



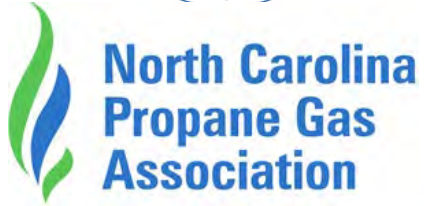
**Session #9: Electric Vehicle Options for Fleets**

**October 07, 2020**



<https://www.sustainablefleetexpo.com/>

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## Next Series Dates & Topics:

**October 14:** Best Practices of the Top Green Fleets

**October 21:** Renewable Fuels, Lubricants & Other Bio-Based Products

**November 04:** Resiliency Considerations With Alternative Fuels & Transportation Technology



# Format

- **Q&A at the end**
- **Submit questions and comments to “Panelists”**
- **Scheduled for 2:00p-3:30p**
- **Handout**
- **Recording**



Rick Sapienza

[resapienza@ncsu.edu](mailto:resapienza@ncsu.edu)

Phone: 919-515-2788

- **Clean Transportation Program Director NC Clean Energy Technology Center at NC State University**
- **8 years with NC State**
- **30+ years experience including General Motors, Draper Lab and Great Lakes Pulp & Fibre in both engineering and business management roles**



## Electric Vehicle Options for Fleets October 07, 2020

2:00-2:15 **Rick Sapienza, NC Clean Energy Technology Center**—Introduction, Information & Resources

2:15-2:22 **Kevin Hartman, Zero Motorcycles**—Electric Motorcycle Applications

2:22-2:29 **Jeff Esfeld, Tropos Technologies**--Reinventing the Low Speed Vehicle

2:29-2:36 **Marisa Bertoia, General Motors Fleet**—Chevrolet Bolt and GM Fleet

2:36-2:43 **Ben Hartford, XLFleet**—Electrification Solutions for Fleets

2:43-2:50 **Kash Sethi, Motiv Power Systems**—Proven EV Trucks & Buses

2:50-2:57 **Mark Childers, Thomas Built**—C2 Jouley Electric School Bus Solution

2:57-3:04 **Mark McGrew, Lion Electric**—All Electric Commercial Vehicle Lineup

3:04-3:11 **Alexander Voets, Daimler/Freightliner**—This is Freightliner e-Mobility

3:10-3:30 **Q&A**

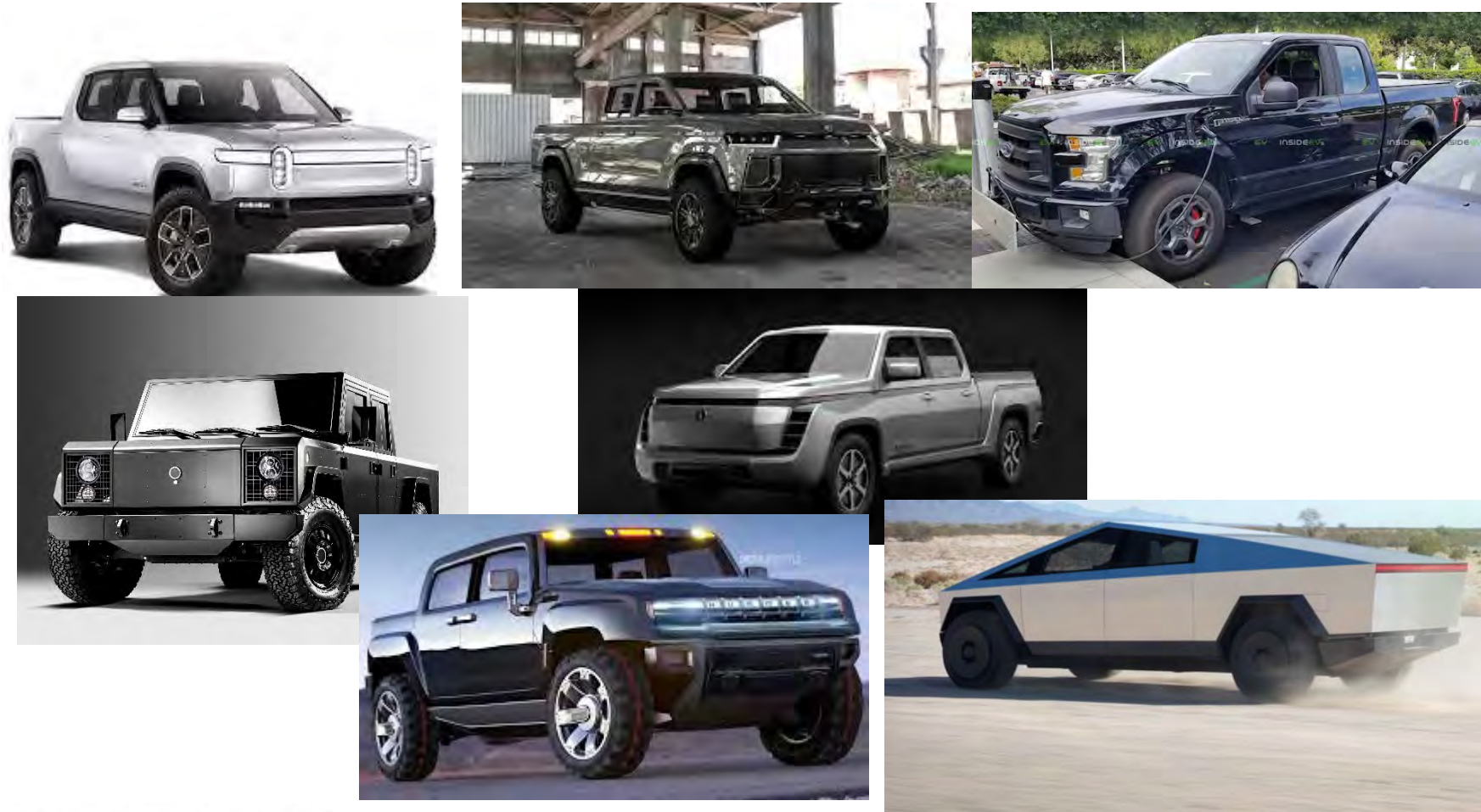


# MD/HD Electric Options Growing





# Electric Pickups Coming Soon



# Electric Low Speed Applications/Options





LD Electric Vehicle Guide (03/2020):

<https://pluginamerica.org/take-action-2/promotional-materials/>





# Plug In America.

## EV Charging 101

**LEVEL 1** STANDARD OUTLET

- Plug into a standard 120V wall outlet
- Connector provided with every EV
- Great for overnight or workplace charging
- Ideal for typical commutes (up to 40 miles)

40 miles overnight

**LEVEL 2** 240 VOLT OUTLET

- Faster charging for longer drives
- Provides a full charge for most EVs in:

4-8 hours empty to full charge

1-2 hours empty to full charge

25 miles per hour of charging

**DC FAST CHARGE**

- Much faster charging at public locations
- 3 different connectors depending on vehicle:

65 miles in 20 minutes

67 miles in 30 minutes

130+ miles in 20 minutes

0 to 80% in 30-40 minutes

**Plug In America** The voice of the EV driver

Founded in 2008, Plug In America is a nonprofit organization serving and representing EV drivers.

- We fight for pro-EV policies, including tax credits and access to HOV lanes. Join our network to take action!
- We present hundreds of EV events across the country each year to educate Americans about the benefits of driving electric.
- Our PlugStar EV Shopping Assistant and EV Support Program make it easy for drivers to switch to clean EVs.

Join the movement at [PlugInAmerica.org](http://PlugInAmerica.org)

@PlugInAmerica    PlugStar.com    DriveElectricWeek.org    DriveElectricEarthDay.org

## Electric Vehicle Guide

Compare vehicles online at [PlugStar.com](http://PlugStar.com)

**All Electric Vehicles**  
sorted by electric range

 Tesla Model S \$79,990 348-390 miles	 Tesla Model X \$84,990 305-351 miles	 Tesla Model 3 \$39,990 250-322 miles	 Tesla Model Y \$52,990 315 miles
 Chevrolet Bolt EV \$36,620 259 miles	 Hyundai Kona Electric \$37,190 258 miles	 Kia Niro EV \$38,500 239 miles	 Jaguar I-PACE \$69,850 234 miles
 Nissan LEAF \$31,600 150-226 miles	 Audi e-tron \$74,800 204 miles	 Porsche Taycan Turbo \$150,900 201 miles	 Hyundai Ioniq Electric \$33,045 170 miles
 BMW i3 \$44,450 153 miles	 Volkswagen e-Golf \$31,895 125 miles	 Fiat 500e \$33,460 84 miles	

[Plug-In Hybrid Vehicles Inside >](#)

## Plug-In Hybrid Vehicles

sorted by electric range

 BMW i3 REX \$48,300 126 / 200	 Karma Revero GT \$135,000 61 / 330	 Honda Clarity Plug-in \$33,400 48 / 340
 Chrysler Pacifica Hybrid \$39,995 32 / 520	 Mercedes-Benz S 560e \$109,750 31 / 549	 Hyundai Ioniq Plug-in \$26,500 29 / 630
 Kia Optima Plug-in \$36,090 28 / 630	 Ford Fusion Plug-in \$35,000 26 / 610	 Kia Niro Plug-in \$28,500 26 / 560
 Toyota Prius Prime \$27,750 25 / 640	 Volvo S60 PHEV \$56,045 22 / 510	 Volvo V60 PHEV \$67,300 22 / 510
 Mitsubishi Outlander PHEV \$36,295 22 / 310	 Volvo S90 PHEV \$63,845 21 / 490	 Lincoln Aviator Grand Touring \$68,800 21 / 460

## Plug-In Hybrid Vehicles

sorted by electric range

 BMW 530e \$53,900 21 / 350	 Audi Q5 PHEV \$52,900 20 / 390	 Volvo XC60 PHEV \$54,595 19 / 520
 Range Rover PHEV \$79,000 19 / 480	 Volvo XC90 PHEV \$67,500 18 / 520	 BMW i8 \$147,500 18 / 320
 Subaru Crosstrek Hybrid \$35,445 17 / 480	 Audi A8 L PHEV \$94,000 17 / 420	 BMW 745e \$95,550 16 / 290
 Porsche Panamera 4 \$103,800 14 / 490	 Porsche Cayenne S \$81,100 13 / 450	 Mercedes-Benz GLC 350e \$50,650 10 / 350

**We make driving electric easy!**

**PlugStar.com**  
Visit [PlugStar.com](http://PlugStar.com) to find a plug-in vehicle, learn about tax credits and other incentives, get equipped for charging, and connect with a PlugStar-certified dealer in your area!

**PlugStar** an EV+ resource

[PlugInAmerica.org](http://PlugInAmerica.org)  
[PlugStar.com](http://PlugStar.com)



# PlugStar<sup>™</sup>

by Plug In America

PlugStar<sup>™</sup> by Plug In America

Shopping Assistant Cars Incentives Charging Events Dealers Login

Everything you need to know to drive electric

Select Make Select Model Find Vehicle

Need help? Our Shopping Assistant makes it easy. [Get Started!](#)



Shopping Assistant



Browse Electric Cars



Find a Local Test Drive Event



Find an Electric Car Dealer or Retailer



Need Help?

Who We Work With:



**Clear filters - See all cars**

15 vehicles displayed

Cash Loan Lease

Budget after incentives, in zip **27502**

< \$200,000

**Vehicle type**

Sedan  Hatchback  
 Coupe  Crossover  
 Minivan  SUV  
 Wagon  Truck

**Seats**

2  4  
 5  > 5

**Fuel**

All-Electric   
 Plug-in Hybrid

**Minimum Range**

Electric Range: 200 miles


Total Range: 0 miles

**Location**

Zip code: 27502

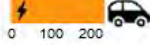
Sort by: Make | Price | Electric Range | Popularity

**Nissan LEAF PLUS**




**\$30,700**  
Base MSRP after Incentives

226 miles electric



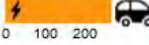
**MORE**

**Chevrolet Bolt EV**



**\$36,620**  
Base MSRP after Incentives

259 miles electric



**MORE**

**Tesla Model 3 Standard Range Plus**




**\$37,990**  
Base MSRP after Incentives

250 miles electric



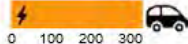
**MORE**

**Tesla Model 3 Long Range AWD**




**\$46,990**  
Base MSRP after Incentives

322 miles electric




**MORE**

**Tesla Model Y Long Range AWD**




**\$49,990**  
Base MSRP after Incentives

316 miles electric




**MORE**

**Tesla Model 3 Performance AWD**



**\$54,990**  
Base MSRP after Incentives

299 miles electric



**MORE**

Clear filters - See all cars

17 vehicles displayed

Cash Loan Lease

Budget after incentives, in zip 27502

< \$200,000

Vehicle type

- Sedan
- Coupe
- Minivan
- Wagon
- Hatchback
- Crossover
- SUV
- Truck

Seats

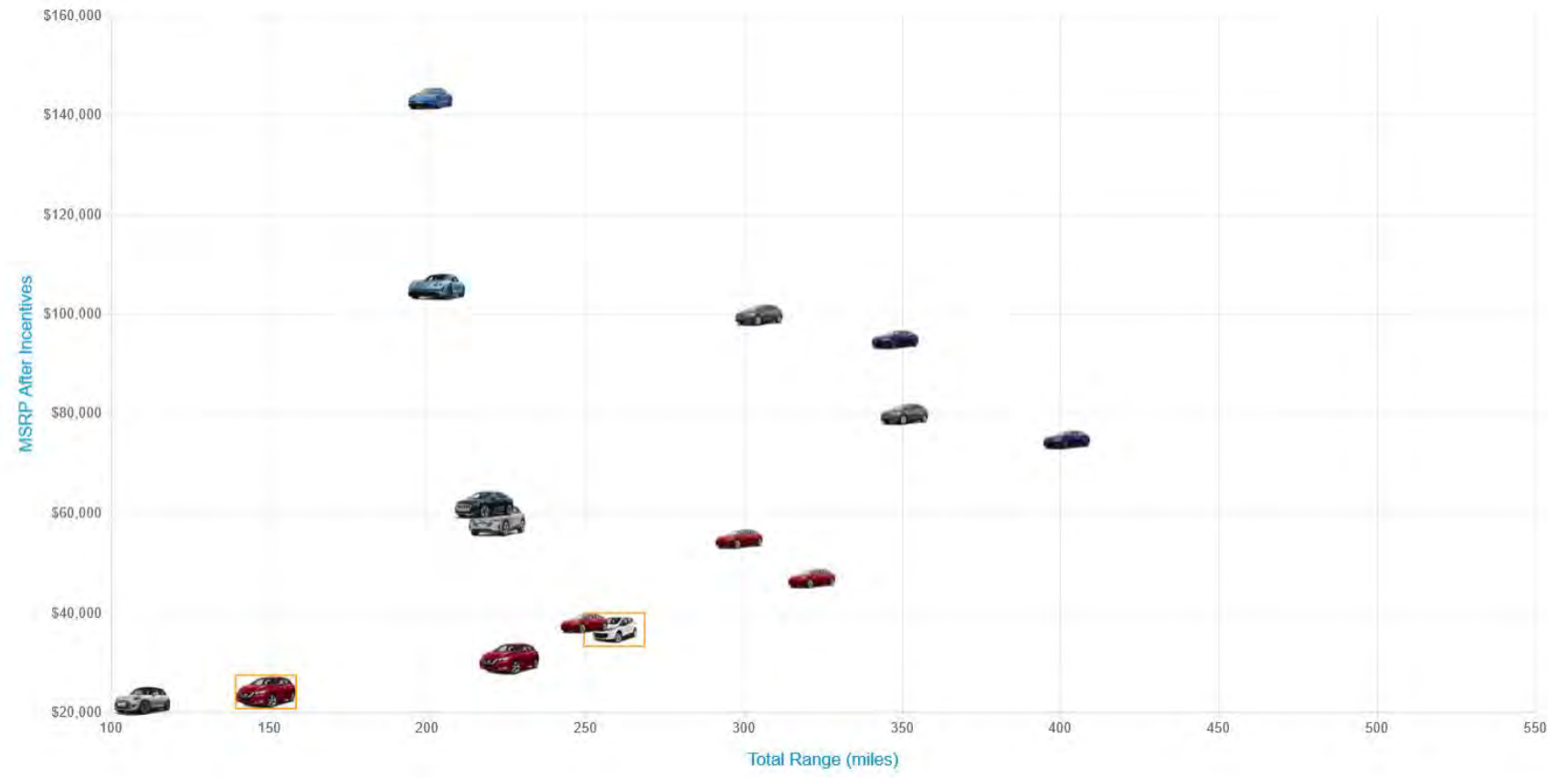
- 2
- 5
- 4
- > 5

Fuel

- All-Electric
- Plug-in Hybrid

Minimum Range

Location



Total Range 
  Electric Range



You are here: Find a Car - Home > Hybrids, Diesels, and Alternative Fuel Cars

Hybrids, Diesels, and Alternative Fuel Cars

Search by Vehicle Type

2020 Select Vehicle Type Go

More Search Options

FHWA Alternative Fuel Corridors

The Federal Highway Administration (FHWA) recently announced the designation of the nation's first alternative fuel corridors for electric, hydrogen, natural gas, and propane vehicles.

Visit the FHWA website for more information.

Browse New Cars



Hybrid



Plug-in Hybrid



All-Electric



Diesel



Flex-Fuel



CNG



Fuel Cell

Related Information

- Alternative Fuels
Green Power: Make Your Plug-in Vehicle Even Greener
Alternative Fuels Data Center (AFDC)
Alternative Fueling Station Locator
Vehicle Cost Calculator

MPG estimates last updated: 10/05/2020

ALSO IN THIS SECTION...

- Find a Car
Compare Side by Side
Power Search
Search Make
Hybrids, Diesels, and Alternative Fuel Cars
Find a SmartWay Vehicle
Best and Worst Vehicles
Fueleconomy.gov Top Ten
Today's Most Viewed Vehicles
Used Car Label Tool



Power Search

Expand any feature by selecting its title. Choose as many or as few features as you like.

**Model Year**

From: 2020 To: 2020

**Make**

**Market Class**

**MSRP**

**Fuel Economy**

**Transmission**

**Drive**

**Engine Technology**

**Cylinders**

**Fuel Type**

**Vehicle Type**

Conventional Gasoline     Hybrid     Dedicated CNG

Diesel     Plug-in Hybrid     Bifuel CNG

Flex-Fuel (E85)     All Electric     Bifuel LPG

**My Selections**

Year(s): 2020

Vehicle Type: All Electric

Search Clear All








Search Results

Sorting is based on EPA Combined City/Hwy MPG. ⓘ

Sort Personalize

View 10 |< < Page 1 > >|

MPG Energy & Environment Costs

	Vehicle	EPA Fuel Economy ↓	Driver MPG	Annual Fuel Cost
<input type="checkbox"/>	2020 Tesla Model 3 Standard Range Plus Automatic (A1), Electricity	 <p><b>141</b> MPGe combined city/hwy 148 132 24 kWh/100 mi</p>	NA	\$450
<input type="checkbox"/>	2020 Hyundai Ioniq Electric Automatic (A1), Electricity	 <p><b>133</b> MPGe combined city/hwy 145 121 25 kWh/100 mi</p>	NA	\$500
<input type="checkbox"/>	2020 Tesla Model 3 Standard Range Automatic (A1), Electricity	 <p><b>131</b> MPGe combined city/hwy 138 124 26 kWh/100 mi</p>	NA	\$500
<input type="checkbox"/>	2020 Tesla Model 3 Long Range Automatic (A1), Electricity	 <p><b>130</b> MPGe combined city/hwy 136 123 26 kWh/100 mi</p>	NA	\$500
<input type="checkbox"/>	2020 Tesla Model 3 Mid Range Automatic (A1), Electricity	 <p><b>123</b> MPGe combined city/hwy 128 117</p>		

My Selections

Year: 2020  
Vehicle Type: Electric  
(Showing 1 to 10 of 37 vehicles)

Modify



INSIDEEVs

<https://insideevs.com/reviews/344001/compare-evs/>



Zero-Emission Technology Inventory Tool

<https://globaldrivetozero.org/tools/zero-emission-technology-inventory/>







SELECT A REGION

SELECT A VEHICLE MANUFACTURER



© 2020 Mapbox © OpenStreetMap

REPORTED VEHICLE AVAILABILITY THROUGH 2023



RESET FILTERS

+ a b | e a u



Last updated on Sept 8, 2020





# ZERO-EMISSION TECHNOLOGY INVENTORY

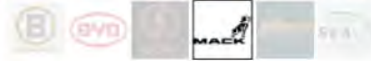


SELECT A VEHICLE PLATFORM TO EXPLORE



SELECT A REGION

SELECT A VEHICLE MANUFACTURER



© 2020 Mapbox © OpenStreetMap

REPORTED VEHICLE AVAILABILITY THROUGH 2023



RESET FILTERS

+ a b l e a u

**Mack**  
electric LR

**Technology:** Electric  
**Weight Class/Size:** Class 8  
**Estimated Payload:** Not available  
**Estimated Range:** Not available  
**Energy Storage:** Not available  
**Estimated Availability:** 2020



SELECT GO TO MANUFACTURER WEBSITE

electric LR

Last updated on Sept 8, 2020





ELECTRIC POWER

# Built tough to run clean.

The fully electric powertrain lets you navigate your route with the same dependability as the Mack LR – while reducing carbon emissions to nearly zero.





U.S. DEPARTMENT OF  
**ENERGY**

Energy Efficiency &  
Renewable Energy

## Alternative Fuels Data Center

[https://afdc.energy.gov/vehicles/electric\\_availability.html](https://afdc.energy.gov/vehicles/electric_availability.html)

<https://afdc.energy.gov/vehicles/search/>





# Alternative Fuels Data Center

Search the AFDC

SEARCH

FUELS & VEHICLES

CONSERVE FUEL

LOCATE STATIONS

LAWS & INCENTIVES

Maps & Data

Case Studies

Publications

Tools

About

Home

EERE » AFDC » Tools » Vehicle Search

[Printable Version](#)



## Alternative Fuel and Advanced Vehicle Search

Find and compare alternative fuel vehicles (AFVs), engines, and hybrid/conversion systems. Some of the light-duty AFVs may count toward vehicle-acquisition requirements for [federal fleets](#) and [state and alternative fuel provider fleets](#) regulated by the Energy Policy Act (EPAct).

Download a complete list:

[Light-Duty Vehicles](#)

[All Vehicles](#)

### Vehicles by Type



[Sedan/Wagon](#)



[Pickup](#)



[SUV](#)



[Van](#)



[Step Van](#)



[Vocational/Cab Chassis](#)



[Street Sweeper](#)



[Refuse](#)



[Tractor](#)



[Passenger Van/Shuttle Bus](#)



[Transit Bus](#)



[School Bus](#)

### Vehicles by Manufacturer

#### Light-Duty

All



SEARCH

#### Medium- and Heavy-Duty

All



SEARCH

### Engines and Hybrid/Conversion Systems

For medium- and heavy-duty vehicles:

ENGINE & POWER SOURCES

CONVERSION & HYBRID SYSTEMS


[ABOUT THE DATA](#)

Search Results - 1 - 5 of 5 vehicles New Search | Download | Print

Filter by: Fuel/Technology: Electric | Class/Type: Step Van | Manufacturer: All


View:

**Ford E-450 Step Van** Electric




**Power Source(s):**  
Motiv Power Systems EPIC 4 150kW electric motor  
**Note:** Based on the Ford E-450 Cutaway. This vehicle is available with an electric power train developed and installed by Motiv Power Systems, a Ford-approved qualified vehicle modifier (QVM). According to Motiv: 106 or 127 kWh battery; up to 100 miles range

**Ford F-59 Cargo Van** Electric




**Power Source(s):**  
Lightning Systems 180kW electric motor  
**Note:** Based on the Ford F-59 stripped chassis. This vehicle is available with an electric power train developed and installed by Lightning Systems, a Ford-approved qualified vehicle modifier (QVM). According to Lightning Systems: 128 kWh battery; up to 110 miles range

**Ford F-59 Step Van** Electric




**Power Source(s):**  
Motiv Power Systems EPIC 5, EPIC 6 250kW electric motor  
**Note:** Based on the Ford F-59 stripped chassis. This vehicle is available with an electric power train developed and installed by Motiv Power Systems, a Ford-approved qualified vehicle modifier (QVM). According to Motiv: 127 kWh battery; 90 miles range

**US Hybrid eCargo** Electric



**Power Source(s):**  
US Hybrid AC Induction with Integrated Gear Reduction 120kW electric motor  
**Note:** According to manufacturer: Utilimaster, Aeromaster FT 1261 Walk-In chassis; 35.84 kWh battery; 75 mile range

**Workhorse C-Series** Electric



**Transmission:** Automatic  
**Power Source(s):**  
Workhorse Dual Axial Flux Interior Permanent Magnet Motors  
**Note:** According to manufacturer: 70kWh battery and up to 100 miles range.

Refine Your Search

**Fuel/Technology** -

- All Fuels
- Biodiesel (B20)
- Ethanol (E85)
- Hydrogen Fuel Cell
- LNG - Liquefied Natural Gas
- CNG - Compressed Natural Gas
- CNG - Bi-fuel
- Propane
- Propane - Bi-fuel
- Electric
- Plug-in Hybrid Electric
- Hybrid Electric
- Hybrid - Diesel Electric

**Class/Type** -

- All Classes/Types
- Sedan/Wagon
- Pickup
- SUV
- Van
- Step Van
- Vocational/Cab Chassis
- Street Sweeper
- Refuse
- Tractor
- Passenger Van/Shuttle Bus
- Transit Bus
- School Bus

**Manufacturer - Light-Duty** +

**Manufacturer - Med & Heavy-Duty** +



Kevin Hartman  
kevin.hartman@zeromotorcycles.com  
630.408.4368

- Sales Director for Fleet and Authority for Zero Motorcycles
- Started at Zero Motorcycles in 2013
- Has spent his career working with public safety agencies in the US and around the world



SFTCS: Electric Vehicle Options for  
Fleets

October 7, 2020

Kevin Hartman  
Sales Director – Fleet/Authority  
[kevin.hartman@zeromotorcycles.com](mailto:kevin.hartman@zeromotorcycles.com)  
630.408.4368





# Authority Fleet

Over 150 law enforcement agencies in U.S.

- 7 departments in NC
- NCCETC Grant Awardees: 12 Zero Motorcycles to date

Fire Departments/EMS

Features:

- No clutch or shifting
- Instant torque
- No heat or emissions
- 5-year battery warranty

Benefits:

- Community Relations
- Low Maintenance Cost/TCO
- Stealth



# 2021 Authority Models

## DSRP ZF14.4

**Range:** 157 miles city  
88 miles highway

**Top Speed:** 102 mph

**Recharge:** 9.8 hours - 120 VAC  
2.5 hours – Level 2 (J1772)



## FXP ZF7.2

**Range:** 88 miles city  
51 miles highway

**Top Speed:** 85 mph

**Recharge:** 9.7 hours - 120 VAC  
Swappable Battery Modules



## MMX ZF7.2

**Range:** 79 miles city  
46 miles aggressive tactical

**Top Speed:** 85 mph

**Recharge:** 6 hours - 120 VAC Off-board  
1 Meter Water Resistance







Jeff Esfeld

[Jeff@TroposTech.com](mailto:Jeff@TroposTech.com)

206-228-5400

- Sales & Business Development Director for Tropos Technologies
- Been involved in commercial electric truck industry since 2003
- Has intimate knowledge of electric vehicle design and architecture
- Works on electrification strategy with some of the largest public and private fleets in the US and Canada



## Reinventing the Low Speed Vehicle



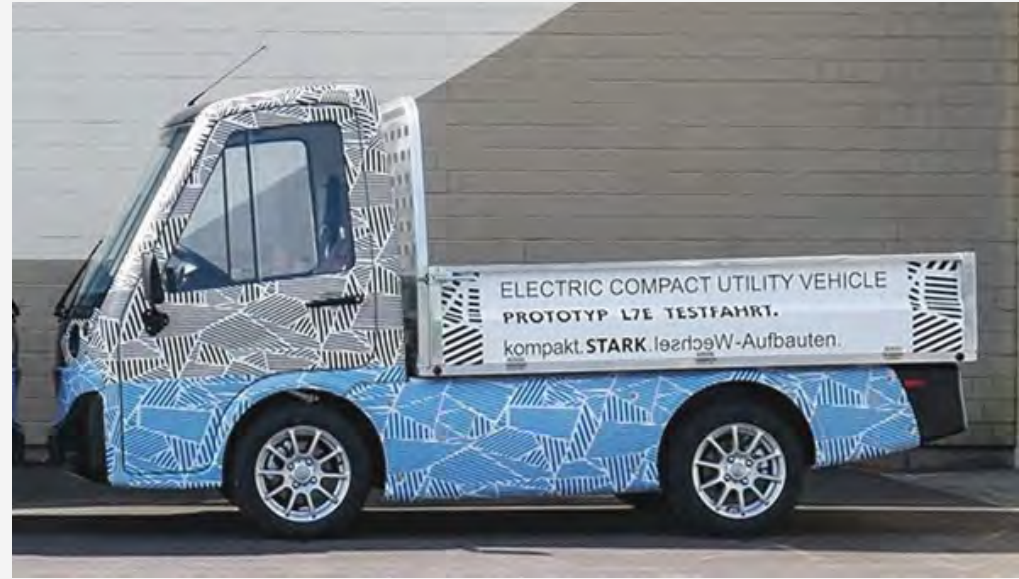


**Tropos Technologies is an EV powertrain, engineering and vehicle development company located in Silicon Valley in Morgan Hill, CA. Tropos is bringing innovation to the Electric Utility Task Vehicle market. We are engaged with major corporate partners and clients to develop and market advanced low speed vehicle EV components, systems and complete vehicles (conventional and autonomous) for the US and global markets.**



**Tropos sources on a “most favorable” basis and assembles complete vehicles in the United States and the EU. World Manufacturer Identifier (WMI) 7JM – In production of both ABLE ST and ABLE XR chassis selling through a growing list of premier Dealers across North America, Europe and Internationally**

## Tropos Motors Europe



Tropos Motors Europe (TME) was established in Germany with partner MOSOLF, Europe's 2<sup>nd</sup> largest Post Production, Fleet Services & Logistics company. A new factory is now operational near Dusseldorf. In early June the European website was launched and sales commenced. 500 trucks have been shipped in 2020 with 800 more in the next few months. 2021 volume estimated at over 3000 units.

# **Why do we need electric low speed vehicles?**

**Low Speed Electric vehicles are an efficient sustainable solution to last mile fleet delivery, campus or facility maintenance, on site emergency responder services and many more uses. Our easy swap options can transform from one application to another. A silent, low maintenance and versatile vehicle that is street legal and can be used indoors and outdoors**





**160 MILE RANGE**

**Pushing the Envelope in: Range, Safety, Capabilities, Value**



Our vehicles:

# The ABLE XR

- Battery Pack: 13 & 26 kWh Lithium Ion
- Range: Up to 80 & 160 miles
- Top Speed: 45 mph depending on state
- Street Legal: Yes
- Suspension: Torsion beam
- Payload on Road: 1100 lbs (2100 lbs off road)
- Towing: 2000 lbs (3000 off road)
- Charge voltage: 110/220v or J1772 at 16 amps
- Time to full Charge: 4 to 8 hours
- Safety: Roll cage, Crash zone, Airbag
- Hill Hold Feature: Yes

- Brakes: 4 wheel disc ABS
- HVAC: Full Heat and AC
- Right Hand Drive available: Yes
- Available Telematics: Yes
- MSRP: ABLE XR1 = \$21,650
- MSRP: ABLE XR2 = \$27,800



Tropos ABLE ST & XR Electric Utility Task Vehicles (UTV) are street legal in all 50 states. Speeds vary by state. Private facilities allow for any speed.

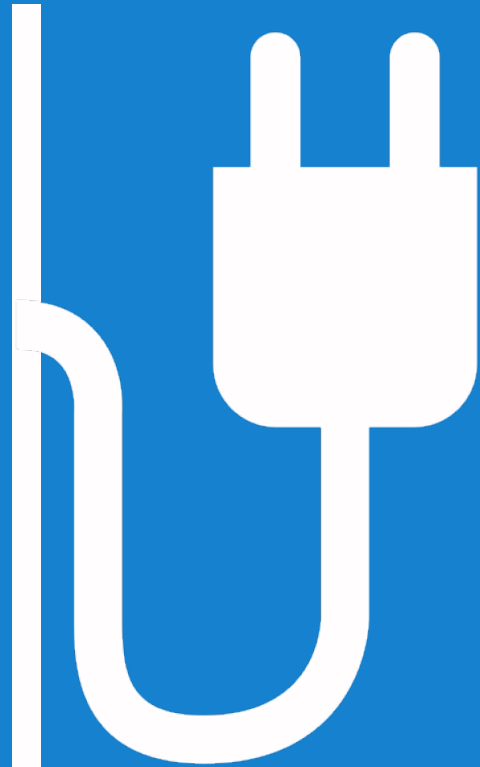
States that allow Street Operation at up to 45 mph:

Arizona, Utah, Nevada, Texas, Minnesota, Wyoming, Idaho, Indiana, Kansas, Montana, North and South Dakota, Washington, Michigan, Kentucky, Nebraska, Ohio, Vermont, Wisconsin, New Hampshire, Tennessee and Colorado

- Counties and Municipalities may be able to adopt these ATV/UTV standards as well
- 



ABLE ST & XR  
AVAILABLE  
UPFIT  
PACKAGES



ABLE Pickup



ABLE Cargo \*



ABLE Sweep



ABLE Trades \*



ABLE EMS<sub>c</sub>



ABLE FRV



ABLE EMS<sub>c</sub>





1380 lbs. Dump Capacity

New Bed Package: The Dump Truck







New Bed Package: The Trades Package w/Tommy Gate Truck





New Bed Package: Right Hand Drive Parking Enforcement Vehicle

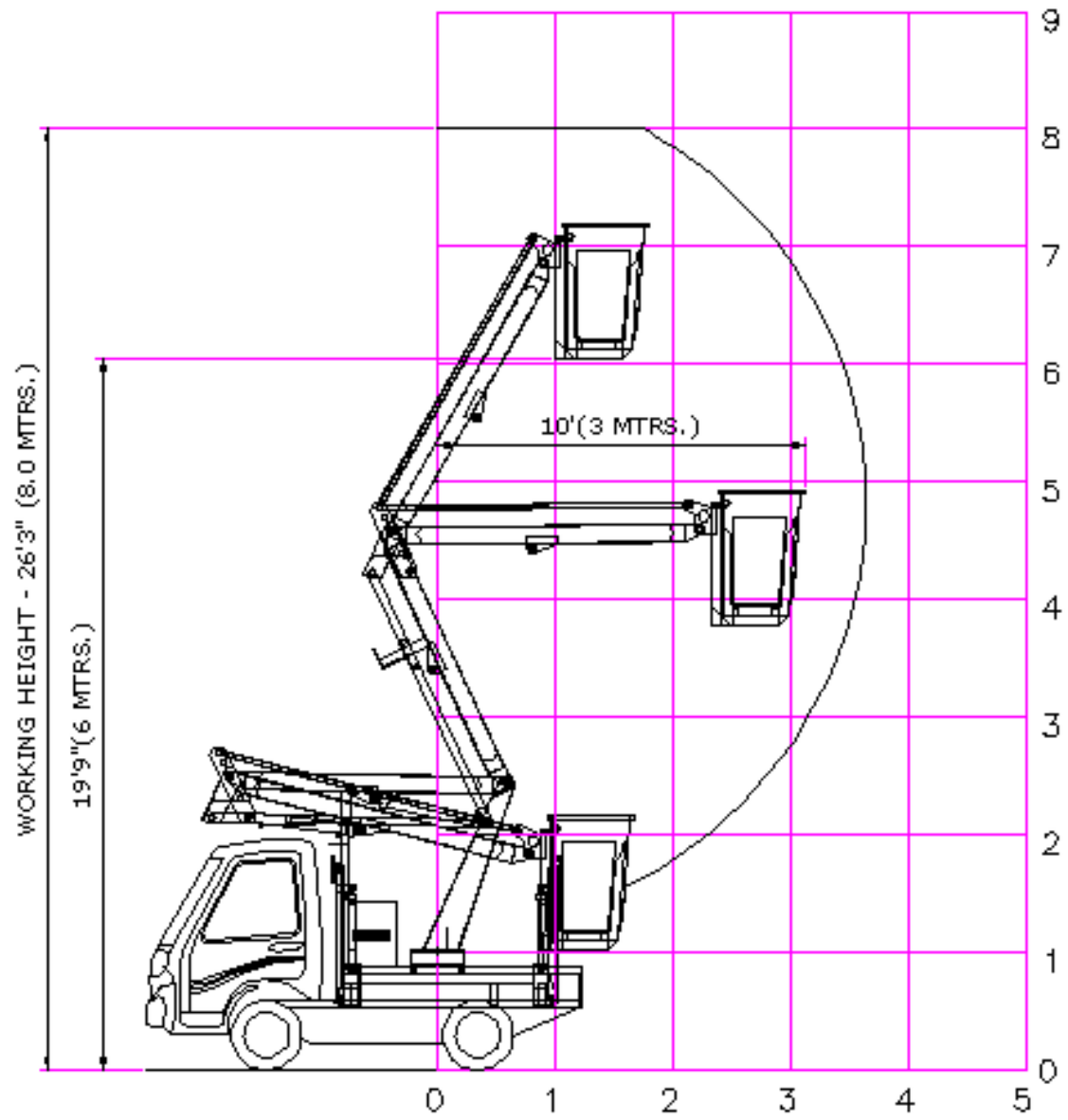




120 or 240 Cubic Foot Last Mile Delivery/Technician Truck

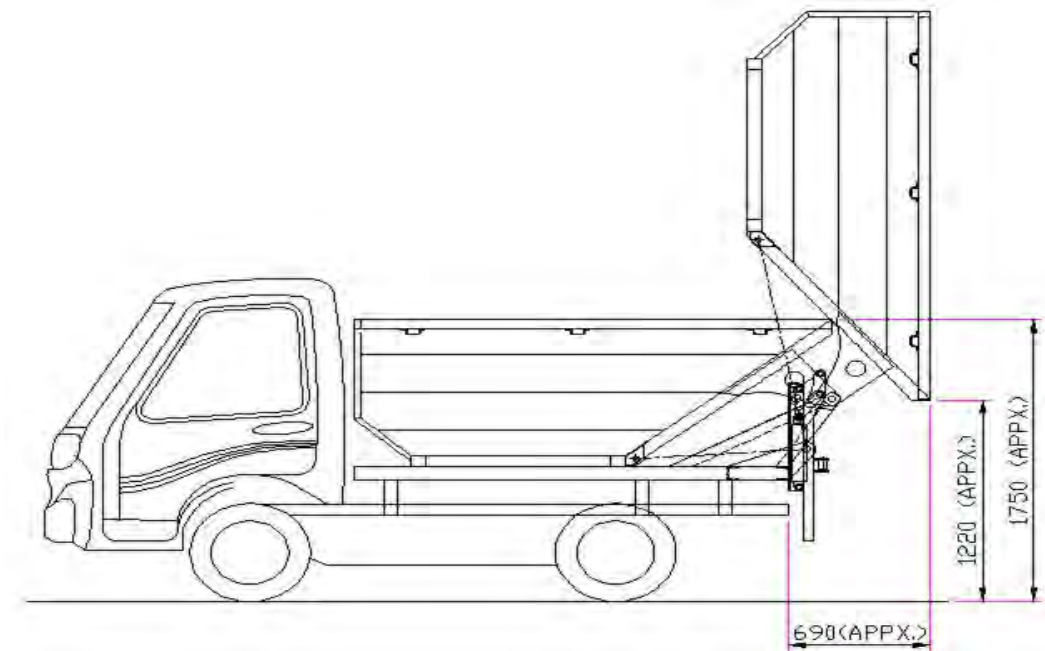
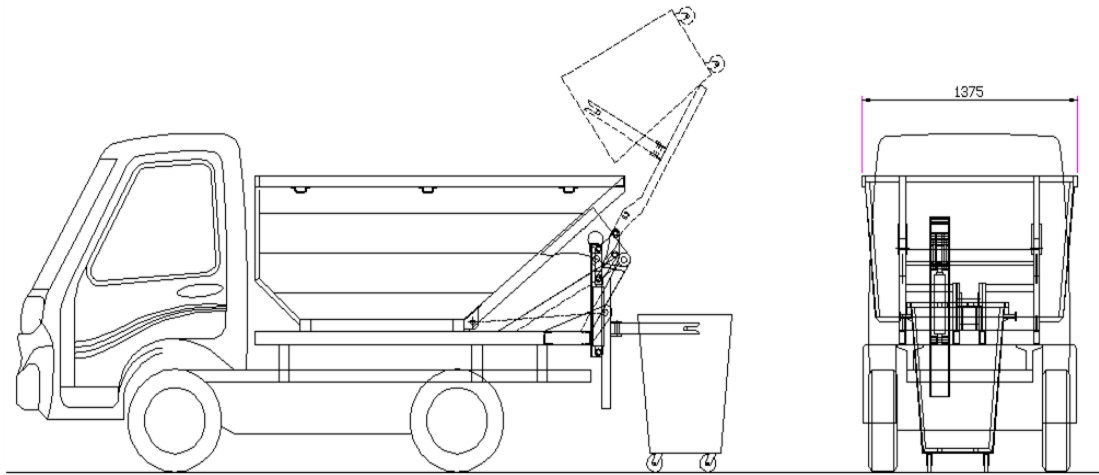


FOOD SERVICE TRUCKS: HEATED, COOLED, FREEZER,  
BEVERAGE, & COMBO<sub>c</sub>

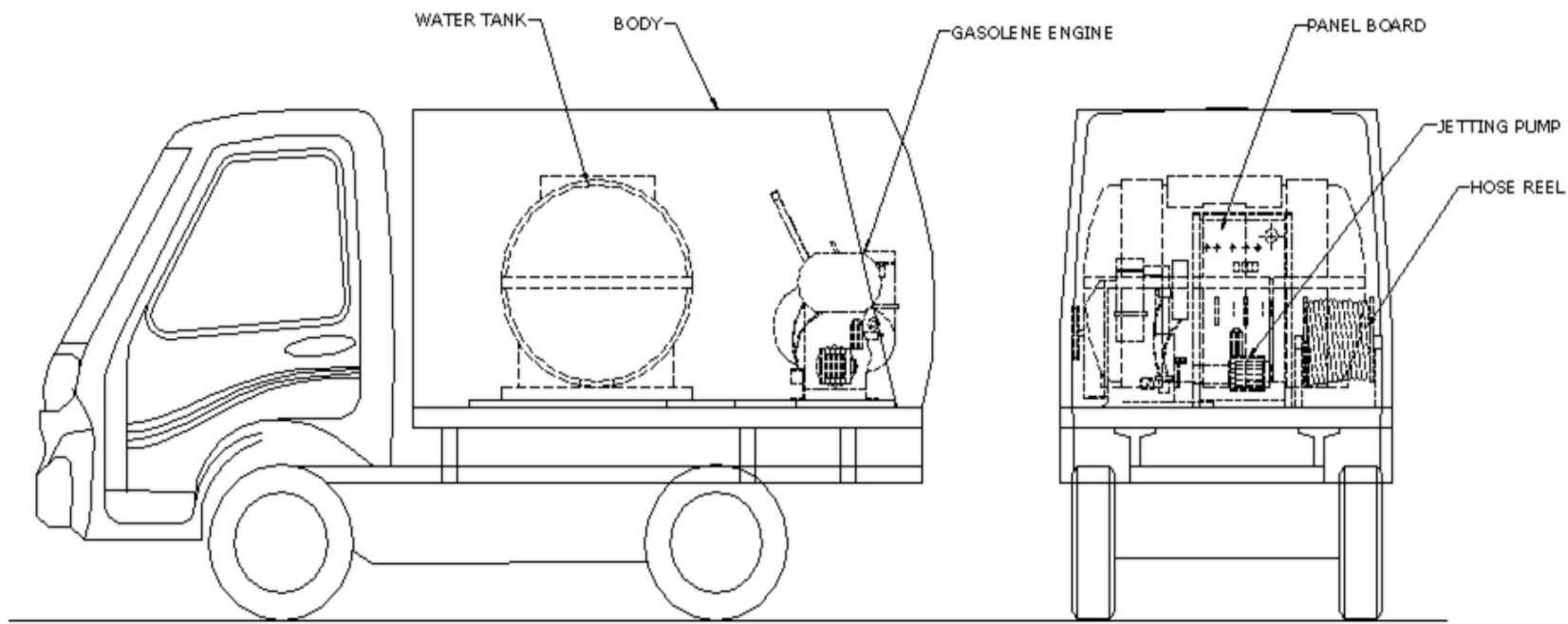


# BUCKET MAN LIFT





# GARBAGE TRUCK WITH BIN LIFTER SYSTEM



# PRESSURE WASHING TRUCK

# 8 PERSON ON CAMPUS PEOPLE MOVERS





# **Fleet Total Cost of Ownership Models\***

**\* Please contact Jeff Esfeld for a custom Fleet TCO Analysis**

# Get In Touch With Us

---

Jeffrey Esfeld  
Sales & Business Development Director

206-228-5400

[Jeff@TroposTech.com](mailto:Jeff@TroposTech.com)

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





## 2021 GM FLEET



Marisa Bertoia

[marisa.bertoia@gm.com](mailto:marisa.bertoia@gm.com)

313-643-1003

- SE Region Government Fleet Account Executive for GM
- Territories include KY, WV, VA, TN, NC, SC, AL, GA, FL, Puerto Rico, and the US Virgin Islands



2021 GM FLEET

# GENERAL MOTORS





2020 CHEVROLET BOLT EV

# 2020 CHEVROLET **BOLT EV**





# 2020 CHEVROLET BOLT EV



## CHARGE UP YOUR PRODUCTIVITY

- Shortest order-to-delivery cycle times for electric vehicles last year<sup>1</sup>
- Could save you up to \$2,500/vehicle in fuel costs over five years compared to the average new vehicle<sup>2</sup> (as of May 20, 2020)
- Offers an array of safety and driver assistance technologies — including available Forward Collision Alert<sup>3</sup> and Automatic Emergency Braking<sup>3</sup> — to help drivers prevent collisions
- Long list of impressive characteristics, including some of the most technologically advanced features, standout looks and plenty of space for people and cargo

<sup>1</sup> Antich, Mike. "Average Fleet Order-To-Delivery Times Worsen in 2019." Automotive FLEET, Sept. 24, 2019. <sup>2</sup> US Department of Energy, go to <https://www.fueleconomy.gov/feg/Find.do?action=sbs&id=40520>. Based on 45% highway, 55% city driving, 15,000 annual miles and current fuel prices. <sup>3</sup> Read the vehicle's Owner's Manual for important safety and driver assistance feature limitations and information. <sup>4</sup> Your actual range will vary based on several factors, including temperature, terrain, battery age and how you use and maintain your vehicle. <sup>5</sup> Whichever comes first. See dealer for limited warranty details.

GM CONFIDENTIAL - As of 5/20/2020

 EPA-ESTIMATED  
**259 MILES**

Pure electric range on a full charge<sup>4</sup>

 **8 YR/100K<sup>5</sup>**

Fleet Management Battery and electric component coverage

 AVAILABLE  
**AUTOMATIC  
EMERGENCY  
BRAKING<sup>3</sup>**

GENERAL MOTORS FLEET





# 2020 CHEVROLET BOLT EV

## TWO TRIMS TO CHOOSE FROM



### LT

- Electronic Precision Shift
  - Electronic transmission range selector with Low selection for throttle off regenerative braking
- Michelin® self-sealing tires
- 10.2-inch diagonal LCD touch-screen
- HD Rear Vision Camera<sup>1</sup>



### PREMIER

- Includes LT features, plus:
  - Lane Change Alert with Side Blind Zone Alert<sup>1</sup>
  - Rear Park Assist<sup>1</sup>
  - Rear Cross Traffic Alert<sup>1</sup>
  - Rear Camera Mirror<sup>1</sup>
  - HD Surround Vision<sup>1</sup>
  - Heated, leather-wrapped steering wheel
  - Heated, leather-appointed seating surfaces

<sup>1</sup> Read the vehicle's Owner's Manual for important safety and driver assistance feature limitations and information.

# 2020 CHEVROLET BOLT EV VERSATILE CARGO SPACE



## CROSSOVER FUNDAMENTALS

- Cargo area functionality similar to a compact/midsize crossover
  - Up to 56.6 cu. ft. of maximum cargo volume<sup>1</sup>
  - Fold-flat rear seats offer the flexibility to transport larger-shaped items whenever you need
  - Standard liftgate for easy cargo loading

## AVAILABLE FALSE CARGO FLOOR

- Provides additional space when you need it while keeping your cargo organized, easily accessible and neatly stowed away

 MAX. CARGO VOLUME<sup>1</sup>  
**56.6 CU. FT.**

Gives drivers ample space for work items

<sup>1</sup> With rear seats folded. Cargo and load capacity limited by weight and distribution.

GM CONFIDENTIAL - As of 5/20/2020

GENERAL MOTORS FLEET





# 2020 CHEVROLET BOLT EV

## BOLT EV CARGO OPTION



### REAR SEAT DELETE PACKAGE

- Transform Bolt EV into Bolt EV Cargo with the Rear Seat Delete Package (RPO: K1T)
- Offers about 66 cu. ft. of cargo space<sup>1</sup>
- Manufactured as an incomplete vehicle
  - Requires a rear cargo upfit through an approved upfitter
- Requires Driver Confidence Package and Driver Confidence II Package



### BASED ON LT TRIM

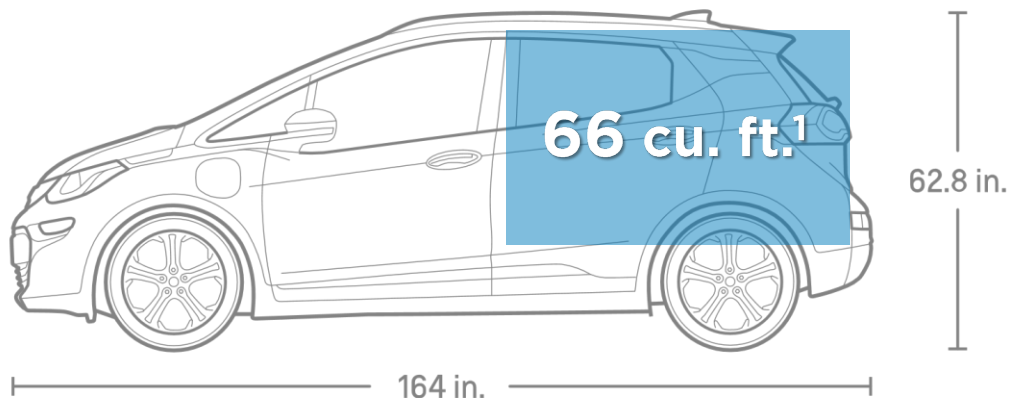
- Includes LT content with the following deletions:
  - Rear seat, upper and lower
  - Rear carpeting
  - Rear-seat side-impact airbags<sup>2</sup> and airbag trim
  - 120-volt charge cord
  - Rear package shelf
  - 17-inch alloy wheels (replaced with 16-inch steel wheels)

<sup>1</sup> With Rear Seat Delete Package. Cargo and load capacity limited by weight and distribution. <sup>2</sup> Always use seat belts and child restraints. Children are safer when properly secured in a rear seat in the appropriate child restraint. See the Owner's Manual for more information.



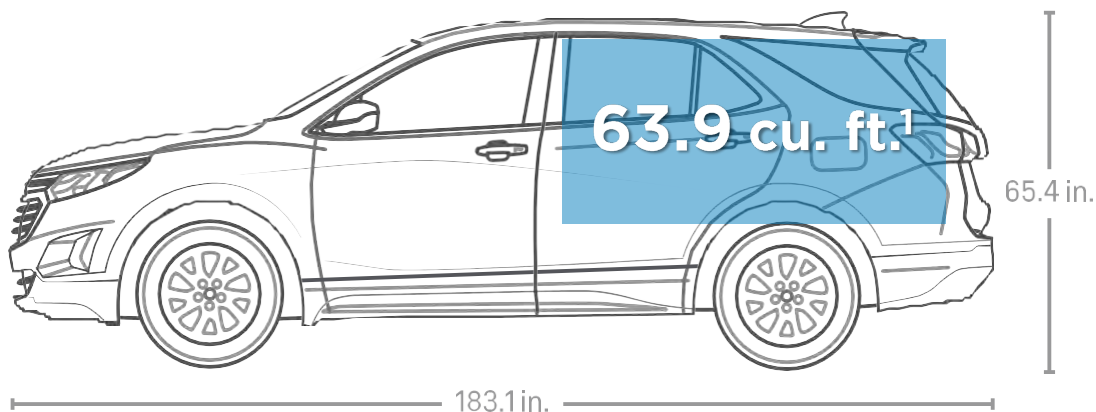
# 2020 CHEVROLET BOLT EV BOLT EV CARGO VS. EQUINOX

## 2020 CHEVROLET BOLT EV CARGO



MAX. PAYLOAD<sup>2</sup>  
**837 LBS.**

## 2020 CHEVROLET EQUINOX



MAX. PAYLOAD<sup>2</sup>  
**1,139 LBS.**  
(LT FWD)  
**1,152 LBS.**  
(LT AWD)

<sup>1</sup> With rear seats folded. Cargo and load capacity limited by weight and distribution <sup>2</sup> These maximum payload ratings are intended for comparison purposes only. Before you buy a vehicle or use it to haul people or cargo, carefully review the vehicle loading section of the Owner's Manual and check the carrying capacity of your specific vehicle on the label on the inside of the driver's door jamb.

# 2020 CHEVROLET BOLT EV MOBILE OFFICE CONNECTIVITY

## STANDARD INFOTAINMENT<sup>1</sup>

- Standard 10.2-inch diagonal LCD touch-screen
- Apple CarPlay™<sup>2</sup> and Android Auto™<sup>3</sup> capable

## WI-FI® ON THE GO

- Available built-in 4G LTE Wi-Fi® Hotspot<sup>4</sup>
- Connect up to 7 devices and maintain connections up to 50 feet from the vehicle<sup>5</sup>
- 1 month or 3GB of 4G LTE data (whichever comes first)<sup>6</sup>

## PRODUCTIVE TECHNOLOGIES

- 8-inch diagonal Driver Information Center with 3 themes and energy monitors
- 2 standard USB ports<sup>7</sup>
  - Dual rear charging-only USB ports<sup>7</sup> available
- Available wireless charging<sup>8</sup>



<sup>1</sup> Functionality varies by model. Full functionality requires compatible Bluetooth and smartphone. Some devices require USB connectivity. <sup>2</sup> Vehicle user interface is a product of Apple and its terms and privacy statements apply. Requires compatible iPhone and data plan rates apply. Apple CarPlay is a trademark of Apple Inc. Siri, iPhone and iTunes are trademarks of Apple Inc., registered in the U.S. and other countries. <sup>3</sup> Vehicle user interface is a product of Google and its terms and privacy statements apply. Requires the Android Auto app on Google Play and an Android compatible smartphone running Android 5.0 Lollipop or higher. Data plan rates apply. Android Auto is a trademark of Google LLC. <sup>4</sup> Service varies with conditions and location. Requires active service plan and paid AT&T data plan. See onstar.com for details and limitations. <sup>5</sup> Vehicle must be on or in the Accessory position for Wi-Fi to function. <sup>6</sup> Service varies with conditions and location. Requires active service plan. Data plans provided by AT&T. See gmfleet.com/connectedservices for details and limitations. Availability subject to change. <sup>7</sup> Not compatible with all devices. <sup>8</sup> The system wirelessly charges one compatible mobile device. Some phones have built-in wireless charging technology and others require a special adapter/back cover. To check for phone or other device compatibility, see my.chevrolet.com/learn for details or consult your carrier.

# 2020 CHEVROLET BOLT EV DRIVER ASSISTANCE TECHNOLOGIES BY TRIM

	LT	PREMIER
HD Rear Vision Camera	S	S
Rear Park Assist	A	S
Lane Change Alert with Side Blind Zone Alert	A	S
Rear Cross Traffic Alert	A	S
Automatic Emergency Braking	A	A
Following Distance Indicator	A	A
Forward Collision Alert	A	A
Front Pedestrian Braking	A	A
Lane Keep Assist with Lane Departure Warning	A	A
HD Surround Vision	—	S
Rear Camera Mirror	—	S

NOTE: Read the vehicle's Owner's Manual for important safety and driver assistance feature limitations and information.

**2019** **TOP SAFETY PICK**  
When equipped with optional Driver Confidence II Package





# WE'RE RAPIDLY EXPANDING OUR EV PORTFOLIO

## ON OUR WAY TO AN ALL-ELECTRIC FUTURE

- With emissions from the use of GM vehicles as the primary contributor to our carbon footprint, the most significant way we can make progress toward our zero-emissions vision is by transitioning to an electric vehicle portfolio
- \$20 billion in capital and engineering resources will be allocated to EV and AV programs between 2020 and 2025
- We're committed to 20 new EVs by 2023 — and we have plans for additional models taking us beyond that



# WE HAVE ALL-NEW EVs ON THE WAY



## CHEVROLET

- Chevrolet will build on the success of the Bolt EV
  - The 2022 Chevrolet Bolt EUV is expected summer 2021
    - Distinct SUV design that offers Super Cruise<sup>1</sup> driver assistance feature for compatible highways – the first vehicle outside of Cadillac to do so
  - Chevrolet BET Truck will be the brand's first electric full-size pickup, offering up to 400 miles of range on a single charge<sup>2,3</sup>
  - A midsize SUV for customers looking for an electric option in this segment



## GMC

- GMC is bringing back the iconic HUMMER brand through two models
  - The 2022 GMC HUMMER EV truck (expected Fall 2021), which boasts performance of 1,000 horsepower<sup>3</sup>, 11,500 lb.-ft. of torque<sup>3</sup> and 0-to-60 mph acceleration in 3.0 seconds<sup>3</sup>
  - GMC HUMMER EV SUV builds off the GMC HUMMER EV truck but will be configured as an off-road-capable SUV



## CADILLAC

- Cadillac plans an upcoming portfolio of battery-electric luxury vehicles, starting with the 2022 LYRIQ
  - Will be the brand's first all-electric crossover
  - Built on GM's next-generation battery-electric architecture, with Ultium at its core

<sup>1</sup> Even while using the Super Cruise driver assistance feature, always pay attention while driving and do not use a handheld device. Visit [cadillacsupercruise.com](https://cadillacsupercruise.com) for compatible highways and more information. Requires properly equipped vehicle, active Super Cruise subscription, working electrical system, cell reception and GPS signal. <sup>2</sup> Your actual range will vary based on several factors, including temperature, terrain and driving technique. <sup>3</sup> Preliminary GM estimate.

# GENERAL MOTORS FLEET

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Benjamin Hartford  
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617-718-0329 x 1118

- Direct Sales Manager at XL Fleet
- Manages relationships with all of the companies' end users
- Previously worked for Tesla Inc.
- Degree from Colby College in Biology, Environmental Studies, and Religious Studies



# Sustainability Starts **Here**

Electrification Solutions for Fleets



**XL Fleet**™

October 7, 2020

# Fleet Electrification Leader



- Founded in 2009
- 130+ million fleet miles driven and counting
- Hybrid and plug-in hybrid ship-thru upfits for commercial & municipal fleets
- Installed by national upfit partners
- Approved by Ford, GM and Isuzu for installation; no impact to OEM factory warranties
- First Ford eQVM; Ship-thru codes available

**ELECTRIFYING FLEETS**

**XL**™

**10 YEARS**

**100 Million Miles**

- 2 million gallons fuel saved
- 20,000 metric tons of CO2 emissions eliminated
- 18,500 hours of increased driver productivity

The graphic is a dark blue square containing the XL Fleet logo and various partner logos. The logos include Coca-Cola, Verizon, Pepsi, Yale University, UCLA, SDGE, NYC Parks, Vans, ThyssenKrupp, Safelite AutoGlass, and City of Seattle.

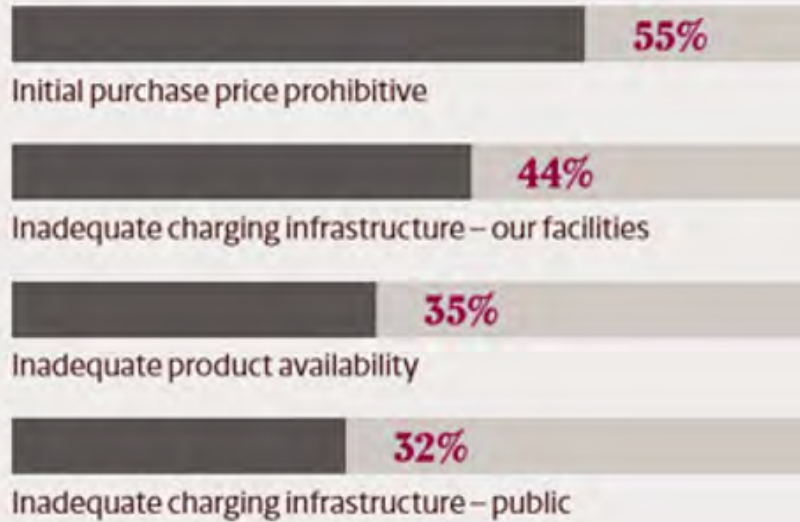




## Sustainability Starts Here



### BARRIERS TO FLEET ELECTRIFICATION



### HEV / PHEV Solutions

- ✓ ROI without incentives
- ✓ Preferred/Spec'd OEM vehicles
- ✓ Maintain service schedules and fleet operations
- ✓ Preserve factory OEM warranty
- ✓ Eliminate range, infrastructure, drivability concerns



# HEV / PHEV Systems

## XLhybrid®

### Overview

- Improve MPG and meet sustainability goals without compromising performance
- Saves fuel and reduces emissions
- No operational risk or infrastructure required for fleet operators

### Powertrain Specifications

**MGP Improvement:** up to 25%

**Lithium Ion Battery:** 1.8 kWh equivalent

**Charging:** Regenerative braking

**System Weight:** 350 – 385 lbs.



## XLplug-in™



### Overview

- Pioneered a plug-in hybrid system that is revolutionary in its simplicity
- High-voltage 18 kWh lithium battery provides shared propulsion with OEM powertrain
- Significantly improve MPG and reduce fuel consumption

### Powertrain Specifications

**MGP Improvement:** up to 50%

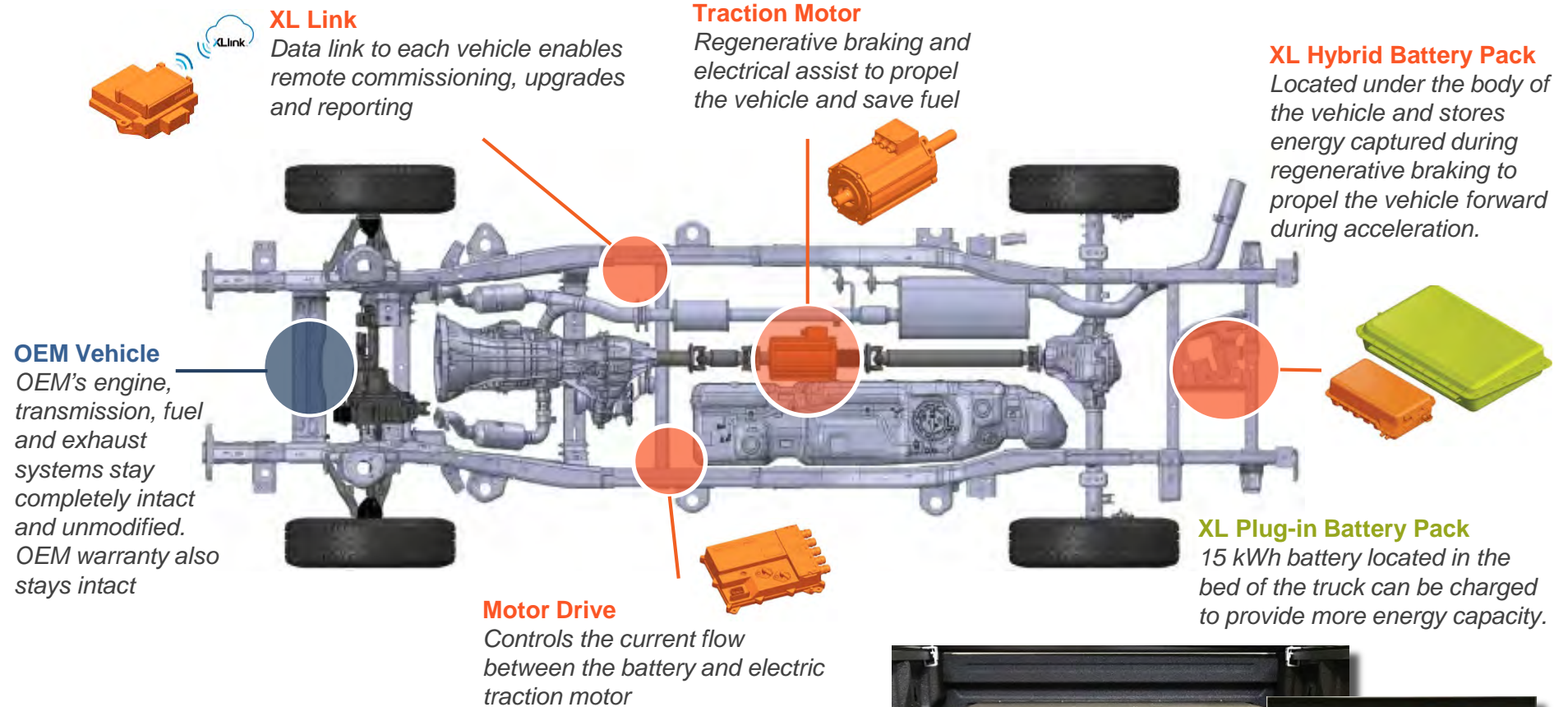
**Lithium Ion Battery:** 15 kWh equivalent

**Charging:** Level 1 (<12 hours) or Level 2 (<5 hours); plus regenerative braking

**System Weight:** 750 lbs.



# Simple, Sustainable Technology



Rear Bumper Plug Port





# Hybrid Upfits are BEV Accelerators



## Cut emissions, not performance



- Sustainability value without the limitations (*cost, infrastructure, product availability*)
- Immediate results drive long-term demand
- Strong installation and service capacity
- Greater charging efficiencies; defer costly facility upgrades

 **HYBRID**

 **PLUG-IN  
HYBRID**



# Many Ways to Order



## Contact XL

Review desired vehicle options

**Ben Hartford**  
617.648.8507 or  
bhartford@xlfleet.com

## FMCs & Dealers

Have your FMC or dealer contact XL to review specs / ship-thru codes  
**sales@xlfleet.com**

## Upfitter Order

Contact a certified sales & installation partner  
**[xlfleet.com/content/how-to-buy](https://xlfleet.com/content/how-to-buy)**





Kash Sethi

[kash.sethi@motivps.com](mailto:kash.sethi@motivps.com)

650-730-7604

- Vice President of Sales for Motiv Power Systems
- Spearheads Motiv's engagement with fleet customers, truck and bus partners, policy stakeholders, and dealers
- Background in EV, utilities and renewable industries
- MBA from Queen's University and BS in Electrical Engineering from University of Windsor



# MOTIV POWER SYSTEMS

*Proven EV Trucks & Buses*



# Intro to Motiv

- Ford eQVM approved all-electric chassis & industry leading truck and bus body partners
- Corporate HQ in California with chassis electrification in Indiana and Michigan
- Software and power electronics specialists with > 20 patent applications and 10 awarded
- Proven 5<sup>th</sup> generation technology with over 6 years of real world EV deployment experience



*Built with industry leading truck and bus builders*





# Our Story



**2009**  
Founded



**2013**  
E-450 all-electric Type A school bus deployed in California (industry first)

**2016**  
- Increased deployments / repeat orders  
- CARB approval for powertrain



**2012**  
Launched Prototype all-electric F-59 powertrain at NTEA Work Truck Show



**2015**  
- E-450 Google shuttle buses deployment  
- F-59 AmeriPride step vans deployment



**2017**  
- Ford eQVM approval (industry first)  
- F-59 Type C with Forest River and Creative Bus Sales





## 2018

- New Strategic Partnerships
- More deployments

**WINNEBAGO**

**REV**  
Vehicles for life

**UTILIMASTER**

**CHAMPION**

**aramark**

## 2020

- New customers, repeat orders
- More deployments
- 3<sup>rd</sup> California location opened, Michigan engineering center announced



## 2019

- Collins School Bus Partnership
- New customers and partners
- BMW passenger car batteries
- All-Electric USPS step vans



**BIMBO**  
Bakeries USA



**UNITED STATES  
POSTAL SERVICE**



**COLLINS**  
REV GROUP



# Proudly Engineered & Assembled in the USA



## Motiv Locations:

- 📍 San Mateo, CA: Headquarters
- 📍 Hayward, CA: Power electronics assembly
- 📍 Stockton, CA – PDI and Service Center
- 📍 Detroit, MI (coming soon): Midwest engineering center

## Chassis Electrification Plants:

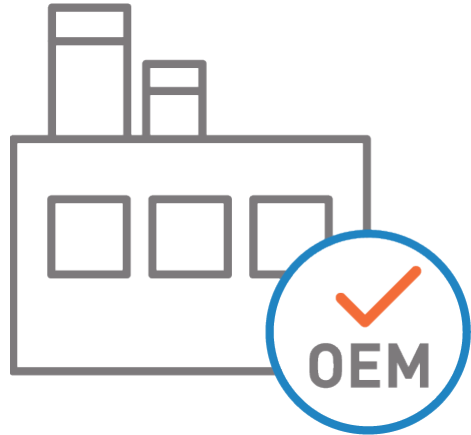
Indiana and Michigan

## Industry-Leading Truck & Bus Partners:

Indiana, Kansas, Michigan, New York, Wisconsin, Iowa, and California

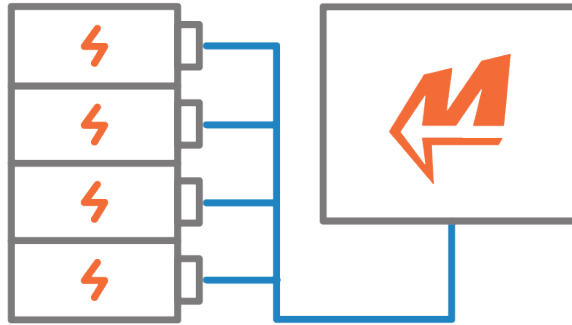


# Why Motiv?



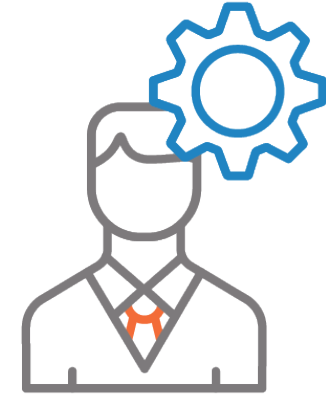
## OEM Approved

- Ford eQVM approved electric chassis - to ensure robust design, reliability, and warranty coverage
- Final stage vehicle built by industry leading bus and truck builders in high-volume production plants



## Proven Batteries

- Commercially proven battery packs – with significant R&D behind them to ensure quality and reliability, and built in high-volume automated production facilities
- Current partners BMW and FZSONICK both have millions of real world miles of experience



## Customer Support

- Strong pre-sales project planning support – incentives, charging infrastructure and more
- Dedicated team of highly trained field technicians at your service to ensure post-deployment success



# Electric Powered Intelligent Chassis (EPIC)



## EPIC E-450

- 14,500 lbs GVWR
- 127 kWh
- 80 - 120 real world miles



## EPIC F-59

- 19-22,000 lbs GVWR
- 127 kWh
- 80 - 120 real world miles



## EPIC F-53

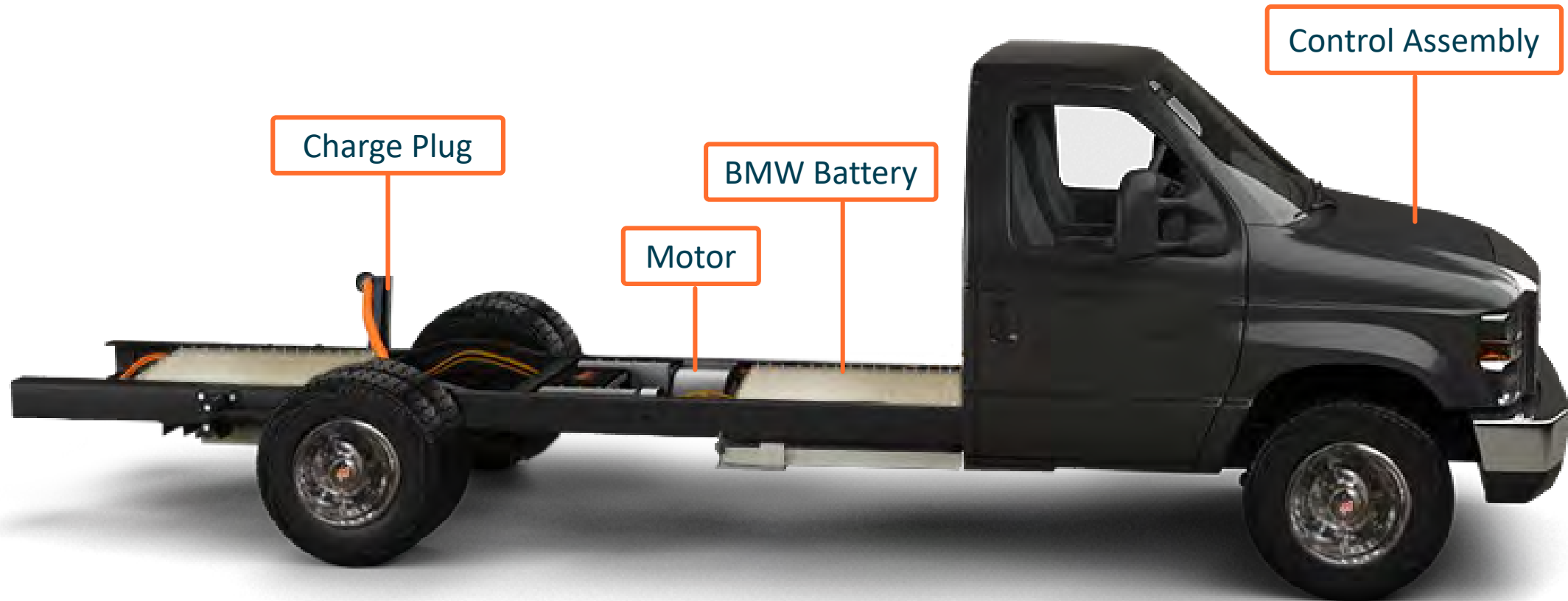
- 26,000 lbs GVWR
- 127 kWh
- 80 - 120 real world miles



Based on popular Ford platforms



# Motiv's EPIC E-450



# Vehicle Applications and Body Partners

**EPIC E-450**  
Class 4



**EPIC F-59**  
Class 5/6



**EPIC F-53**  
Class 6





# Step Vans



- Founded in 1973 and employs over 300 people today
- Manufacturing facility based in Bristol, IN
- UTM step vans come with low step-in cab and rear door height to provide optimum points of entry and exit, as well as larger windshield for optimal visibility

OEM PLATFORM	Ford E450 and F-59
MAX GVWR	14,500 - 22,000 lbs
CARGO LENGTH	14 – 22 ft
VEHICLE HEIGHT   WIDTH	81 or 85 in   86 or 93 in
BATTERY SYSTEM	127 kWh BMW Lithium-Ion
RANGE	105 miles
MAX SPEED	65 mph
LEVEL 2 AC CHARGING	15 kW / J1772
LEVEL 3 DC FAST CHARGING	50 kW / CCS



# Step Vans



- Founded in 1946, and currently located in Sturgis, Michigan and employs over 300 people today
- MO step vans come with heavy duty windshield wiper motors and reinforced cargo area floor foundations. Rear end structure also provides 50% more strength than others

OEM PLATFORM	Ford E450 and F-59
MAX GVWR	14,500 - 22,000 lbs
CARGO LENGTH	16 – 22 ft
VEHICLE HEIGHT   WIDTH	81 or 85 in   86 or 93 in
BATTERY SYSTEM	127 kWh BMW Lithium-Ion
RANGE	105 miles
MAX SPEED	65 mph
LEVEL 2 AC CHARGING	15 kW / J1772
LEVEL 3 DC FAST CHARGING	50 kW / CCS





# Box Trucks & Work Trucks



## Rockport COMMERCIAL VEHICLES

- A division of Forest River, Rockport was founded in Elkhart, IN in 2002 and employs over 140 people today
- Rockport box trucks come with low entry height, multiple side and rear door configurations, and optional shelving and cargo control packages

OEM PLATFORM	Ford E-450
MAX GVWR	14,500 lbs
CARGO LENGTH	13 – 18 ft
BATTERY SYSTEM	127 kWh BMW Lithium-Ion
RANGE	105 miles
GRADEABILITY	17%
MAX SPEED	65 mph
LEVEL 2 AC CHARGING	15 kW / J1772
LEVEL 3 DC FAST CHARGING	50 kW / CCS





# Type A School Buses



- Founded in 1967, manufacturing based in South Hutchinson, KS. Employs over 200 people today
- Produces > 3,500 Type A school buses per year
- Collins developed the first Type A school bus in 1967. Today, their buses come with tinted high-visibility passenger windows, galvanized HSLA steel body construction, and other modern features

OEM PLATFORM	Ford E-450
MAX GVWR	14,500 lbs
OVERALL LENGTH	24 feet
BATTERY SYSTEM	127 kWh BMW Lithium-Ion
RANGE	105 miles
GRADEABILITY	17%
MAX SPEED	65 mph
LEVEL 2 AC CHARGING	15 kW / J1772
LEVEL 3 DC FAST CHARGING	50 kW / CCS



# Type A School Buses



- Founded in 2007 and employs over 40 people today in a 70,000 square ft building in Warwick, NY
- Produced the first-ever Type A Electric School bus in 2013 (electrified by Motiv)

OEM PLATFORM	Ford E-450
MAX GVWR	14,500 lbs
OVERALL LENGTH	23 feet
BATTERY SYSTEM	127 kWh BMW Lithium-Ion
RANGE	105 miles
GRADEABILITY	17%
MAX SPEED	65 mph
LEVEL 2 AC CHARGING	15 kW / J1772
LEVEL 3 DC FAST CHARGING	50 kW / CCS





# Shuttle Buses



- Founded in 1953, located in Imlay City, MI, employs over 300 people today
- Utilizes over 194,000 square feet of manufacturing space to produce more than 1,500 buses per year
- Champion is one of the largest custom commercial bus manufacturers of small to mid-size buses in the industry.

OEM PLATFORM	Ford E-450
MAX GVWR	14,500 lbs
OVERALL LENGTH	23 or 26 feet
BATTERY SYSTEM	127 kWh BMW Lithium-Ion
RANGE	105 miles
GRADEABILITY	17%
MAX SPEED	65 mph
LEVEL 2 AC CHARGING	15 kW / J1772
LEVEL 3 DC FAST CHARGING	50 kW / CCS





# Shuttle Buses



## ELDORADO

- Founded in 1979, currently located in Salina, Kansas in a 250,000 sq ft facility employing 300 people
- Eldorado was of the first cutaway bus manufacturers in the U.S. building the “People Mover” in 1979. Today, they offer nearly 100 floor plans with thousands of options

OEM PLATFORM	Ford E-450
MAX GVWR	14,500 lbs
OVERALL LENGTH	23 or 25 feet
BATTERY SYSTEM	127 kWh BMW Lithium-Ion
RANGE	105 miles
GRADEABILITY	17%
MAX SPEED	65 mph
LEVEL 2 AC CHARGING	15 kW / J1772
LEVEL 3 DC FAST CHARGING	50 kW / CCS



# Customer Success Stories

## Aramark / AmeriPride



- 31 trucks deployed across 5 depots
- >300,000 miles, >99% uptime
- Large deployment planned for 2021

## USPS



- 7 delivery vans deployed in 2019
- >30,000 miles, >98% uptime

## Bimbo Bakeries



- 5 trucks deployed in 2019
- >15,000 miles, 100% uptime
- 20 currently in production, large deployment planned for 2021

## Type C School Buses



- 21 buses deployed across 12 school districts across CA
- >125,000 miles, >95% uptime

## Google / Mountain View



- 6 shuttles deployed in 2015-16
- >500,000 miles, high customer satisfaction even though early generation deployment

## Type A School Buses



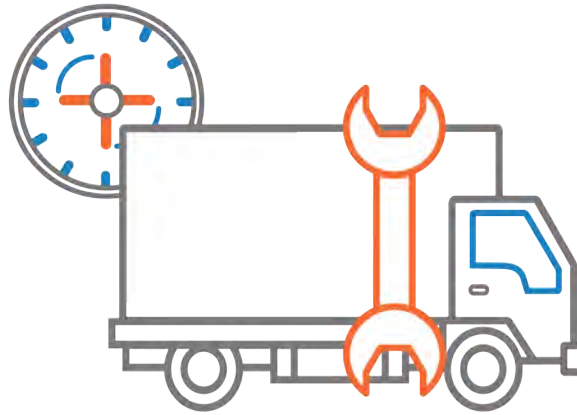
- 18 buses deployed across 4 school districts in CA and NY
- >100,000 miles, >97% uptime

# Your Pathway to Electrification



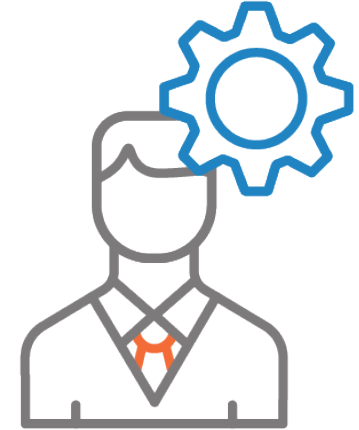
## Project Planning

- Review routes: range, route profile, and HVAC usage
- Check for eligible funding programs
- Review charging infrastructure needs
- Total Cost of Ownership analysis
- Evaluate vehicle options – focus on technology maturity, local presence and customer support infrastructure



## Project Execution

- Ensure charging infrastructure is installed and powered before vehicle deliveries
- Formal driver and mechanic training
- High touch Customer Service to ensure a seamless deployment
- Usage reports detailing uptime, utilization and daily mileage/range
- Driver training refreshers as needed



## Customer Support

- One of our Core Values: **Customer Support** extends all the way from pre sales to after sales
- Dedicated team of highly trained field technicians at your service to ensure post-deployment success



# Thank You



**Kash Sethi**

Vice President, Sales  
Motiv Power Systems

[kash.sethi@motivps.com](mailto:kash.sethi@motivps.com)





Mark Childers

[mark.childers@daimler.com](mailto:mark.childers@daimler.com)

336-881-6589

- Manager of Powertrain and Technology Sales for Thomas Built Buses
- Responsible for strategic growth of all powertrain solutions across product lines
- Recent years focus on electric C2 “Jouley”
- Previous experience with business development, sales and operational management with another major truck OEM
- Finance degree from Appalachian State University and a MBA from Elon University





# Sustainable Fleet Technology Conference

October 7, 2020





# Daimler Trucks Electric Portfolio



DAIMLER



Mercedes-Benz





# Specifications Overview



UP TO **135**  
MILES RANGE



**220**  
kWh TOTAL  
BATTERY  
CAPACITY



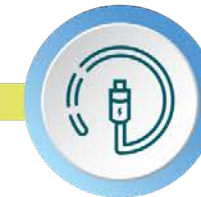
**295**  
PEAK  
HORSEPOWER



**2**  
SPEED  
TRANSMISSION



**100**  
% CHARGE  
<3.3 HOURS  
DC 60kw  
CHARGER



**DC FAST  
CHARGE**  
J1772-CCS1 PLUG

# Day in the Life of a BEV School Bus



# JOULEY

Day Operation with Overnight  
Charging and Mid-day Re-charge



*Example: School bus operates morning route with a return to bus yard for charging. After period of charging, school bus operates afternoon route with return to bus yard. After afternoon route, school bus is charged overnight.*



# SMARTER CHARGING FOR ELECTRIC SCHOOL BUSES



## • STANDARDIZED TECHNOLOGY

Industry-standard charging technology seamlessly connects with your electric buses and other EVs.

## • FAST CHARGING

DC charging enables a full charge in less than 3 hours. With additional dispensers, up to 4 buses can be charged in automated sequence in less than 12 hours.

## • VEHICLE TO GRID (V2G) CAPABLE

Proterra's utility-preferred DC charging solution is optimized for bi-directional power flow, with inverters integrated into the charger rather than on the bus.

## • TURNKEY INFRASTRUCTURE

Proterra offers turnkey installation of your charging infrastructure to simplify your transition to an electric fleet.



Open source  
communications  
protocol

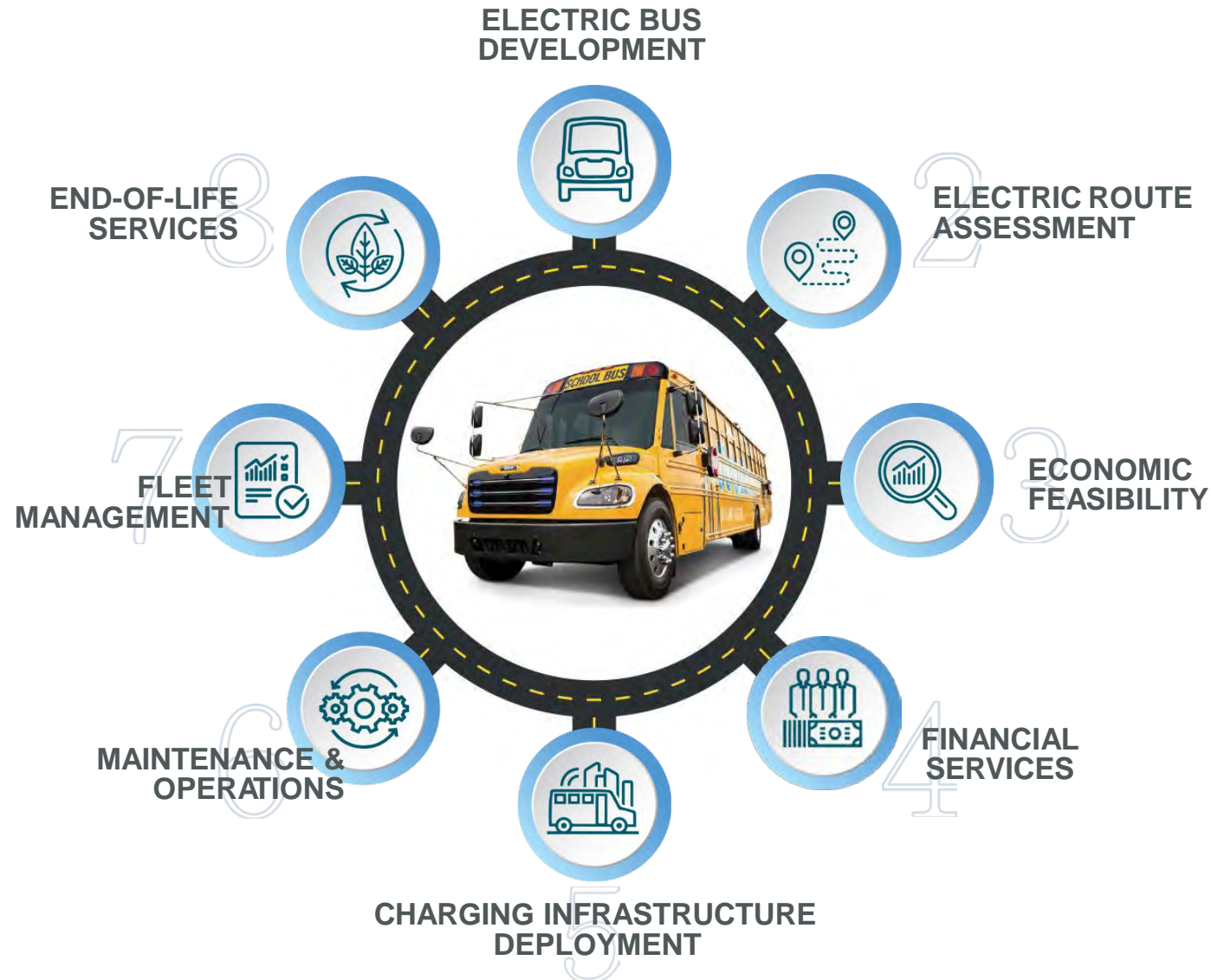


V2G Bi-directional  
V2G capability



Smart grid ready

# Ecosystem Support for School Buses



# Reduced Maintenance Costs



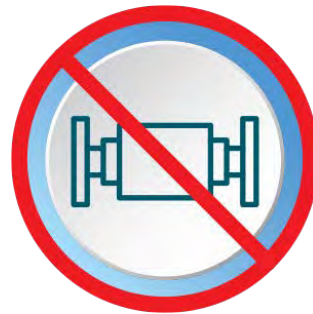
FUEL



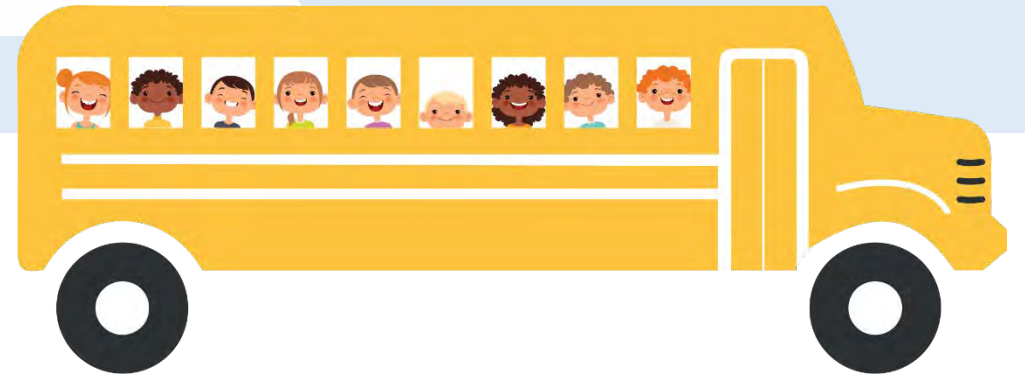
OIL S/FILTERS/  
LUBRICANTS



BELTS



AFTER TREATMENT  
COMPONENTS



IMPROVED  
RIDE FOR STUDENTS

NO ENVIRONMENTAL EMISSIONS

HEALTH BENEFITS  
FOR RIDERS





**Thomas**  
BUILT BUSES



Thank You!

---

V I S I T U S A T

<https://thomasbuiltbuses.com/school-buses/saf-t-liner-c2-jouley/>



# Contact Information



**DAIMLER**

**J. Mark Childers**  
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Powertrain & Technology Sales  
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[mark.childers@daimler.com](mailto:mark.childers@daimler.com)

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Office: 336.881.6589  
Cell: 336.906.6307



**Greg Webb**  
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An all-electric commercial  
vehicle manufacturer

OCTOBER 2020

- Senior Sales Manager at The Lion Electric Co.
- More than 20 years sales and management experience in transportation and trucking
- 10 years with sustainable and alternative fuel solutions
- BA in Marketing University of Kentucky





# Lion Electric



 **LION ELECTRIC**

An all-electric commercial  
vehicle manufacturer

OCTOBER 2020



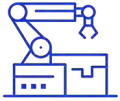
# Who is Lion



300+ electric vehicles in operation



More than 4 million zero-emission miles driven



2 500 electric vehicles per year manufacturing capacity, battery lab and battery manufacturing operations



R&D center in Montreal, with a total of 4 to be opened by 2022



Build a highly-automated truck factory in 2021 with a total forecasted capacity of 12,250+ trucks

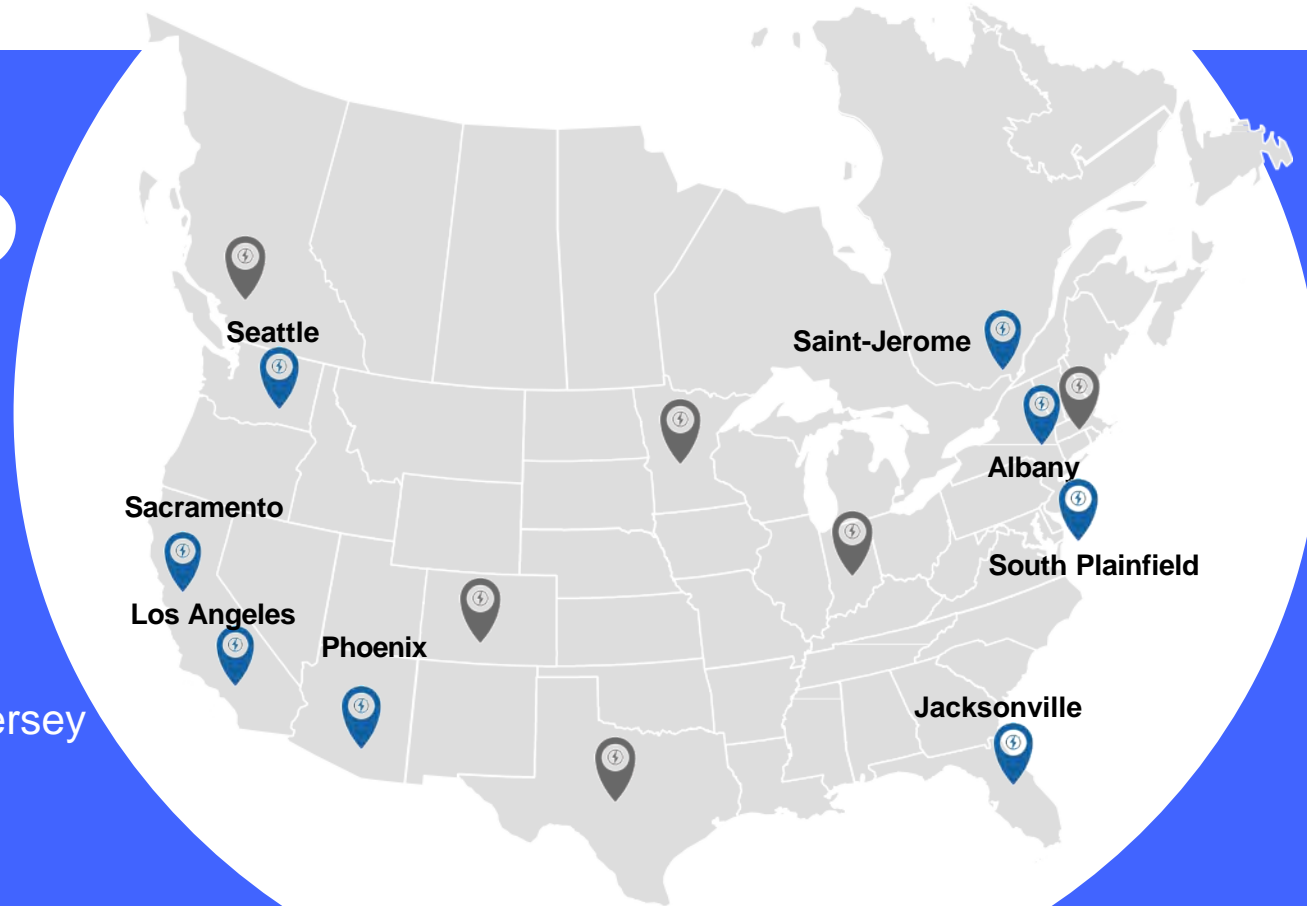


360+ employees (min 500 within 1 year)/ 95 R&D / 2 000 indirect jobs

# Experience / Service Centers

## Currently opened

- Sacramento, California
- Los Angeles, California
- Seattle, Washington
- Jacksonville, Florida
- Albany, New York
- Phoenix, Arizona
- South Plainfield, New Jersey
- Saint-Jerome, Quebec



## At least 7 more openings in 2021

- Minnesota
- British Columbia
- Colorado
- Texas
- Indiana
- Massachusetts



# Purpose-Built to be Electric

**LESS MOVING PARTS**

Electric motor : 20 parts vs. Diesel engine : 2,000 parts

**Total body parts** – Electric parts: 7,000 vs. Diesel parts: 30,000

Accessible, everything goes where it belongs

- Our vehicles are not retrofitted diesel, they are born to be 100% electric
- We build our own cab and chassis
- More kWh available than any other OEM delivering trucks today
- Composite cab - no rust, no corrosion, no paint, no down time
- Regenerative braking system – brakes last 3x longer
- Custom-built driver information center & clusters

# All-Electric Urban Trucks

## LION6

### All-Electric Class 6 Truck

26,000 lbs. GVWR  
Up to 180 miles  
Up to 252 kWh



## LION8

### All-Electric Class 8 Truck

Up to 66,000 lbs. GVWR  
Up to 170 miles  
Up to 336 kWh



MODULAR  
BATTERY  
APPROACH

# The Lion chassis: a versatile platform with huge potential



Lion vocational trucks are the only heavy electric specialty vehicles perfectly integrated to date. Our chassis and electric powertrain will serve as a platform to accommodate the various applications available.



**Lion Crane**



**Lion Stake Bed**



**Lion Refrigerated**



**Lion Utility**



# All-electric refuse truck



## SAVINGS

Electric vs Hydraulic

50%

Reduction of energy consumption of an electric vs hydraulic on an electric chassis

## ADVANTAGES

- 1,000 - 1,200 cans per day
- Integrated solution means less energy used so the truck can complete its route
- No hydraulic fluid or pumps
- All compaction and arm movements are powered by the Lion8 HV batteries that drives the electric motor
- Less weight than a hydraulic body

## PROMOTIONAL VIDEO



[SEE THE TRUCK IN ACTION](#)

# All-Electric Bucket Truck



## Lion8 – Bucket Truck

All-electric Class 8 Bucket truck

### MAXIMUM POWER

Up to 350 kW / 470 HP

### BATTERY CAPACITY

Up to 336 kWh

### CHARGING TYPE

Standard : Level III (DC) – CCS-COMBO

Optional : Level II (AC) – J1772

## FACTOR THAT WILL IMPACT THE RANGE

With an integrated solution on the Lion8 bucket trucks, there are factors that will impact the range:

- ✓ AC (2 kW) per hour of operation
- ✓ Heat (4 kW) per hour of operation
- ✓ Bucket operation: up to 27 kW per day
- ✓ 24 V auxiliary items

Our approach will be different with each customer due to a variety of duty cycles. Lion offers several kWh battery packs to meet the needs of each customers and their route profile.

# All-Electric Urban Tractor



## Lion8 - Tractor

All-electric Class 8 Tractor truck

### MAXIMUM POWER

Up to 536 kW

### MAXIMUM TORQUE

5,300 ft-lb

### RANGE

Up to 210 miles

### BATTERY CAPACITY

Up to 588 kWh

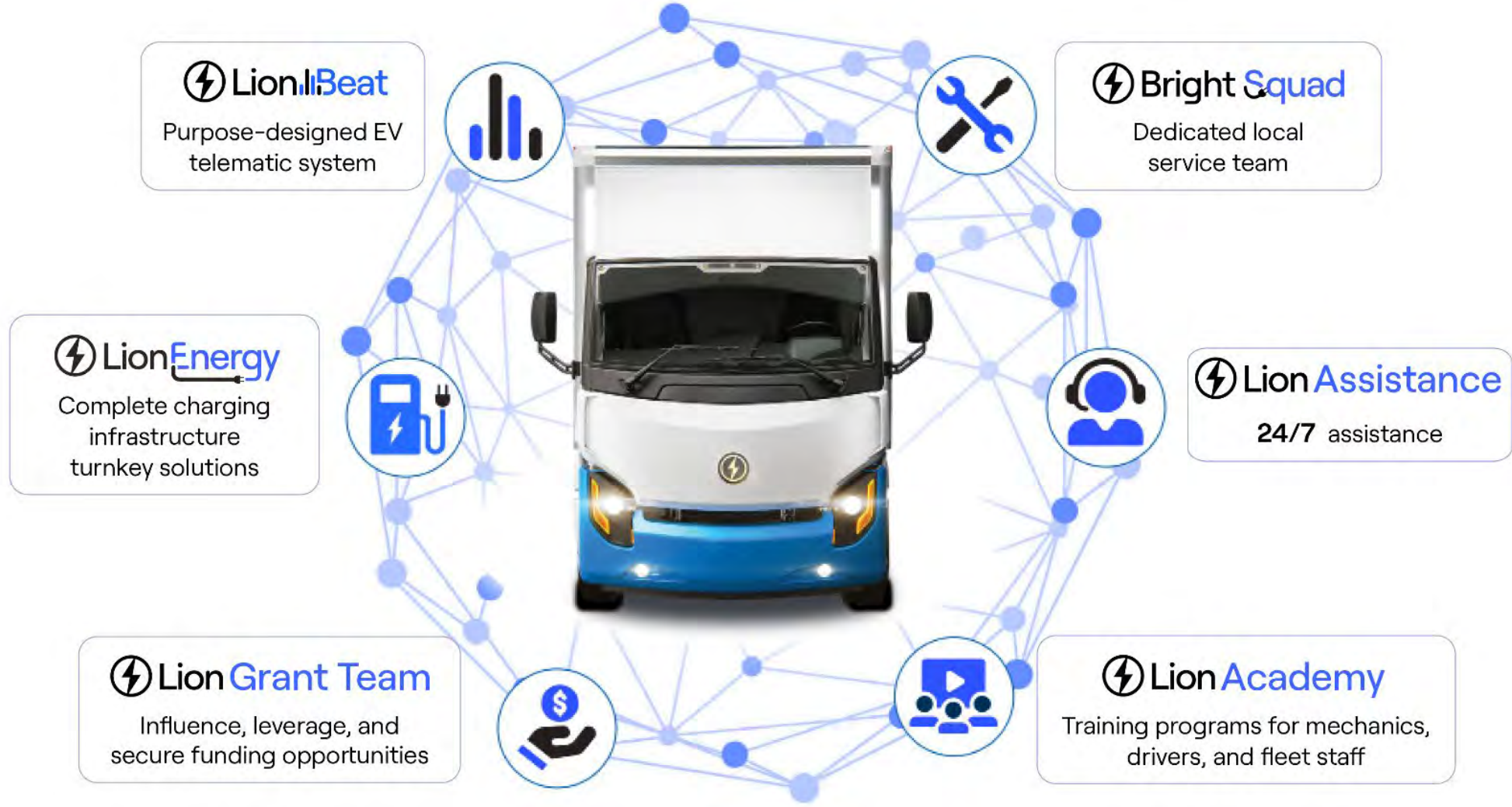
### CHARGING TYPE

Standard : Level III (DC) - CCS-COMBO

Optional : Level II (AC) - J1772



# Support at every step!



# What makes Lion the leader?



- Experience in the deployment of electric vehicles
- Constant support from the Lion Academy
- Purpose-built to be 100% electric
- Infrastructure support with Lion Energy
- Ability to leverage incentives

# The bright move

## CONTACT

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Alexander Voets  
[alexander.voets@daimler.com](mailto:alexander.voets@daimler.com)

- Sales and Marketing Manager for e-Mobility at Daimler
- Under Daimler's Freightliner brand working on Innovation Fleet and Customer Experience Fleet pilot with the objective of launching electric class 6-8 truck to market in 2022
- Spent his career in areas where automotive and technology industries meet working on connected and autonomous projects
- Master's in Industrial Engineering from University of Technology Aachen in Germany and Master's in Engineering and Management from Tsinghua University Beijing



# This is Freightliner eMobility

This is Freightliner eMobility / October 2020



*Run Smart™*



# Over 400k Miles Accumulated on our Pilot Projects

**ELECTRIC  
INNOVATION  
FLEET**



**EX  
FLEET**



- **30 fully battery-electric** medium-duty and heavy-duty trucks; 20 eCascadias and 10 eM2
- Putting electric trucks to the test: **Real Customers, Real Routes, Real Freight**
- **Collaboration** and Learning

- The success of the Innovation Fleet led us to build an **additional 8 fully battery-electric** medium-duty and heavy-duty trucks; 6 eCascadias and 2 eM2
- Cycle through a number of customers to **experience the eTrucks in their own operation**



# Learnings and Driver Feedback



“This thing is **whisper quiet**, I don’t need to crank my radio up”

“I don’t **smell** like diesel”

“Other drivers **ask about it** – they can’t believe it”

“I love the **regenerative braking**”

“This rig is **stable** with no turn”

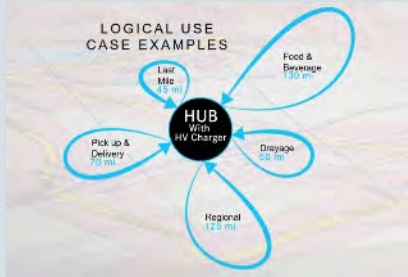
Less **fatigue** at the end of the day

Easier pre- and post-trip inspection

Low **center of gravity** provides nice ride comfort – especially when turning

# Deployment of eTrucks goes beyond the vehicle – the entire electrical eco-system needs to be developed

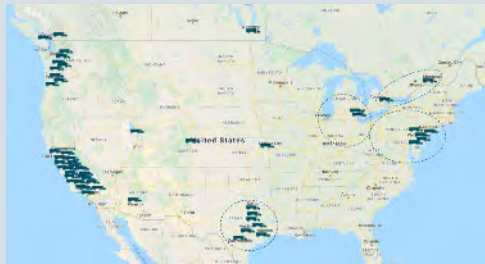
## Customer Use Cases



## Charging Infrastructure



## Regulatory & Incentives

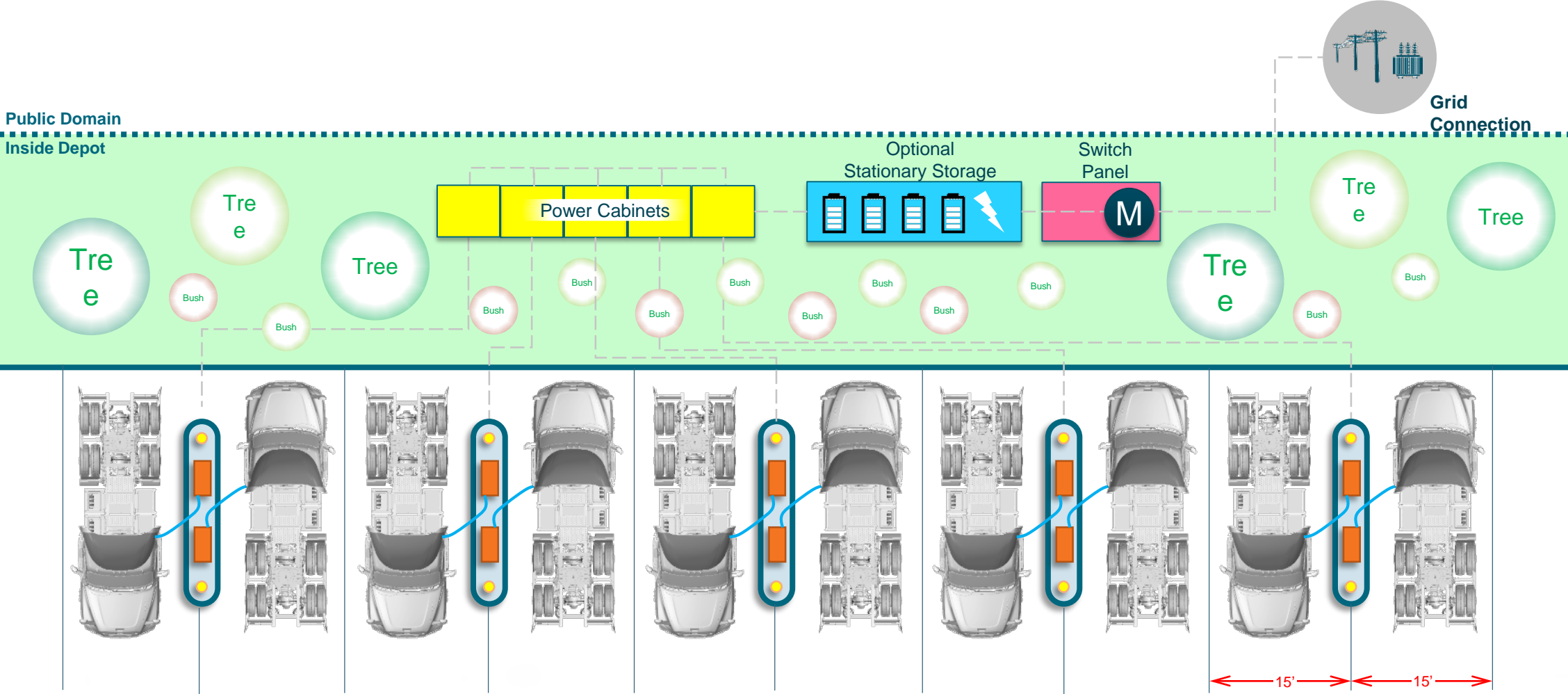


## Service/Dealer Roll-out





# Charging Depot Solutions: Overview of Layout





# Specification targets for series production vehicles in 2022



## eM2

*Designed for Pick-Up and Delivery Application*

Truck Class	6-7	GVWR	26K to 33K lbs
Battery Size	Up to 315 kWh	Horse Power	300 hp (224 kW)
Range	230 miles		



## eCascadia Day Cab

*Designed for Distribution Application*

Truck Class	8	GCWR	80,000 lbs
Battery Size	Up to 475 kWh	Horse Power	525 hp (391 kW)
Range	250 miles		

\*Vehicles pictured are not representative of final series-intent design

THANK YOU.

eCASCADIA

A close-up photograph of the front of a white Freightliner truck. The focus is on the 'eCASCADIA' badge, where the 'e' is blue and 'CASCADIA' is silver. Below the badge, a glowing orange light is visible, likely a turn signal or side marker light. The background is a plain white surface.



**Session #9: Electric Vehicle Options for Fleets**

**October 07, 2020**