



# GETTING TO WORK: MEDIUM AND HEAVY DUTY ELECTRIC VEHICLES

HOSTED BY SOUTHERN NEVADA'S  
CLEAN CITIES COALITION

MAY 10, 2023

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# OVERVIEW

- Clean Cities Introduction
- Presentations
- Q&A



**Dave Schaller**  
NACFE



**Marcie Willard**  
Lightning eMotors



**Matt Meyer**  
DANNAR

- National network through the US Department of Energy
- Goal:
  - Reduce petroleum fuels
    - Approved alternative fuels
    - Idling reduction
- Purpose:
  - Reduce dependence on foreign oil
  - Provide cleaner air
  - Lower greenhouse gas emissions
- 75 Coalitions in the United States
  - ...but no representation in Nevada!
- Clark County is currently working towards a designation





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## WHO IS A STAKEHOLDER?

- Anyone interested in reducing their petroleum fuel use!
- We want to work with:
  - Fleet managers
  - Car dealerships
  - Nonprofits
  - Municipalities
  - Fuel providers
  - Public Organizations
  - Trade unions and mechanics
  - Individuals interested in sustainable transportation

# HOW TO PARTICIPATE?

Quarterly Stakeholder Meetings

Online Programming

In-Person Events

Join a Working Group

Opportunities to support, present & host





## WANT TO LEARN MORE?

Visit our website by scanning this QR code

Email [Nicole.Wargo@ClarkCountyNV.gov](mailto:Nicole.Wargo@ClarkCountyNV.gov)





**Southern  
Nevada  
Clean Cities  
Coalition**



# Getting To Work: MD & HD Electric Vehicles

Dave Schaller

May 2023



# North American Council for Freight Efficiency



- Unbiased, fuel agnostic, non-profit
- Mission to double freight efficiency
- All stakeholders
- Scale available technologies, **guide future change** and Run on Less demonstrations.

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

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





# No Membership Fees: Thanks to Sponsors

Platinum



Gold



Silver



Bronze



Philanthropy



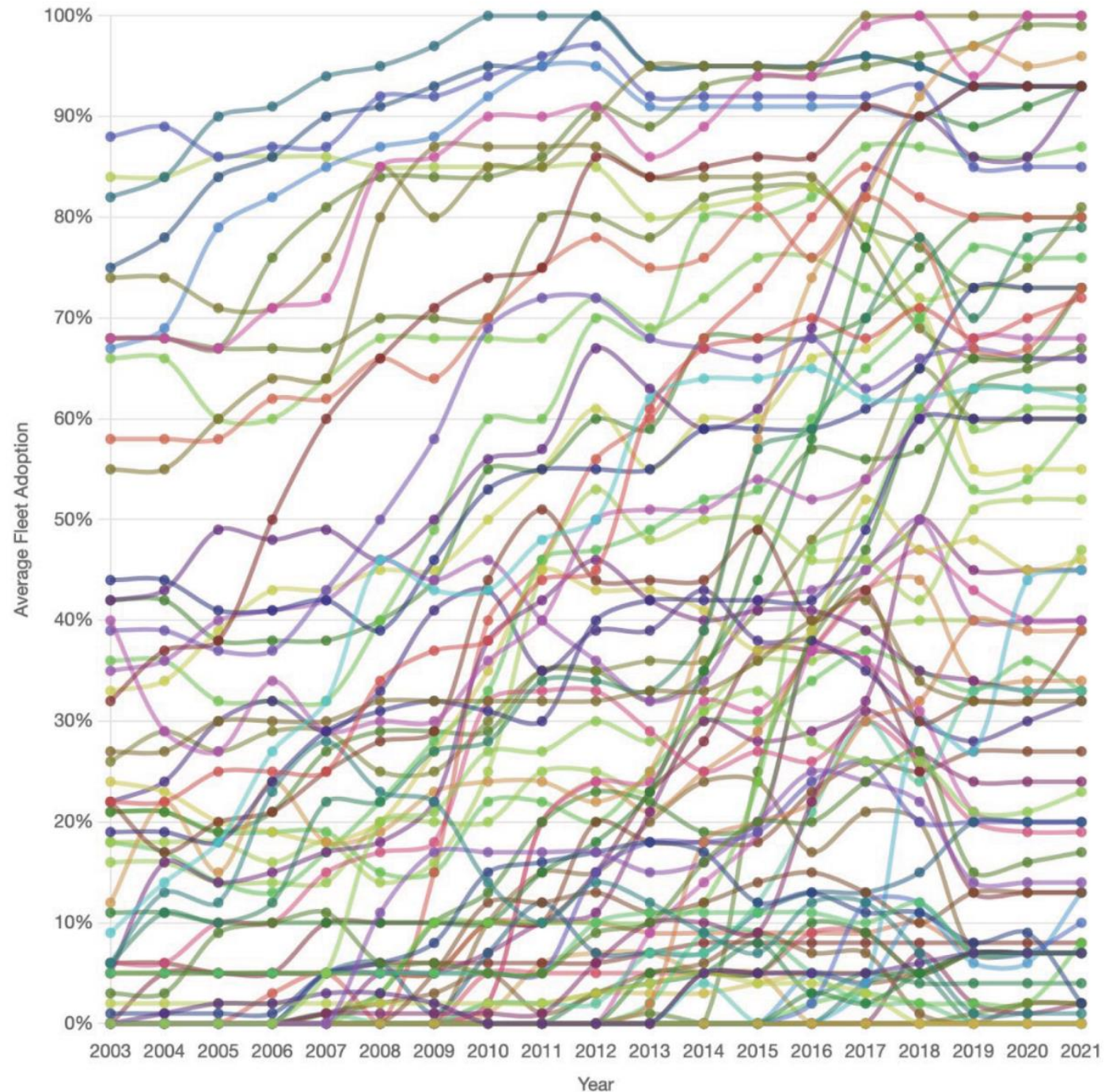
## 2022 Fiscal Supporters

# Annual Fleet Fuel Study

New Release: December 2022

Adoption takes time

Hard things take longer



# 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

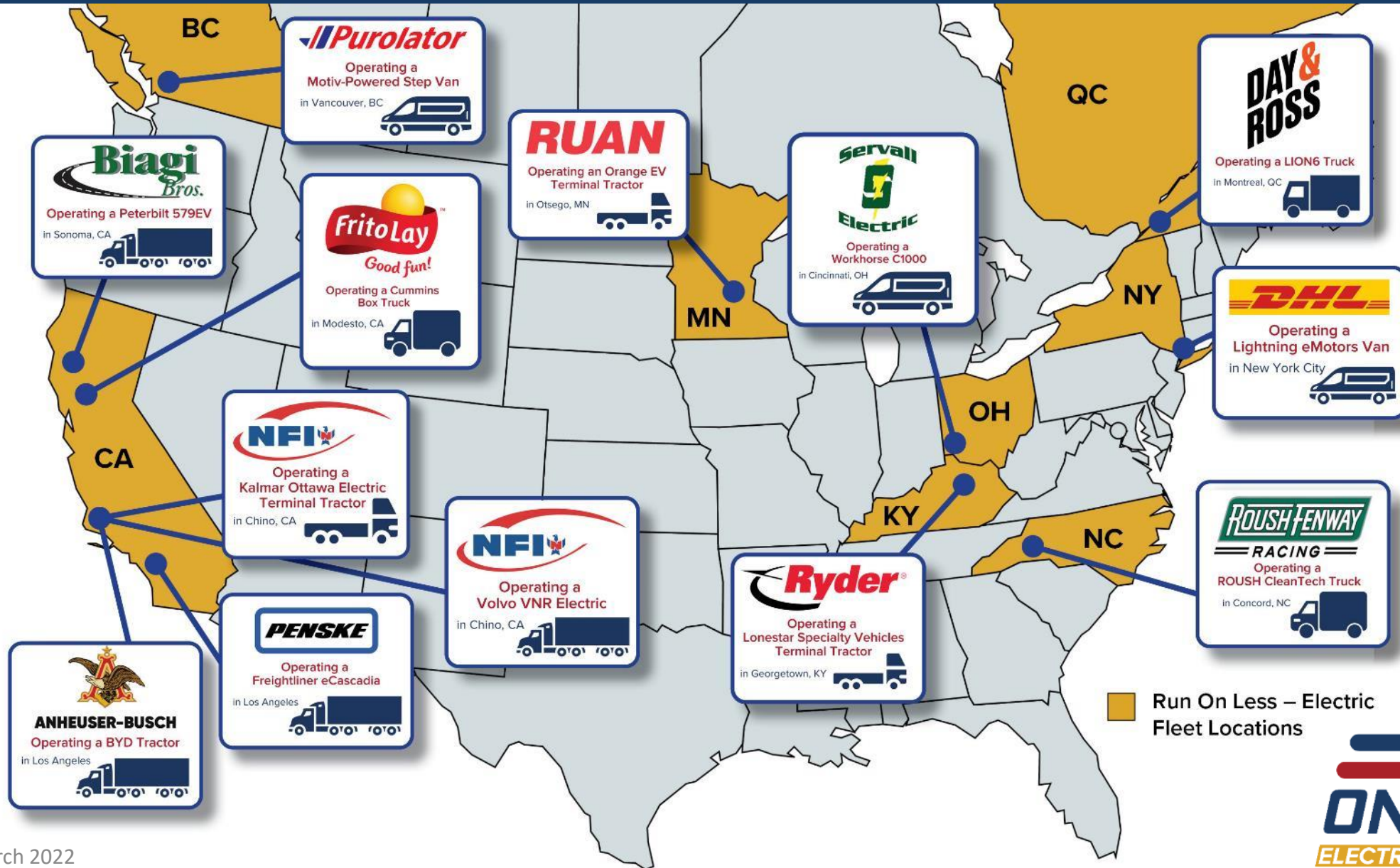


**All BEVs**  
13 Fleets  
New metrics!

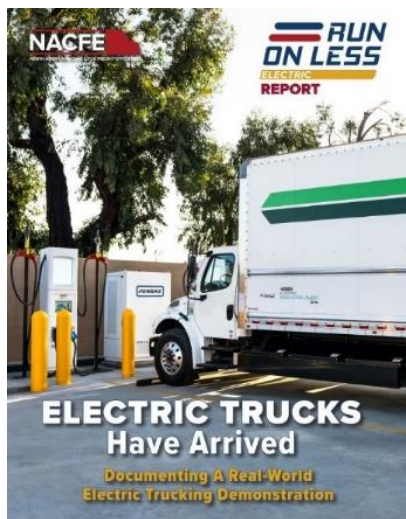


**BEV Depots**  
8 Depots  
Infrastructure

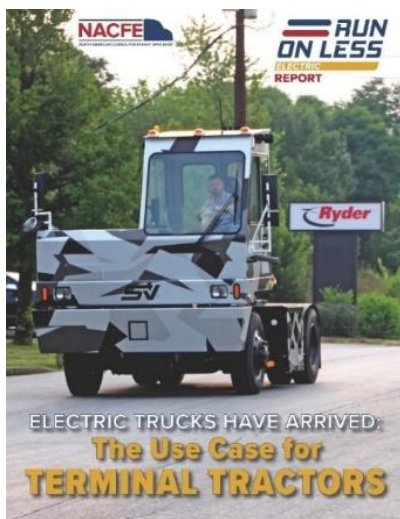
# Run on Less – Electric Participants



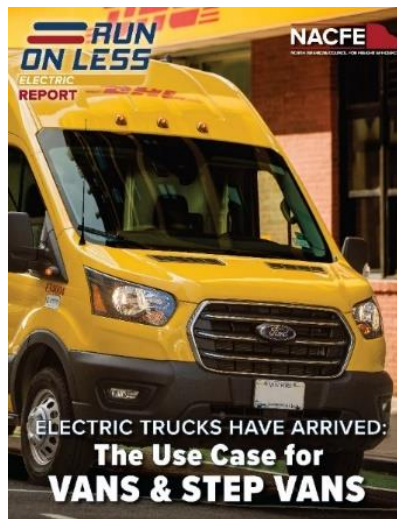
# RoL-E Reports



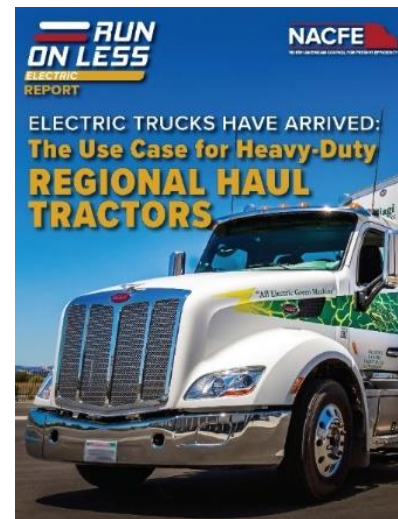
January 12, 2022  
Review Of Complete  
Demonstration:  
[Electric Trucks Have Arrived](#)



March 6, 2022  
The Use Case For  
[TERMINAL TRACTORS](#)



April 11, 2022  
The Use Case For  
[VANS & STEP VANS](#)



May 5, 2022  
The Use Case For  
[REGIONAL HAUL TRACTORS](#)



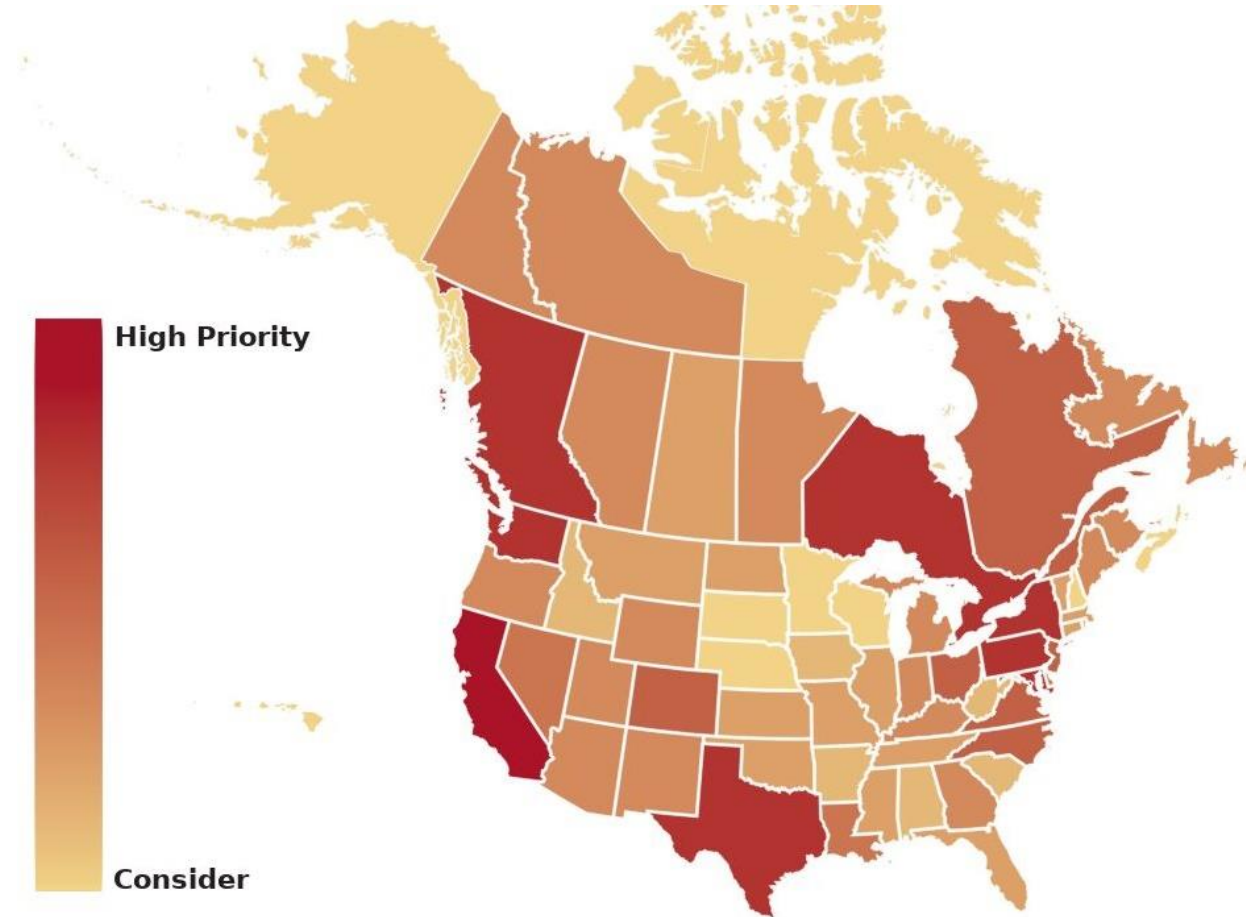
June 28, 2022  
The Use Case For  
[MEDIUM DUTY BOX TRUCKS](#)

**Other NACFE Whitepapers on Truck EVs:**  
<https://nacfe.org/research/electric-trucks/>



# Adoption Timing: Other Influences

- Timing will vary from fleet to fleet.
- Location will have a HUGE impact on timing.
- Fleets with multiple locations are likely to start in the most favorable locations.
- The fleet headquarters won't necessarily be the starting point for electrification.
- Fleets with 100% electrification goals won't necessarily put an EV in every location during phase in. They are more likely to focus their training, service and parts in strategic locations first.
- It is not unusual for a fleet to have multiple divisions that operate very differently from each other.
- Build where there is access to power



Report Link:

<https://nacfe.org/downloads/high-potential-regions-for-electric-truck-deployments-technical-appendix/>

# Run On Less – Electric Depots



[Get Involved As A Depot or Sponsor](#)

## 2023 Concept:

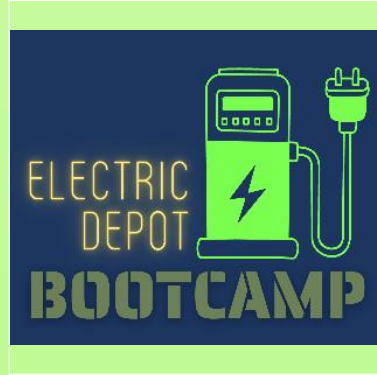
- Scaling MD & HD Electric Trucks
- USA, Canada & Mexico
- 8 Depots
- *At least* 15 EV trucks at each depot
- **Focus on Infrastructure & Charging Systems**
- Second EV Truck Bootcamp Series
- Analyzing 100+ possible locations

# RoL-E DEPOT Timeline



## Announcements

- Jan 10 Press Call including first sponsors
- Feb 26 TMC Press Event
- Bootcamp registration opens mid-March
- Announce Participants late-April



## Bootcamp

- 10 Episodes
- Topics concern scaling of electric truck adoption
- ~50 Expert Speakers
- Starts Apr 25th through Sep 5<sup>th</sup>



## Pre-Run

- Visit all participants June and July
- Continued Promotion
- Post Case Study Profile Videos throughout Aug
- Potential In-Person Workshops



## Actual Run Event

- Kickoff at T&D World in Sacramento
- Run occurs ~Sep 11<sup>th</sup> through the 30<sup>th</sup>
- Social Media Assets for Participants and Sponsors
- Release findings at Finale events



## Post-Run

- Analyze data and report
- Share findings at multiple trucking and utility conferences
- Other specific engagements
- Through mid-2024



# DEPOTS Electric Truck Bootcamp

1. Best Practices for Utility-Fleet Relationships
2. Grants and Incentives for the Trucks and Infrastructure
3. Electric Truck Developments
4. Faster Charging — Opportunities and Challenges at 350KW and higher
5. Opportunities to Extend BEV Range (via charging technologies)
6. Electricity Resiliency and Availability (microgrids, renewable energy...)
7. Current and Future Regulations for Zero Emission Trucks
8. Managed Charging to Improve Availability, Cost and Range
9. Scaling Charging Infrastructure Equipment
10. Electric Depot Site Planning and Construction

[Register here](#)



# Run on Less DEPOT Participants



QUEENS, NY



FRESNO, CA



ONTARIO, CA



SACRAMENTO, CA



COMMERCE, CA



SOUTH EL MONTE, CA



COMPTON, CA

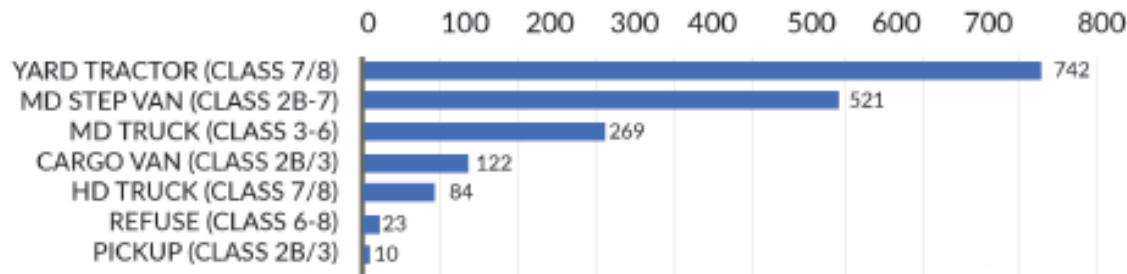
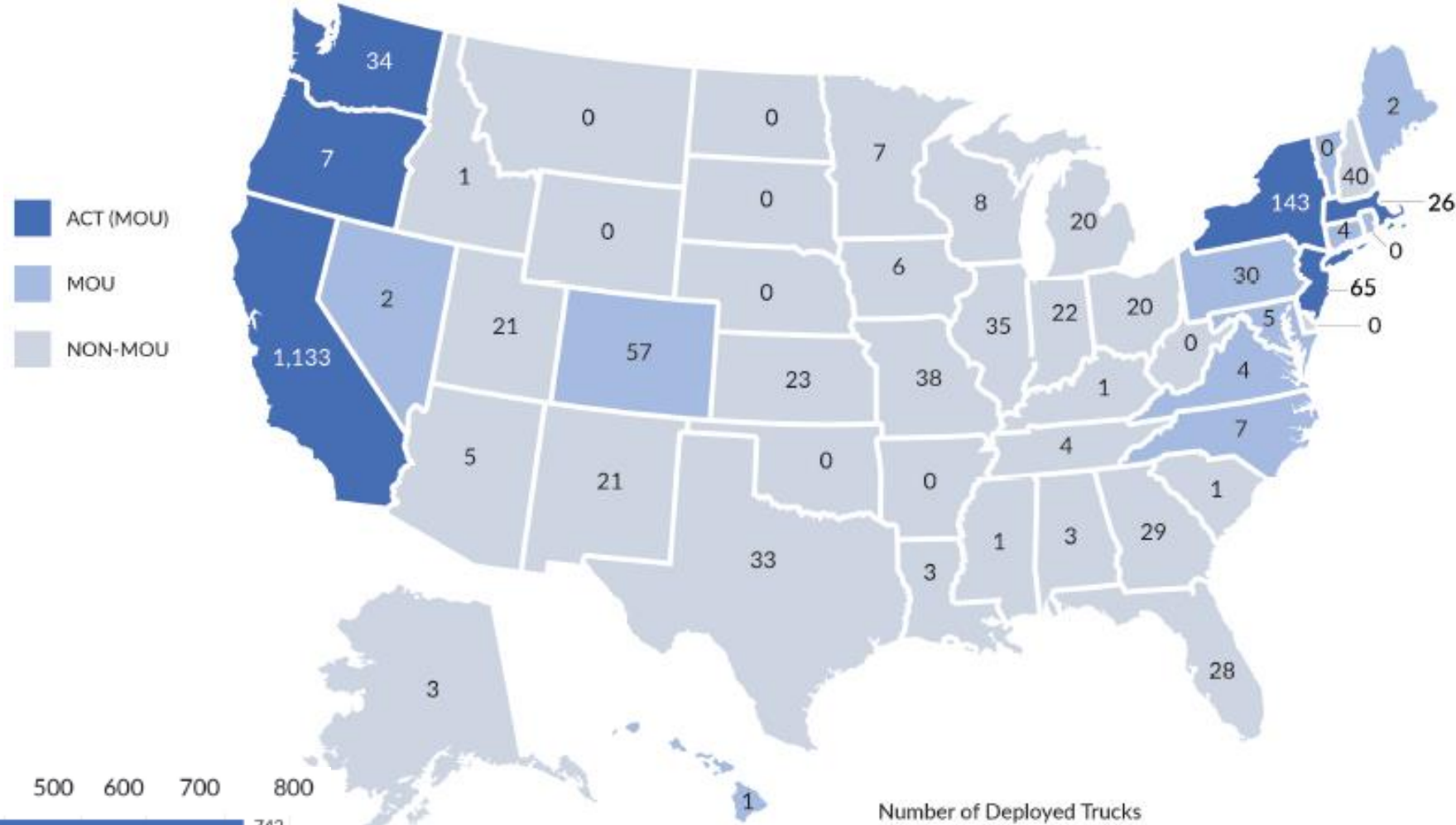


LONG BEACH, CA



# EV Truck Deployments (March '22)

- 1,895 Zero Emission Trucks Deployed 2b-8
- 60% are in California

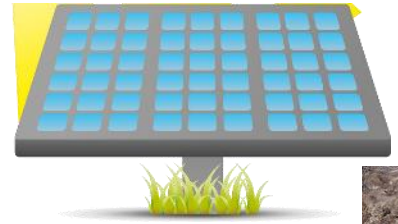


Source: <https://calstart.org/wp-content/uploads/2022/07/ZIO-ZETs-June-2022-Market-Update.pdf>

# Getting to Know Each Other

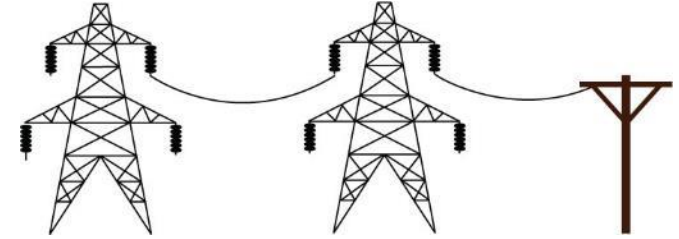


Primer:  
UTILITIES  
on FLEETS



## FLEETS

## UTILITIES



Primer:  
FLEETS on  
UTILITIES



January 2022

# Complexity In Both Industries

## Truck Fleets

Trucks  
Tractors  
Trailers

Drivers:  
Company  
Independent Contractors  
Owner-Operators

Vehicles:  
Owned  
Leased

Facilities:  
Owned  
Leased

Dozens of  
different  
applications

Fuels: diesel, biodiesel, CNG,  
LNG, LP, DME, electric,  
hydrogen, renewable diesel,  
RNG, RLP, hybrids & more

## Utilities

Services:  
Generation  
Transmission  
Distribution

Ownership:  
Independent  
Municipal  
Cooperatives

Rate Structures:  
Time Of Use  
Demand Charges

Regulated  
& Unregulated

Fuels: NG, coal, hydroelectric, solar,  
wind, nuclear, and more

**“If you’ve seen  
one \_\_\_\_,  
you have only  
seen one.”**



# ICE & Electric Truck OEMs



February 2023



CCS1



CCS2



CHAdeMO



J1772



MCS or CharIN



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

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



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

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

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**v** [NACFE](#)



Dave Schaller

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260-602-5713



NYSE:ZEV

Lightning eMotors- Marcie Willard  
FAQ's and Fiction



## Lightning eMotors history

Started in 2008 as a hybrid, went full Battery Electric 2017

240,000 sq ft manufacturing facility in Loveland, CO

250+ employees

Class 3-6 MD focus- shuttles, vans, Type A buses, box trucks, service trucks, and mobile charging

Hundreds of vehicles on the road

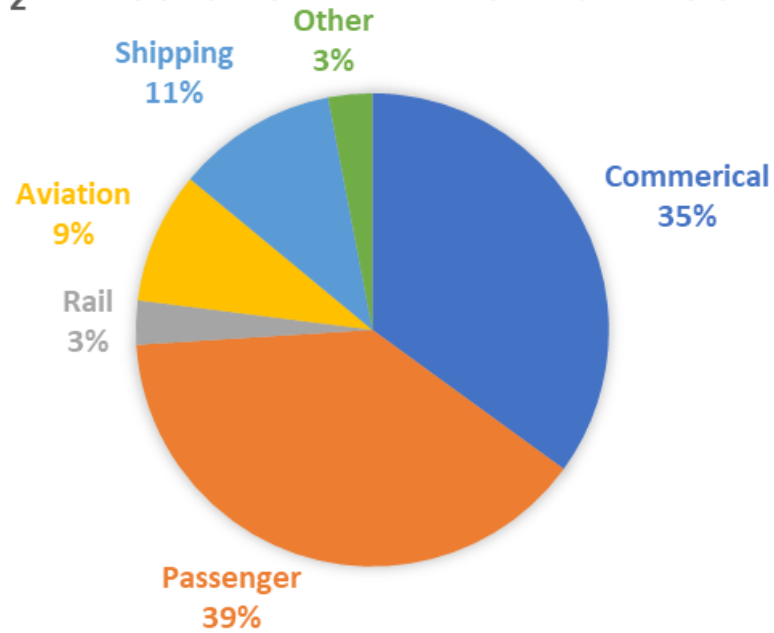
Almost 4,000,000 miles of data tracked on these vehicles- we monitor over 75 different data points 24/7/365

Content is based on the data we've collected through our deployments

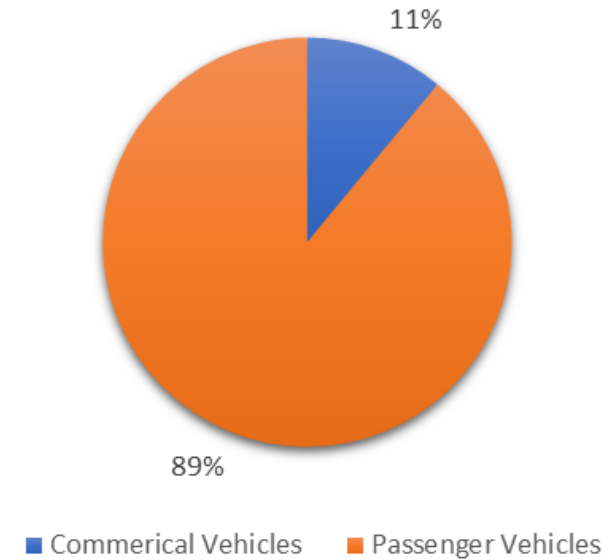


## Transportation CO<sub>2</sub> by the Numbers

### CO<sub>2</sub> EMISSIONS BY VEHICLE CATEGORY

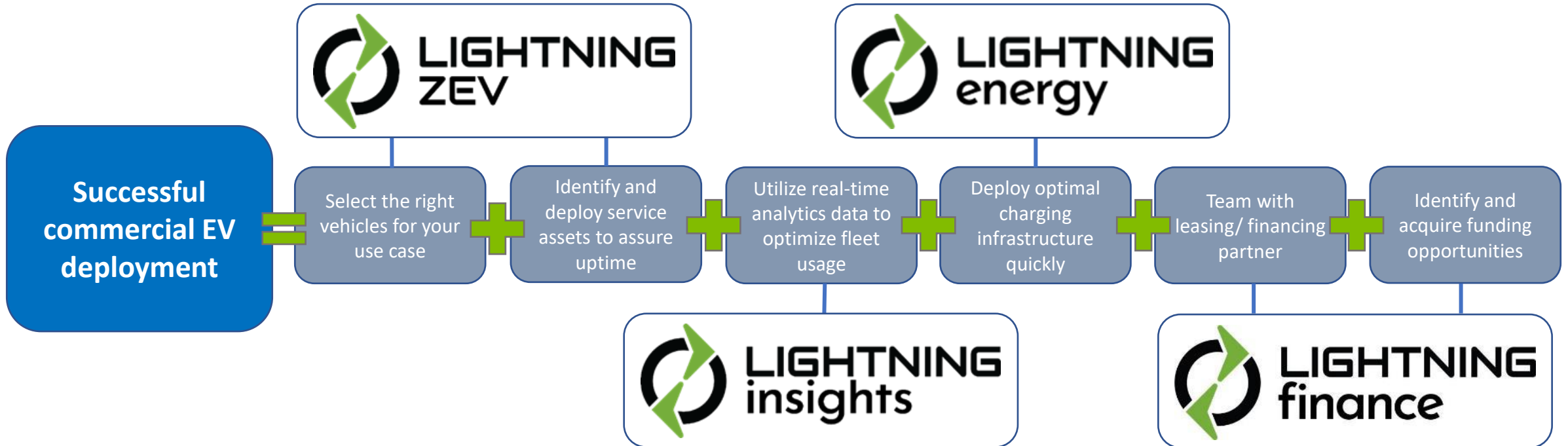


### # OF VEHICLES ON THE ROAD



# The Fleet Electrification Equation

Six variables to a successful commercial EV deployment



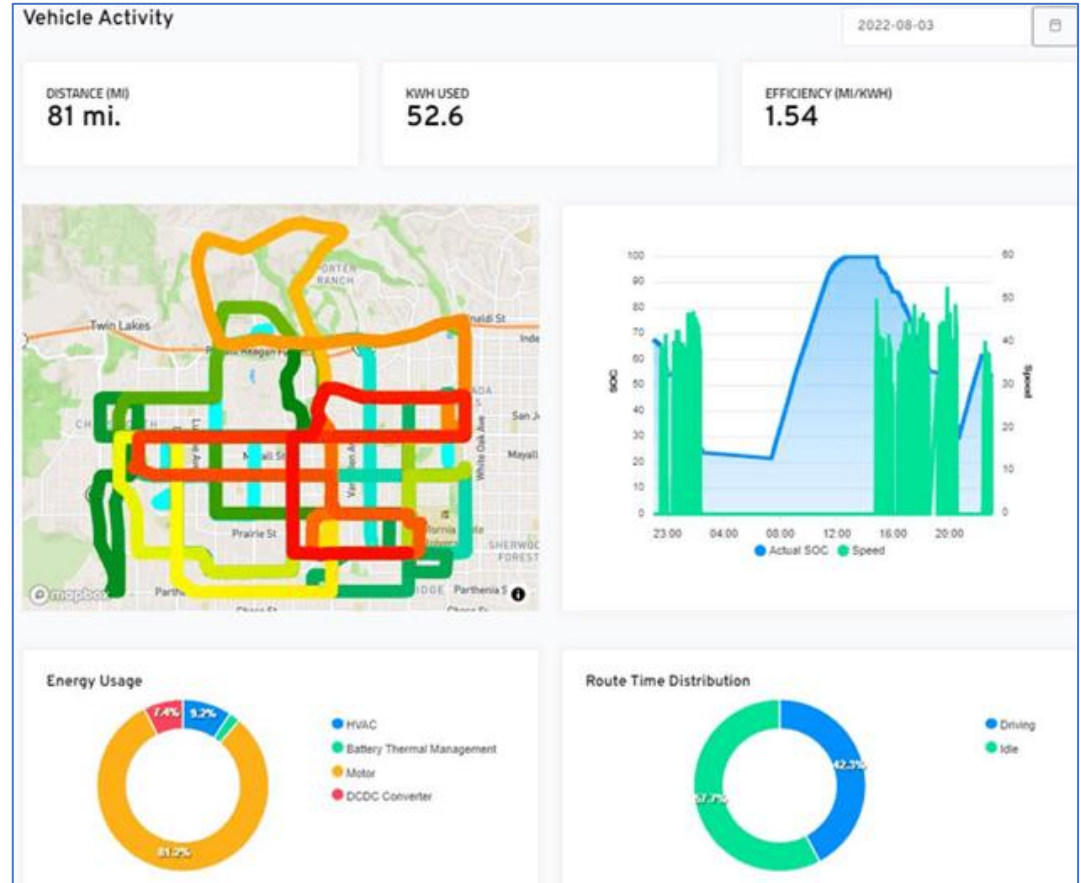
<https://fleet.lightningemotors.com/>

# ➤➤ Elephant 1: Range is an EV Limiter

Response: Mostly False

While range is a consideration for EV fleets, there are a number of actions that can be taken to keep range anxiety to a minimum:

- Fleets are phasing EVs in starting with best fit routes.
- Opportunity charging is your friend
- Right size your vehicles to accommodate payload and additional batteries
- Driver training is critical
- Route modeling available



## ➤➤ Elephant 2: Colder Temperatures Negatively Impact Range

Response: True

	Fleet Use Case	Location	Overall Efficiency*	Efficiency March-October*	Efficiency November-February*	Efficiency Loss/Gain
1	ZEV3 Passenger Vans	S. Florida	1.51	1.48	1.59	+7.4
2	ZEV3 Passenger Vans	Central Cal	1.55	1.56	1.50	-3.8%
3	ZEV 4 Delivery Trucks	New York	1.08	1.12	0.92	-17.8%
4	ZEV3 Delivery Vans	New York	1.20	1.30	0.86	-33.8%

### Observations and comments:

- Our “baseline” environment (fleet 1) with a relatively stable temperature saw a fairly consistent range year-round.
- Fleet 2 with a limited range of temperatures year-round saw a relatively small decline
- Fleet 3 with significant seasonal temperature shifts saw an 18% decline in efficiency
- Fleet 4 also saw wide seasonal temperature changes and saw a larger drop in efficiency, likely a result of frequently leaving the vehicle and losing cabin heat during delivery.

## ➤➤ Elephant 3: Driving a Commercial EV is More Complicated Than ICE Response: Mostly False: Driving It, No. Driving It WELL May Require a Little Training

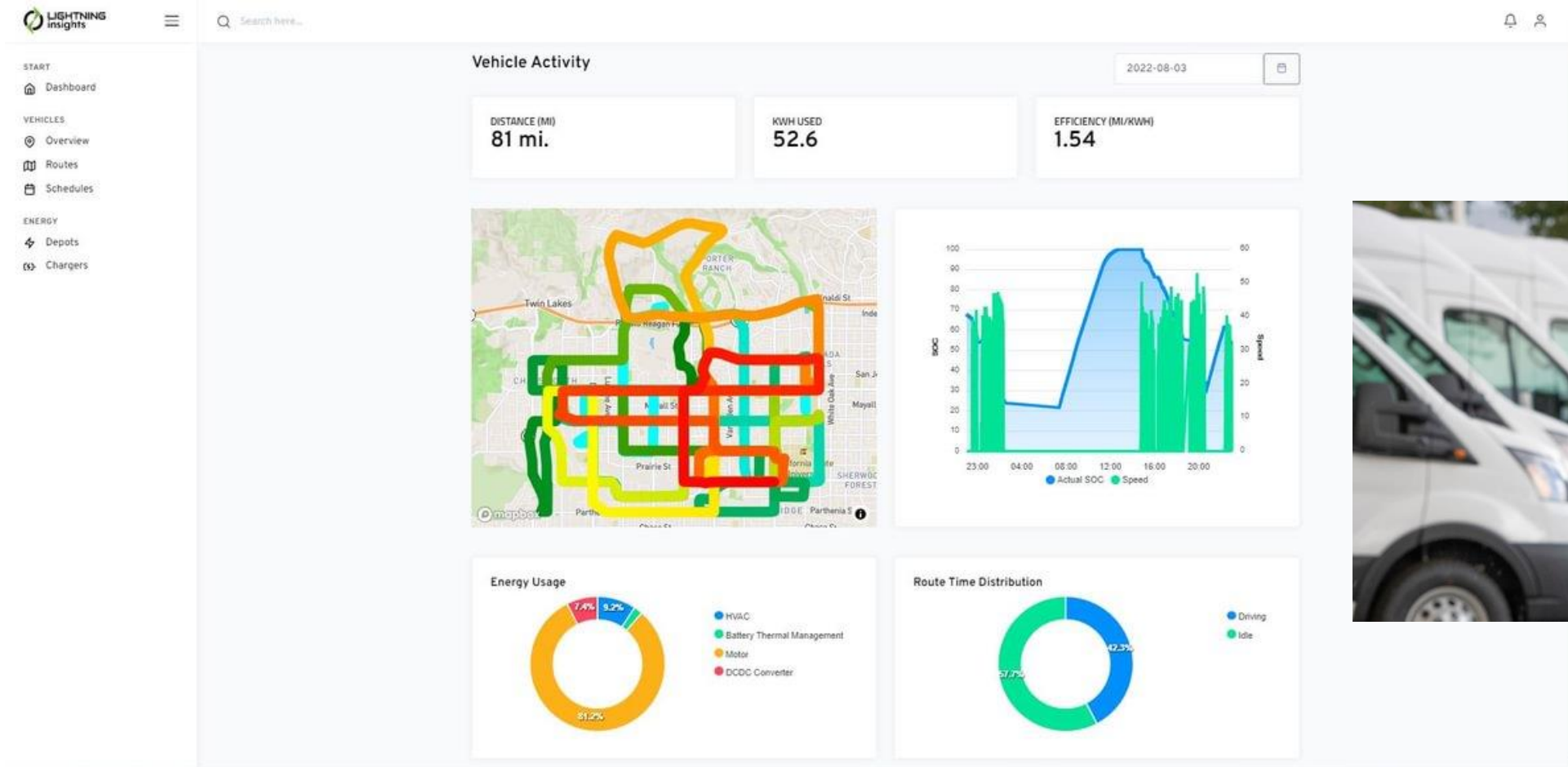
### Case study:

- Use Case: Retail product delivery
- Challenge: Fleet not getting expected range
- Solution: Reviewed telematics data to determine energy usage and determined drivers were not utilizing the vehicles efficiently. Worked with Lightning to deploy a driver gamification contest to change driver behavior.
- Results: **6% efficiency gain across the fleet and 22% for top performer**

### Takeaway:

**Training drivers on how to utilize regenerative breaking, accelerate evenly, and use cabin heating/cooling optimally (i.e. pre-condition cab while on charger) can have a significant impact on vehicle performance.**

# Lightning Insights Provides Deep EV Understanding

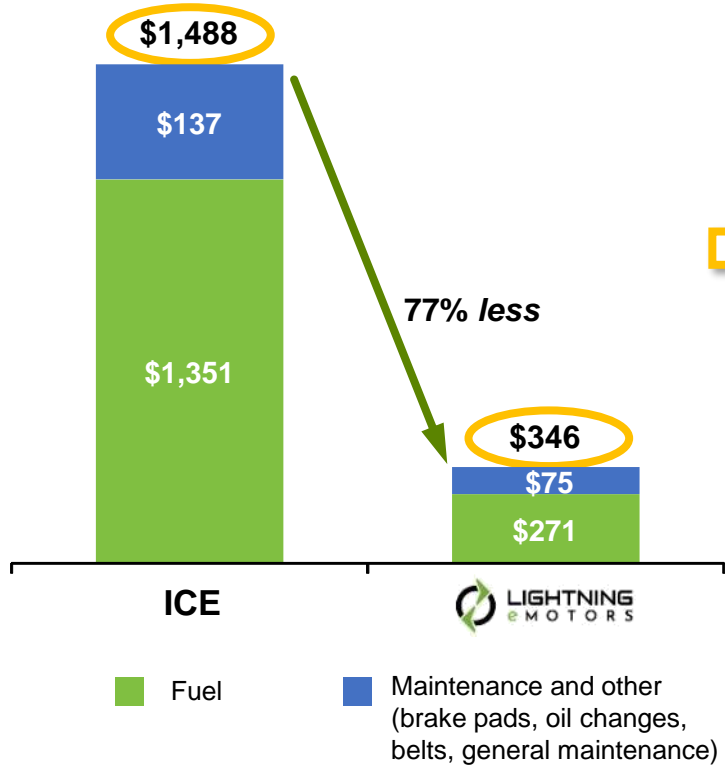


# Elephant 4: EVs are Too Expensive- it depends

Class 3 Lightning Electric Transit vs. gasoline equivalent (3,500 miles / month)



## Monthly fuel + maintenance cost



## Cost comparison

Illustrative lease example

	Gasoline	Electric	
		With grants	No grants
Fuel and maintenance cost per month	\$1,488	\$346	\$346
Vehicle lease	\$702	\$978	\$1,584
Charger lease (assuming level 2 11.5kW charger)	--	\$29	\$29
LCFS (Low Carbon Fuel Standard) Credit	--	(\$615)	(\$615)
<b>Total monthly cost</b>	<b>\$2,190</b>	<b>\$738</b>	<b>\$1,344</b>
<b>Monthly cost difference to gasoline</b>	--	<b>\$1,452</b>	<b>\$846</b>



## ➤➤ The MPGe – a Gauge of Energy Efficiency

	Efficiency m/kWh	Equivalent MPG	MPGe
ZEV3	1.45	15	48.9
ZEV4	1.22	8	41.1
ZEV5	1.02	6	34.4

## ➤➤ Elephant 5: The Grid Will Not Be Able to Keep Up With Demand

Response: Not True

There are several solutions to grid demand that make EVs very viable:

- Utilities are planning for this switch, and already have excess energy at night
- Microgrids are a great way to amplify operating cost savings
- New energy sources are very exciting – Fusion
- Related topic: The grid is NOT as polluting as ICE vehicles
  - Highest emission grid is still 4x cleaner to operating an EV than an ICE vehicle
  - Cleanest grid is 10x cleaner and improving
- Software schedule vehicle charging
- V2G
- Power generation moving towards renewables/clean energy

- Elephant 6 -Charging- it takes too long and is too expensive
- Mostly false- DC charging is efficient and electricity is cheaper than fossil fuels

Charger	Charge Time for 120 kWh (0%-100%)
13.2 kW Level 2	9.9 Hours
25 kW Level 3	5.2 Hours
50 kW Level 3	3.0 Hours

Electric Vehicles other than Tesla have standard charging ports- AC level 2 slow charging and DC level 3 fast charging  
AC chargers start at around \$2500 / 220 V  
DC chargers start at around \$15,000 / 480 V  
Most states/utilities offer infrastructure incentives



## Elephant 7- Maintenance and Service is complicated and expensive Mostly false- cheaper and easier (once trained) and we help with service

	INTERVAL (MILES)	ALTERNATIVE INTERVAL
MULTI-POINT LIGHTNING ELECTRIC INSPECTION	Every 10,000 miles	Every six (6) months
COOLANT REPLACEMENT	First replace at 150,000 miles. Next replacement after 50,000 miles or three (3) years following the last replacement.	
TRANSMISSION FLUID REPLACEMENT	Replace every 60,000 miles.	

Electric Vehicles average 80% less in maintenance and 60% less in “fuel” costs, these help with TCO- less to fix and less to service and kw/hr less than gas/diesel  
Regenerative braking extends life of brake pads, tire changes same as ICE vehicle

We have a service network established in a few states already

We provide service training to fleets who want to manage their own maintenance

We send our techs direct to the fleet location

Keep parts in stock, 25% of issues can be handled remotely- we monitor every vehicle 24/7



## Elephant 8 - Batteries- how long will they last and what about the environment

- Our battery warranty is the same as our vehicle warranty- 5 yrs or 60,000 miles, longer warranties can be purchased
- We anticipate batteries have a 7-10 yr life span or 3,000 charge cycles
- Battery chemistry is Lithium Ion- lithium is currently mined but there is a lot of research and work being done to identify lithium in different sources and with different extraction methods
- Second life of batteries- several companies are actively addressing battery recycling- i.e. Redwood Materials
- For Lightning, once the batteries are at 80% SOH, we will be replacing them with new batteries and using the older batteries in our Lightning Mobile system.

## »» In Summary

- Commercial EVs can have a bigger impact on climate change per vehicle than most passenger vehicles, when you retire one ICE bus, it is the equivalent of taking 175 cars off the road
- Costs are coming down, but TCO is already positive
- A variety of grants amplifies the TCO- Federal, State and local \$
- Vehicles are available today
- Not all commercial use cases are ideal for EVs, but most will- final mile delivery, airport shuttles, school bus, Community Lyft, etc
- Some use cases will solve problems beyond climate change- i.e. public health



# The Detroit Influence

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Matt Meyer

DANNAR



# Yesterday: Detroit 2008 - 2012

*“Electric cars are not ready for prime time. They’re interesting toys for very, very rich people.”*

Reuters, March 2012

Environment



Price  
Performance  
Reliability  
Range  
Safe



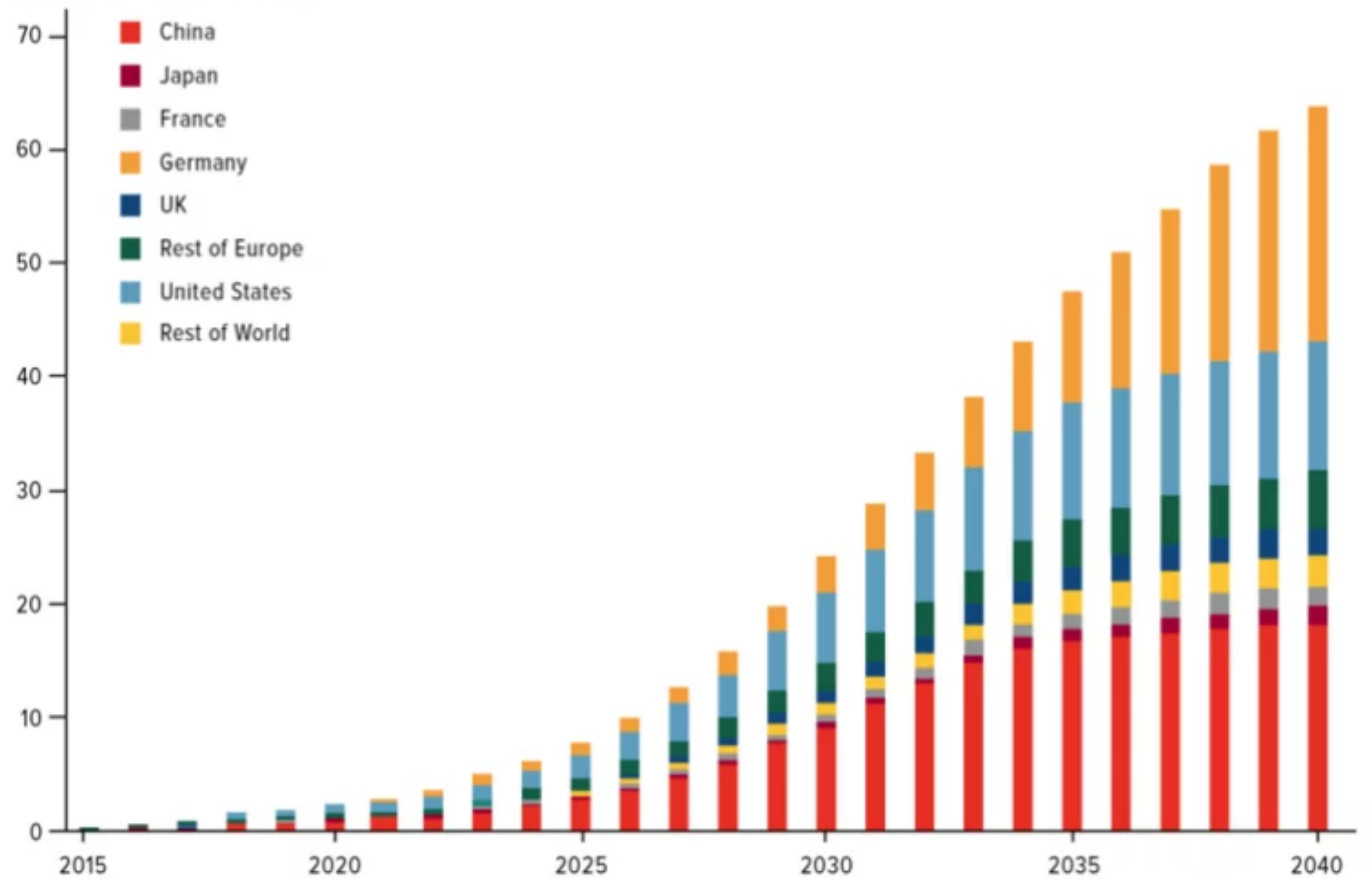


# Today: the “Revolution”

- Mercedes: 2025 EV only platforms.
- VW: \$83B to EV/Digital next 5 years.
- Lightning 200K+ pre-orders 1<sup>st</sup> week.

## Projected Annual Global Electric Vehicle Sales

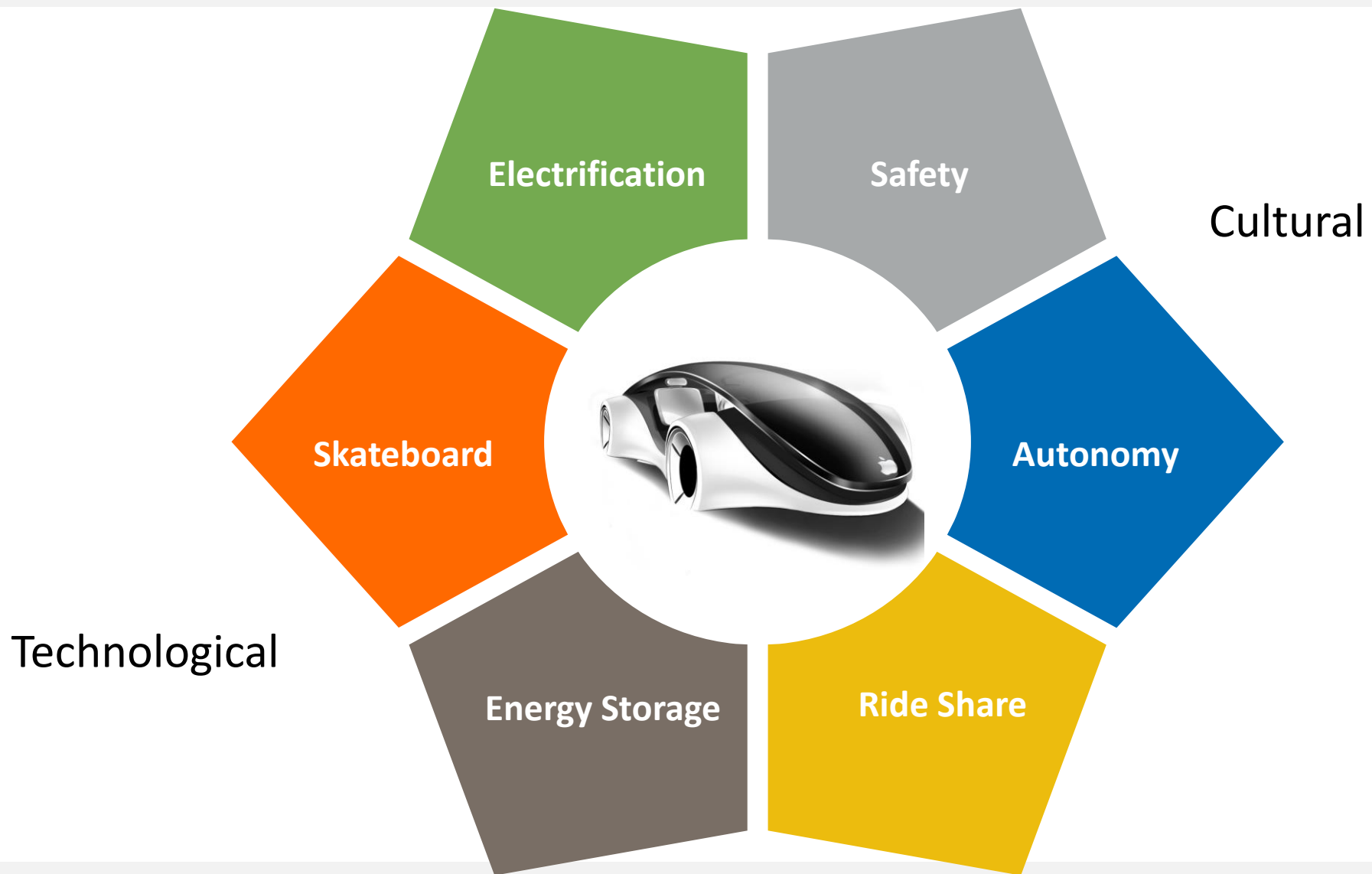
Annual EV Sales In Millions



Source: Bloomberg New Energy Finance, Katasa Research, U.S. Global Investors

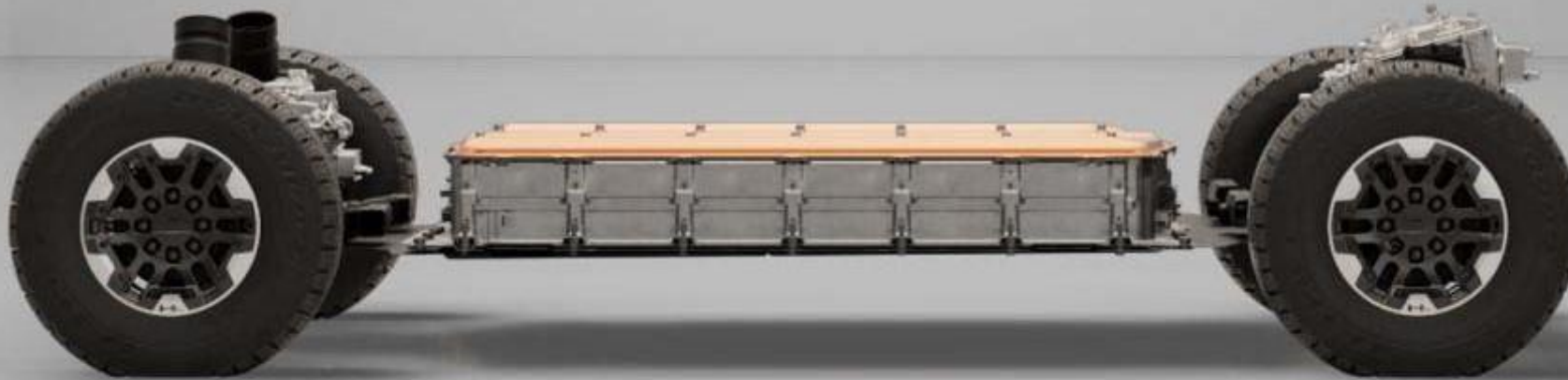
“Transformational change ...” “Seismic shift ...” “Quirky environmentalists to Main St ...”

# Six Distinct Changes in Automotive

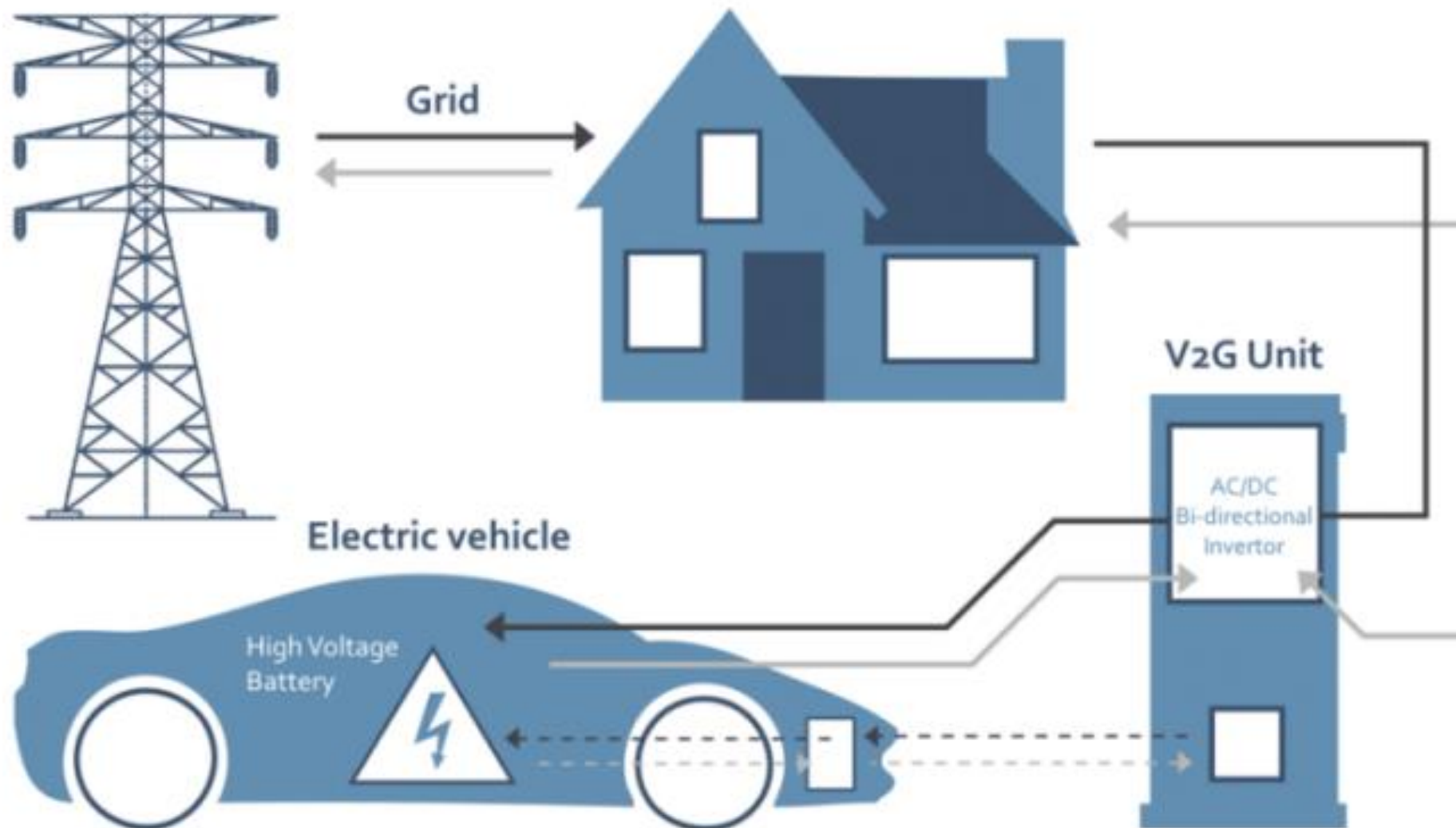


# Skateboard Design

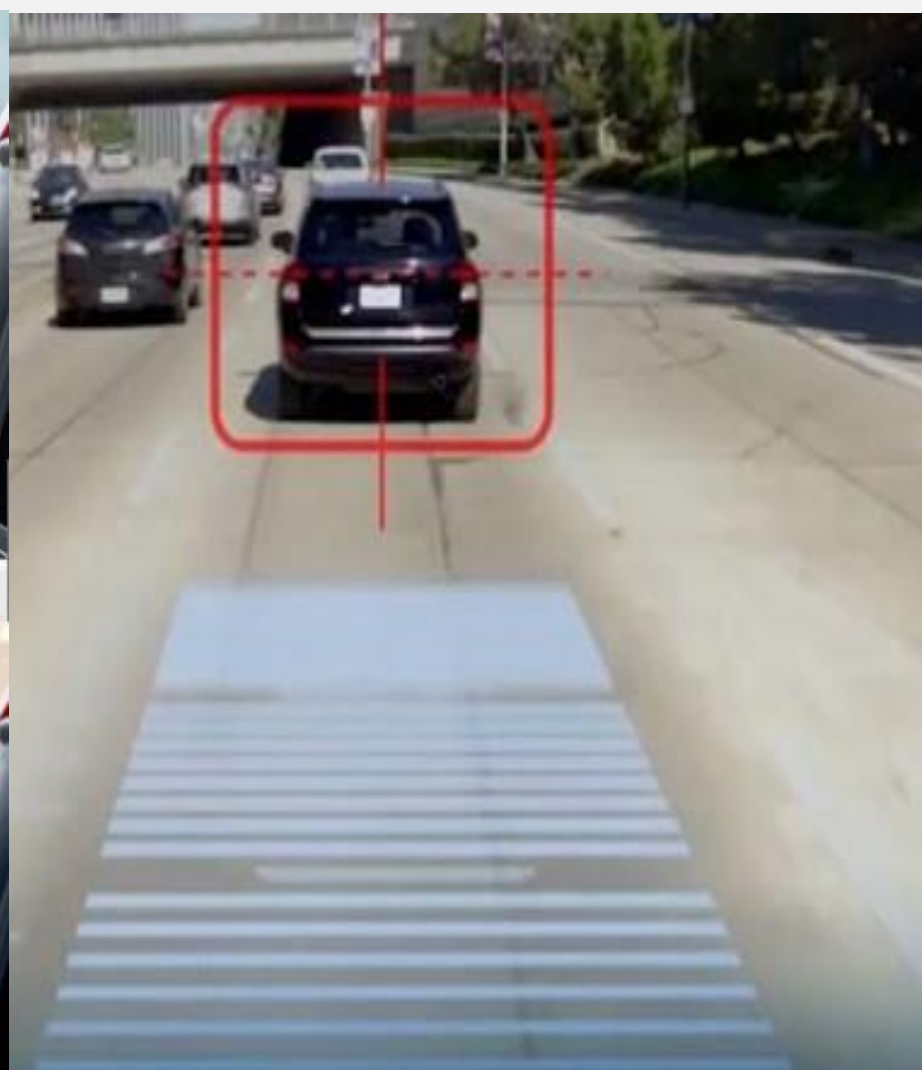
Power Components Below  
Freedom to Configure Above  
Low Center of Gravity: Enhanced Safety & Performance



# Value of Stored Energy $\longrightarrow$ V2G Power Delivery



# Advanced Safety Features



# Autonomous Technology & Driverless Rideshare

**SAE Level 3** – You are not driving when systems engaged.

SAE Levels 4 & 5 already achievable.



**Waymo** – driverless ride-hailing service.

>\$5B invested. 20 million miles driven.

# Ride Share: Cultural Shift

March 1983

Su	Mo	Tu	We	Th	Fr	Sa
27	28	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31	1	2
3	4	5	6	7	8	9



# Automotive Revolution Not Over ... Not Even Close.

Imagine a Future Without ...

Internal Combustion  
Driver's License  
Car Ownership  
Steering Wheels





# Disruptive Auto Tech → Widespread Impact Off-Road

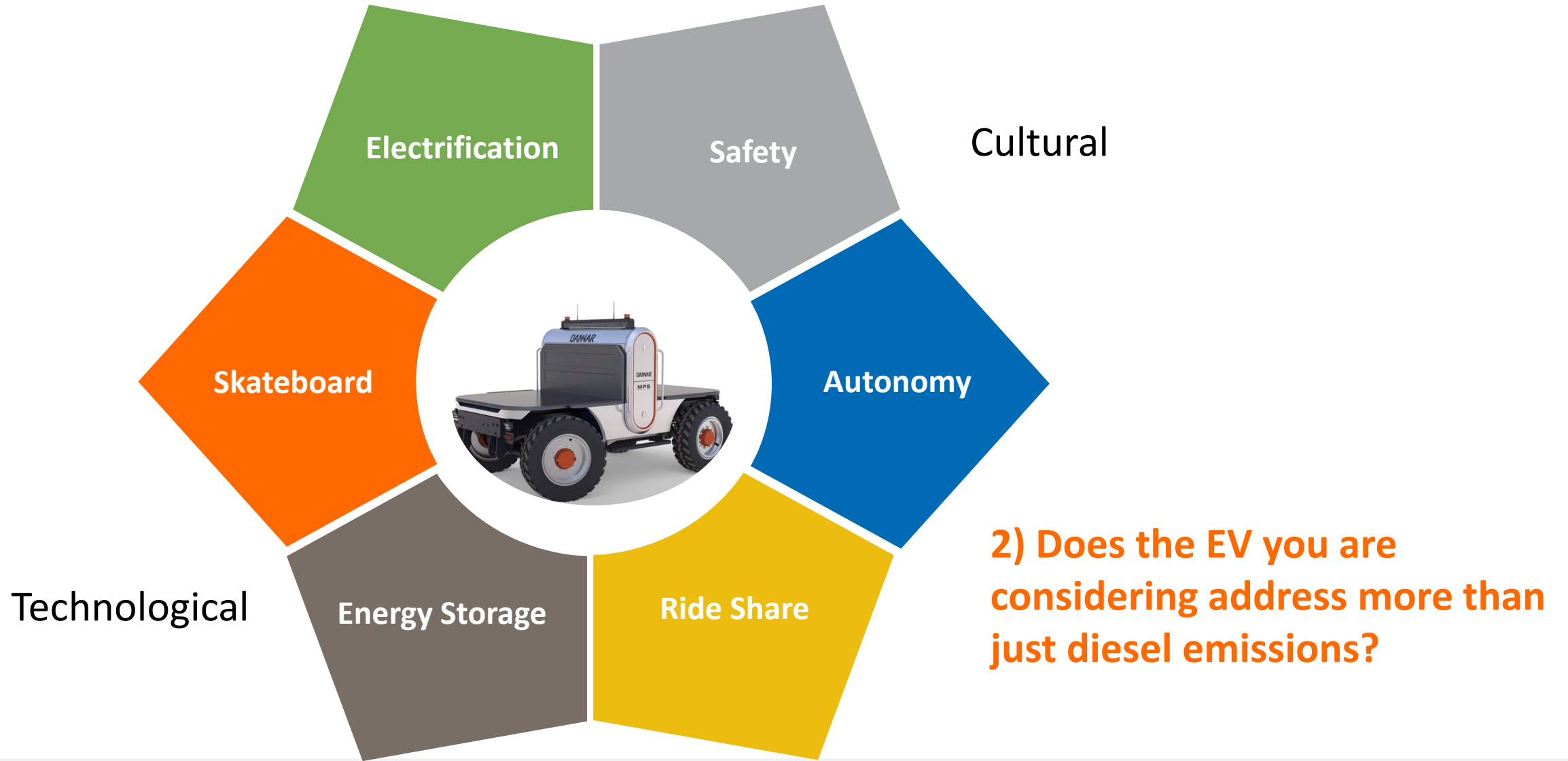


# Name that Wheel Loader ...

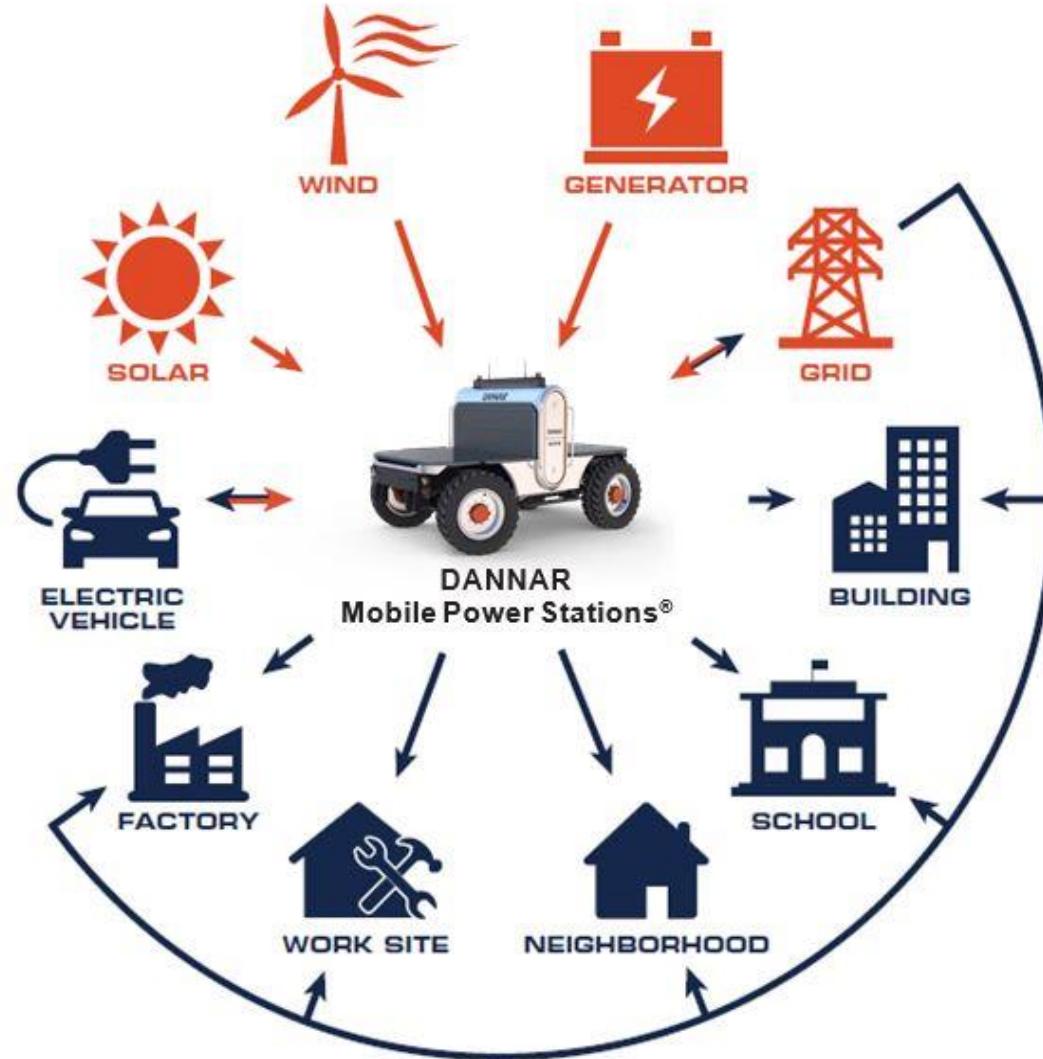


1) How long will your fleet budgets be spent here, knowing the revolution is coming?

# Not just “Not Diesel” – Comprehensive Disruptive Change



# The Technological & Cultural Inevitability ...



# DANNAR Mobile Power Station<sup>®</sup>

## WORKS. POWERS. PROTECTS.



**Base Weight 16,000 lbs. | Lifts 30,000\* lbs. | Drawbar Pull 600,000 lbs. | All-Day Run Capacity | 25 mph Travel Speed**  
w/base modification

# Mobile Energy Storage (to 500kWh) & Export Flexibility

Planned Power - Job Sites & Events  
Resiliency/Emergency Preparedness  
Exportable -120v/240v  
Bi-Directional 480 3-P (option)



Level 2 Charger standard  
Level 3 DC Fast Charge (option)



# Configurable Skateboard & Autonomous Capable



Work Arms \* 3-Point Hitch \* Open Decks  
Smart Platform – Designed for Autonomy

# Safe & Multifunctional

Operator Safety in Design  
Low Center of Gravity  
Remote Control Operation



Infrastructure \* Emergency Response \* Seasonal Needs  
(shared resource)



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San Clemente, CA



Available on the GSA/CMAS Schedule  
MANUFACTURED IN THE USA

**DANNAR**<sup>®</sup>  
POWER TO TRANSFORM





# THANK YOU!

NICOLE WARGO, CLARK COUNTY SUSTAINABILITY FELLOW

CLEAN CITIES COALITION

NICOLE.WARGO@CLARKCOUNTYNV.GOV



SCAN ME