



Lightning Systems

AltWheels 2018
Fuel Reduction Technologies
October 15th, 2018



MISSION

**Leader in Zero Emission Powertrains
for Commercial Fleet Vehicles**

Lightning Systems

FLEET EFFICIENCY TECHNOLOGY PROVIDER SINCE 2008

\$35M

Invested to Date



10 years Experience

Engineering + Integrating + Commercialization



50+

Worldwide Fleet Customers



KIESSLING
TRANSIT INC.
Serving All Special Needs

Peapod®

MORGAN
★ OLSON



Experts in Engineering & Commercialization of Fleet Efficiency Technologies

URBAN TRUCKS AND BUSES . . .

A Global Crisis, Global Opportunity

45 million

trucks and buses running worldwide

\$150B sold each year

30%

of all harmful emissions

+40%

of all fuel used in urban areas

EVs & Fuel Cells - the only Zero Emissions solutions

- New regulations mandating ZEVs in 30+ international cities
 - \$15B+ US government subsidies for 7+ years

MODULAR ZEV POWERTRAIN: 2 SOLUTIONS

1. Repower

Repower **existing internal combustion engine (ICE) powered vehicles**

Large existing market being **pressed to move to clean vehicles**

Large commercial vehicles have **20 to 25 year life-span**

Competitive ZEV products have **18 to 24 month lead time**

Saves fleets **75%** over cost of new unit

2. New Vehicles

Convert **new vehicles** to ZEV

Endorsed by **Ford**

Lightning **expertise** developed with nine years of hydraulic hybrid conversions

Less expensive than competitive new ZEV products

Significant incentives available (VW, etc.)

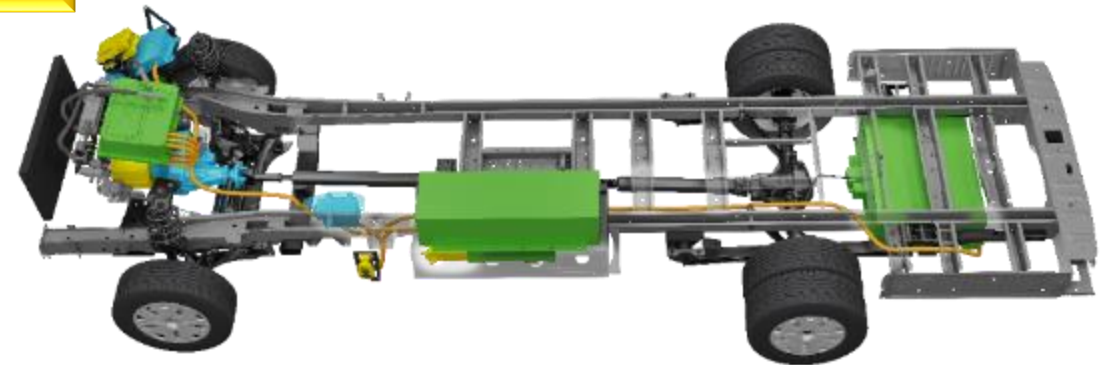
MODULAR AND SCALABLE ZEV POWERTRAIN

Standard scalable core for all vehicle classes

- E-Motor, Software, thermally managed Batteries, Fuel Cells
- Three Transmissions to cover vehicle classes 3 to 8
- Comprehensive componentry (power steering, power brakes, power distribution)

Engineering, Kitting, and Supply Chain Expertise

- CAN bus and VCU/ECU integration expertise
- Mechanical integration expertise



Benefits of ZEV to Commercial Customers:

- Reduced fuel costs
- Reduction in GHG and CO2 emissions
- Quieter, smoother, quicker
- Highest quality (proven suppliers, proven platforms)
- Minimal Preventative Maintenance required
 - Fluid service/inspection anticipated 75% less than diesel
 - Brake service anticipated 80% less than diesel



Lightning's ZEV Products

Class 3 through Class 8

LIGHTNING ZEV PRODUCT LINE-UP

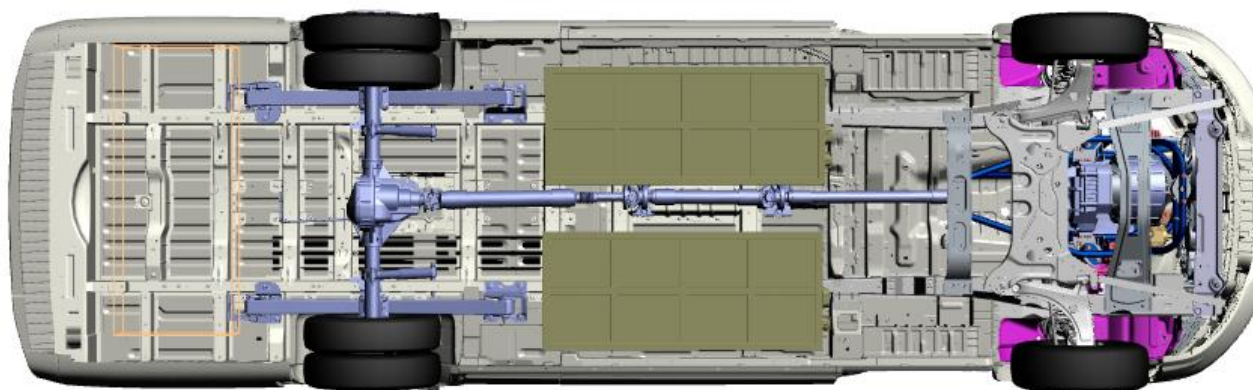
- **Modular ZEV platform** allows us to immediately have competitive products in most MHD markets
- Thermally managed battery packs with industry-leading efficiency, top-of-the-line electronic components
- **New and Repowers: BEV and FCEV**

	GVWR	Class 3	Class 4-5	Class 6	Class 7	Class 8
		10,001-14,000	14,001-19,500	19,501-26,000	26,001-33,000	>33,000
TRUCK		Ford Transit	Ford E-450	GM 6500XD		
						
BUS		Ford Transit	Ford E-450	Ford F-59 Chassis	Transit Bus Repower	Transit Bus Repower
				 Coming soon		



BATTERY ELECTRIC FORD TRANSIT 350 HD

- Class 3 – 10,300 lbs
- Part of Ford eQVM program (Ford Vehicle Warranty remains intact)
- Service and installation network in place
- Available in the Cargo/Shuttle or Cab/Chassis
- CARB EO April 2018





BATTERY ELECTRIC FORD E-450

- Class 4
- Part of Ford eQVM program (Ford Vehicle Warranty remains intact)
- Service and installation network in place
- Repower or new build

Base Chassis	Ford E-450 Cutaway
GVWR	14,500 lbs
Electric Range	80 miles or 110 miles
Electric Vehicle Supply Equipment (EVSE)	6.6 kW on board charger with J1772 connector
Efficiency	Delivering Q1 2019
Battery Capacity	86 kWh or 129 kWh
Charge Time	17.5 hours (level 2) 2-3 hours (DCFC)
Payload	Depends on configuration
Maximum Speed	65 mph (electronically limited)
Peak Power	220 kW (295 hp)
Torque Rating	700 Nm (516 Ft-lbs)
Warranty	✓ Bass Chassis: Ford standard warranty ✓ EV Conversion: Lightning Systems standard warranty – Powertrain 5 yr/60,000 mi
Options	<ul style="list-style-type: none"> • DC Fast Charge: 50 kW on board charger with J1772 with CCS Combo connector • Analytics: predictive maintenance, route scoring, range analysis, driver behavior, geofencing



BATTERY ELECTRIC CLASS 6 (Low Cab Forward)

- Service and installation network in place
- Repower or new
- CARB EOs underway

Base Chassis	Class 6, LEV100, Low Cab Forward
GVWR	25,950 lbs
Electric Range	110 miles
Electric Vehicle Supply Equipment (EVSE)	6.6 kW on board charger with J1772 connector
Availability	Delivering in Q4 2018
Battery Capacity	160 kWh
Charge Time	20 hours (level 2) 3 hours (DCFC)
Maximum Speed	65 mph (electronically limited)
Peak Power	220 kW (295 hp)
Torque Rating	700 Nm (516 Ft-lbs)
Warranty	✓ Base Chassis: OEM standard warranty ✓ EV Conversion: Lightning Systems standard warranty – Powertrain 5 yr/60,000 mi
Options	<ul style="list-style-type: none"> • DC Fast Charge: 50 kW on board charger with J1772 with CCS Combo connector • Analytics: predictive maintenance, route scoring, range analysis, driver behavior, geofencing
Base Chassis	Class 6, LEV100, Low Cab Forward



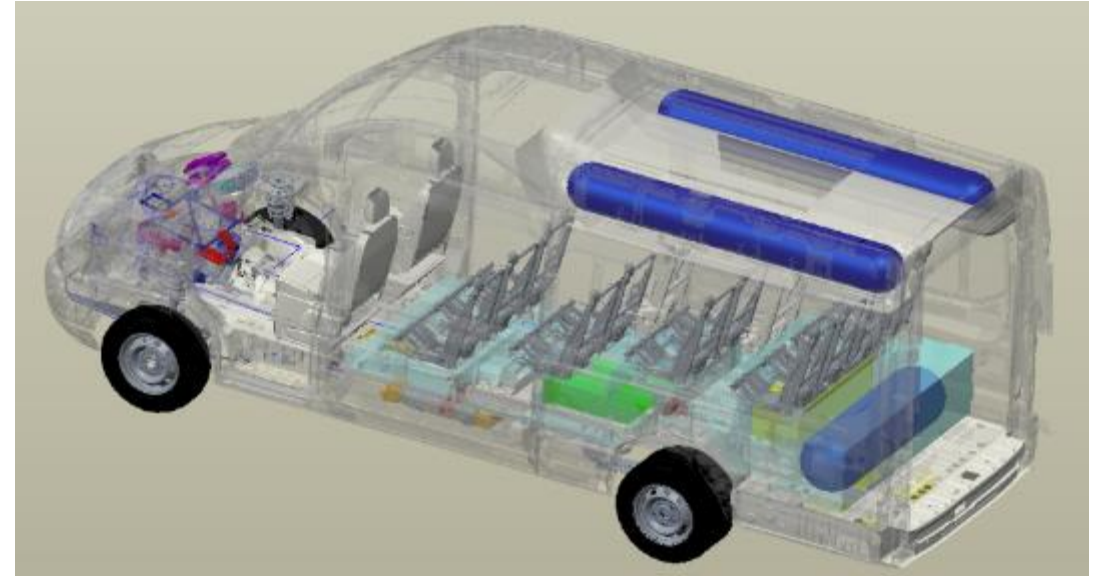
BATTERY ELECTRIC CITY BUS REPOWER

- Repower only
- CARB EO underway
- Orders for 10 in Colorado

Base Chassis	Low floor 30', 35', 40'
GVWR	30,000 to 44,000 lbs
Electric Range	140 to 200 miles depending on configuration
Electric Vehicle Supply Equipment (EVSE)	50 kW on board charger with J1772 connector with CCS Combo connector
Battery Capacity	320kWh
Charge Time	5 hours (DC fast charging)
Passengers Capacity	20-30 depending on size and configuration
Maximum Speed	65 mph (electronically limited)
Peak Power	295 hp (220 kW)
Torque Rating	516 lb-ft (700 Nm)
Warranty	✓ EV Repower: Lightning Systems standard warranty: Powertrain & battery 5 yr/60,000 mi
Options	• Analytics: predictive maintenance, route scoring, range analysis, driver behavior, geofencing
Base Chassis	Low floor 30', 35', 40'

WHAT'S NEXT: HYDROGEN FUEL CELL ELECTRIC VEHICLE

- Fully Integrated *option* for **all** Lightning ZEV systems
- Increases range to over 250 miles for each platform
- Uses same modular concept with smaller batteries and added hydrogen fuel storage
- Working with Ballard and others ...





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