

Battery Electric Trucks

Rob Graff
May 16, 2024

IN PRACTICE



What I Want to Tell You in Ten Minutes

- NACFE is a great resource that will not cost you a
- Battery electric trucks are in use today in real fleets doing real work.
- Challenges remain, but they are not insurmountable.
- Clean Air Agencies can support developing the common ecosystem that electric utilities and truck fleets need to meet their mutual goals.



North American Council for Freight Efficiency



www.NACFE.org

www.RunonLess.com

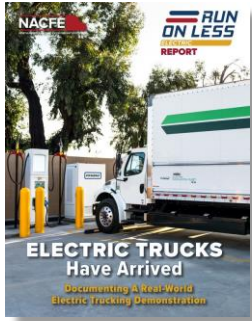
- Seed planted at RMI 15 years ago
- Mission: double freight efficiency
- Unbiased, fuel agnostic, non-profit
- All stakeholders
- Provide guidance on available and emerging technologies:
Aerodynamics to HFC vehicles
- *Run on Less* demonstrations



IN
PARTNERSHIP
WITH



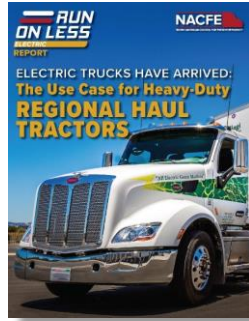
Key Reports on ZE Trucks



Jan 2022
Review Of Complete
Demonstration:
[Electric Trucks Have Arrived](#)



Jun 2022
The Use Case For
[Medium Duty
Box Trucks](#)



May 2022
The Use Case For
[Regional Haul
Tractors](#)



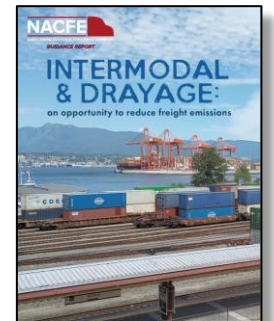
Feb 2023
[The Messy Middle:
A Time For Action](#)



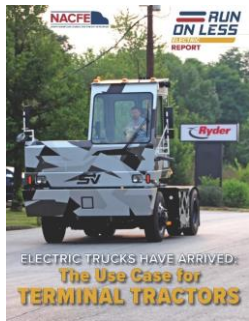
Dec 2020
[Making Sense of Heavy Duty
Hydrogen Fuel Cell Tractors](#)



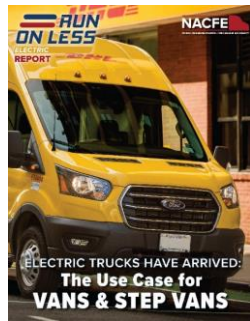
Apr 2023
[Hydrogen Trucks:
Long-Hauls Future?](#)



Dec 2023
[Intermodal &
Drayage](#)



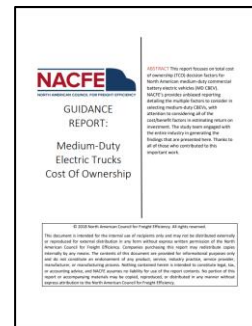
Mar 2022
The Use Case For
[Terminal Tractors](#)



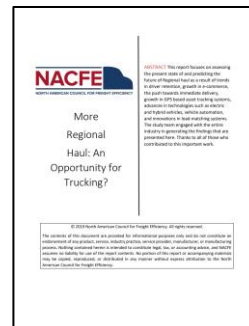
Apr 2022
The Use Case For
[Vans & Step Vans](#)



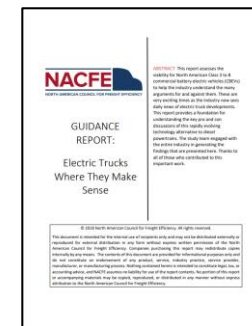
May 2024
[Electric Truck
Depots are
Evolving](#)



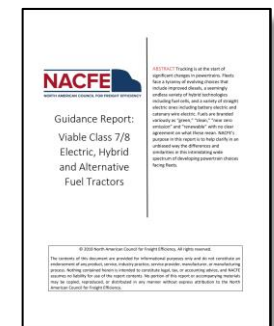
Oct 2018
[Medium Duty
Electric Trucks TCO](#)



Apr 2019
[More Regional Haul:
An Opportunity for
Trucking?](#)




May 2018
[Electric Trucks:
Where They Make
Sense](#)



Dec 2019
[Viable Class 7/8
Electric, Hybrid and
Alternative Fuel
Tractors](#)

www.nacfe.org


Key Reports on Charging Infrastructure



NACFE
NORTH AMERICAN COUNCIL FOR FREIGHT EFFICIENCY

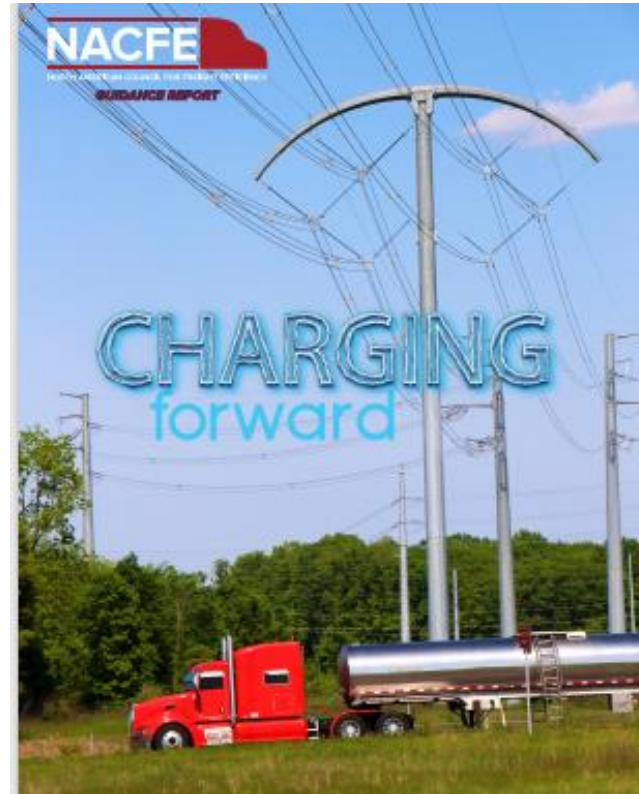

Amping Up: Charging Infrastructure for Electric Trucks Guidance Report

ABSTRACT: This report focuses on charging infrastructure decision factors for North American commercial battery electric vehicles (CBEVs). NACFE provides unbiased reporting detailing the multiple factors to consider in planning for charging infrastructure, which is widely regarded as the most challenging aspect of CBEV deployment. The study team engaged with the entire industry in generating the findings that are presented here. Thanks to all of those who contributed to this important work.



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March 1, 2019
Purchaser's Internal Use Only



Charting the Course for Early Truck Electrification

NACFE



02:19

vimeo



High-Potential Regions for Electric Truck Deployments

NACFE



03:39

vimeo

EXECUTIVE SUMMARY

When it comes to early electric truck deployment, there is a lot to think about—everything from charging infrastructure to which companies are the best in the market to where the most funding and incentives are available. This Resource helps not just fleets, but utilities, CBEV manufacturers, and others think through the many considerations to ensure that wherever they deploy electric trucks, they're successful.

—Peter Basso, Director of Global Sustainability, UPS

TECHNOLOGY
Range, climate, and power availability are key factors in determining the viability of electric trucks in different regions.

REGULATIONS
Local, state, and federal regulations can significantly impact the deployment of electric trucks in different regions.

INCENTIVES
Federal, state, and local incentives can significantly impact the deployment of electric trucks in different regions.

MARKET
The availability of electric trucks and charging infrastructure is a key factor in determining the viability of electric trucks in different regions.

OPERATIONS
The availability of electric trucks and charging infrastructure is a key factor in determining the viability of electric trucks in different regions.

www.nacfe.org

Run on Less - "Best of the Best"

2017



2019



2021



2023



Long Haul
7 Fleets
10.1 MPG



Regional Haul
10 Fleets
8.3 MPG



All BEVs
13 Fleets
New metrics!



BEV Depots
10 Depots
Infrastructure

Run on Less - Electric DEPOT 2023

- 10 fleet locations
- Each has at least 15 electric trucks
 - Many had more
- Fleet videos
- Telematics data

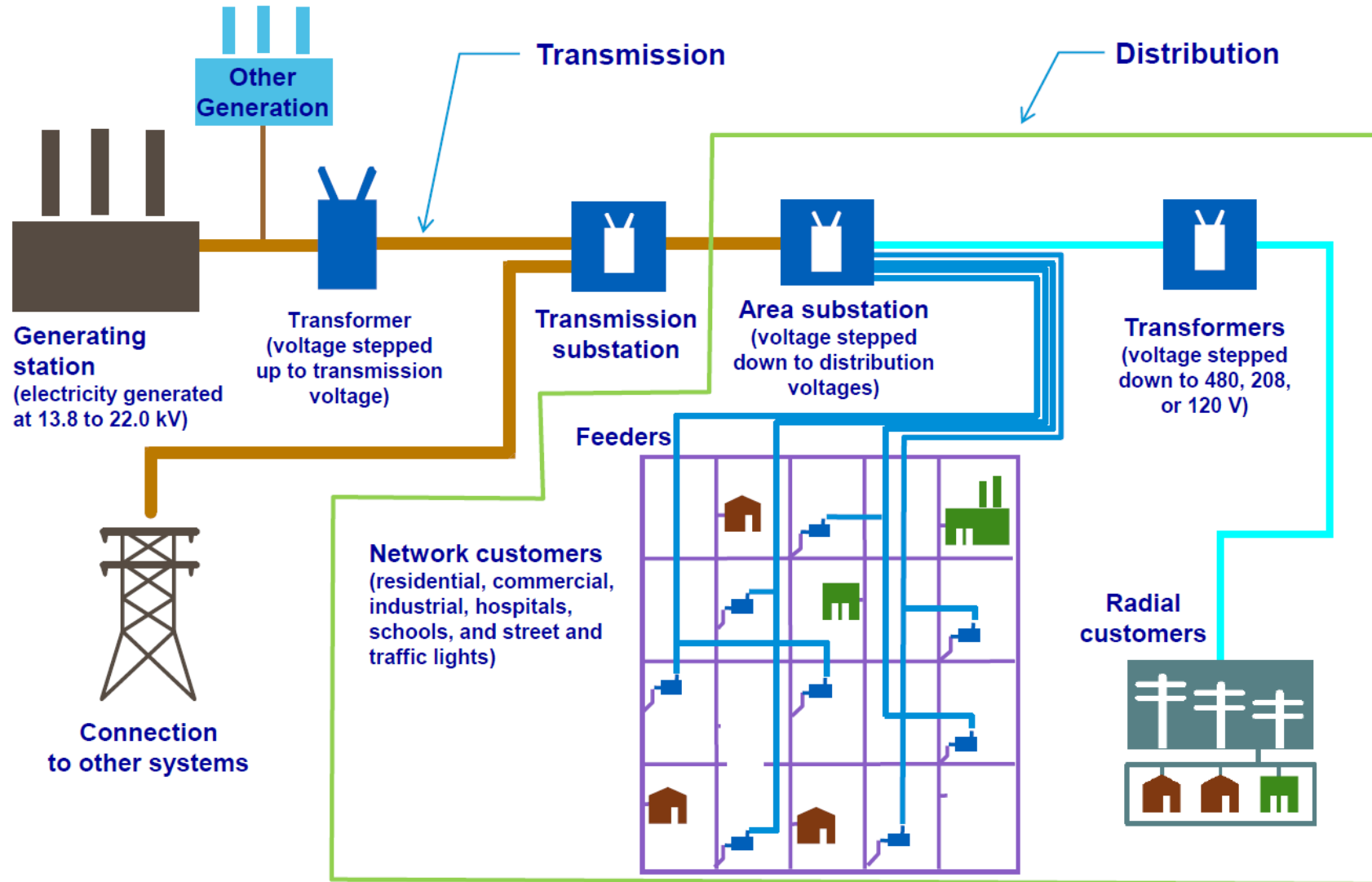
All information at:
RunOnLess.com





[take a breath]

Electrical System in One Picture

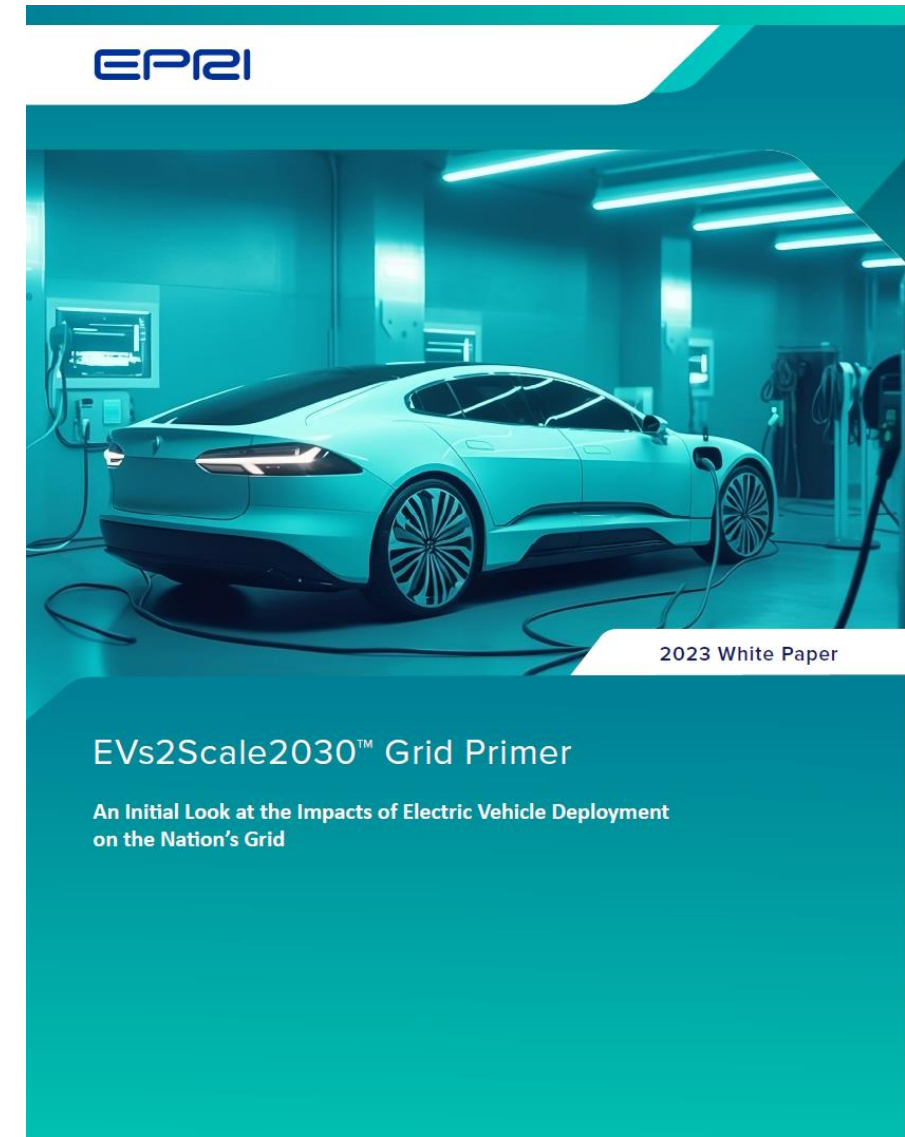


Over 3200 Utilities in the US

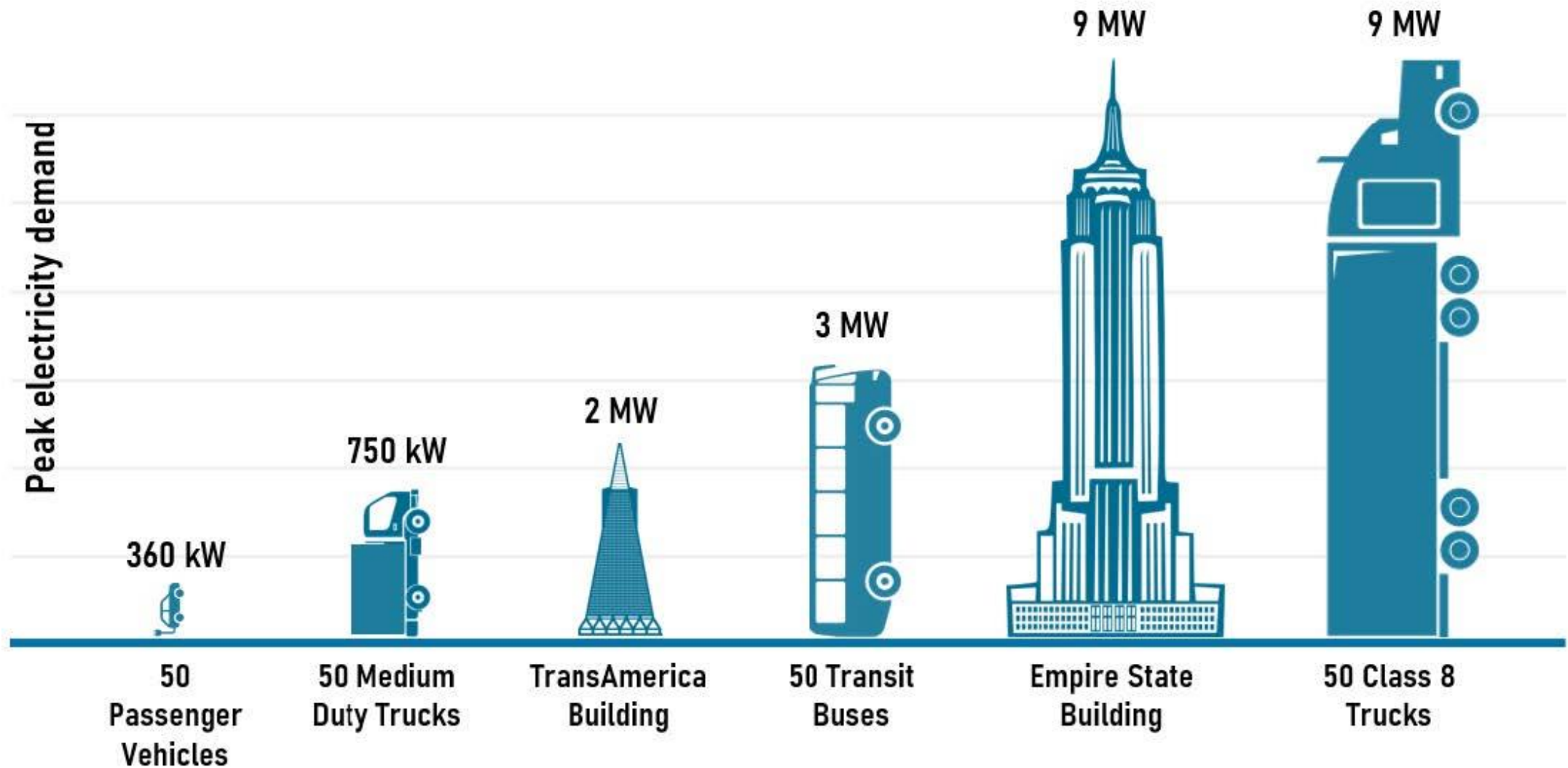
EPRI's surveyed 18 utilities across the US regarding upgrade required to serve higher load requirements

“There is no such thing as a “typical” distribution grid. Each distribution system and feeder is designed differently based on aspects like geographical location, build year, number and type of customers being served, utility practices, and regulatory landscape, among others.”

<https://www.epri.com/research/products/000000003002028010>



Electric Fleets use a Lot of Power



Electric Fleets and Electric Utilities

Category	Load Size
Small	< 1 MW
Medium	1 to 5 MW
Large	5-10 MW
Very Large	10 – 20 MW+



- Frito-Lay Queens = 0.9 MWh/day \approx 100 kW load
- Schneider El Monte = 52 MWh/day \approx 6 MW load

Given NACFE modeling of current electric trucks and known duty cycles for all trucks at each site.

Upgrades and Time – Varies Greatly

UPGRADE	TYPICAL TIMEFRAME	LOAD SIZE
No upgrades	0 to 12 months	1 to 5 MW
Upgrades to an existing feeder	6 to 24 months	1 to 20 MW
Building a new feeder	12 to 36+ months	5 to 20 MW
Upgrades to an existing substation	24 to 60 months	5 to 20 MW
Building a new substation	24 to 60+ months	10 to 20 MW

What Can Ease This Bottleneck?

- Early communications between fleets and utilities
- Humility on both sides of the conversation
 - Both are part of very complex systems
 - Both industries are learning about how best to change
 - Fleets:
 - How to better specify vehicles and chargers
 - How to better manage timing and level of power usage
 - Utilities:
 - Learn more about exactly how fleets work
 - Develop flexibility in load planning systems
 - Look to experienced third parties, such as consultants.

Takeaways

- NACFE is a great resource that will not cost you a
- Battery electric trucks are in use today in real fleets doing real work.
- Challenges remain, but they are not insurmountable.
- Clean Air Agencies can support developing the common ecosystem that electric utilities and truck fleets need to meet their mutual goals.



THANK YOU
rob.graff@nacfe.org

The logo for NACFE features the acronym "NACFE" in a bold, white, sans-serif font. The letters are positioned between two horizontal red lines. To the right of the text is a large, solid red shape that resembles a stylized map of North America or a similar geographical outline.

NACFE

NORTH AMERICAN COUNCIL FOR FREIGHT EFFICIENCY

THANK YOU

rob.graff@nacfe.org

Small depots are ready for electrification now and electrification at large depots is gaining momentum.

There have been big improvements in trucks and chargers since Run on Less - Electric in 2021.

The industry needs cost and weight reductions to improve the total cost of ownership.

It's still taking too long for power to be delivered and infrastructure to be installed which is driving the use of portable/temporary charging.

FINDINGS

Range can be extended with multiple charges per shift at the depot and en route.

The diversity, passion and capability of the people involved is helping to scale electric trucks.

GULP

Market Segmentation & ZEV Reports

Class 3-6	Vans & Step Vans		RoL-E Vans & Step Vans EV Use Case – Apr '22
Class 6	MD Box Trucks		MD Electric Trucks TCO – Oct '18 RoL-E MD Box Trucks EV Use Case – Jun '22
Class 7&8	Reg Haul - Return to Base	Short	ZEV for Drayage Report – Coming Jan '24 More Reg Haul – An Opportunity – Apr '19 Viable Class 7/8 Electric Trucks – Dec '19 RoL-E Report EVs Have Arrived – Jan '22 RoL-E Terminal Tractors Use Case – Mar '22 RoL-E HD Tractors Use Case – May '22 Charging Forward (Infrastructure) – Jun '23
		Medium	
Long			
	Long Haul - Disparate Routes		Elec Trucks Where They Make Sense – May '18 Hydrogen Trucks LH's Future – Apr '23

Market Segmentation & ZEV Reports

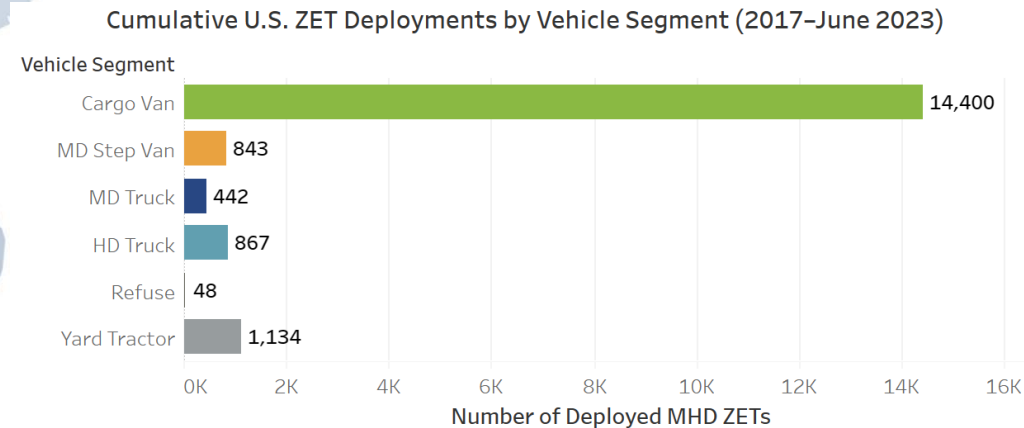
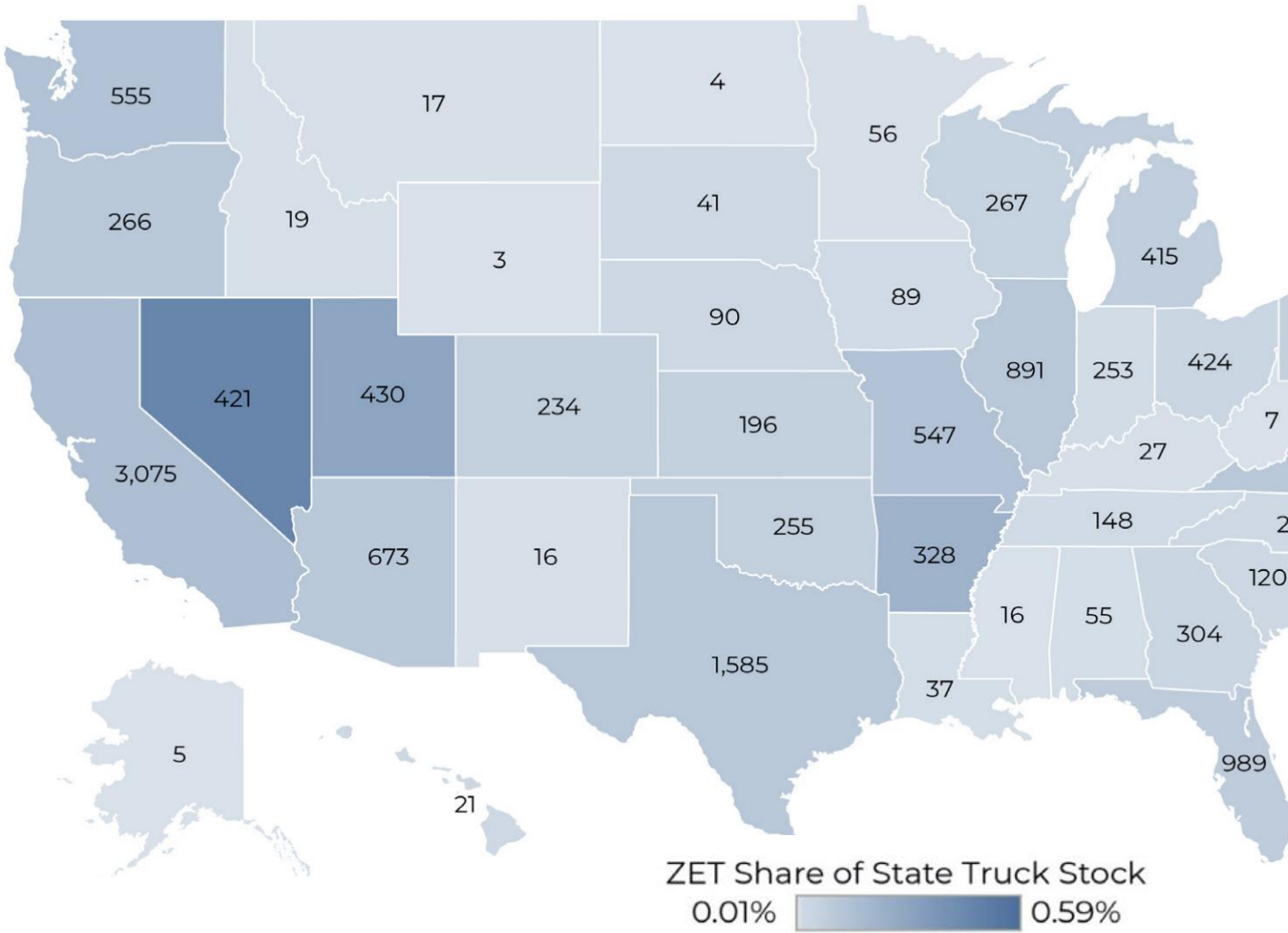
Class 3-6	Vans & Step Vans		RoL-E Vans & Step Vans EV Use Case – Apr '22
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		Long	
	Long Haul - Disparate Routes		Elec Trucks Where They Make Sense – May '18 Hydrogen Trucks LH's Future – Apr '23

Run on Less – Electric DEPOT

EV Truck Deployments (Jun '23)



- Deployed as of June 2023
- 17,734 Zero Emission Trucks Deployed 2b-8
- 13% are in California (2022 = 46% and 2021=60%)



Source: CALSTART January 2024

[Zeroing in on Zero-Emission Trucks: The State of the U.S. Market \(calstart.org\)](https://calstart.org)

Upgrading Distribution System

Substation Level

Transformer upgrade

New transformer

New substation

Feeder Level

Line/transformer upgrade

New line/transformer

New voltage regulation equipment
(line regulators/capacitors)

Voltage class upgrade

New feeder