



# Current and Future Regulations for Zero Emission Trucks

July 25, 2023



IN  
PARTNERSHIP  
WITH



# DEPOTS Electric Truck Bootcamp Series

1. **Best Practices for Utility-Fleet Relationships** (April 25<sup>th</sup>) ✓
2. **Grants and Incentives for the Trucks and Infrastructure** (May 16<sup>th</sup>) ✓
3. **Electric Truck Developments** (May 30<sup>th</sup>) ✓
4. **Faster Charging — Opportunities and Challenges at 350KW and higher** (June 13<sup>th</sup>) ✓
5. **Opportunities to Extend BEV Range** (June 27<sup>th</sup>) ✓
6. **Electricity Resiliency and Availability** (July 11<sup>th</sup>) ✓
7. **Current and Future Regulations for Zero Emission Trucks** (July 25<sup>th</sup>)
8. **Managed Charging to Improve Availability, Cost and Range** (August 8<sup>th</sup>)
9. **Scaling Charging Infrastructure Equipment** (August 22<sup>nd</sup>)
10. **Electric Depot Site Planning and Construction** (September 5<sup>th</sup>)

**2021 Bootcamp is still available at:** <https://runonless.com/electric/bootcamp-electric/>

# DEPOTS Electric Truck Bootcamp Series

## Up Next: Selecting & Managing Cost-Effective Charging

August 8, 2023 1:00p ET



**Charlotte Argue**

*Senior Manager, Sustainable  
Mobility  
Geotab*



**Mark Braby**

*Chief Commercial Officer  
Synop*



**Joshua Goldman**

*General ConsVice President of  
Mobilityultant  
Xendee*



**Sean Larkin**

*Senior Director, Medium &  
Heavy-Duty Fleets  
bp pulse*

# 2023 DEPOT Fleets

## Update from The Run Planning...



**Follow the Fleets, Drivers, OEMs, EVSEs, Utilities  
and more:**

RunOnLess.com and on Twitter @RunOnLess

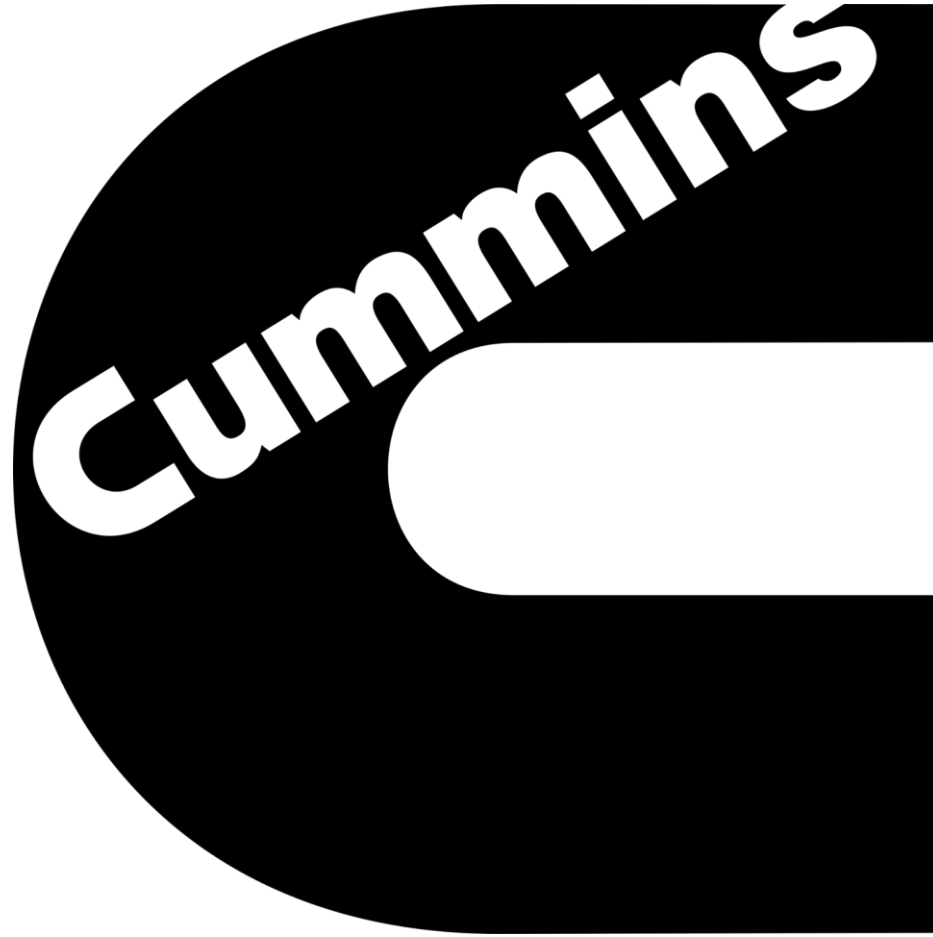


# 2023 Infrastructure Report



To access the report go to: <https://nacfe.org/research/electric-trucks/#charging-infrastructure>

# Today's Bootcamp Sponsor



# Quiz for Today's Session

## Completing Today's Quiz:

- Go to [runonless.com](https://runonless.com) and click back into the session
- Click 'Take Quiz' button
- Create username and password to keep track of your progress
- Spend a few minutes answering the questions and receive your 2023 RoLE - DEPOT badges



# What You Should Know

## Q&A

Submit your questions to the host using the Q&A box in the upper right-hand corner

## Recording

A recording of today's webinar will be available on [runonless.com](https://runonless.com)

## Technical Issues

Contact Stephane Babcock at [stephane.babcock@gladstein.org](mailto:stephane.babcock@gladstein.org)



IN  
PARTNERSHIP  
WITH





# Today's Bootcamp Speakers

## Current & Future Regulations for Zero-Emission Trucks



**Adam Browning**

*EVP Policy & Communications  
Forum Mobility*



**John Mikulin**

*Mobile Source Sub-Lead  
Coordinator  
U.S. EPA*



**David Treichler**

*Director of Strategy and  
Technology  
Oncor Electric Delivery*



**Ann Xu**

*Co-Founder and CEO  
ElectroTempo, Inc.*



Hosted by:

**Rick Mihelic**

Director of Emerging Technologies



# EPA Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles – Phase 3

## Overview Briefing of the Proposal

---

NORTH AMERICAN COUNCIL FOR FREIGHT EFFICIENCY / ROCKY MOUNTAIN INSTITUTE

RUN ON LESS ELECTRIC DEPOT BOOTCAMP - WEBINAR #7

TUESDAY 7/25/2023



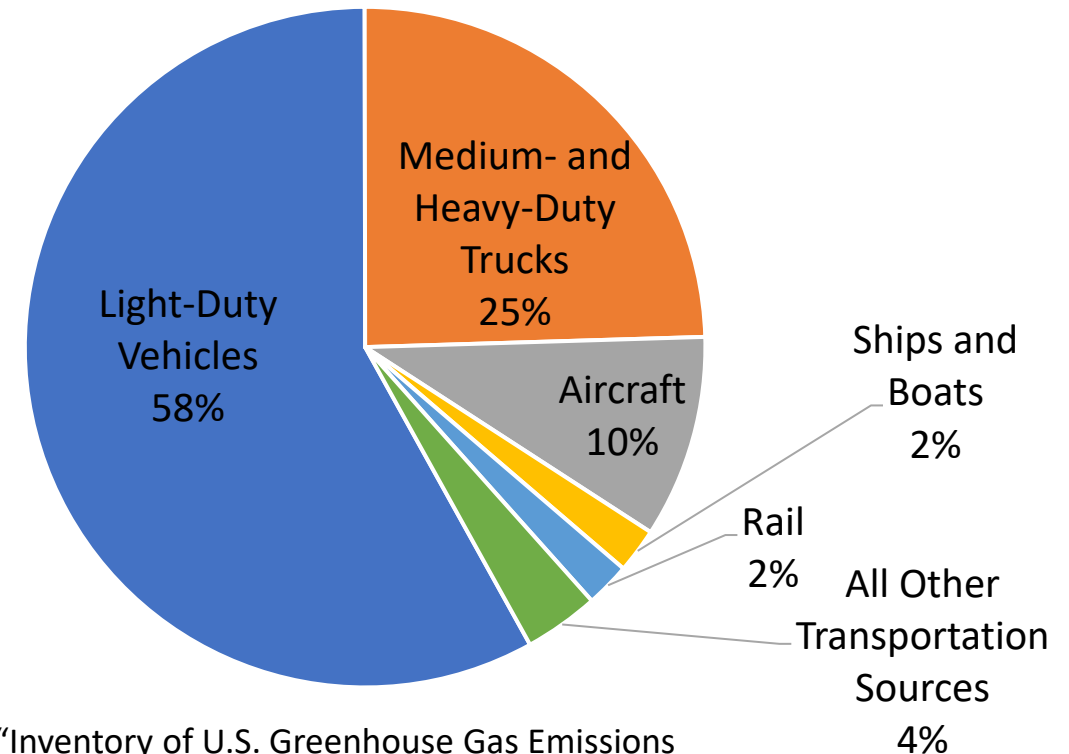
# Background: Key Statutory Provisions and Importance of Reducing HD Air Pollution



## Clean Air Act Statutory Authority

- Section 202(a)(1) of the Clean Air Act (CAA) requires the EPA to *"by regulation prescribe (and from time-to-time revise) . . . standards applicable to the emission of any air pollutant from any class or classes of new motor vehicles or new motor vehicle engines. . . , which in his judgment cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare."*
- Standards take effect *"after such period as the Administrator finds necessary to permit the development and application of the requisite technology, giving appropriate consideration to the cost of compliance within such period."*
- **EPA also must consider issues of technological feasibility, compliance cost, and lead time. EPA may consider other factors.**

**HD is the 2<sup>nd</sup> largest source of GHG emissions in the transportation sector, and a significant source of local and regional air pollution**



"Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2020," EPA 430-R-22-003

# Background: HD GHG Phases 1 and 2 Program Highlights

- Standards set by heavy-duty regulatory categories, e.g., tractors, vocational vehicles, large pickups/vans
- Phase 1 vehicle standards implemented 2014 through 2018; Phase 2 program started in 2021, fully phase in by 2027

**Combination  
Tractors**



**Vocational Vehicles**



**Large Pickups & Vans**



When designing program in 2016, EPA envisioned these technologies *could* be used to meet Phase 2:

- Engine, transmission, and driveline improvements
- Extended and workday idle reduction technologies
- Aerodynamic devices
- Lower rolling resistance tires
- Automatic tire inflation systems
- Weight reduction
- Engine stop start
- Powertrain hybridization
- Combustion optimization
- Improved air handling
- Reduced friction within the engine
- Improved emissions after-treatment technologies
- Engine waste heat recovery

# Background: What Has Changed Since Phase 2?

- **HD ZEV market**
  - Over 200 models in use today for some applications, many more applications to come
  - Costs of ZEV technologies are projected to fall
  - Manufacturers have set goals for ZEV sales reaching 50-60% by 2030
- **Inflation Reduction Act and Bipartisan Infrastructure Law** provide many monetary incentives to support the supply chain, production, and purchase of HD ZEVs and associated infrastructure
- Actions by states to accelerate adoption of HD ZEVs
  - **Multi-State Medium- and Heavy-Duty Zero Emission Vehicle MOU** signed by 17 states, D.C., and Quebec to achieve 100% MHD ZEV sales by 2050 and 30% by 2030 in their jurisdictions
  - California's **Advanced Clean Trucks** program adopted by 8 states and requiring 40-75% MHD ZEV sales by 2035



# Background: Scope of HD Phase 3 and EO 14037

## Light- and Medium- Duty Proposal

### Light-Duty



### Medium-Duty



## HD Phase 3 Proposal

### Vocational Vehicles



### Short-haul Tractors



### Long-haul Tractors



**Executive Order 14037**, “Strengthening American Leadership in Clean Cars and Trucks,” August 2021, provides EPA direction for this rulemaking

*Medium- and Heavy-Duty Engines and Vehicles Greenhouse Gas and Fuel Efficiency Standards as Soon as 2030 and Later.*

(3b) The Administrator of the EPA shall, as appropriate and consistent with applicable law, and in consideration of the role that zero-emission heavy-duty vehicles might have in reducing emissions from certain market segments, **consider updating the existing greenhouse gas emissions standards for heavy-duty engines and vehicles beginning with model year 2027 and extending through and including at least model year 2029.**

(4a) The Administrator of the EPA shall, as appropriate and consistent with applicable law, consider beginning work on a rulemaking under the Clean Air Act to establish **new greenhouse gas emissions standards for heavy-duty engines and vehicles to begin as soon as model year 2030.**

# EPA Clean Trucks Plan

<https://www.epa.gov/regulations-emissions-vehicles-and-engines/clean-trucks-plan>



- **Heavy-Duty 2027 Criteria Pollutant Emissions Standards**

- Finalized in December 2022, effective for U.S. model year 2027+ heavy-duty on-highway engines
- Increased Performance Stringency (FTP/SET vs. U.S. 2010+): >82% NO<sub>x</sub>, 50% PM<sub>2.5</sub>, >57% HC, >61% CO
- Rule Page - <https://www.epa.gov/regulations-emissions-vehicles-and-engines/final-rule-and-related-materials-control-air-pollution>

- **Light and Medium-Duty Multi-Pollutant Emissions Standards**

- Proposed standards for model year 2027+, comment period closed on 7/5/2023
- Docket ID # EPA-HQ-OAR-2022-0829 - <https://www.regulations.gov/docket/EPA-HQ-OAR-2022-0829>

- **Heavy-Duty GHG Phase 3 Emissions Standards**

- Proposed standards for model year 2027+, comment period closed on 6/16/2023
- Docket ID # EPA-HQ-OAR-2022-0985 - <https://www.regulations.gov/docket/EPA-HQ-OAR-2022-0985>



# HD GHG Phase 3 Highlights

- EPA is not proposing a ZEV mandate. The agency is proposing stronger performance-based CO<sub>2</sub> emission standards that begin in MY 2027 and phase in **through MY 2032**. We also request comment on standards more and less stringent than the proposal, as well as standards extending to MY 2035.
- The proposed standards **align with and support the commitments and investments** from trucking fleets, vehicle manufacturers, and U.S. states as they plan to increase the use of zero-emission vehicle (ZEV) technologies in heavy-duty fleets.
- The proposal considers new information such as the **Bipartisan Infrastructure Law and the Inflation Reduction Act**, which provide unprecedented investments to support the development of and market for ZEV technologies and their infrastructure.

# Phase 3 Builds on Phase 2's Program Structure

- **Phase 3 standards maintain the flexible structure** created in EPA's Phase 2 GHG program, which is designed to reflect the diverse nature of the heavy-duty industry
- The proposed standards are **performance based and do not mandate the use of a specific technology**
- Standards are first differentiated between tractors and vocational vehicles
  - Vocational vehicles are divided into 23 different subcategories for setting standards – 8 are for specialized vehicles
  - For tractors, standards are divided into 10 different subcategories for standards
  - In total, **there are 33 unique HD vehicle subcategories** for standards for each model year of the program
- Optional CO<sub>2</sub> Emissions Averaging, Banking and Trading (ABT) program
  - Allows emissions credits to be generated and used to meet the standards
  - 5-year credit life, 3-year deficit carry forward
- Note: EPA is not proposing to change the separate CO<sub>2</sub>, N<sub>2</sub>O and CH<sub>4</sub> standards for HD engines set under the Phase 2 program

# Aggregated Projected Mix of Technologies by Model Year

- For each model year of the program, EPA projects a technology mix that could be used to meet the proposed standards and those we ask for comment on by aggregating projected ZEV adoption rates from 100+ individual vehicle types
- Underlying these aggregated ZEV adoption rates, EPA expects some specific vehicle applications to achieve much higher adoption rates (e.g., 55% for school buses and 80% for step vans)

Proposal	2027	2028	2029	2030	2031	2032
Vocational	20%	25%	30%	35%	40%	50%
Short-Haul Tractors	10%	12%	15%	20%	30%	35%
Long-Haul Tractors	0%	0%	0%	10%	20%	25%

Alternative	2027	2028	2029	2030	2031	2032
Vocational	14%	20%	25%	30%	35%	40%
Short-Haul Tractors	5%	8%	10%	15%	20%	25%
Long-Haul Tractors	0%	0%	0%	10%	15%	20%

Seek Comment – CARB ACT Rule	2027	2028	2029	2030	2031	2032
Vocational	20%	30%	40%	50%	55%	60%
Tractors	15%	20%	25%	30%	35%	40%



# Estimated Cost to **Manufacturers** for Model Year 2032 Vehicles

- The **average per-vehicle estimated cost to manufacturers for 2032** ZEVs and internal combustion engine vehicles combined are shown by regulatory group in the table below
- These estimates account for the battery tax credit under the Inflation Reduction Act (IRS 45X), but not the vehicle tax credit (IRS 45W) as this credit is available to purchasers (next slide)

Regulatory Group	Fleet-Average Per-Vehicle Manufacturer Cost
LHD Vocational	-\$4,300
MHD Vocational	\$330
HHD Vocational	\$2,300
Short-Haul (Day Cab) Tractors	\$8,000
Long-Haul (Sleeper Cab) Tractors	\$11,000

For comparison, the projected fleet average per-vehicle costs projected of the HD GHG Phase 2 CO<sub>2</sub> standards were:

- between \$1,500 and \$5,700 per vehicle for MY 2027 vocational vehicles
- between \$10,000 and \$14,000 per vehicle for MY 2027 tractors

# Estimated Cost and Payback for **Purchasers of** MY 2032 Vehicles

- The **per-vehicle estimated upfront cost to purchasers** for a **2032 ZEV relative to a comparable internal combustion engine vehicle** are shown in the table below, including vehicle and EVSE costs
- This is supported by incentives such as tax credits under the Inflation Reduction Act, including the vehicle tax credit (IRS 45W) and the battery tax credit (IRS 45X)
- We project the upfront cost increases would be recouped by owners over the vehicle lifetime through operational savings, with pay back periods ranging from 1 to 7 years

Regulatory Group	Upfront vehicle cost difference (including tax credits)	Upfront EVSE costs	Annual Operational Savings (fuel, M&R)	Payback period (year)
LHD Vocational	-\$9,600	\$11,000	\$4,000	1
MHD Vocational	-\$2,900	\$14,000	\$5,400	3
HHD Vocational	-\$8,500	\$17,000	\$7,400	2
Short-Haul (Day Cab) Tractors	\$580	\$17,000	\$6,800	3
Long-Haul (Sleeper Cab) Tractors	\$15,000	\$0	\$2,300	7

# Projected Emission Impacts of the Proposed GHG Standards

- GHG Emission Impacts
  - **Net (downstream and upstream) cumulative CO<sub>2</sub> reductions of 1.8B metric tons through 2055**
    - Downstream CO<sub>2</sub> reductions of **2.2B metric tons** through 2055 (18% reduction vs. baseline)
    - Upstream CO<sub>2</sub> increases from power plants of **0.4B metric tons** through 2055
  - **Equivalent to a whole year's emissions from the entire transportation sector**
- Non-GHG emission impacts that would result from increased use of ZEV technology projected under the Phase 3 program
  - In 2055 (U.S. Short Tons)

Pollutant	Downstream Vehicle Emissions	Electricity Generation Units	Refinery	Net Impact
Nitrogen Oxides (NO <sub>x</sub> )	-71,000	790	-1,800	<b>-72,000</b>
Primary PM <sub>2.5</sub>	-970	750	-440	<b>-650</b>
Volatile Organic Compounds (VOC)	-21,000	750	-1,200	<b>-21,000</b>
Sulfur Dioxide (SO <sub>2</sub> )	-520	910	-640	<b>-250</b>

# Monetized Benefits to Society

- The Phase 3 Program would reduce adverse impacts associated with climate change and exposure to non-GHG pollutants and thus would yield significant benefits, both monetized and unmonetized
- EPA estimates that monetized **net benefits to society would be approximately \$320B** through the year 2055, **more than 5 times the cost** in vehicle technology and associated electric vehicle supply equipment (EVSE) combined
- The cost of vehicle technology (not including the vehicle or battery tax credits) and EVSE would be approximately \$9B and \$47B respectively
- The HD industry would save approximately \$250B in operating costs (e.g., savings that come from less liquid fuel used, lower maintenance and repair costs for ZEV technologies as compared to ICE technologies, etc.)
- **Significant social benefits include:**
  - \$87B in climate benefits
  - Between \$15B and \$29B in reduced emissions of non-GHG pollutants, primarily those that contribute to ambient concentrations of PM<sub>2.5</sub>
  - \$12B in energy security benefits from 4.3B barrels of reduced oil imports

*Values presented here are present value for 2027 through 2055 at 3% discount rate in 2021 dollars*



# HD Phase 3 Rulemaking Timeline

---

- Public hearings were held on May 2 and 3
- Public comment period closed on June 16

<https://www.regulations.gov/docket/EPA-HQ-OAR-2022-0985>

- **Goal is to issue the final rule as soon as December 2023**

- See EPA's website for more information on this rulemaking

<https://www.epa.gov/regulations-emissions-vehicles-and-engines/proposed-rule-greenhouse-gas-emissions-standards-heavy>



# Ideas, Comments, Questions...?

**John Mikulin**

Mobile Source Sub-Lead Coordinator  
Office of Air and Radiation

**U.S. EPA**

**1-415-972-3956**

**[mikulin.john@epa.gov](mailto:mikulin.john@epa.gov)**

<http://www.linkedin.com/in/johnmikulin>

<https://www.epa.gov/aboutepa/about-office-air-and-radiation-oar>



# The Context of Electric Transportation Tariffs

.....  
NACFE Run on Less Electric Depot Bootcamp #7 July 2023  
David Treichler, Director Strategy and Technology



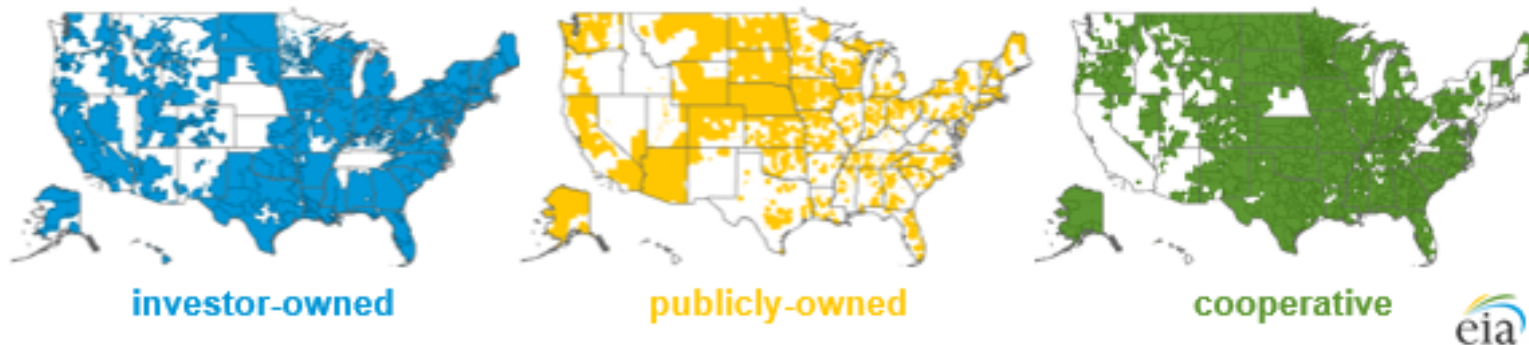
# One Size Does Not Fill All: 2,938 Utilities and Cooperatives

**Investor-owned utilities**, or IOUs, are large electric distributors that issue stock owned by shareholders. Almost three-quarters of utility customers get their electricity from these companies. IOUs are most prevalent in heavily populated areas on the East and West coasts. In 2017, 168 IOUs served an average of 654,600 electric customers. The two largest IOUs are in California: Pacific Gas and Electric, with 5.48 million customers, and Southern California Edison Company, with 5.07 million customers.

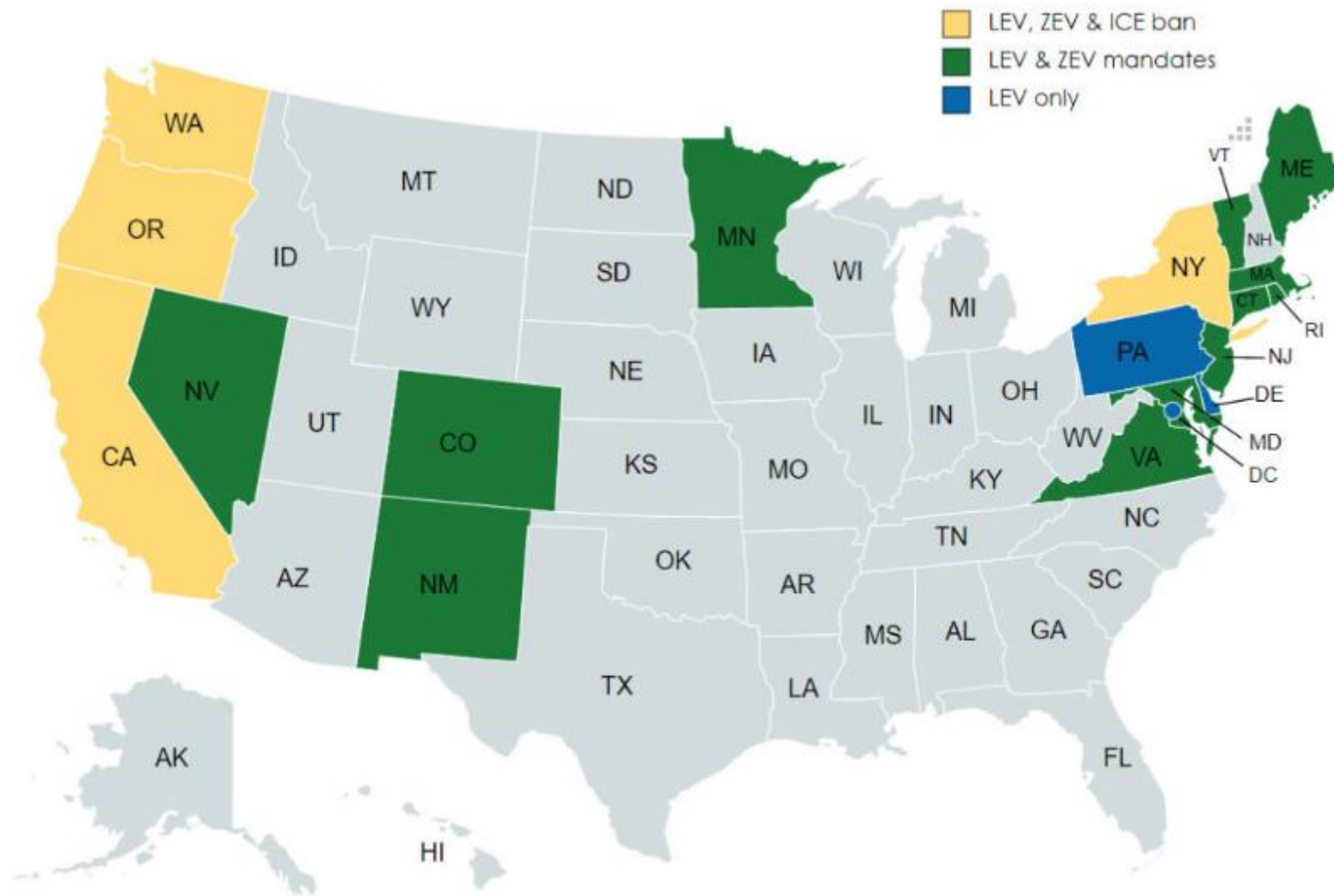
**Publicly owned utilities**, or POUs, include federal-, state-, and municipal-run utilities. In addition to government entities, political subdivisions may run POUs, also called public utility districts—utilities that residents vote into existence that operate independently of city or county government. The United States has 1,958 POUs with an average of 12,100 electricity customers each. The largest POUs are the state-run Puerto Rico Electric Power Authority (PREPA), with 1.47 million customers, and the Los Angeles Department of Water and Power, a municipal utility with 1.43 million customers.

**Cooperatives**, or co-ops, are not-for-profit member-owned utilities. Co-ops are located in 47 states but are most prevalent in the Midwest and Southeast. The United States has 812 co-ops with an average of 24,500 electricity customers each. The largest co-op is Pedernales Electric Co-op, in Johnson City, Texas, with 333,809 customers, nearly 50% more customers than the second-largest co-op, Jackson Electric Member Corporation, in Jefferson, Georgia.

Counties served by U.S. utilities, by type of ownership (2017)



# Economics vs Public Policy





# Basic Tariff Principles

## TARIFF DESIGN OBJECTIVES

Tariffs are designed to:

- Ensure cost recovery for utility
- Ensure revenue stability for utility
- Fairly apportion the cost of service to different customers based on “cost-causation”
- Encourage energy conservation and “grid-friendly” behavior

## TARIFF ATTRIBUTES

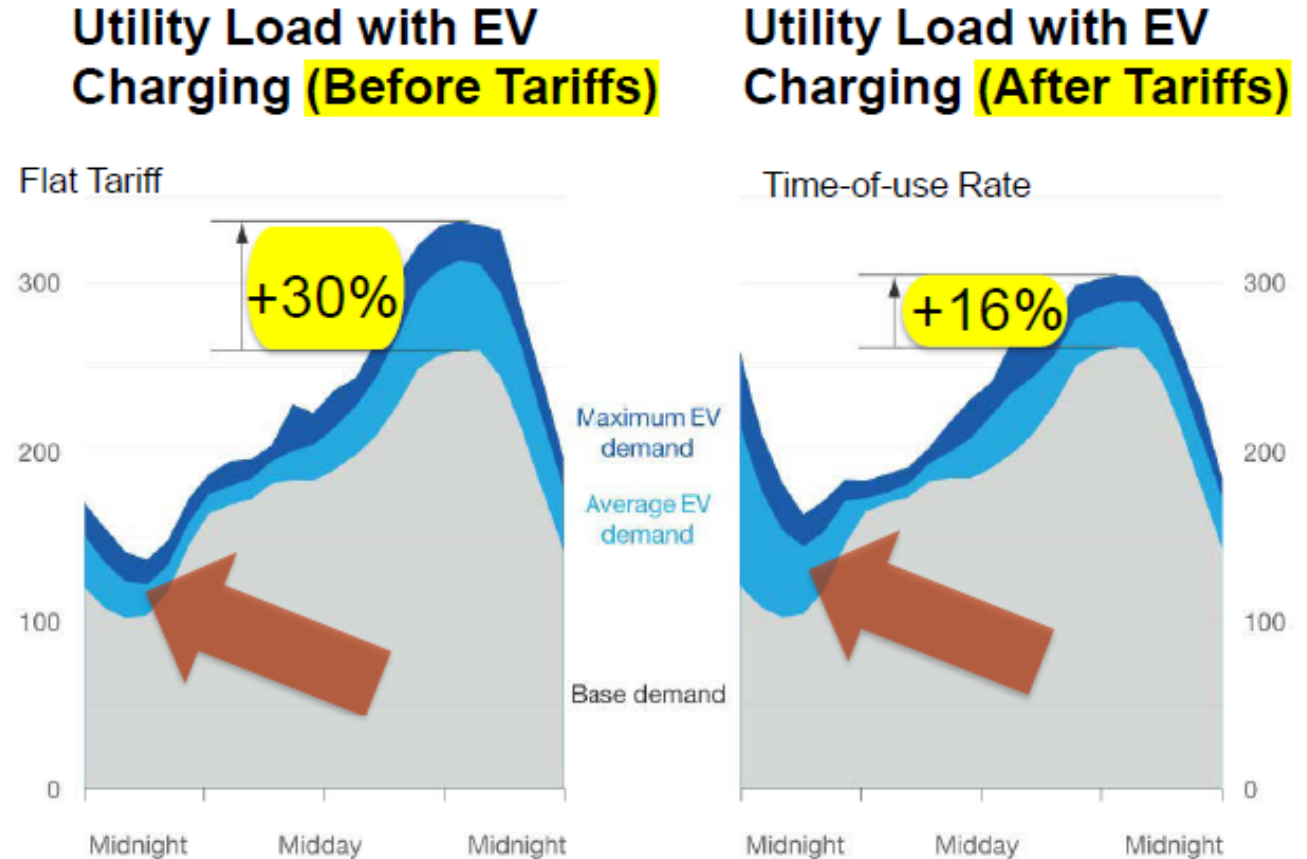
Tariffs should be:

- Simple
- Understandable
- Feasible to implement
- Publicly acceptable



# Peak vs Off Peak Charging Impacts

- EVs can have a large impact on a utility's load
- This large, new demand can help OR hurt a utility
- **Tariffs are used to manage this new demand in a helpful way**



# Underlying Issues That Will Drive Changing Tariffs: Uncontrolled Charging



1. Resource Adequacy – Is there enough generation to meet the demand from large transportation loads?
2. Extreme utilization - impacts on utility equipment – especially transformers which are in short supply
3. Cost Shifting – not everyone benefits and should therefore pay more
4. Stranded Assets – utility investment to serve a load that is subsequently abandoned and therefore does not produce the assigned recovery.

**Utility Perspective:** Electric loads take time to construct and connect. Usually a year or more. Large loads usually take multiple years. Our regulated processes are designed to react to this time scale. We cannot speed the process if a public commission must approve our investments and their approval takes up to a year before we even begin.

However, an electric truck can generally be delivered in a matter of months.

**Therefore, initiate your electrical service upgrades well before ordering your electric trucks.**



# electrotempo

*Charging Network  
Planning & Intelligence*

**ElectroTempo.com**



# ElectroTempo accelerates & future-proofs investments for electric vehicles

## Product Summary

Machine learning tools that optimize the total cost of ownership for EVs and associated infrastructure.

## Traction

Our software supports clients in deploying and managing EV infrastructure across fleets, site hosts, and utilities

## Active Customers

## Timeline

TUTORIAL

Growth Scenario

0530 ▾



All charts are cumulative

Click on a dataset in the legend to toggle on/off

[COMPARE ANOTHER GROWTH SCENARIO](#)

MARKET ADOPTION

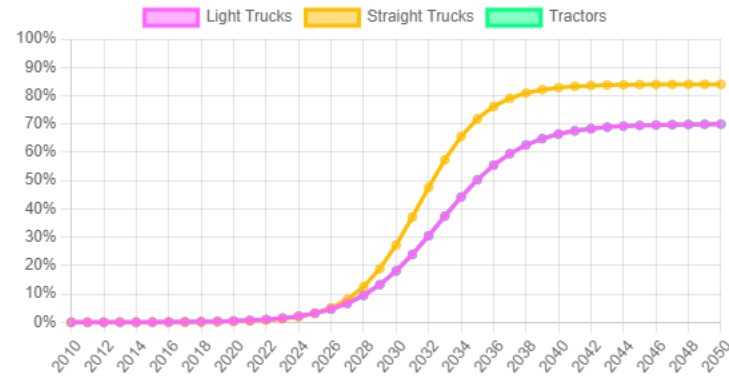
LIGHT DUTY CHARGING DEMAND

MEDIUM/HEAVY DUTY CHARGING DEMAND

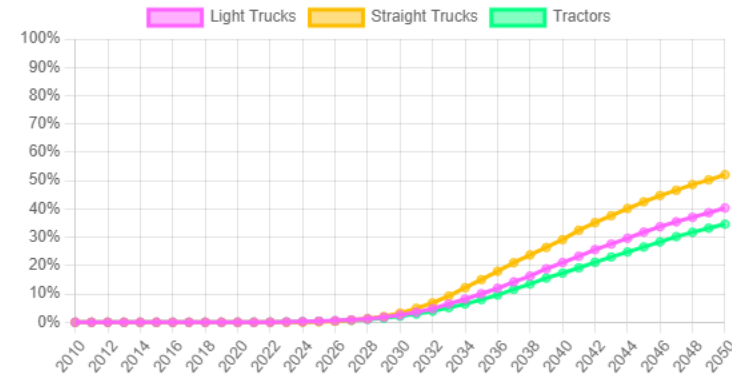
EMISSIONS

PARAMETERS

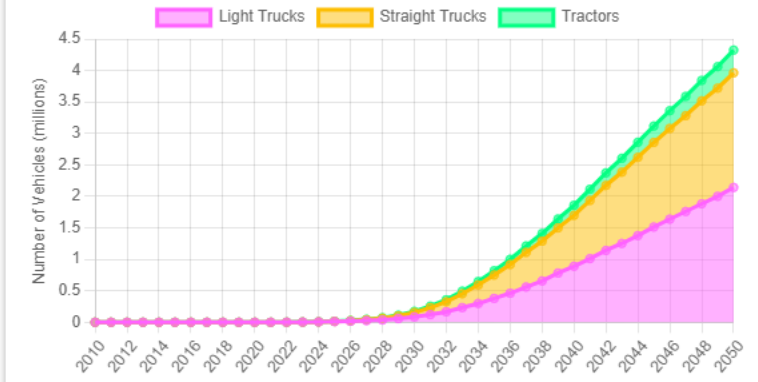
## Sales Curve ?



## EV Penetration ?



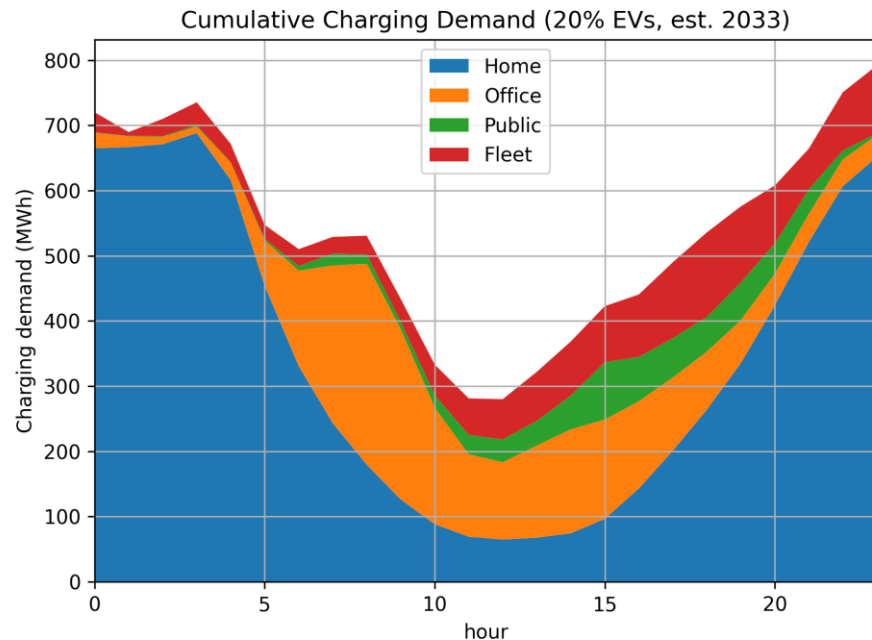
## Number of EVs



# Rapidly model a range of EV adoption scenarios based on market input

# Simulate Charging Demand

- Overlay light-, medium-, and heavy-duty vehicle charging demand
- Assess availability of capacity and real estate



Hour 0

hour\_0

0 - 555

555 - 1895

1895 - 4267

4267 - 10452

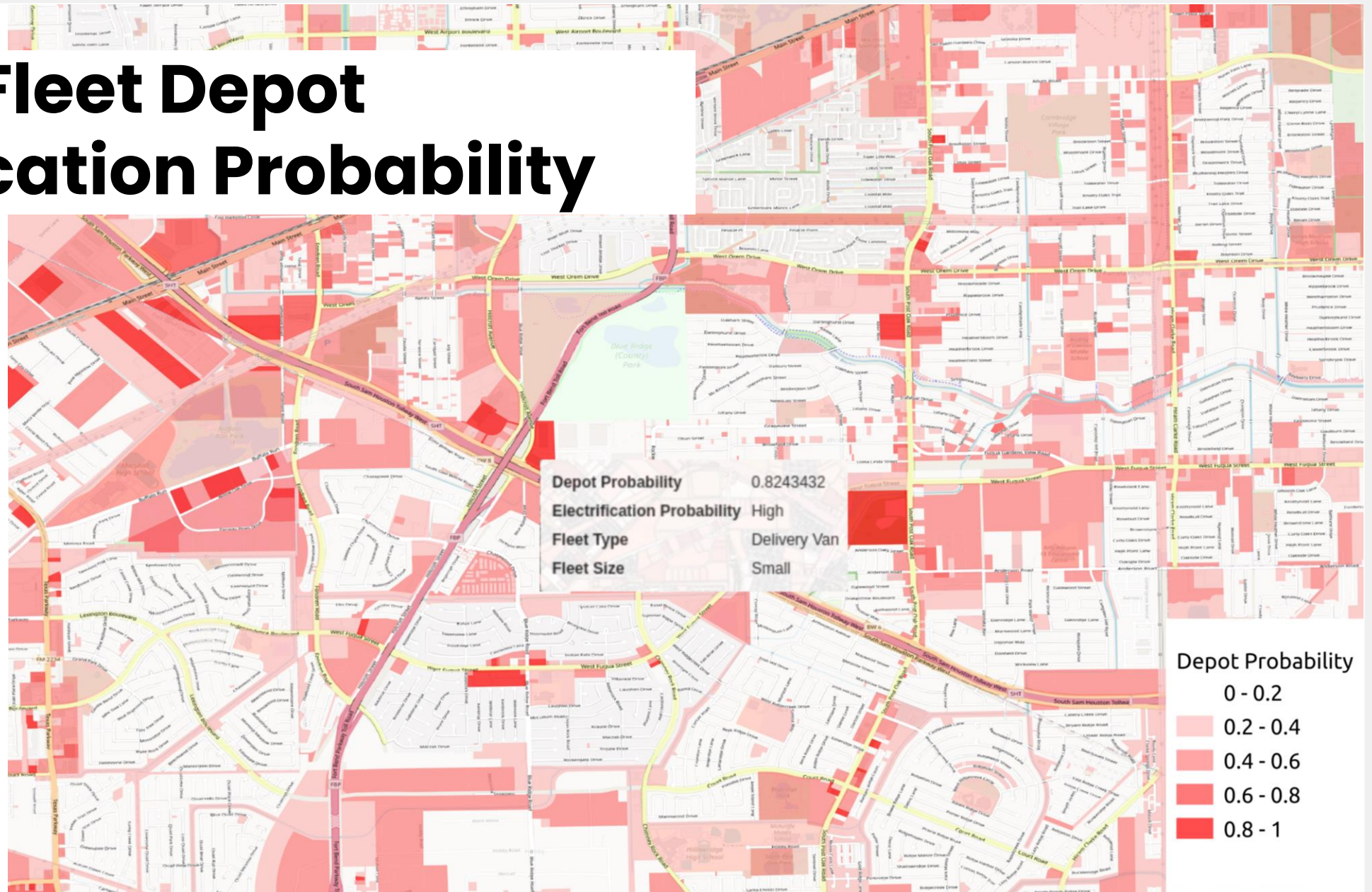
10452 - 20759

OpenStreetMap



# Predict Fleet Depot Electrification Probability

Plan and execute customer engagement programs based on a data-driven approach





## Depots

TUTORIAL

Year

Horizon

2023 2025 2027 2029 2031 2033 2035

## Demand Controls

Electricity Demand Type

☒ Power☐ Energy

Season

☒ Winter☐ Summer☐ Shoulder

Layers

☐ Feeder Lines☒ Depots

Hour

All day ☐

12am 4am 8am 12pm 4pm 8pm 11pm

# Estimate Truck Depot Charging Demand

Search



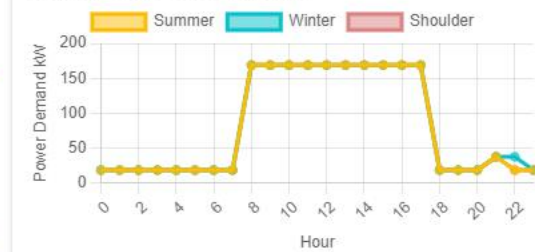
## Depot Information

PROPERTIES

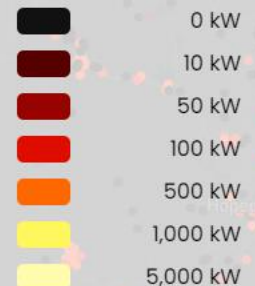
POWER DEMAND

ENERGY DEMAND

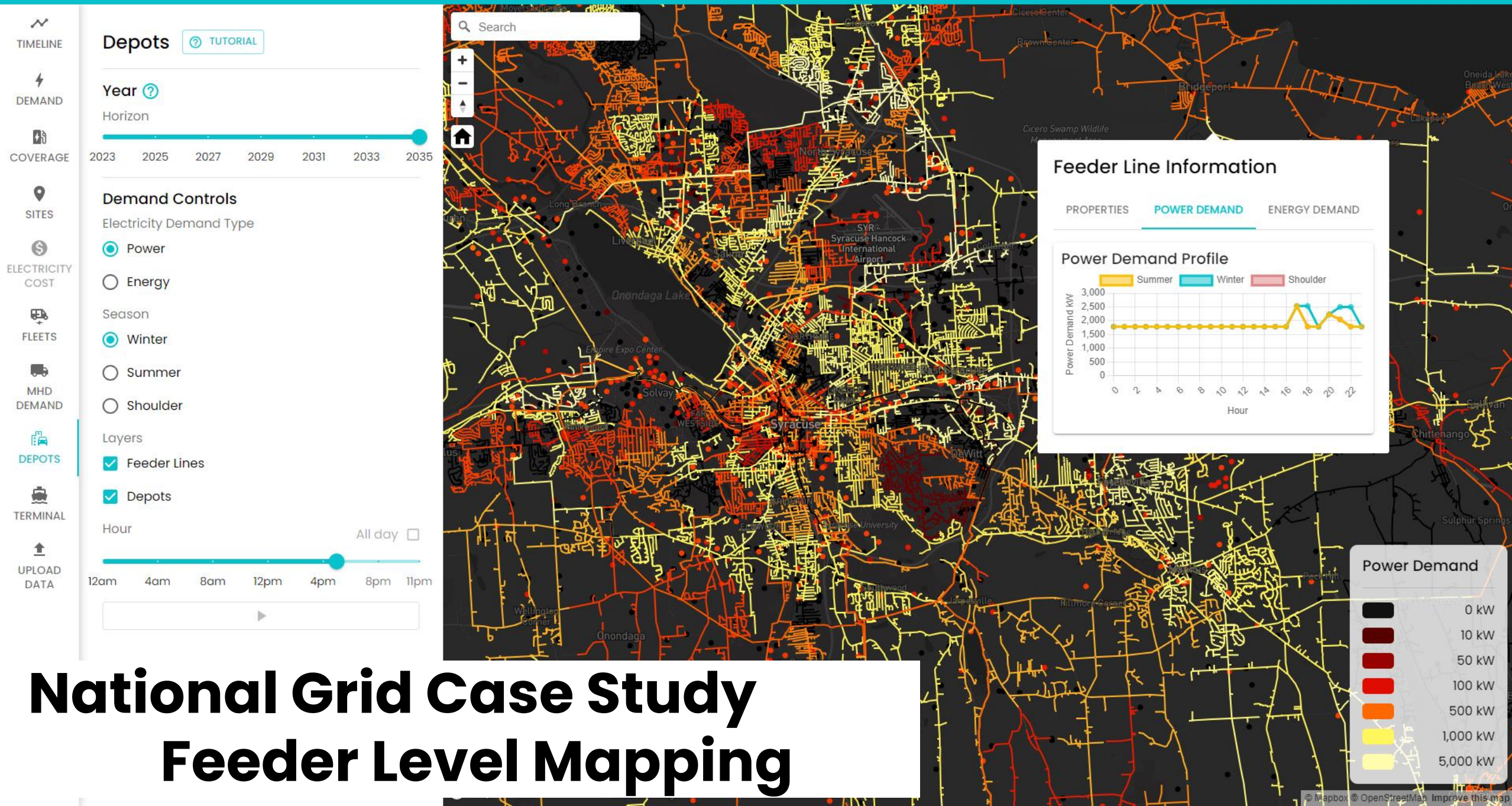
## Power Demand Profile



## Power Demand







# National Grid Case Study

## Feeder Level Mapping



# POLICY NEEDS FOR SUCCESSFUL ZEV TRANSITION



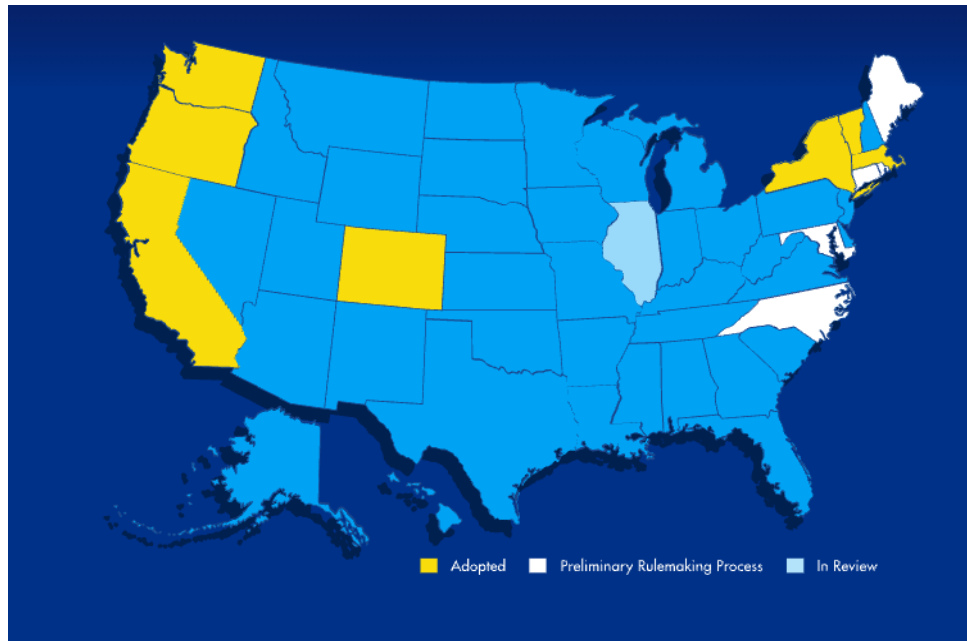
# The policy components of ZEV market transition

Success means cleaner air for our communities, a safer climate, and lower cost per mile for truckers.

- Demand drivers: build scale
- Cost equalizers: glidepath to diesel parity
- Interconnection/infrastructure enablers

# Demand drivers: mandates

## States adopting California's Advanced Clean Trucks Rule



State	Status	Beginning MY	Fleet Reporting Date
California	Adopted	2024	April 1, 2021
Massachusetts	Adopted	2025	Not required
New Jersey	Adopted	2025	April 1, 2023
New York	Adopted	2025	April 1, 2023
Oregon	Adopted	2025	June 30, 2022
Vermont	Adopted	2026	Not required
Washington	Adopted	2025	September 30, 2023
Colorado	Adopted	2024	November 30, 2024 December 31, 2027
Connecticut	Preliminary Rulemaking Process	2024	-
Maine	Preliminary Rulemaking Process	2026	-
Maryland	Preliminary Rulemaking Process	2027	-
North Carolina	Preliminary Rulemaking Process	2027	-
Rhode Island	Draft Rule Language Released	2027	Not required
DC	In Review	-	-
Illinois	In Review	-	-

*As of May 17, 2023*



# California's Advanced Clean Fleets:

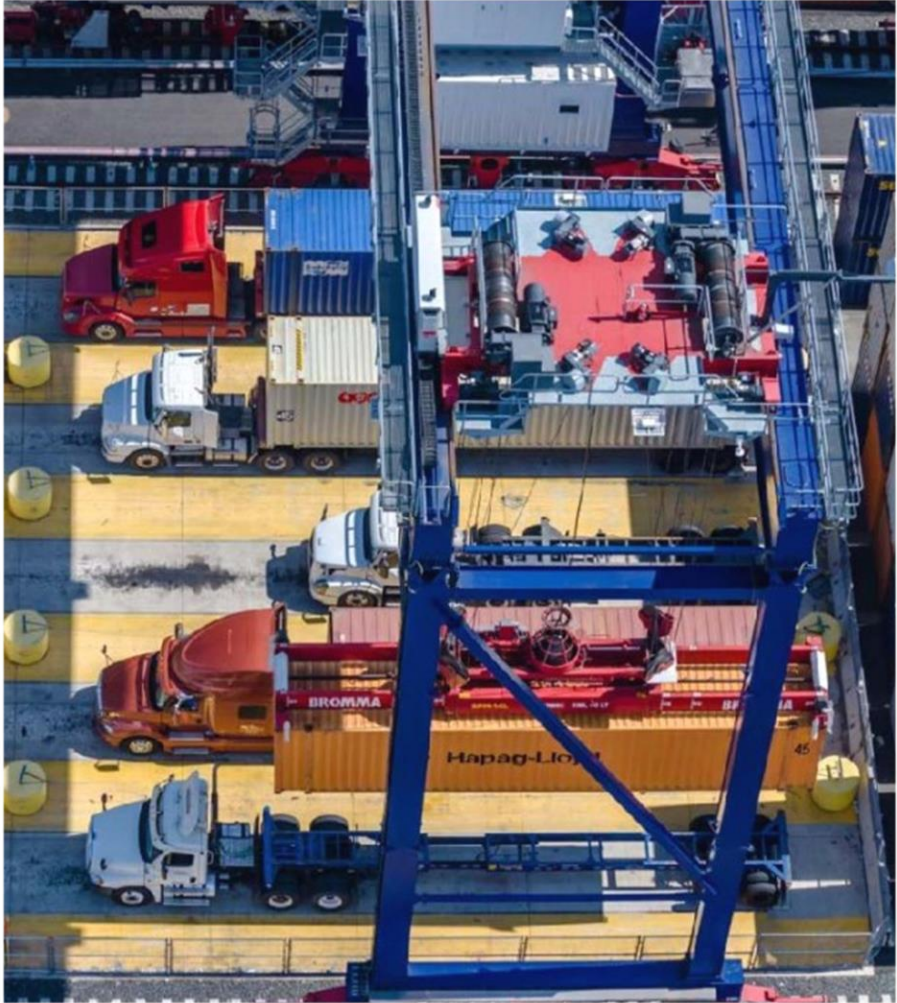
## MHD ZEVs in California:

- 510,000 in 2035
- 1,350,000 by 2045
- 1,690,000 by 2050

## Charging Infrastructure Needed

- 157,000 chargers will be needed to support 180,000 medium- and heavy-duty trucks by 2030
- Average install rate of 53 MHD chargers a day through 2030
- 2031-2045: need average install rate of 229 MHD chargers a day

# Metrics of Transition for CA Drayage by 2035



**80%**

Independent  
operator



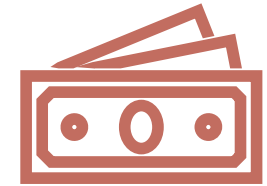
**3,000 acres\***

Charging infrastructure needed



**>2,500MW**

-Charging capacity need  
-2,200 chargers a year



**~\$26B Needed**

~\$9B for trucks  
~\$10B for real estate  
~\$7B for chargers

# Cost equalizers: diesel parity

- Long term TCO is promising: lower costs per mile within sight
- Every investment has to compete, and diesel has a long tail
- Trucks, chargers, charging: each need investment



## LCFS

Low Carbon Fuel Standard Program

### Free electricity and more for electric vehicles

LCFS is a market-based program focused on reducing carbon intensity by providing carbon credit generation opportunities that offsets electricity costs and more in many cases.



Hybrid & Zero-Emission Truck & Bus Voucher Incentive Project

### 50% Instant rebate on ZEV Trucks

HVIP provides point-of-purchase price reductions.

Forum developed a program with CARB called **Innovative Fleet**, a \$25MM program targeted at Independent Operators



Port Infrastructure Development Program

### 80% cost sharing on ZE infrastructure for ports

\$450M in funding to improve safety, efficiency, and reliability of movement of goods through ports

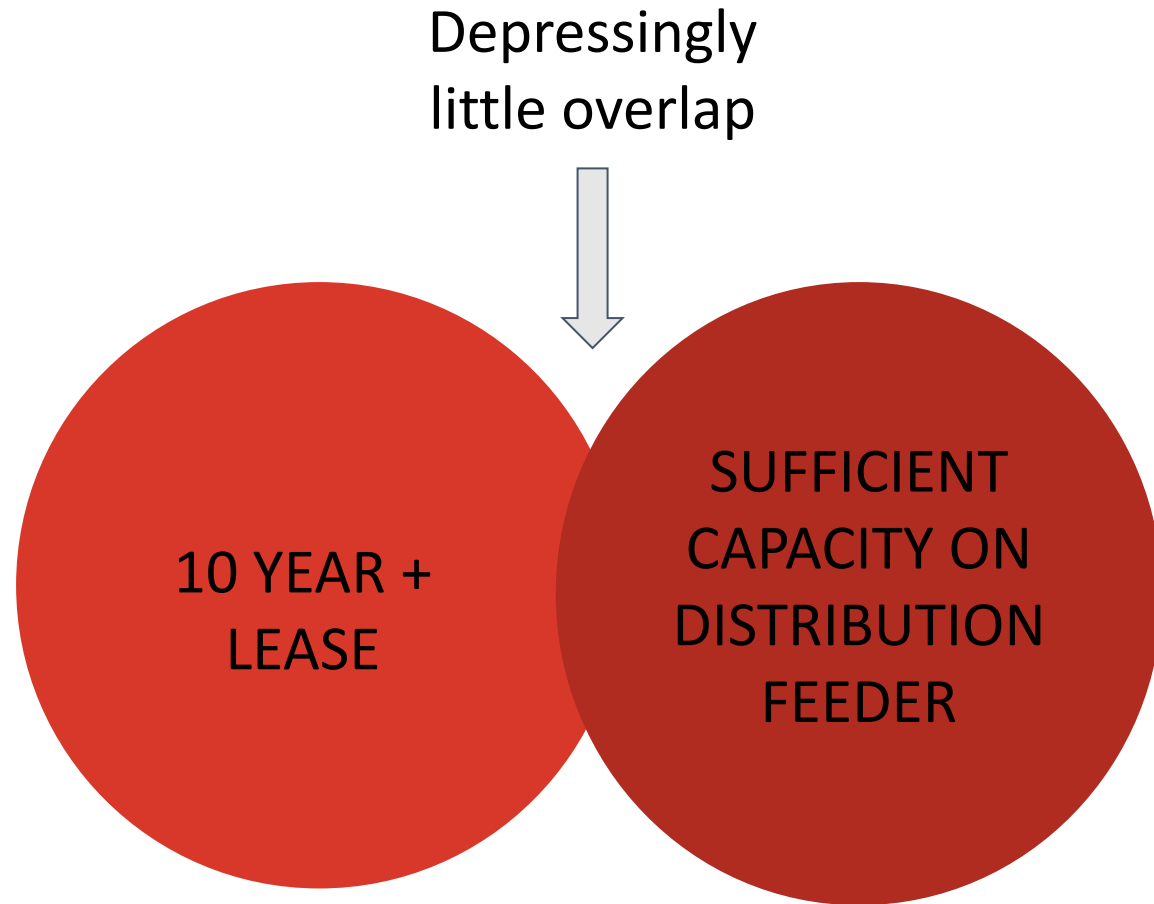
Additional incentives through other programs including:

- Bay Area AQMD: Carl Moyer Program
- Bay Area AQMD: Proposition 1B – Goods Movement Emission Reduction Program
- CARB: VW Environmental Trust
- CEC: Clean Transportation Program (aka Alternative Renewable Fuel Technology Program)
- CEC: EnergIZE

# Infrastructure/Interconnection

- **Short term:**
  - speed of interconnection
  - transparent hosting capacity analysis for siting new depots
- **Medium term: maximize utilization of existing distribution system**
  - Tetris more load via dynamic tariffs, protective relays
- **Long term:**
  - Allow utilities to proactively build out in freight corridors

# Why are 3rd Party Depots Important?



- Many fleets and owner/operators will not be able to charge trucks where currently domiciled
  - Drayage is 80% independent owner-operator
  - Over 50% of warehouses are > 5 year leases
- Third-party depots are sited on freight routes, in places where power is available.
- This increases speed of deployment, and by maximizing utilization of existing grid infrastructure, reduces overall ratepayer costs of electrification.

# The Forum Mobility Solution

- Forum Mobility is building a network of charging depots, sited specifically for drayage, in and around ports and along freight corridors to common freight destinations.
- Forum offers two options:
  - Charging only – you bring your truck
  - A battery-electric truck and charging together
- Fees are monthly, terms are 2-4 years

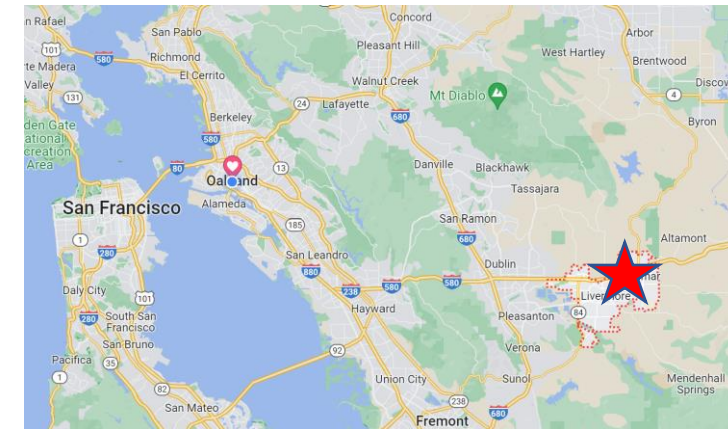


# Forum Depot – Livermore/Greenville Example



Livermore Site:

- 96 Truck Facility
- 6 MW
- Mix of fast chargers and overnight dwell
- Driver parking











[abrowning@forummobility.com](mailto:abrowning@forummobility.com)

510.520.0630



@forum\_zev



[linkedin.com/company/forum-mobility](https://www.linkedin.com/company/forum-mobility)



## Current & Future Regulations for Zero-Emission Trucks



**Adam Browning**

*EVP Policy & Communications  
Forum Mobility*



**John Mikulin**

*Mobile Source Sub-Lead  
Coordinator  
U.S. EPA*



**David Treichler**

*Director of Strategy and  
Technology  
Oncor Electric Delivery*



**Ann Xu**

*Co-Founder and CEO  
ElectroTempo, Inc.*



Moderator:

**Rick Mihelic**

*Director of Emerging Technologies*





CCS1



CCS2



CHAdeMO



J1772



MCS or CharIN



[NACFE.org](https://www.nacfe.org)

Let's Stay Connected...  
... And charged up!



[NACFE](#) (& Spanish: [NACFE LATAM](#))



[NACFE](#)



[@NACFE\\_Freight](#) & [@RunOnLess](#)



[NACFE](#)



[RunOnLess.com](https://RunOnLess.com)

