

# Industry Perspective of Medium-Duty and Heavy-Duty Fleet Vehicles

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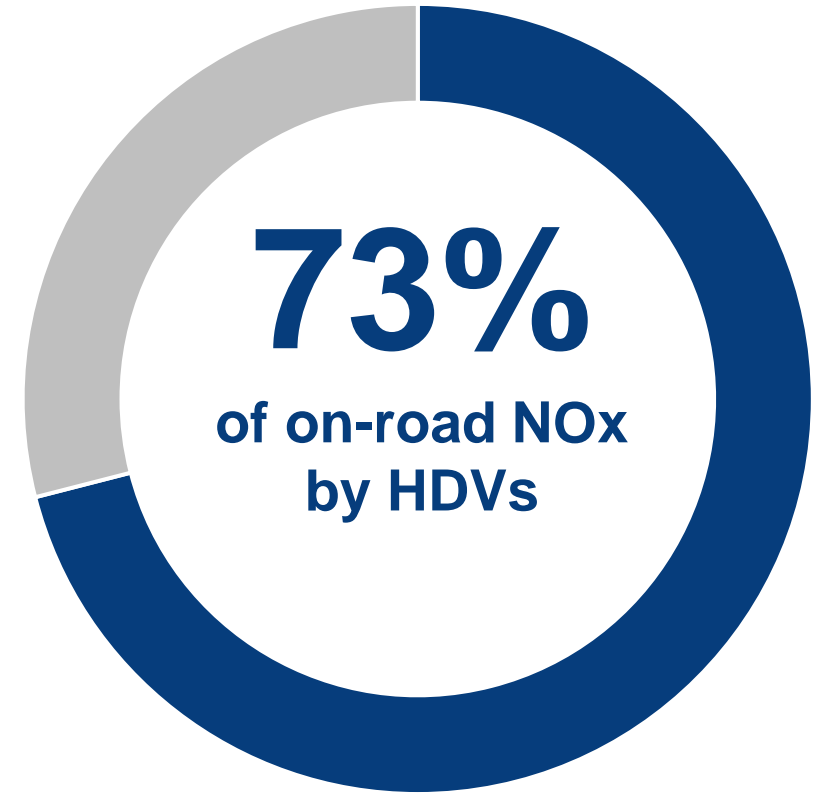
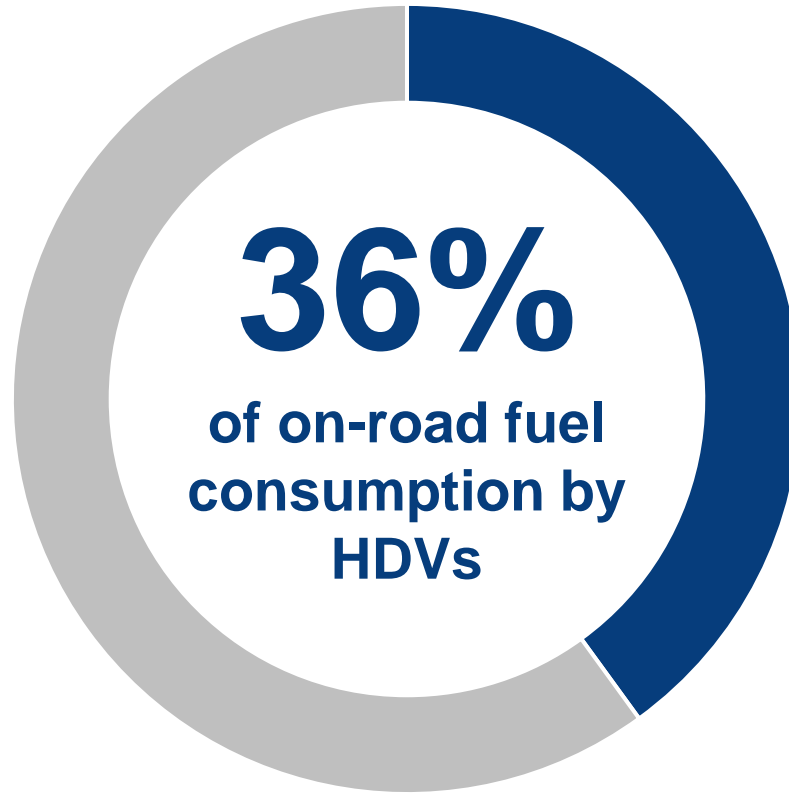
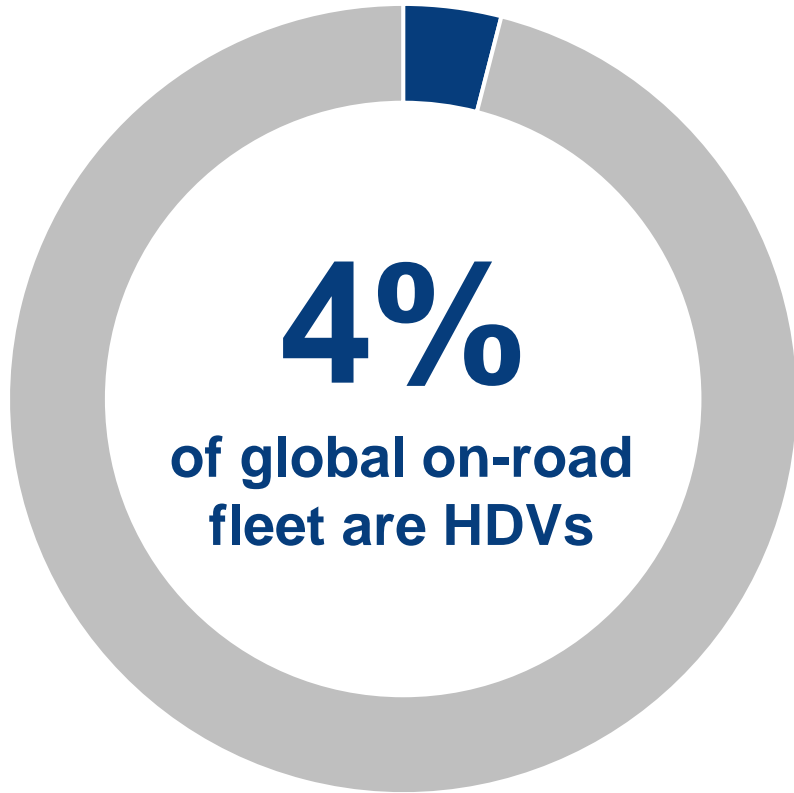
A Climate-Safe Vision  
for California's Heavy Duty Vehicle Fleets  
February 16, 2023



# Over 300 Members

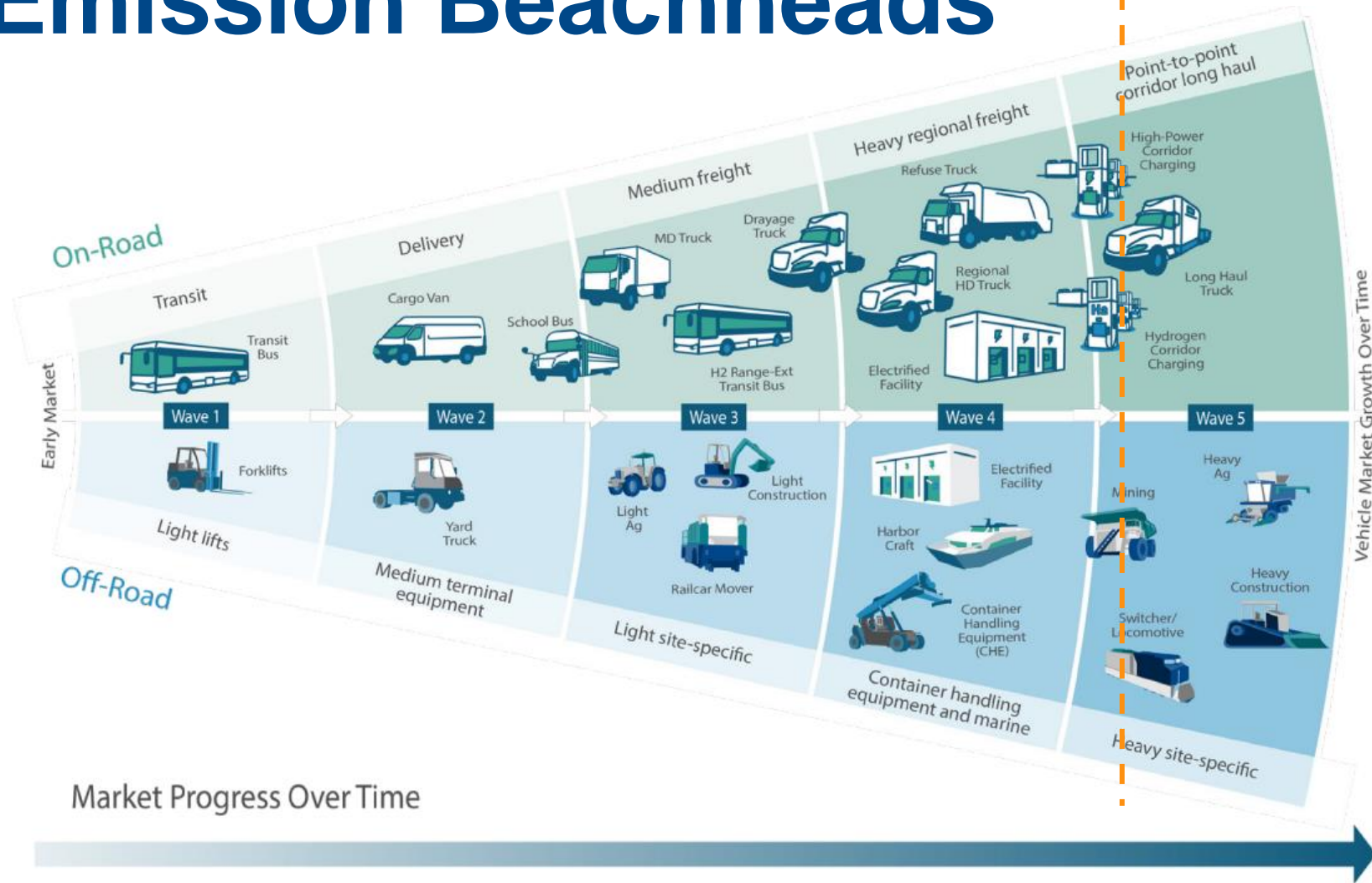


# Why Focus on ZE MHDVs?



# Zero Emission Beachheads

We are here



Similar drivetrain and component sizing can scale to early near applications

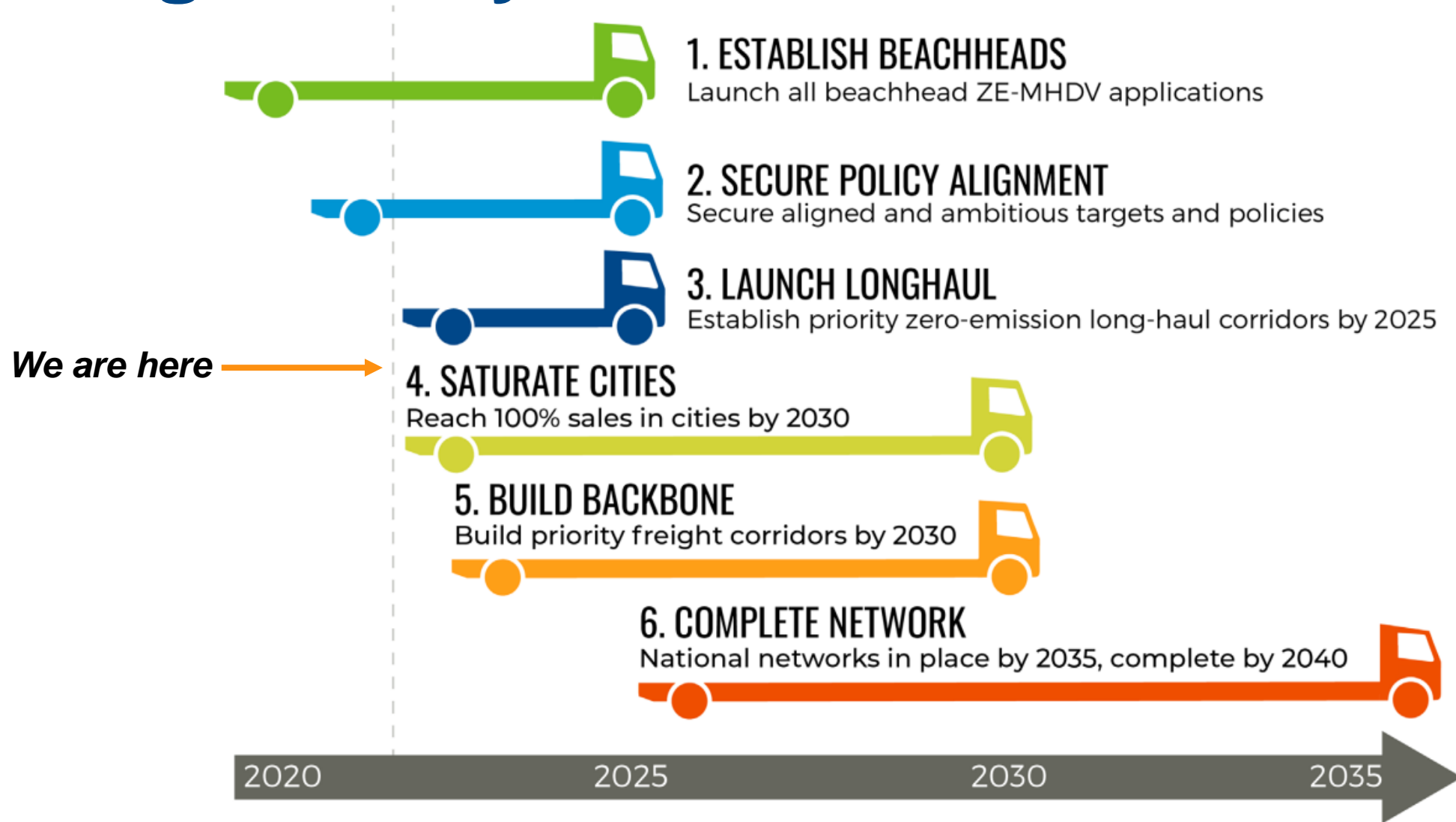
Expanded supply chain capabilities and price reductions enable additional applications

Steadily increasing volumes and infrastructure strengthen business case and performance confidence

Source: The Beachhead Strategy <https://calstart.org/beachhead-model-background/>





# Going Zero by 2040

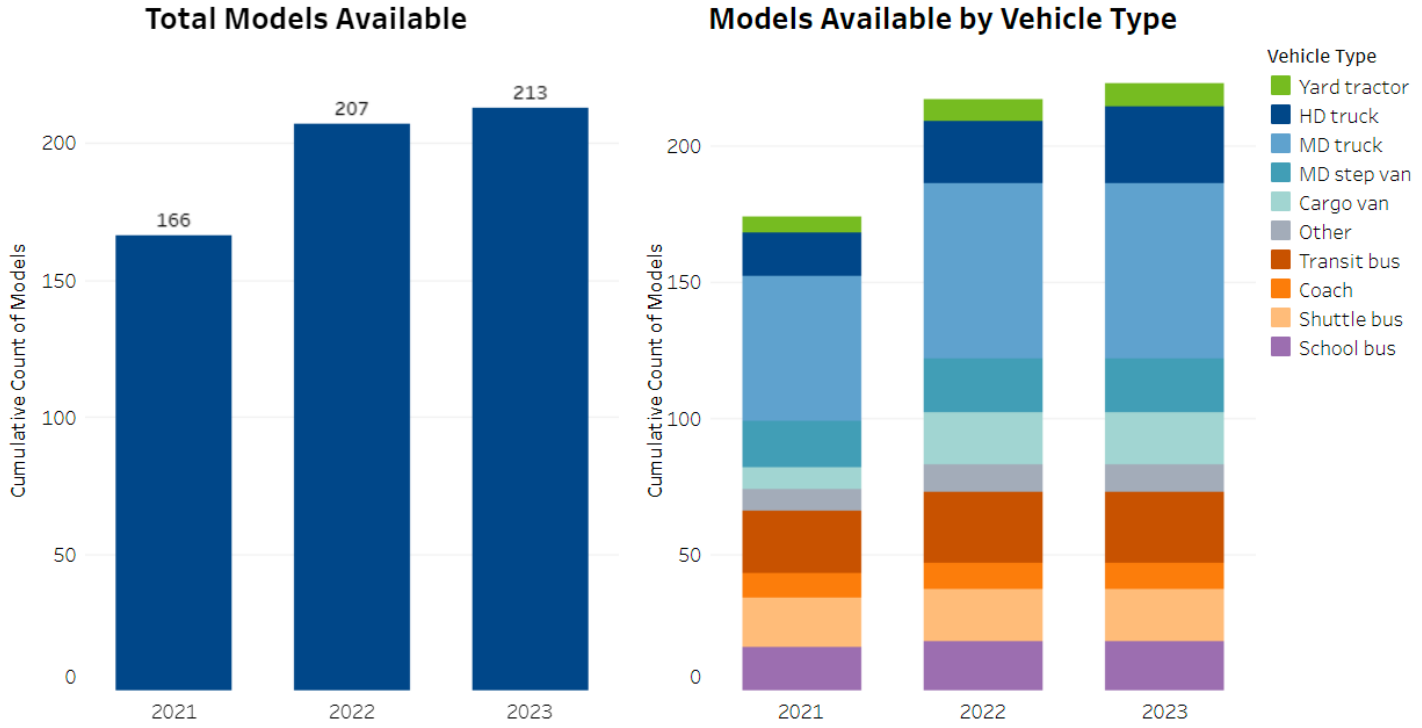


# Growing Availability, But Urgent Need to Accelerate Market

Models Available | Growth by Region | OEMs by Vehicle Types | Top 10 OEMs by Range | Truck Range | Bus Range | Truck Bubble Chart | Bus Bubble Chart

Select Regions: U.S. & Canada | 
 Select Vehicle Types: (All) | 
 Select Vehicle Technologies: (All) | 
 Available Through: 2021 - 2023

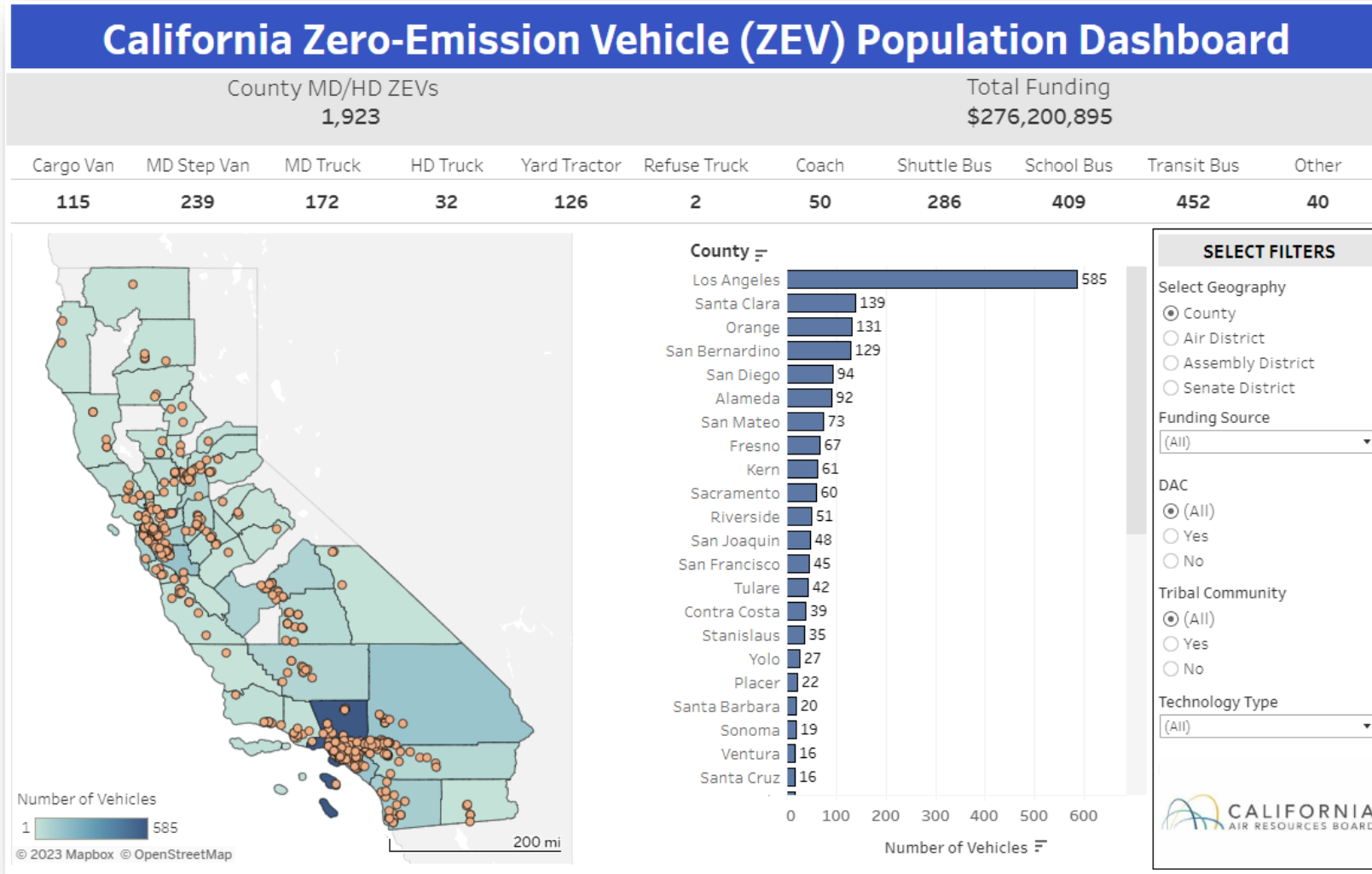





Source: ZETI Data Explorer <https://globaldrivetozero.org/tools/zeti-data-explorer/>



# 2000 MHD ZEVs Deployed in CA



Source: HVIP <https://californiahvip.org/industryinitiatives>



# Transforming Freight Facilities in CA



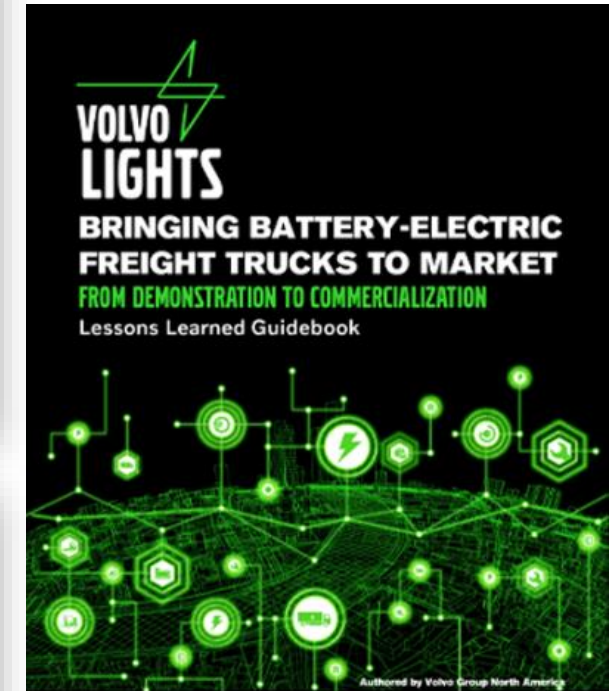
- Jan 18, 2023: Frito-Lay Pilot Project Unveiled Model Program at Modesto Plant
- Company planning to replicate program at other plants



# Paving the Way for Widescale Electrification



- Volvo LIGHTS designed and implemented a blueprint for the complete ecosystem needed to successfully deploy commercial battery-electric freight trucks



VOLVO LIGHTS Low Impact Green Fleets Transport Solutions is part of California's Green Fleets, a statewide initiative that puts billions of Cap and Trade dollars to work reducing greenhouse gas emissions, strengthening the economy, and improving public health and the environment — particularly in disadvantaged communities. The total project cost was \$30 million, with a funding award of \$44.8 million.

# Adoption of ZEBs Still Growing Steadily



LADOT BYD Demonstration



SJRTD Proterra Demonstration



Gtrans CCW Demonstration

- Count of full-size ZEBs has grown to 5,480 – 66% increase since 2021
- Fuel cell electric buses with a 64% increase in adoption since 2021



# Schools Buses Primed for Electrification but Districts Need Help

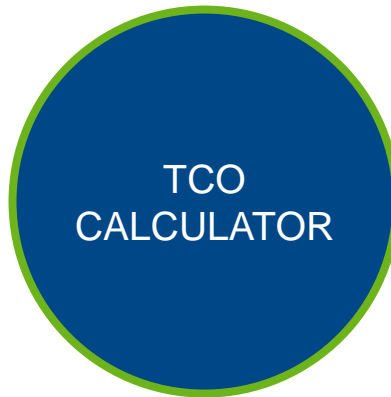


San Diego Clean Mobility in Schools Pilot Project



SCAQMD ESB Data Collection

# Technical Assistance Resources



Live

Live

Live

REVISION

Live +

**Advanced Vehicle Technology and Infrastructure**  
**Funding Finder Tool**

The Funding Finder Tool is designed to help stakeholders search and filter for Medium-and-Heavy-Duty Alternative Infrastructure programs in the state of California. Start by filtering results by ZIP Code then filter based on the criteria. Please note that for the most accurate and up to date information about each program, you should visit the website of the agency directly.

Search for Funds

51 of 51 programs displayed.

keyword filter

ZIP Code

County

Technology

Vehicle Type

Infrastructure

Private / Public Fleet

Scrappage

Can be Combined with HVIP

Funding Stipulations

First Come First Served

Can be Combined with Energize

<b>Organization(s):</b> Santa Barbara County APCD <b>Program:</b> Clean Air Grants (various) <b>Funding:</b> See website for details	<b>Vehicle Types:</b> Infrastructure, Transit, School, Off-Road, Truck, Bus, Other Vehicle Type <b>Technology:</b> Hydrogen, Battery Electric, Hybrid, CNG/Low Nox, Other Fuel Technology	<b>Total Program Fund:</b> TBD
<b>Organization(s):</b> California Energy Commission (CEC) and California Air Resources Board (CARB) <b>Program:</b> Clean Mobility Options <b>Funding:</b> Varies	<b>Vehicle Types:</b> Infrastructure, Other Vehicle Type <b>Technology:</b> Hydrogen, Battery Electric, Hybrid, CNG/Low Nox, Other Fuel Technology	<b>Total Program Fund:</b> TBD
<b>Organization(s):</b> California Energy Commission (CEC) and Electric Program Investment Charge Program (EPIC) <b>Program:</b> Vehicle-to-Building for Resilient Backup Power <b>Funding:</b> See website for details	<b>Vehicle Types:</b> Infrastructure, Other Fuel Technology	<b>Total Program Fund:</b> TBD



**CALIFORNIA HVIP DEPLOYMENT SPOTLIGHT**  
**LION ELECTRIC LIONC SCHOOL BUS**

**PROJECT SUMMARY**

Sixteen first-generation (model year 2016) Lion Electric LionC school buses were deployed in a pilot project to transport children in the Greater Sacramento Region. These electric school buses (ESBs) operated from January 2018 to December 2019 in disadvantaged communities in the Elk Grove (ESD10), Sacramento City (SCSD), and Twin Rivers (TRSD) school districts. After this project, each district expanded its fleet of ESBs.

**DUTY CYCLE**

Vocation Student Transit

Average Daily Distance: 45 miles

Average Daily Speed: 18 miles per hour

Maximum Capacity: 77 seats

Average Temperature: Summer 74 F, Winter 59 F

Operational routes varied in length among the school districts, with daily distances of 25-58 miles. Routes were mostly flat and involved urban, residential, rural, and freeway driving. Each ESB was allocated 1.5 hours for pick-up in the morning and 1.5 hours for drop-off in the afternoon.

During the data collection period, temperatures in the Greater Sacramento Region were 59-84 F in summer months and 46-74 F in winter months.

**CHARGING**

Charger Type: Level 2

Charging Methodology: Depot Day/Night

5-7 hours per charge

The ESBs charged at on-site private locations, with an average of 1-25 charging events per day in use. Each bus had a nominal battery capacity of 105 kWh or 132 kWh and fully charged in about 6 hours using 19.2-kW Clippor Creek Model CS-100-3 Level 2 chargers or in 7 hours using 16.8-kW EV Connect/BTC Power Level 2 chargers. Both chargers had SAE J1772 connectors. Each vehicle's average daily energy consumption was 86.6 kWh.

**PERFORMANCE**

Energy Efficiency: 2.6 kWh/mi

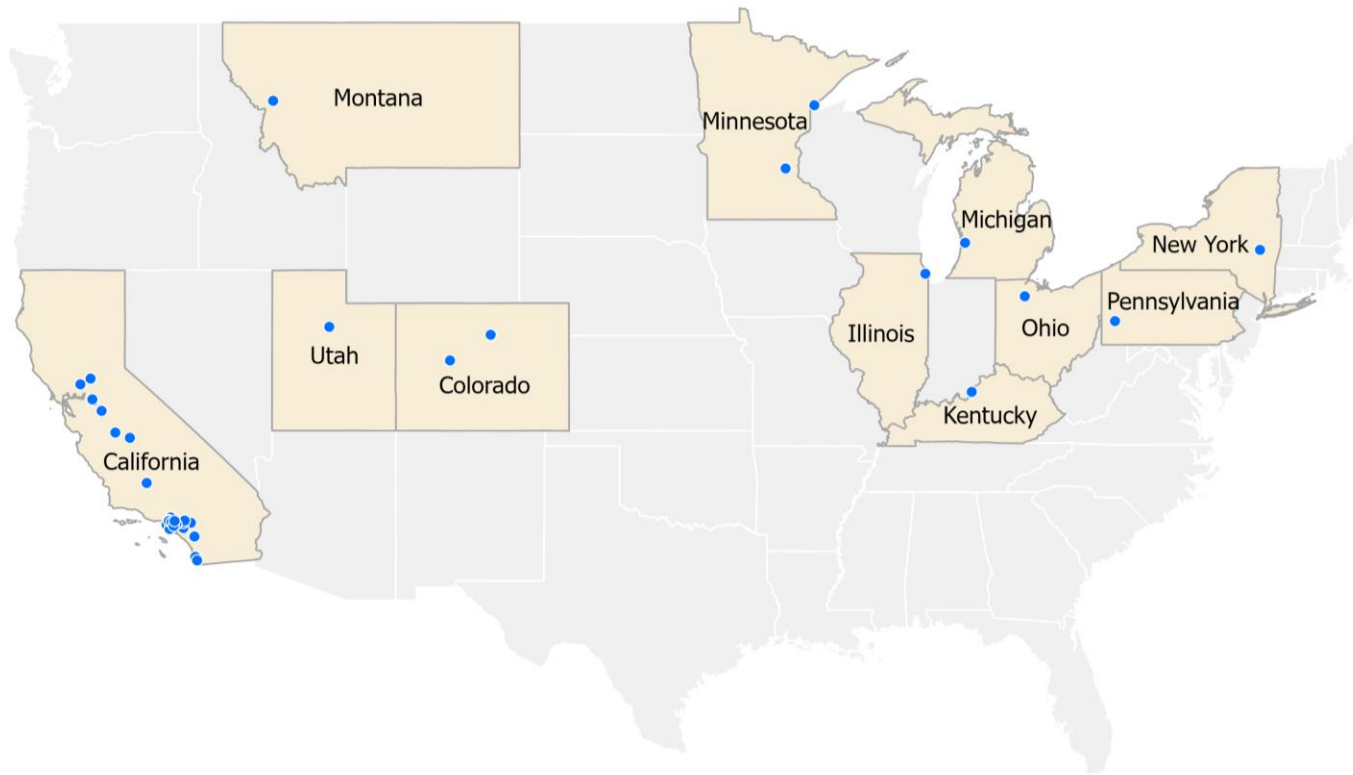
Miles per Gallon Equivalent: 17.3 mpg

\*Certain factors can significantly affect the range and efficiency of electric vehicles (EVs), especially ambient temperature, topography, speed, and load. Total factors must be considered when selecting a suitable EV to meet a specific daily cycle.



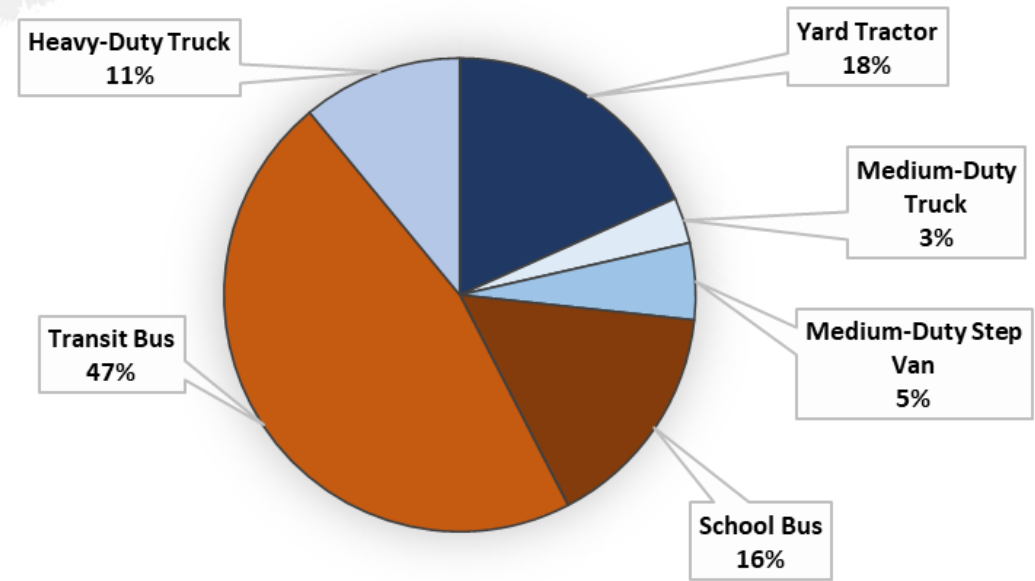
# Nationwide Deployment Learnings

**256** vehicles across **11** states and **37** distinct fleets participating in the program

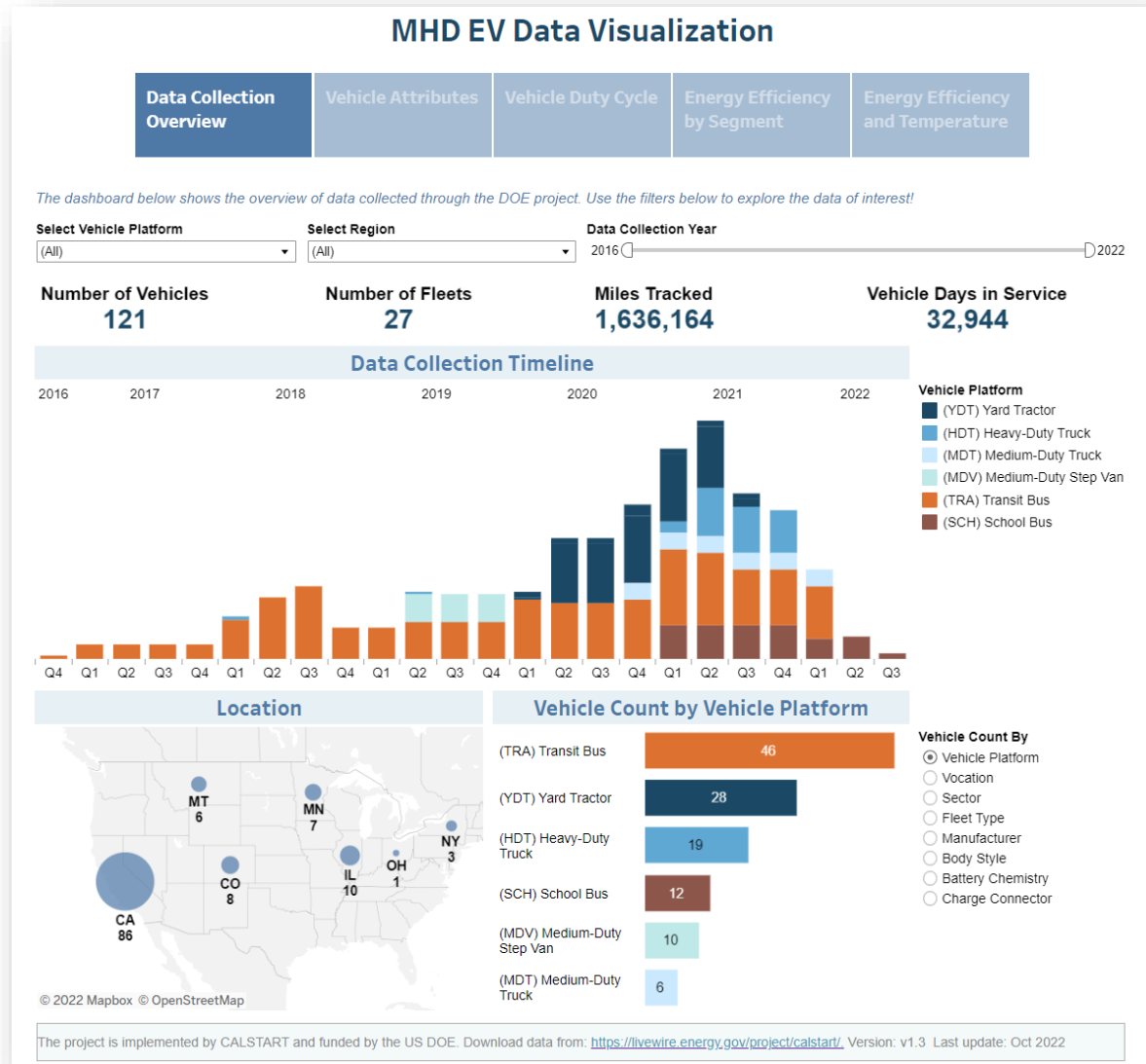


● Active MHD EV deployments collecting data

### Confirmed Vehicle Makeup



# Data is Publicly Accessible



Access the Dashboard in Project Website:  
<https://calstart.org/projects/medium-heavy-duty-ev-deployment-data/>

Download Data from LiveWire:  
<https://livewire.energy.gov/project/calstart>

# Thank you!

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A Climate-Safe Vision  
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June 13, 2022

