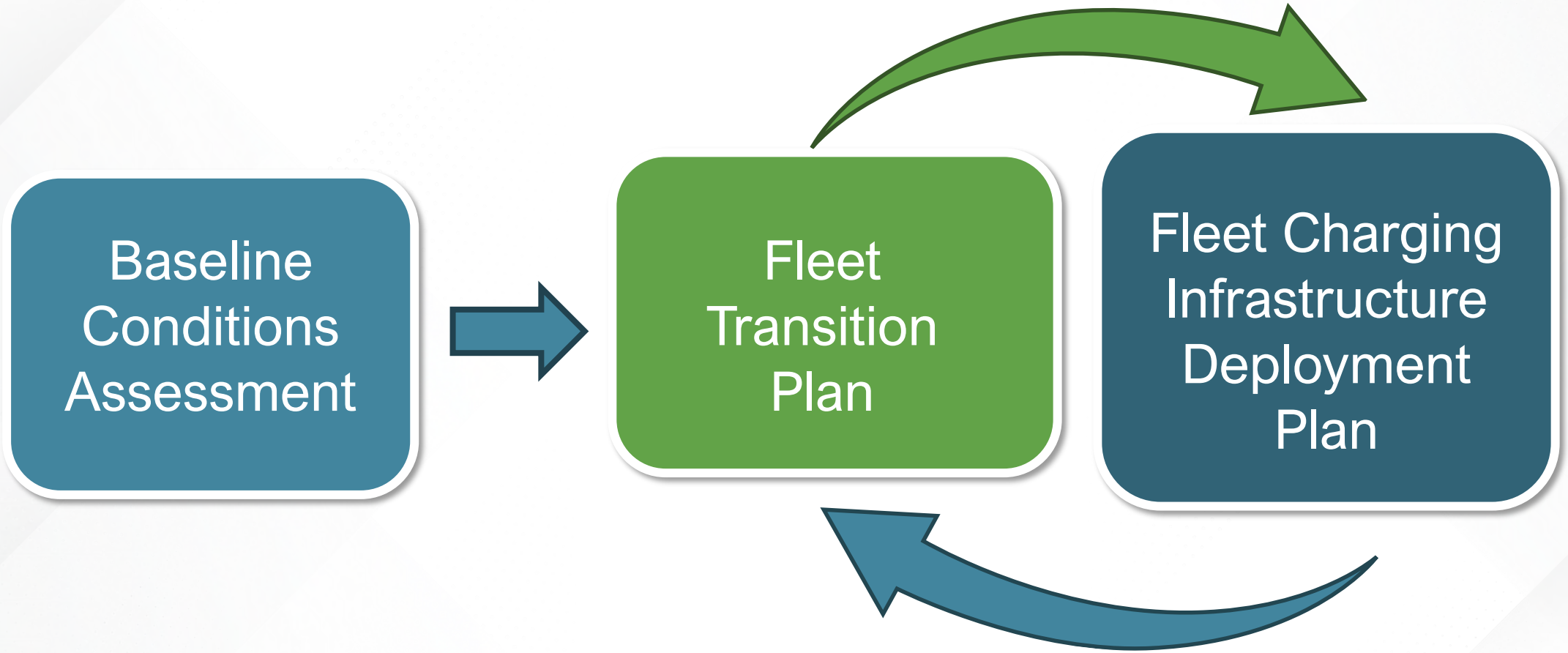
$ Low
$ $ Moderate
$ $ $ High

Ownership Type	Cost	Potential Revenue
Third-Party Owned and Operated	**$** Program Management	**0 - $**
Self-Owned, Third-Party Operated	**$ $** Hardware, Software, Program Management	**$ - $$**
Self-Owned and Operated	**$ $ $** Hardware, Software, Operations, Maintenance, Program Management	**$ $ $** *(May be challenging to break even)*
Leased or Charging as a Service (CaaS)	**$ $** Subscription Fee, Program Management	**$ - $$** Shared with Third-Party
Advertising-Supported Free Charging	**$** Program Management	**$** Monthly Site Host Payment (typically small)

Fleet Electrification

FLEET ELECTRIFICATION

Overview



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FLEET ELECTRIFICATION

Advanced Clean Fleets Regulation

- On April 28, 2023, the California Air Resources Board (CARB) approved the Advanced Clean Fleets (ACF) Regulation
  - Part of CARB's overall approach to accelerate a large-scale transition to zero-emission M/HDV
  - Works in conjunction with other regulations
    - E.g., Advanced Clean Trucks (ACT) Regulation
  - ~$26.5 billion in health benefits from reduced emissions
  - ~$48 billion in net cost savings to fleets

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FLEET ELECTRIFICATION

Advanced Clean Fleets Regulation

State and Local Governments

- Medium- and heavy-duty on-road vehicles
- Vehicles with gross vehicle weight rating (GVWR) >8,500 pounds
- Off-road yard tractors
- Light-duty mail vehicles
- Light-duty package delivery vehicles

Box trucks, vans,
two-axle buses, yard trucks

Work trucks, day cab tractors,
three-axle buses

Sleeper cab tractors,
specialty vehicles

FLEET ELECTRIFICATION

Advanced Clean Fleets Regulation

State and Local Governments

Compliance

- January 1, 2024 – At least 50% of vehicle purchases are ZEVs
- January 1, 2027 – 100% of vehicle purchases are ZEVs

Reporting

- April 1, 2024 – Submit compliance report including fleet info

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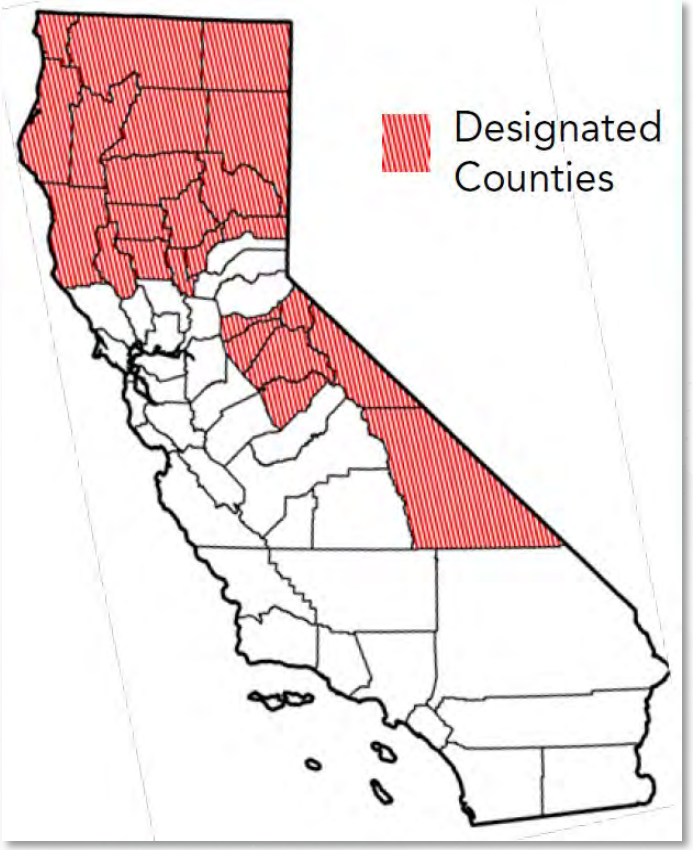
FLEET ELECTRIFICATION

Advanced Clean Fleets Regulation

State and Local Governments

- ACF includes several exemptions based on vehicle type, usage, etc.
- Some fleets may delay ZEV purchases until January 1, 2027 (but must purchase 100% ZEVs after):
  - Small government fleets (≤10 trucks)
  - Fleets in some lower-population counties
- Some fleets are exempt from ACF but subject to different regulations:
  - School buses (Zero-Emission School Bus Mandate)
  - Transit buses (Innovative Clean Transit regulation)
  - Airport shuttles (Zero-Emission Airport Shuttle regulation)



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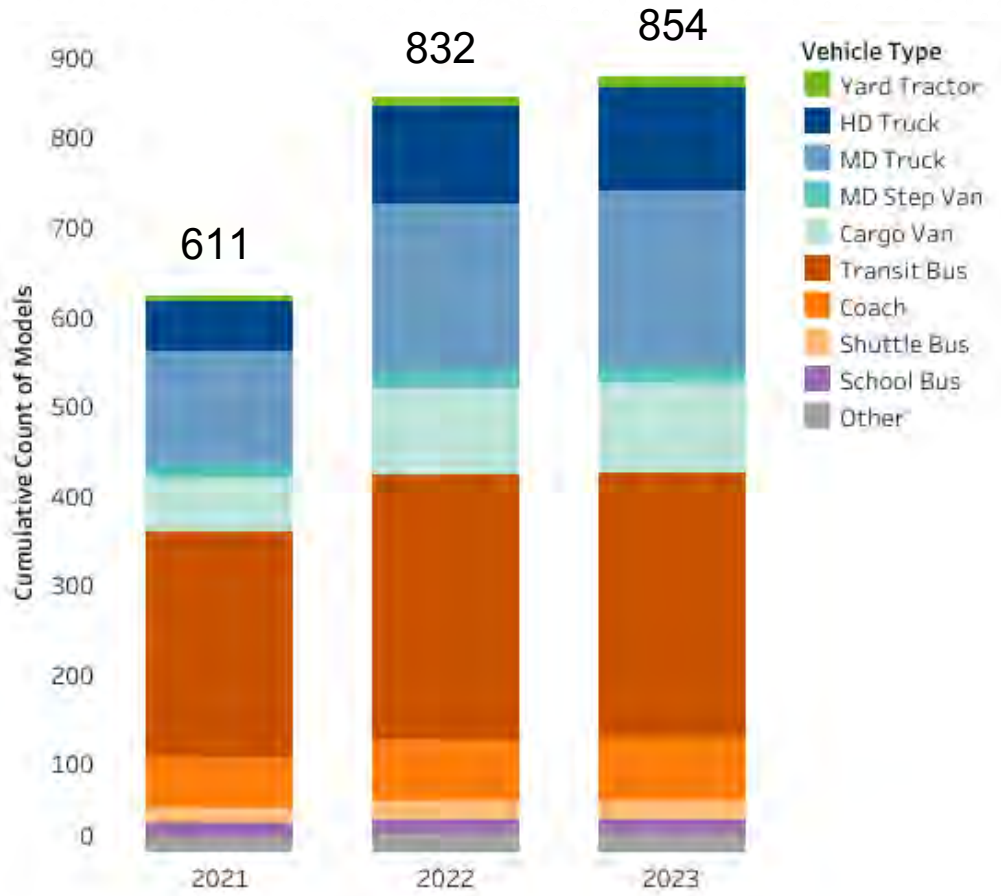
FLEET ELECTRIFICATION

Current State of ZEV Options

- CALSTART maintains an online vehicle inventory called the [Zero-emission Technology Inventory (ZETI) Tool] for M/HDV

Number of Medium-/Heavy-Duty ZEV Models Available by Vehicle Type



FUNDING

FUNDING

Types

Type	Description
Discretionary Grant	• Most common grant type • Projects competitively selected based on eligibility, evaluation criteria, program priorities
Formula Grant	• Apportion funding based on formulas • Recipients can be states, tribes, cities, counties, transit agencies • Recipients may award funding to other entities
Loan Financing	• Leverage funds to accelerate project delivery • May also attract other non-Federal parties for co-investment • Examples include secured (direct) loans, loan guarantees, lines of credit
Tax Incentives	• Reduce taxable income – e.g., exclusions, or deductions to reduce taxable income • Decrease tax liability – e.g., credits, preferential tax rates, deferrals • Refundable tax credits may generate cash payments from Govt to taxpayer
Rebates	• Paid via reduction, return, or refund after purchase • Instant rebates may occur at the time of purchase
Utility Incentives	• Rebates, discounts, services, or support offered by electric utility • Paid at the time of purchase, via refund, on electric bill, or provided as free or discounted product or service

FUNDING

Sample Sources – For Public Chargers

Name	Source	Type	Description	Funding Limit
Alternative Fuel Infrastructure Tax Credit	Federal	Tax Credit	Up to 30% of charger cost	$100,000
EV Charger Reliability and Accessibility Accelerator	Federal	Grant	Up to 80% of cost to repair or replace nonfunctional chargers	-
Zero-Emission Commercial Vehicles (EnergIIZE) Project	State	Grant	Public chargers for M/HD drayage trucks	$1,000,000/project
Golden State Priority Project - CALeVIP Central Coast	State	Rebate	Up to 50% of cost for high-power DCFCs in east/central CA DAC/LIC	$100,000/connector
San Joaquin Valley AQMD Clean Vehicle Fueling Infrastructure Program	County	Grant	Up to 100% of cost for Level 2 and DCFCs	-
Alameda Municipal Power Commercial EV Charger Rebate	Utility	Rebate	Up to 100% of cost for Level 2 chargers	$6,500/charger; $39,000/applicant
Roseville Electric Commercial EV Charger Rebate	Utility	Rebate	Free site assessment and up to 100% of cost for Level 2 chargers	$20,000/charger

FUNDING

Sample Sources – For Fleet Electrification

Name	Source	Type	Description	Funding Limit
Bus Replacement Grant	State	Grant	Purchase new ZEBs to replace fossil fuel bus	$160,000-$400,000 based on bus type
Heavy-Duty Low Emission Vehicle Replacement and Repower Grants	State	Grant	Up to 100% of government project costs	Up to $3 million per entity
Plug-In Hybrid and Zero Emission Light-Duty Public Fleet Vehicle Fleet Rebates	State	Rebate	Purchase qualified light-duty PHEV or ZEV	$1,000-$7,000 based on ZEV type
Low and Zero Emission Public Transportation Funding	Federal	Grant	Purchase or lease of low-emission buses or ZEBs	-
California Clean Vehicle Rebate Project (CVRP) for Fleets Program	State	Rebate	Up to $7,500 for purchase/lease of ≤30 vehicles per year	-
Transportation Authority of Marin – EV Fleet Rebate Program	County	Rebate	Replace ICE vehicles w/EVs or PHEVs	$1,500-$5,000 based on ZEV type

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