



# Medium and Heavy-Duty Markets Gear Up: Latest Finds from Electric Truck Demonstrations and Early Deployments

**U.S. Environmental Protection Agency  
SmartWay Transport Partnership  
March 30, 2022, 2 – 3 PM (ET)**



# Today's discussion

- Challenges and Benefits of Electrification in Goods Movement
- NACFE: Run on Less Electric
  - Results of Real-World Demonstrations
- NFI
  - Pioneering a Transition to Zero-Emission Good Movement
- CALSTART
  - Partnerships, incentives, validation, policy



# Challenges and Benefits of Electrification in Goods Movement



- In transportation sector, onroad HD/MD trucks represent
  - 6% of all vehicles on the road
  - 26% of transportation petroleum-based fuel use
  - Around 1/2 NO<sub>x</sub>, 1/4 of GHG emissions
  - Disproportionate community impacts
  
- Potential benefits of electrification
  - Cleaner, more diverse energy source
  - Zero tailpipe emissions
  - Air quality improvements
  - Stable, historically lower energy cost
  - Lower Total Cost of Ownership, Operations



## POLL 1

Does your company currently operate any electric vehicles (fork lift, terminal, PUD, box truck, regional) in its fleets or shipping operations?

yes

no

Within the next five years, does your company plan on purchasing electric vehicles as an alternative to traditional, petroleum-based equipment?

yes

no





# Medium and Heavy-Duty Markets Gear Up: Latest Findings from Electric Truck Demonstrations & Early Deployments

Dave Schaller  
March 2022



# Run on Less by NACFE

2017



Long Haul  
7 Fleets  
10.1 MPG

2019



Regional Haul  
10 Fleets  
8.3 MPG

2021

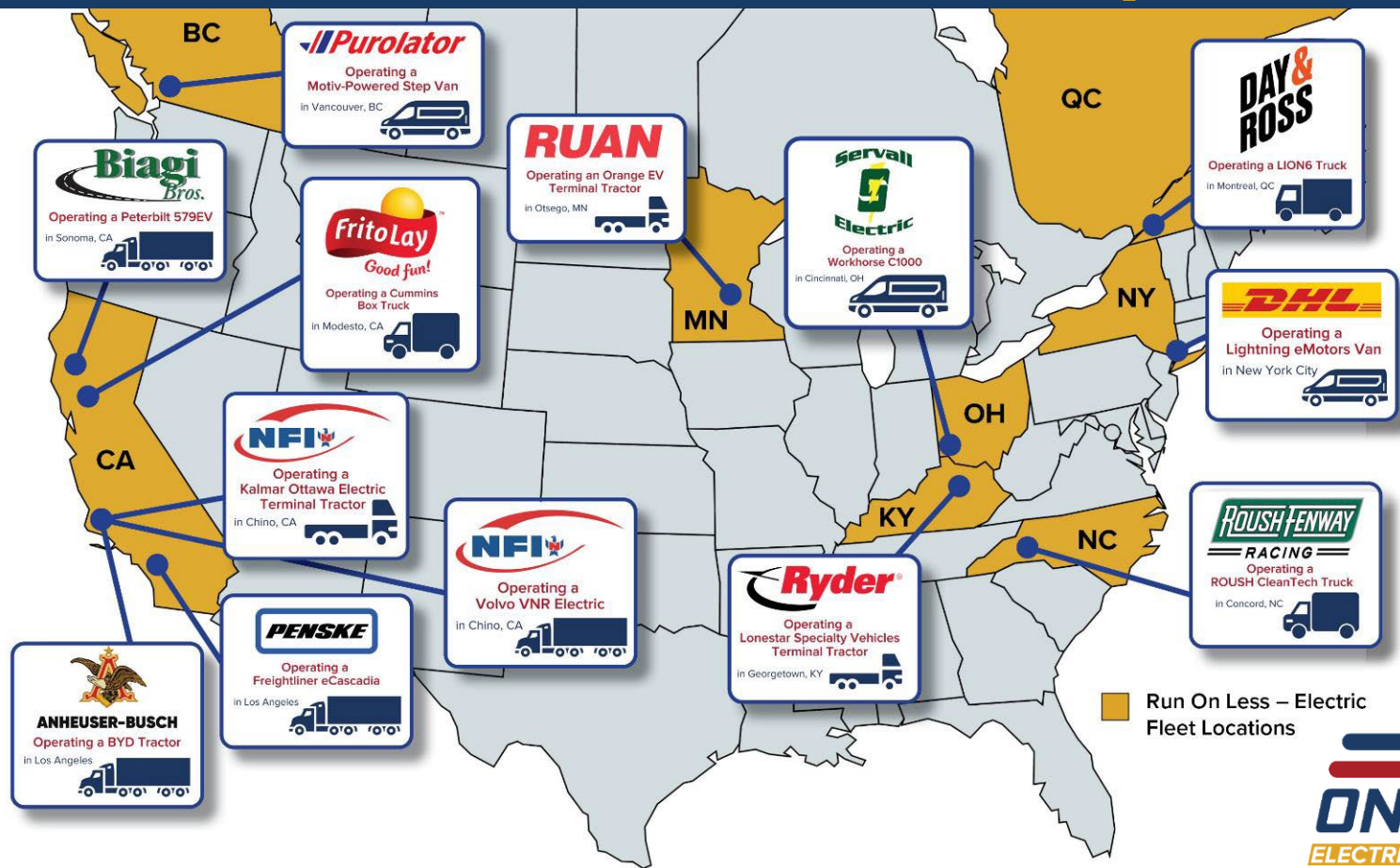


All BEVs  
13 Fleets  
New metrics!

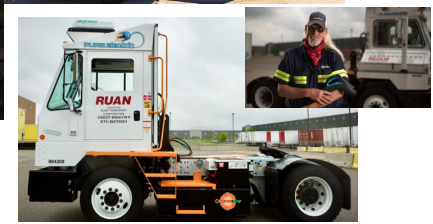




# Run on Less – Electric Participants



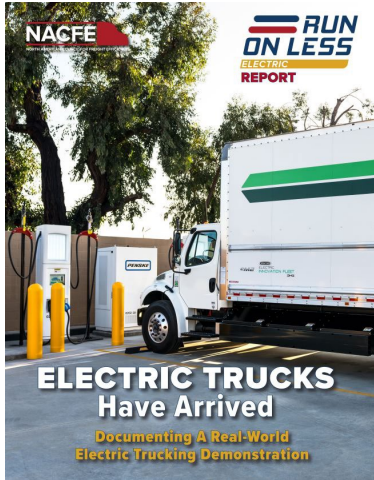
# The Real World



March 2022



# RoL-E Reports



## Review Of Complete Demonstration: [Electric Trucks Have Arrived](#)

**MD BOX TRUCKS** Jointly Owned, Senior Program Manager, NACFE

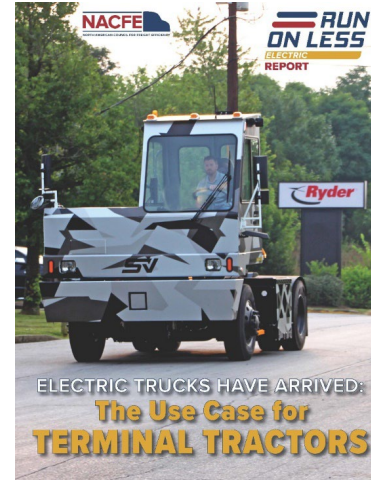
**NACFE**  
THE NATIONAL ASSOCIATION OF CARRIER FLEET ELECTRICITY

**Market Segment & Fleet Profile Fact Sheet**



Operational Characteristics	
Duty Cycle	Return to Base
Use Case	Pickup & Delivery
Average Range	Less than 300 miles
Routes	Variable
Fueling	Centralized
Miles per Gallon	10.0
Replacement Cycle	10-2
Average Age	8-1
Axis Configuration	4x2

## [4 Market Segment Fact Sheets](#)



## The Use Case For [TERMINAL TRACTORS](#)

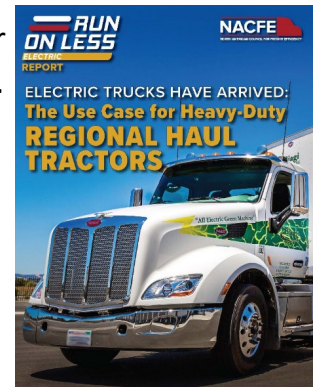
## The Use Case For **VANS & STEP VANS**



## The Use Case For **MEDIUM DUTY BOX TRUCKS**



## The Use Case For **REGIONAL HAUL TRACTORS**



# Specs: Anheuser-Busch

## Truck



Truck Class	<b>Class 8</b>
Type	<b>Heavy-Duty Tractor</b>
OEM	<b>BYD</b>
Model	<b>8TT Tandem Axle</b>
Production Level	<b>In Series Production</b>
Battery Capacity	<b>435 kWh</b>
Estimated Range	<b>150 - 200 Miles</b>
Components	<b>Cabover</b>



## Charger & Utility Company

## Driver

### Driver



Name	<b>Rene Solis</b>
Years Driving	<b>30 Years</b>
Home Base	<b>Pomona, CA</b>

### Charging Station



Max Charge Rate	<b>40 kW (GB/T)</b>
Parking Configuration	<b>Pull in with Trailer</b>
Utility	<b>Southern California Edison</b>

## Duty Cycle

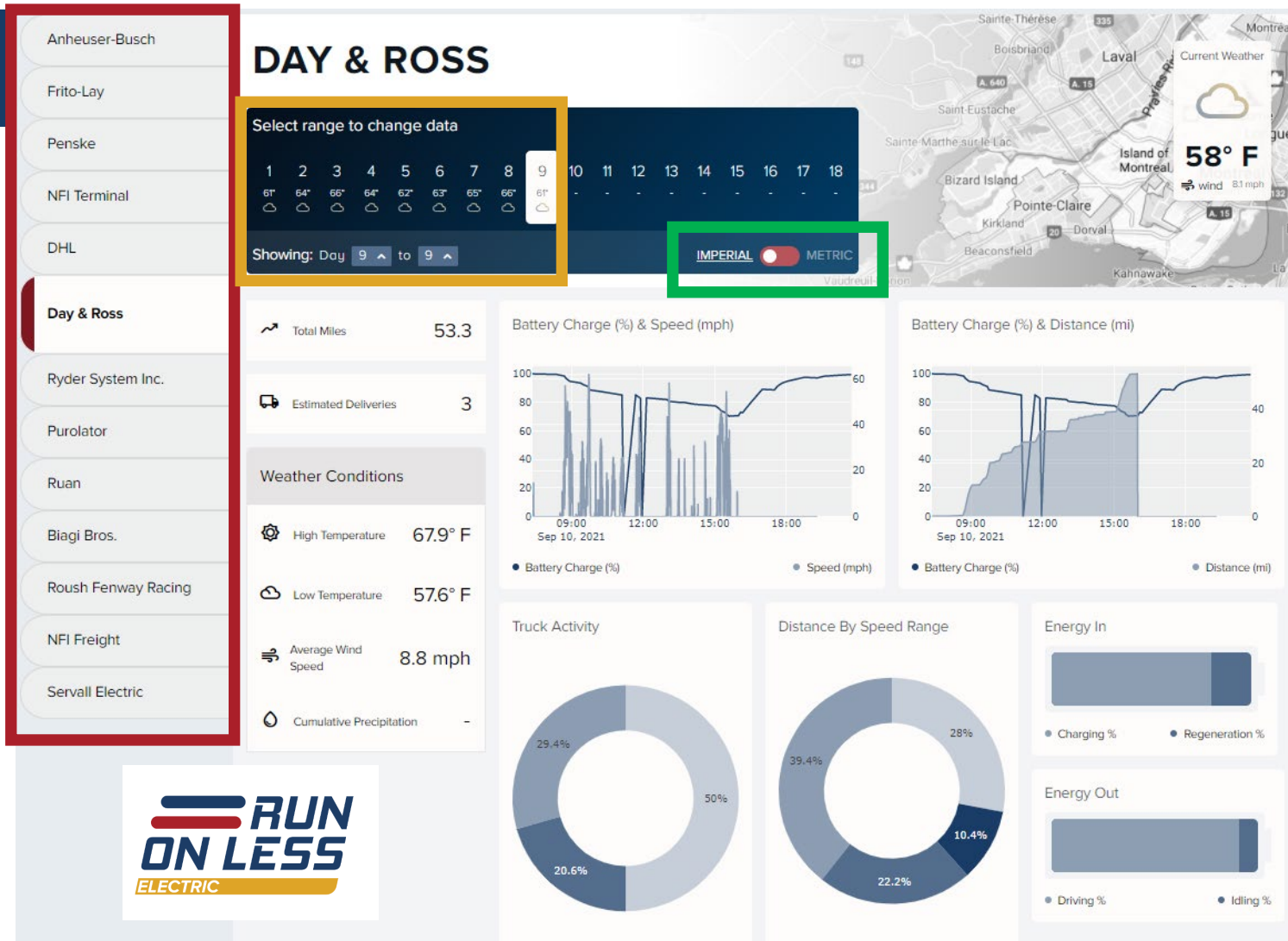
### Route



Route Type	<b>Diminishing Load (7-10 stops per day)</b>
Goods	<b>Beer and Seltzer</b>
Payload Range	<b>Usually heavy, up to 82,000 lbs</b>

# Metrics

1. Select any of the 13 fleets
2. Select a day or range of days
3. Select Units of Measure
4. Enjoy the data!



March 2022





# Run on Less – Electric Videos

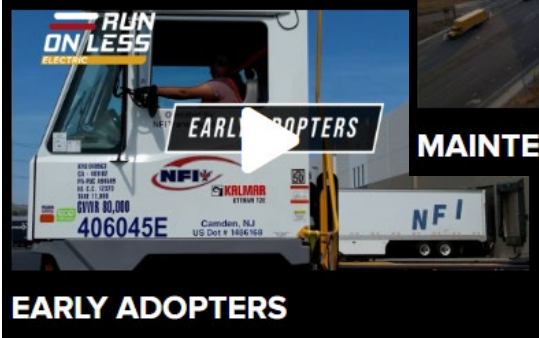
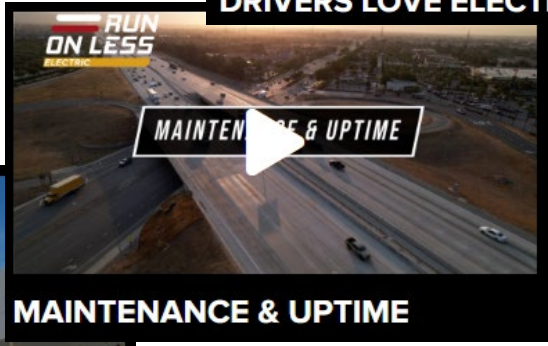
## Real World, Real Time Case Studies

- Video for each fleet & OEM
- Fleet Interviews: Drivers & Leaders
- OEM Interviews & more



March 2022

# Run on Less – Electric Videos



## “Stories from the Road”

- New video every day
- All commercial truck EV related
- Pulled from several dozen interviews



March 2022



# Electric Truck Bootcamp

## ELECTRIC TRUCK BOOTCAMP

### SESSION

- 1 Why Electric Trucks?
- 2 Charging 101 – Planning & Buildout
- 3 Charging 201 – Power Management & Resilience
- 4 Working with Your Utility
- 5 Incentives for Electrification
- 6 Maintenance, Training & Safety
- 7 Finance & Innovative Business Models
- 8 Battery Supply Chains & End of Life
- 9 Global Perspectives
- 10 Drivers & Electric Trucks



[WWW.RUNONLESS.COM](http://WWW.RUNONLESS.COM)

**SCAN**  
for Training  
Videos,  
Quizzes  
and Badges



# Electric Trucks

## Collaboration

- Fleets
- OEMs (Existing & *New*)
- Suppliers
- Dealerships (Sales/Service)
- Governments
- *Charging System Suppliers*
- *Utility Companies*

March 2022





CCS1



CCS2



CHAdeMO



J1772



MCS or CharIN



[NACFE.org](http://NACFE.org)



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

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

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



[NACFE](#)



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



[NACFE](#)



Dave Schaller

[David.Schaller@NACFE.org](mailto:David.Schaller@NACFE.org)

260-602-5713

## POLL 2



Please rank, in order of importance, the biggest challenge your organization sees in purchasing or transitioning to an electric truck/s in its fleet,

Truck cost

Infrastructure  
cost

Knowledge of how electric truck performs  
compared to traditional diesel or gas truck

Other \_\_\_\_\_  
\_\_\_\_\_







**Bill Bliem** | *Senior Vice President, Fleet Services*

TRIAD1828 | 2 COOPER STREET | CAMDEN, NJ 08102



[www.nfiindustries.com](http://www.nfiindustries.com)



# About NFI

Privately held by the Brown Family since its inception in 1932, NFI is a fully integrated third-party supply chain solutions provider. Serving customers around the world, across a variety of industries, NFI is dedicated to providing customized, engineered solutions that propel business to succeed.

Established in 1932

\$3 Billion  
Annual Revenue

14,500+ employees

58M+ SF of  
warehouse space

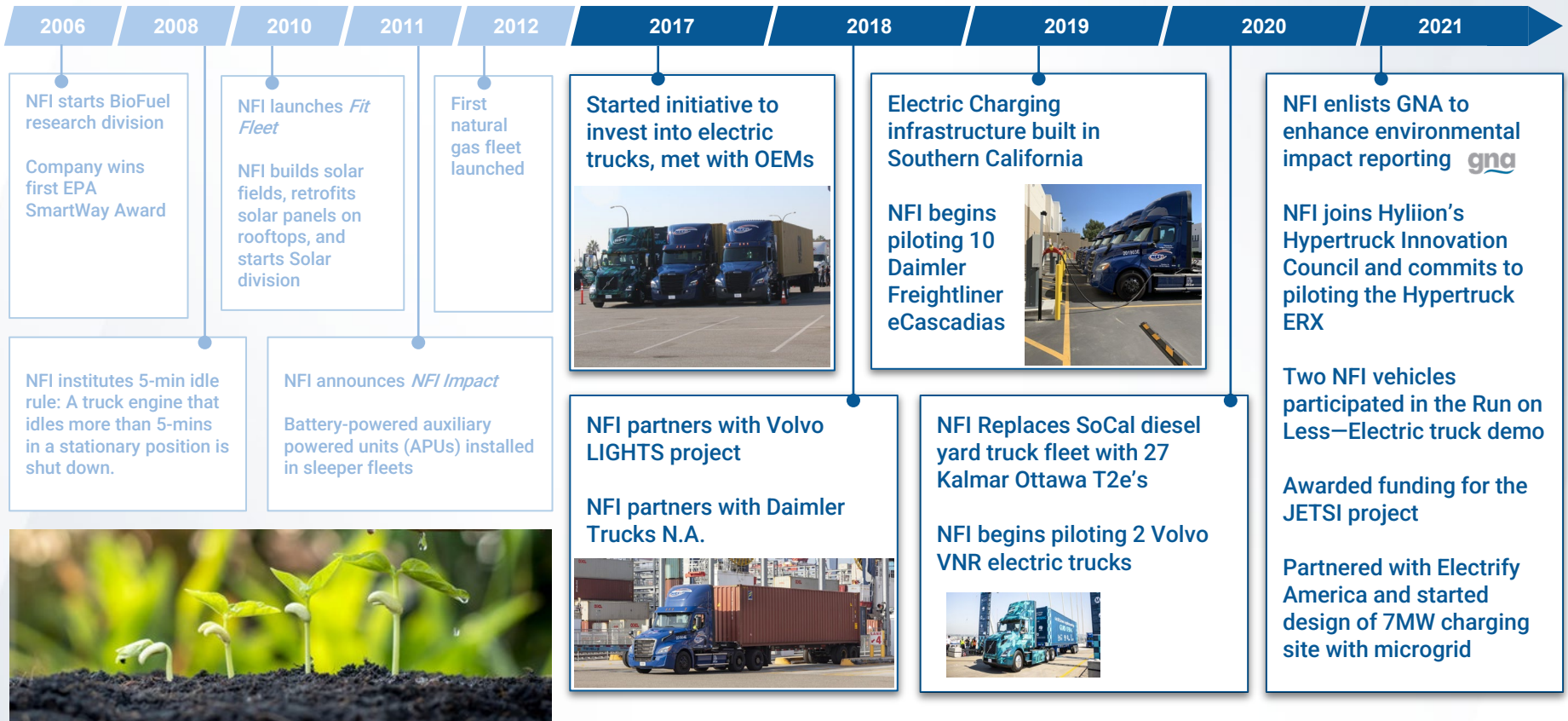
4,500+ tractors

12,500+ trailers

We deliver logistics solutions  
that *transform* the way business  
gets done.



# Sustainability Timeline



# | JETSI

## About the Project

Announced in 2021, the JETSI (Joint Electric Truck Scaling Initiative) Project, funded by CARB and CEC and led by South Coast AQMD, is the largest commercial deployment of battery-electric trucks in North America to date. Helping to significantly increase the number of zero-emission heavy-duty trucks available for goods movement while achieving necessary emission reductions, accomplishments JETSI and NFI will achieve by 2023 include:



**690,000**

Diesel-Gallons Replaced

**8,247**

Metric Tons of GHG Eliminated

**5 Tons**

Pollutants reduced annually



**30**

**Class-8 battery-electric Freightliner eCascadias** will be deployed by NFI from DTNA

**30**

**20 Volvo VNR electric trucks** will be deployed through JETSI and 10 through additional funding

**19**

**350 kW Ultra-fast DC Cabinets** will be installed, with **38 fast chargers**



**1 MW**

Solar power installed onsite

**5 MWh**

Energy storage built onsite

**2.4 Million**

kWh of zero-emission energy generated annually



# Determination of fleet fit

## | Ontario Drayage Fleet



⇒  
50-55 Miles  
Empty

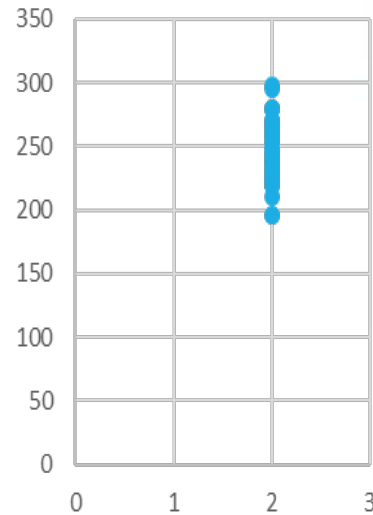


⇐  
10-20 Miles  
Empty

⇐  
60-75 Miles  
Loaded



Miles per day/  
Trips per day



## Considerations

- Distance
- Payload
- Efficiency
- Charging locations
- Charging rate
- Time available to charge

Age

**Efficiency**

**1.8 - 2.2 kWh/mi on our 200 mile tractors  
(2 kWh/mi average)**

50 Miles = 100kWh = 1375 lbs battery weight

**275 miles - approx. 8250 lbs (600 kWh)**

**Keep in mind the reduction in battery output over time**

**Factors –**

Age –Temperatures - Operating at high and low state of charge - Charging speeds - Usage (energy cycles)





# Sustainable Infrastructure



## Charging Infrastructure

NFI's charging infrastructure operates from the grid but creates resiliency to charge NFI's heavy-duty fleet. It's the single largest charging infrastructure project supporting heavy-duty electric trucks in the U.S.

**19**

350 kW Ultra-fast DC Cabinets with 38 chargers by 2023

**7**

150 kW chargers In Chino, CA

**5**

Plans in progress for 150 kW chargers In Paramount, CA

**27**

Yard tractor chargers installed in SoCal campuses

**2**

90 kW chargers In Chino, CA



## Solar Power & Storage

NFI's solar power and storage helps not only to power it's electric vehicles, but also the warehouses and material handling equipment they sit above.

**8 MW**

NFI-owned solar power installed on NFI warehouses (including 1MW with the JETSI Project)

**5 MWh**

of energy storage will be built through the JETSI Project

## Lessons Learned so far on BEV's



### Efficiency is key ingredient

- 1 Don't forget to include all your mpg improvement specs in your BEV
- 2 Driver training is essential

### Range is a factor

- 3 Know your limits, then subtract a percentage
- 4 Range will not increase

### Consider infrastructure first

- 5 Talk to your utility early and often
- 6 Work on future proofing your investment

### Currently not possible without funding assistance

In total, NFI is committing nearly \$23M in investments as a partner in the most significant initiatives advancing zero-emission technology for the transportation industry and has made a concerted effort to win more than \$107.7 million in competitive grants with its partners to build a foundation to scale zero-emission technologies.

# Lessons Learned on Sustainability

## BEV is Part of the Equation

- 1** BEV will help us achieve a portion of our sustainability goals
- 2** Exploring additional options to round out our initiatives
  - Hydrogen
  - Hybrid/Range extender

## Partnerships are Essential

- 3** Need partners with a shared commitment to sustainability goals
  - OEMs
  - Agencies
  - Infrastructure
- 4** Adaptability and flexibility are crucial

## Future Predictions are Hard

- 5** Lessons learned allow us to be better predictors, future proof our investments
- 6** Need to think about sustainability holistically
  - Equipment
  - Infrastructure
  - Workforce Training
- 7** How we achieve zero emissions is still to be determined



# Get in Contact

**Bill Bliem** | *Senior Vice President, Fleet Services*

[bill.bliem@nfiindustries.com](mailto:bill.bliem@nfiindustries.com)

856.507.4443



[www.nfiindustries.com](http://www.nfiindustries.com)



## Medium and Heavy-Duty Markets Gear Up:

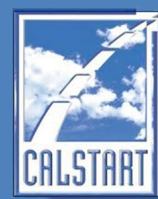
### Latest Findings from Electric Truck Demos and Deployment

U.S. EPA SmartWay Transport Partnership  
March 30, 2022

Kevin Walkowicz CALSTART Sr. Director Truck and Off-Road Program







# CALSTART: A National Clean Transportation Organization

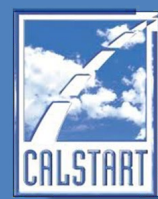
## CALSTART's Mission:

- Work with Industry and Government to Develop Clean Transportation Solutions
- Focus on Developing Solutions across 4 Key Transportation Initiatives:
  - Light Duty Passenger Vehicles
  - Trucks and Off-Road Vehicles
  - Buses and Innovative Mobility
  - Clean Fuels and Infrastructure
- 20+ years of Expertise and Capabilities to Develop Solutions:
  - Technology Demonstration and Validation
  - Market Acceleration (Vouchers and Incentives)
  - State and Federal Policy Development
  - Member Support and Services

Over 300 members to advance and accelerate clean transportation solutions



Headquarters in Pasadena, CA with Regional Offices in Detroit, NYC, Denver, Berkeley, San Joaquin Valley

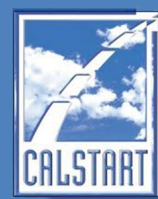


# The Advanced Clean Truck (ACT) Rule

- **June 2020: CA Enacted the Advanced Clean Truck Rule**
- **July 2020: 15 additional states sign an MOU to get to 100% zero emissions by 2050 (NESCAUM)**
- **By End of 2021: 5 additional states have joined CA to enact ACT**  
WA, OR, NY, NY, MA
- **More MOU states could take action in 2022:**
  - CT, PA, CO, ME, VA?
- **CA's ACT is Mfg sales mandate but other 'ecosystem' components are being advocated for:**
  - Incentives (vehicles and infrastructure)
  - Advanced Clean Fleet (ACF) regulation – CA will pass this year, others may follow
  - PUC and other utility rate and programs (EV rates, etc)
  - Utility Make Ready Programs (utility side upgrades for charging)



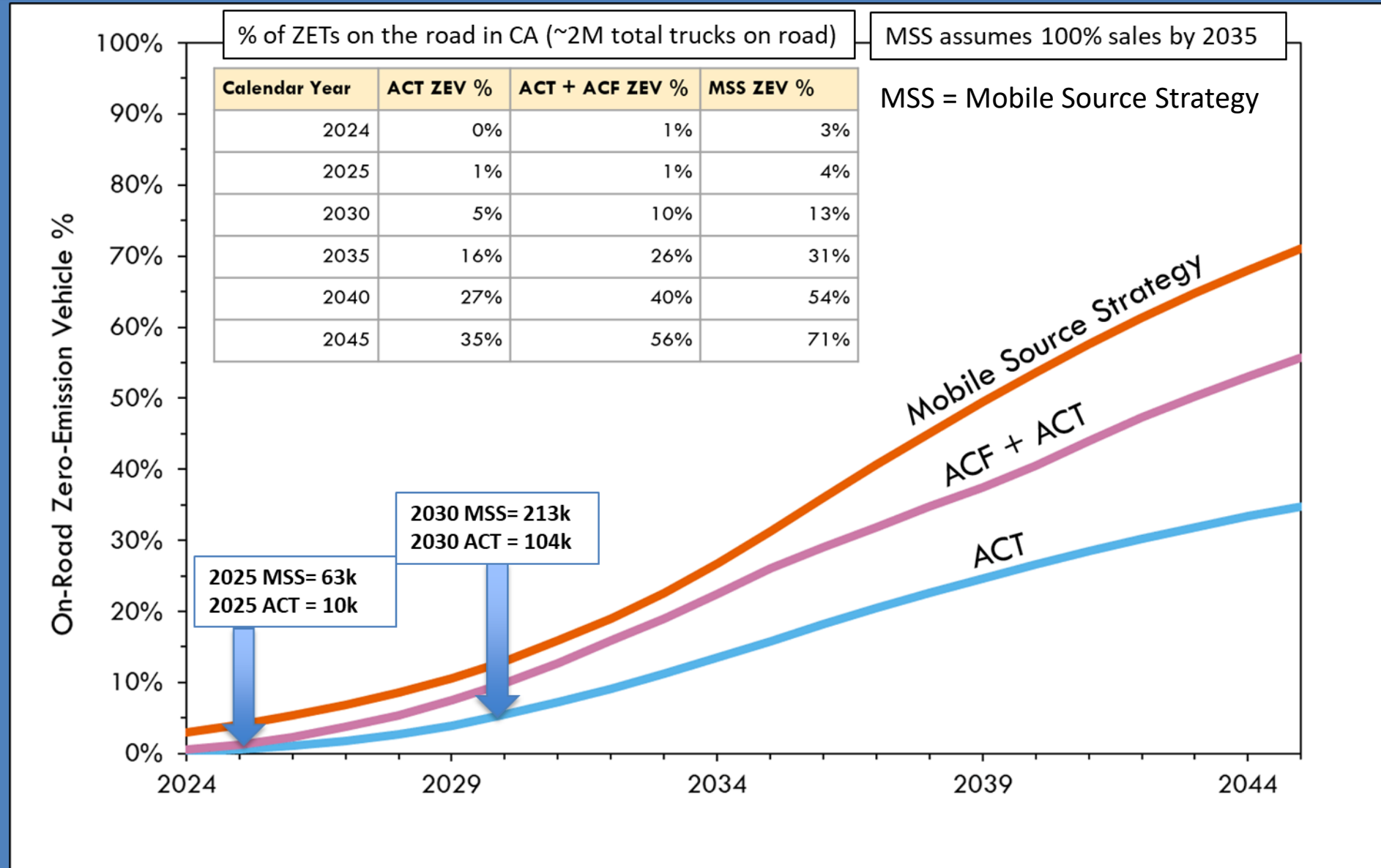
Model Year (MY)	Class 2b-3	Class 4-8	Class 7-8 Tractors
2024	5%	9%	5%
2025	7%	11%	7%
2026	10%	13%	10%
2027	15%	20%	15%
2028	20%	30%	20%
2029	25%	40%	25%
2030	30%	50%	30%
2031	35%	55%	35%
2032	40%	60%	40%
2033	45%	65%	40%
2034	50%	70%	40%
2035+	55%	75%	40%

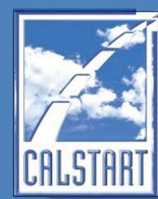


# Projected MHD Vehicles on the Road in CA

## ACT Regulation

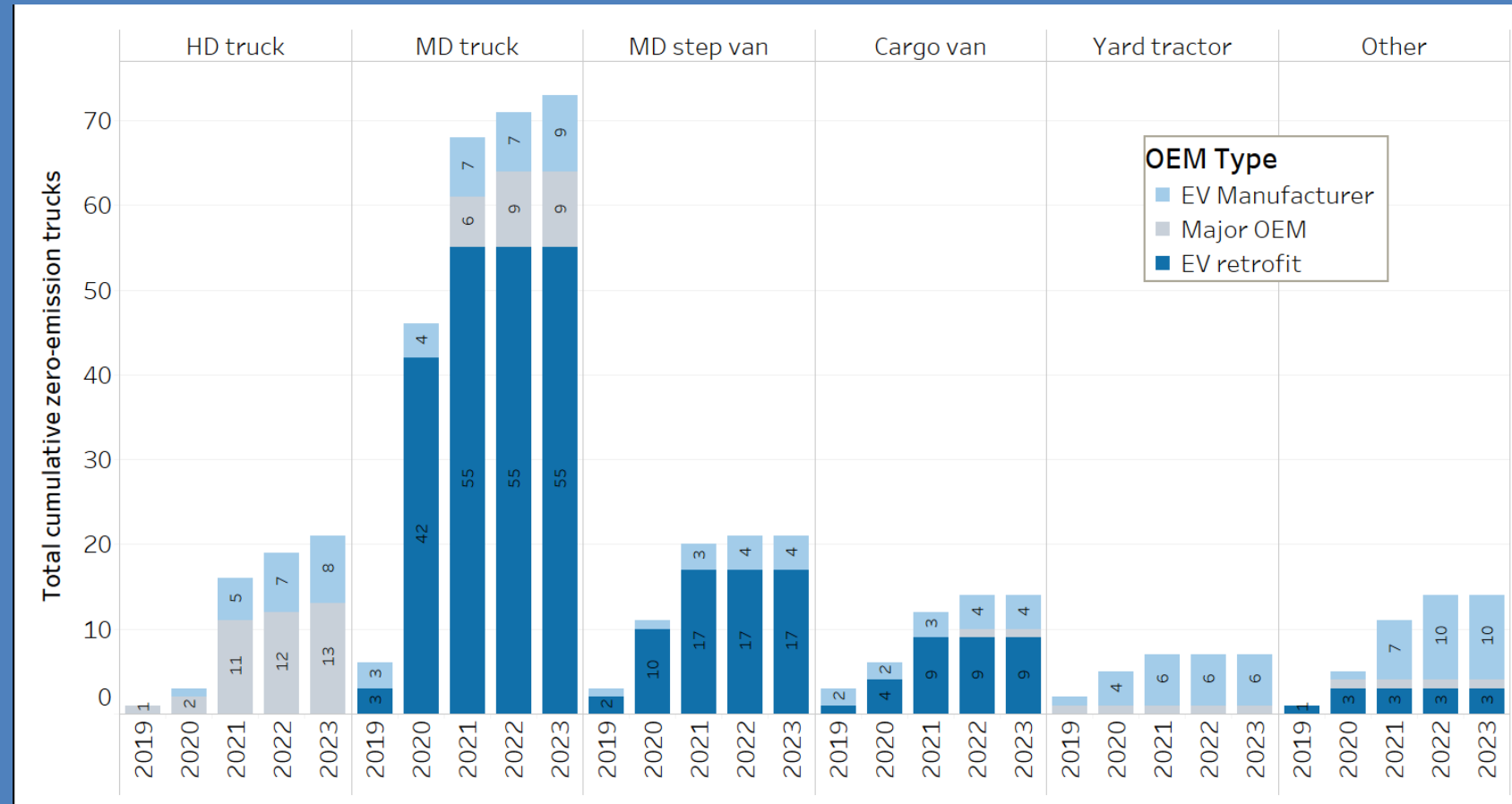
Year	Yearly ACT Driven Sales Expected
2024	4,300
2025	5,800
2026	8,000
2027	12,200
2028	17,000
2029	22,000
2030	27,000





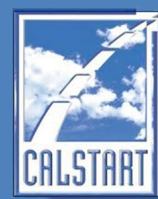
# What is Available Now?

According to CALSTART's Zero Emission Truck Inventory (ZETI): through 2021 there were over 120 models of MHD trucks available from dozens of mfgs available in US and Canada today – with more coming in 2022 and beyond



From CALSTART's Global Drive to Zero Zero Emission Truck Inventory (ZETI)





# How many Zero Emission Trucks have been deployed?

**1,215 Class 2b-8 Zero Emission Trucks (on and off road) deployed since 2011**

~50% were MD trucks

~20% were yard tractor

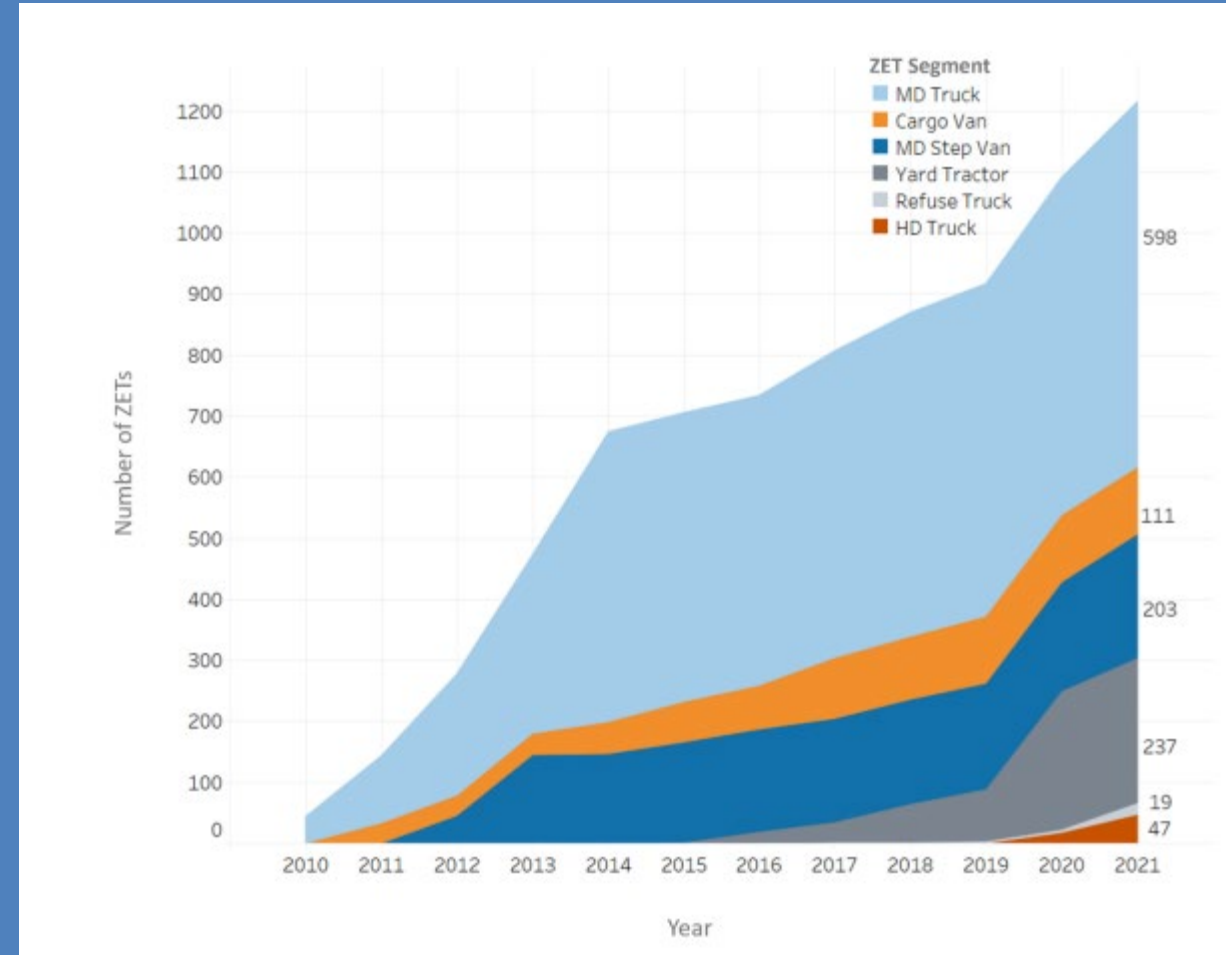
~500 were from early 2011-2013 pilot projects with many no longer in service

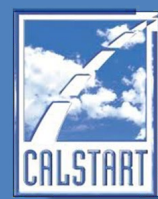
## **Nationally:**

~67% of ZET deployments were from upfitters (Motiv, Lightning eMotors, SEA, etc)

~13% by 'ZET only' mfgs (BYD, Orange EV)

~20% by conventional mfgs (Daimler, Volvo, Navistar, PACCAR, etc)





# Medium and Heavy-Duty Purchase Incentives: HVIP and Energize

The screenshot shows the HVIP website with the following content:

- Navigation: Home, Vehicles, Purchasers, Sellers, Impact, News
- Section: HYBRID AND ZERO-EMISSION TRUCK AND BUS VOUCHER INCENTIVE PROJECT
- Section: Incentives for Clean Trucks and Buses
- Text: Point-of-sale discounts to power California communities and drive commercial technology transformation
- Image: A white truck connected to a charging station.
- Text: Straight Trucks
- Text: \$45K INCENTIVE RANGE \$120K
- Buttons: Vehicle Catalog
- Statistics:
  - 9,000+ Clean Vehicles Funded
  - 60% In Pollution-Burdened Communities
  - 1,580+ Fleets Participating
  - 20% Average Savings per Vehicle

## Hybrid and Zero Emission Truck and Bus Voucher Incentive Program (HVIP):

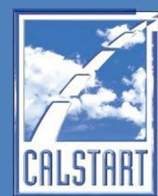
- A point-of-sale discount to purchaser to offset incremental cost of clean vehicles – funded through CARB
- CALSTART has administered since 2010
- Over \$600M allocated since inception
- Class 2b-8 eligible for incentives
- Truck Voucher amounts of \$7,500 (2b)- \$150,000 (class 8 drayage)
- 2022 - Additional 15% incentive if deployed in disadvantaged communities (DAC) and less than 100 truck fleet



## Energize (CEC funded): MHD Infrastructure

- New program just launched last week with initial \$17M
- Additional funding planned
- Four 'funding lanes':
  - EV Fast Track – already purchased vehicles
  - EV Public Charging – for publicly available infrastructure
  - H2 Refueling – fleets or station owners deploying H2
  - EV Jump Start – DAC located users

**energize**  
COMMERCIAL VEHICLES



# CALIFORNIA HVIP: 2021 SUMMARY / 2022 PROJECTION

Approved Vouchers of \$247M for HVIP in 2021

Truck Type	Quantity
Transit Bus	250
School Bus	400
Shuttle Bus	100
Class 8 Tractors	600 (432 Drayage)
Class 4-8 Trucks	600
Refuse and Utility	50
EPTO	36
<b>Total</b>	<b>~2,000 trucks and buses</b>

New for 2022 : **OPENS on March 30<sup>th</sup> !!!**

- Class 2b availability –Ford eTransit, more to follow
- ~500M available this year
- Similar amount for next year – pending budget approval
- New for 2022 is the ‘Innovative Small e-Fleets (ISeF) – \$25M to fund fleets
- Set Asides: \$65M for transit buses, \$46M for Drayage, \$122M for School Buses

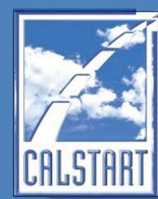
• \$569.5M in Funding Plan

2022 HVIP

• Would provide \$524.5M in Voucher Funding

• Projected Mix:

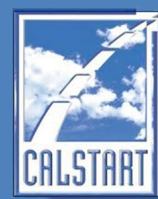
Truck	2,631	280,023,262
Bus	660	93,840,987
School Bus	487	148,651,602
EPTO	76	1,980,222
<b>TOTAL</b>	<b>3,854</b>	<b>524,496,072</b>



## 2021 HVIP MOST REQUESTED MODELS

Volvo VNR BEV Tractor	222
Freightliner eCascadia BEV Tractor	172
Blue Bird All American School Bus	150
Lightning FT3-86 Battery Electric Truck (Cargo and Bus)	119
SEA FORD F-59 EV	101
Xos SV01, battery-electric truck 4x2	99
BYD 8TT Battery Electric Truck	79
Motiv Power System EPIC F-59 Step Van, Shuttle Bus, Truck	78
Micro Bird G5 School Bus	73
LionD Electric School Bus	61





# UPDATE ON MHD: 2021 ZE DRAYAGE TRUCKS IN CA – CARB’S PROJECT 800

As of end of 2021:

HVIP	CARB CEC Pilot	VW Funds	MSRC	YTD Total
432	70	12	116	630



BYD 8TT

HVIP Vouchers	Quantity
BYD (8TT)	50
Freightliner (eCascadia)	80
Kenworth (T680e)	36
Lion (Lion8)	10
Peterbilt (579EV)	50
Volvo (VNR)	206
Total	432



eCascadia



Lion8



T680e

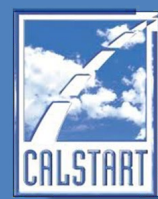


VNR



579EV

Avg HVIP  
drayage truck  
purchase price:  
\$420k



# Truck Deployment Learnings

## Some HVIP Voucher Cancellations in 2021: How to minimize next year

- Infrastructure availability and install expertise/support – need more assistance from utilities or others
- Infrastructure cost and timing - unknowns to install owned infrastructure, lack of public charging for trucks
- Leased Yard Space (installation of infrastructure challenges) – how to get landlord to invest
- Range vs routes and lack of on-route fast charging (+ 200 mi per day needed for some exceeds batteries offered)
- Truck Economics still difficult, even with voucher (2x price of new diesel, even with voucher)
- Unproven / Performance Unknowns: need more demos

CARB/CEC Drayage Pilots (2021) →

## Small Fleets : ISeF hoping to solve this starting in 2022

- Typically buying used \$50k trucks for lower payments – need similar costs
- Can't own/install infrastructure, so need a provider
- Lack of 'spare' trucks in case service is needed; quicker turnaround with older truck repairs
- Less expertise to navigate incentives, infrastructure, LCFS, brokered deals
- Less dealer attention

Project/Fleet(s)	Number of ZETs Deployed	Truck Manufacturer	Type/Model
South Coast AQMD / NFI & Schneider	100	Volvo (20), Daimler (80)	VNRe, eCascadia
Center for Transportation and the Environment / NorCAL Drayage	30	Hyundai	XCIENT Fuel Cell Electric
San Joaquin Valley APCD / Pepsi	50	Tesla	BET Class 8 Semi
San Joaquin Valley APCD / Albertsons	50	Volvo	VNRe
California Hispanic Chamber of Commerce Foundation / Gonzales Logistics Inc	50	Lion	LionBT Drayage



Thank You!  
For More Information:

[www.CALSTART.org](http://www.CALSTART.org)  
[kwalkowicz@calstart.org](mailto:kwalkowicz@calstart.org)



[kearns.denise@epa.gov](mailto:kearns.denise@epa.gov)

**734-214-4240**

