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ELECTRIC TRUCK Buyers Guide

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Electric Car

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COMMERCIAL VEHICLES

COMPLETE REVIEWS

THE FUTURE OF COMMERCE

FREIGHTLINER eCASCADIA

BYD Class 6

MCI J4500e

US: $9.45 CA: $11.45

From the Editor

Commercial electric trucks picked up momentum this year, most notably by the deployment of field test units of the Freightliner eCascadia and Volvo VNR. Low volumes of battery-electric trucks of various sizes, and larger volumes of buses have been available for a few years, but customer trials of a full size Class 8 Semi elevated the visibility of electric trucks for the entire industry.

Battery-electric trucks have the capability of dramatically lowering operating costs. According to a 2018 study by the North American Council For Freight Efficiency (NACFE), the average new Class 8 Semi gets 7.28 mpg. The Federal Highway Administration, which included older trucks in its survey, pegs the number at 5.9 mpg.

Even using NACFE's more efficient numbers for comparison, a truck operating an average 105,041 miles at the national fuel average cost of $2.65 per gallon has an annual fuel cost of $38,236.

An electric truck averaging 2 kilowatt-hours per mile at $0.12 per kW would have an annual fuel cost of only $25,210, a savings of $13,026 per year over the diesel.

Add $12,120 at California's average cost per gallon of $3.49 for a total fuel cost of $50,356 per year. Over a 12 year, 1.2 million mile useful life of the vehicle, fuel cost is $458,883 at the national average and $604,274 in California.

Compare that to a lifetime cost of $302,518 for electric fuel, less if you have access to rates lower than $0.12 per kW. Over the life of the vehicle, an electric truck driver will save $156,315 vs diesel at the national average, and $301,756 in California. Electric rates are significantly more stable than diesel prices, which have varied from a high of $4.80 per gallon in summer 2008 to a low of $1.98 in February 2016.

"Total Cost of Ownership cost savings of $264,086 to $409,528 over 12 years is a significant competitive advantage for electric trucks."

Those savings are before considering lower maintenance costs. An electric truck never needs oil changes and tune-ups, belts or air filters (other than a cabin air filter). Maintenance cost for commercial over-the-road trucks run approximately $17,962 per year, $215,544 over the life of a diesel vehicle according to the American Transportation Research Institute's study of 2018 operating costs.

Total Cost of Ownership cost savings of $264,086 to $409,528 over 12 years is a significant competitive advantage for electric trucks. Consider also all of the other advantages electric drivetrains confer: Better low end torque, better handling because of a lower center of gravity, quieter, smoother running, refinements that distinguish electric drivetrains. Automatic compliance with anti-idling regulations is another significant advantage.

Those are powerful incentives for fleets to consider electric power for all trips that can be made within the 250-300 mile range expected from the longest range electric trucks.

Tesla has announced that the Tesla Semi production will slip to 2021. Daimler plans to bring the eCascadia to volume production in 2021.

Christopher Alan
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Talk to the experts who have presented EVs to audiences all over the United States over the past 8 years. Find out how electric cars and trucks can save you thousands of dollars over the life of the vehicle.

Also available to drive are the Tesla Model 3, Tesla Model S, Jaguar i-Pace, Audi e-tron, and others.

Electric Car
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Buyers Guide

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2020 Q4

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Commercial EV Matrix

Specification Quick Reference

TRUCKS & VANS

Make	Model	Yr Intro	Battery kWh	Range (mi)	MPGe	HP/Lb-ft	GVWR	MSRP Base	Page
BYD	Class 6	2019	221	125	--	335/1,328	26,000 lbs	On Request	18
BYD	Class 8	2018	435	150	--	483/1,770	105,000 lbs	On Request	17
Canadian Elec. Veh.	Might-E Truck	2004	--	50	--	15-47/--	3,000 lbs	$29,000 +	26
Chanje	V8100	2018	100	150	50	198/563	16,535 lbs	On Request	29
Cummins	PowerDrive	2018	--	50	--	--	--	--	23
Freightliner	eCascadia	2022	315, 475	250	--	360-525/--	82,000 lbs	--	9
Freightliner	eM2	2022	210, 315	230	--	180-300/--	26,000-33,000 lbs	--	13
LightningElectric	Ford Transit Van	2019	43, 86	60, 120	63.5	215/733	10,360 lbs	$132,900 +	28
Lion Electric Co	Lion8	2019	480	250	--	470/2,507	54,600 lbs	--	16
Motiv Power Systems	EPIC F-450	2015	127	120	28	201/780	14,500 lbs	--	20
Motiv Power Systems	EPIC F-53	2015	127	120	28	335/1,700	22,000, 26,000 lbs	--	25
Motiv Power Systems	EPIC F-59	2015	127	120	28	335/1,700	22,000 lbs	--	22
Nikola	Tre	2022	720	300	--	645/1,327	--	--	8
Peterbilt	220EV	2020	141-282	250	--	355/1,000	26,000 lbs	--	14
Peterbilt	579EV	2020	396	110-200	--	670/--	80,000 lbs	--	12
Phoenix	Zeus 500 Truck	--	70, 105, 140	80, 115, 150	--	308/--	14,500 lbs	--	21
SEA Electric	Hino M5 EV	2020	138	200	--	170/1,106	19,500 lbs	On Request	19
Tesla	Semi	2021	--	300, 500	--	--	80,000 lbs	$150,000+	7
Volvo	VNR Electric	2021	264	150	--	455/4,051	32,500 lbs	--	10
Winnebago	J33SE	--	126.6	85-125	--	268/1,534	22,000 lbs	--	24
Workhorse	C1000	2020	70	100	--	--	12,000 lbs	--	27
XOS	ET-One	2021	300 x-pack	100-300	15.3	450-700/--	80,000 lbs	$150,000+	11
XOS	Medium Duty	2020	120 x-pack	120	42.2	300/--	19,500-26,000 lbs	$80,000+	15

COACHES &BUSSES

Make	Model	Yr Intro	Battery kWh	Range (mi)	MPGe	Passengers	GVWR	MSRP Base	Page
Blue Bird	All American RE Elec	2018	--	120	--	78-84	36,000 lbs	--	41
BYD	Double Decker Bus	2020	446	230	--	77+1	59,100 lbs	On Request	37
BYD	Motor Coach	--	446	230	--	57+1	54,013 lbs	On Request	33
BYD	Transit Bus	--	352	157-177	--	37+1	43,431 lbs	On Request	34
Green Power	EV Star	2018	118	150	49	19	14,331 lbs	On Request	42
Green Power	EV350	2017	430	220	24	40	47,400 lbs	On Request	36
Green Power	BEAST/SYNAPSE	2018	194.5	150	26	90	38,580 lbs	On Request	39
Lion Electric Co	LionC	2016	220	65-155	--	71	33,000 lbs	On Request	40
Lion Electric Co	LionM	2018	80-160	75-150	--	31	--	--	38
MCI	J4500e	2021	544	230	18	60	54,000 lbs	On Request	30
New Flyer	Xcelsior CHARGE	--	213-466	135	--	125	--	--	32
Phoenix	Zeus Shuttle	--	70-140	80-150	--	16-23	14,500 lbs	--	43
Proterra	ZX5	2013	220-440	121-238	18.8-25.1	29	42,000 lbs	--	35
Van Hool	CX45E DriveTrain	2021	648	230	--	56	54,000 lbs	On Request	31

Vehicles not available for sale within the next 12 months of printing deadline will appear in subsequent editions of ECI magazine. Subscriptions available at electric-car-insider.com. Dashes in the matrix represent specs not available at time of printing.

Battery Electric

ACQUISITION
MSRP **$150,000, $180,000**
Availability **2021**
U.S. Sales Units ..... **--**

RANGE
EV Range ..... **300, 500 mi**
MPGe ..... **--**

PERFORMANCE
Gradeability ..... **5% at 60 mph**
Top Speed ..... **-- mph**
Drag Coefficient **0.36**

BATTERY
Volts ..... **-- V**
Watt-hours ..... **-- kWh**
Cooling ..... **Liquid**

DRIVETRAIN
HP/Lb-ft ..... **--**
Drive Type ..... **RWD**
Axles ..... **--**

CHARGING
Power Rating ..... **-- kW**
Charge Time L2 ..... **-- hrs**
Charge Time DC ..... **30 mins**
Connector ..... **Megacharger**

DIMENSIONS
Curb Weight ..... **-- lbs**
GVWR ..... **80,000 lbs**
Wheelbase ..... **-- in**
Length ..... **-- in**
Width ..... **-- in**
Height ..... **-- in**

2021 TESLA Semi

The electric vehicle manufacturer that made a name for itself with passenger EVs such as the Model X and Model 3 will soon enter the truck segment of the auto industry with its all-electric Semi: a battery powered class 8 tractor-trailer truck.

As is characteristic of Tesla's vehicles, the Semi has a futuristic look with a smooth and sculpted tractor body. Its panoramic and shatterproof windshield is accented at the top by multicolor lights. The truck is designed to achieve a 0.36 Cd that is roughly half that of diesel trucks. This aerodynamic efficiency contributes to the Semi's fully loaded (80,000 lbs) 0-60 mph time of 20 seconds and highway range of 300 miles or 500 miles depending on the trim. Tesla reports that the Semi will be able to recharge to 400 miles of range in 30 minutes. Tesla is building out a Megacharger network for commercial vehicles that guarantees low electricity prices.

The Semi features a centered driver's seat for an optimal view of the road and convenient either-side entry and exit. There is a removable jump seat for an extra passenger. A signature Tesla touchscreen is located on either side of the driver. All operation hardware and software is included, obviating the need for costly and difficult-to-use third party devices. Tesla's advanced autopilot technology, which includes lane-keeping, auto e-braking, and collision warning, comes standard.

Production will begin in 2021. Prominent companies such as FedEx, Walmart, and PepsiCo have placed sizable preorders.

Story: Austin Tannenbaum, Photos: Tesla

Battery Electric

2022 NIKOLA Tre

Although Tre, Italian for three, is Nikola's third semi truck design, it will be the first vehicle to be delivered to customers according to the company. Tre should be available in very limited quantities in the fourth quarter of 2021 and in full production in 2022 if all goes well, always a heavy qualifier for a startup creating such a complex product.

That complexity may be eased a little considering that the Tre is is based on a slightly stretched version of new Iveco S-Way European cabover tractor, rather than an entirely clean sheet design. The S-Way is the latest iteration of the Italian company Iveco's line of semi tractors tracing back decades through the Stralis to EuroStar and EuroTech.

The battery-electric version of the Tre is projected to deliver 300 miles of all-electric range from a 720 kWh battery pack. The battery will be comprised of nine modules. Three will be located between the frame rails and three will be positioned on each side outside the frame. Nikola says a fuel-cell version of the vehicle will be produced in 2023.

The cab-over configuration, common in Europe, provides better maneuverability on the urban and metro routes the truck will be used.

Nikola expects to to produce about 35,000 trucks per year when the company's new Arizona factory is fully operational.

ACQUISITION

MSRP	**$ --**
Availability	**2022**
U.S. Sales Units	**--**

RANGE

EV Range	**300 mi**
MPGe	**--**

PERFORMANCE

Gradeability	**--**
Top Speed	**-- mph**
Drag Coefficient	**--**

BATTERY

Volts	**-- V**
Watt-hours	**720 kWh**
Cooling	**--**

DRIVETRAIN

HP/Lb-ft	**645/1,327**
Drive Type	**4x2**
Axles	**6x2 or 6x4**

CHARGING

Power Rating	**-- kW**
Charge Time L2	**-- hrs**
Charge Time DC	**-- hrs**
Connector	**--**

DIMENSIONS

Curb Weight	**-- lbs**
GVWR	**-- lbs**
Wheelbase	**-- in**
Length	**-- in**
Width	**-- in**
Height	**-- in**

Story: Christopher Alan, Photos: Nikola

Battery Electric

ACQUISITION
MSRP ..... **$ --**
Availability **2022**
U.S. Sales Units ..... **N/A**

RANGE
EV Range ..... **250 mi**
MPGe ..... **--**

PERFORMANCE
Gradeability ..... **--**
Top Speed ... **65 mph (opt. for 70)**
Drag Coefficient ..... **--**

BATTERY
Volts ..... **-- V**
Watt-hours ..... **315 or 475 kWh**
Cooling ..... **Liquid**

DRIVETRAIN
HP/Lb-ft **360-525/--**
Drive Type .. **prop. eAxle System**
Axles ..... **single, tandem eAxle**

CHARGING
Power Rating ..... **-- kW**
Charge Time L2 ..... **N/A**
Charge Time DC ..... **90 min**
Connector **CCS1**

DIMENSIONS
Curb Weight ..... **-- lbs**
GCWR ..... **82,000 lbs**
Wheelbase ..... **-- in**
Length ..... **273, 306 in**
Width ..... **100.7 in**
Height . **116.2 (157.4 w/ro. fairing) in**

2022 FREIGHTLINER eCascadia

Daimler AG subsidiary Freightliner Trucks has offered its popular, conventionally fueled Cascadia semi-truck since 2007. When news of Tesla's Semi broke in 2017, the American truck manufacturer got to work designing its own electric tractor trailer. The result, achieved in less than two years, is the all-electric Freightliner eCascadia.

The eCascadia is a heavy duty highway tractor designed for local and regional distribution and drayage. It is categorized as a class 8 vehicle, which applies to trucks with a gross vehicle weight rating (GVWR) of over 33,000 pounds. Freightliner reports that the eCascadia has an 82,000-pound gross combined weight rating (GCWR). The eCascadia's 525 peak horsepower and 475-kWh battery pack combine to power 250 miles of range. The truck provides five steps of regenerative braking. DC fast charging via a CCS port refuels the battery from 0-80 percent in 90 minutes—that's 200 hauling miles in an hour and a half.

The eCascadia has a sharp front end with slim headlights and a large, commanding grille accented by two columns of blue LEDs. A row of blue LEDs is tastefully placed above the windshield. A pair of steps under the driver's side door and an ergonomically placed bottom handle afford easy entry. On the inside, a digital dash and a center touchscreen impart a modern look.

Freightliner delivered the first two eCascadias to Penske and NFI in August 2019. Mass production is scheduled to begin in 2021.

Story: Austin Tannenbaum, Photos: Freightliner

Battery Electric

2021 VOLVO VNR Electric

The Volvo VNR electric went on sale in North America on December 3, 2020. It will begin production in early 2021 at the company's manufacturing plant in Dublin, Virginia.

The VNR Electric is an all-electric addition to their regional-haul VNR line. As well as being entirely emission free, the VNR Electric will run more quietly than its conventionally fueled counterparts, allowing for operation during the night and in the early morning. Volvo Trucks predicts that these extended hours of operation will be especially useful in urban areas that are congested at peak hours.

The VNR Electric is based on the powertrain technology currently employed by the Volvo FE Electric, designed for refuse and city distribution, which became commercially available in Europe in limited numbers during the second half of 2019. The design also benefits from the experience of fellow Volvo Group member Volvo Buses, which has sold over 4,000 electric buses since 2010. The VNR line currently consists of the conventionally fueled VNR 300, VNR 400, and VNR 640. As the VNR 400 and VNR 640 are sleeper cabs, the VNR Electric is built upon the same platform as the VNR 300, a lightweight day cab.

A number of the conventional VNRs' features provide distinct benefits to the EV semi—the VNR line's short, sloped hood, for example, offers drivers a clear view of their surroundings in busy, urban environments.

ACQUISITION

MSRP ..... **$ --**
Availability **2021**
U.S. Sales Units ..... **--**

RANGE

EV Range ..... **150 mi**
MPGe ..... **--**

PERFORMANCE

Gradeability **16%**
Top Speed ..... **65 mph**
Drag Coefficient ..... **--**

BATTERY

Volts ..... **660 V**
Watt-hours ..... **264 kWh**
Cooling . **Passive Cooling Circuit**

DRIVETRAIN

HP/Lb-ft **455/4,051**
Drive Type ..... **2 Electric Motor**
Axles ..... **2 to 3**

CHARGING

Power Rating ..... **150 kW**
Charge Time L2 ..... **-- hrs**
Charge Time DC ..... **70 min**
Connector ..... **CCS1 or CCS2**

DIMENSIONS

Curb Weight ..... **17,690 lbs**
GVWR ..... **32,500 lbs**
Wheelbase ..... **167 in**
Length ..... **252 in**
Width ..... **101 in**
Height ..... **158 in**

Story: Christopher Alan, Photos: Volvo

Battery Electric

ACQUISITION
MSRP ..... **$150,000+**
Availability **Q4 2021**
U.S. Sales Units ..... **--**

RANGE
EV Range ..... **100-300 mi**
MPGe **15.3**

PERFORMANCE
Gradeability **15%**
Top Speed ..... **75 mph**
Drag Coefficient ..... **--**

BATTERY
Volts ..... **12/24 V**
Watt-hours ..... **300 kWh x-pack**
Cooling ..... **Active Air**

DRIVETRAIN
HP/Lb-ft **450-700/--**
Drive Type ... **Direct Drive, eAxle**
Axles **6x4**

CHARGING
Power Rating ..... **18.6, 350 kW**
Charge Time L2 ..... **6-12 hrs**
Charge Time DC ..... **1-10 hrs**
Connector ..... **J1772, CCS 1**

DIMENSIONS
Curb Weight **14,500 – 19,900 lbs**
GVWR ..... **80,000 lbs**
Wheelbase ..... **166-225 in**
Length ..... **296.96 in**
Width ..... **97.16 in**
Height ..... **149.93 in**

2021 XOS ET-One

The Xos ET-One is a class 8 semi-truck intended for short-haul, drayage, refuse, and other applications with short, repeatable routes. The ET-One can travel up to 300 miles on a single charge and offers 300 to 700 horsepower for jobs with a range of power requirements. In designing the ET-One, Xos collaborated with auto-industry veterans and analyzed the needs of owners of both large and small fleets. Rather than redesigning each part of the trucks, Xos focused on its proprietary lithium-ion batteries and turned to established partners for maintenance, distribution, and manufacturing. Off-the-shelf parts will look and function in ways familiar to fleet owners and operators, for smooth integration. Because the ET-One requires fewer moving parts than traditionally fueled semi-trucks, Xos estimates that the cost of maintenance will be 60 percent lower. Fuel is expected to cost 70 percent less per mile. The ET-One is also expected to provide up to 30 percent more power than a diesel truck. The ET-One has drawn comparisons not only to diesel vehicles but to electric competitors, such as the acclaimed Tesla Semi. Both can handle a GVWR of 80,000 pounds. A standard ET-One matches the expected base price of 300-mile Tesla Semi at $150,000, though other configurations may cost as much as $250,000. A base 500-mile Tesla Semi is expected to cost $180,000. As with Tesla, the ET-One will first be made available online, though as production expands, they will be delivered to authorized dealerships, providing operators an opportunity to experience the truck up close.

Story: Molly Green, Photos: Xos

Battery Electric

2020 PETERBILT 579EV

As its name implies, the Peterbilt 579EV is an all-electric version of the company's diesel Model 579. Designed as a day cab rather than a sleeper like its predecessor, the 579EV's 80,000-pound GVWR, 670 horsepower, and motor power rating of 370 to 500 kW are strong specs for short-haul and drayage applications.

To meet a spectrum of operating requirements, the 579EV's TransPower Energy Storage Subsystems are fully modular. Each battery pack has an energy density of about 44 kWh and can be applied in configurations that provide between 264 and 420 kWh. Range and charging time vary with these configurations—following a one- to five-hour full charge of the batteries, the 579EV can travel between 110 and 200 miles.

This isn't the fastest charging time or longest range in Peterbilt's EV lineup. The 220EV, intended for similar applications, takes an hour to charge and has an estimated range of 250 miles. However, the 579EV has a much higher battery capacity than the 220EV's 140 to 348 kWh. The 579EV can also handle a significantly higher GVWR, as the 220EV's maximum weight is only 26,000 pounds. The 579EV is, therefore, the better choice for short, repeatable routes that require high hauling capabilities.

The 579EV has already seen use in select fleets, such as those of the Port of Long Beach and third-party logistics company Biagi Bros., to prove effectiveness and timely return on investment. Low volume production is expected to begin by the end of the year.

ACQUISITION

MSRP	**$ --**
Availability	**2020**
U.S. Sales Units	**--**

RANGE

EV Range	**110-200 mi**
MPGe	**--**

PERFORMANCE

Gradeability	**--**
Top Speed	**75 mph**
Drag Coefficient	**--**

BATTERY

Volts	**650 V**
Watt-hours	**396 kWh**
Cooling	**--**

DRIVETRAIN

HP/Lb-ft	**670/--**
Drive Type	**--**
Axles	**--**

CHARGING

Power Rating	**19 Kwh, 150 Kwh**
Charge Time L2	**11-20 hrs**
Charge Time DC	**1.5-3 hrs**
Connector	**CCS1**

DIMENSIONS

Curb Weight	**20,500 lbs**
GVWR	**80,000 lbs**
Wheelbase	**-- in**
Length	**117 in BBC**
Width	**94.4 in**
Height	**83.8 in**

Story: Molly Green, Photos: Peterbilt

Battery Electric

ACQUISITION
MSRP ..... **$--**
Availability **2022**
U.S. Sales Units ..... **N/A**

RANGE
EV Range ..... **230 mi**
MPGe ..... **--**

PERFORMANCE
Gradeability ..... **--**
Top Speed .... **65 mph (opt. for 70)**
Drag Coefficient ..... **--**

BATTERY
Volts ..... **-- V**
Watt-hours ..... **210, 315 kWh**
Cooling ..... **Liquid**

DRIVETRAIN
HP/Lb-ft **180-300/--**
Drive Type .. **prop. eAxle System**
Axles ..... **single eAxle**

CHARGING
Power Rating ..... **-- kW**
Charge Time L2 ..... **N/A**
Charge Time DC ..... **1 hr**
Connector **CCS1**

DIMENSIONS
Curb Weight ..... **-- lbs**
GVWR ..... **26,000-33,000 lbs**
Wheelbase ..... **-- in**
Length ..... **391 in**
Width ..... **100 in**
Height **102.5 (137.4 w/ro. fairing) in**

2022 FREIGHTLINER eM2

The medium duty Freightliner eM2 106 will have a range of 230 miles, longer than is offered by many commercial electric vehicles. The 315-kWh battery charges to 80 percent in 60 minutes, for an additional range of 184 miles, maximizing uptime. While 314 miles doesn't meet the requirements of long-haul routes, it does provide significant route flexibility and alleviate some range anxiety. As is the case with the class 8 eCascadia electric truck, which is based on the Freightliner New Cascadia, the Freightliner eM2 106 is based on Freightliner's conventionally fueled M2 106. Though information on how closely the two will compare is scarce at this point in the engineering process, the eM2 106 is expected to provide 300 horsepower, which is slightly less than the conventional M2 106's 350 horsepower. Since it was unveiled at the Capital Market and Technology Day at Portland International Raceway in June 2018, the eM2 106 has been integrated into select fleets for testing in real-world operating conditions to ensure that the truck performs as promised. The first eM2 106 was delivered in December 2018 to Penske Truck Leasing Corporation in Los Angeles, who planned to test the truck in local delivery in California and the Pacific Northwest.

In basing their electric vehicles on other models, Freightliner's stated intention is to take advantage of efficiencies and processes developed for pre-existing production platforms. This implies that they will be able to scale to meet demand when the production of the eM2 106 begins in 2021.

Story: Molly Green, Photos: Freightliner

Battery Electric

2020 PETERBILT 220EV

The 220EV, an all-electric version of the diesel Model 220, is the Peterbilt EV line's medium duty offering. Its 250-mile range makes it well-suited for applications with repeatable routes such as short haul, drayage, and refuse. Only an hour of DC fast charging is required to fill its 140- to 348-kWh battery (capacity is dependent on the components selected), which maximizes uptime and keeps cargo moving. The 220EV's Meritor Blue-Horizon two-speed drive eAxle provides up to 355 horsepower, greater than its diesel predecessor's 260. As both the 579EV and 520EV use mid-ship motor drive subsystems, it's the only member of the EV lineup to use an eAxle configuration, wherein the motor is mounted directly on the rear axle. This allows for easy placement of other components, such as the two TransPower battery packs, throughout the vehicle. With a GVWR of 26,000 pounds, the 220EV isn't the heaviest Peterbilt electric truck; the 579EV, also designed for short haul and drayage, weighs 80,000 pounds when fully loaded. The 220EV's range, however, is significantly longer than the 579EV's 110 to 200 miles, which makes it better suited to operations with longer routes, provided its hauling capabilities are sufficient. Several Peterbilt electric trucks were delivered to select companies' fleets, such as Frito-Lay's, for real-world testing in 2019 and early 2020. Pricing information will be made available to a wider customer base in the second quarter of 2020, at which point Peterbilt will start accepting orders. Low volume production is expected to begin by the end of the year.

ACQUISITION

MSRP	**$ --**
Availability	**2020**
U.S. Sales Units	**--**

RANGE

EV Range	**250 mi**
MPGe	**--**

PERFORMANCE

Gradeability	**--**
Top Speed	**67 mph**
Drag Coefficient	**--**

BATTERY

Volts	**618 V**
Watt-hours	**141-282 kWh**
Cooling	**Liquid**

DRIVETRAIN

HP/Lb-ft	**355/1,000**
Drive Type	**Direct Drive**
Axles	**--**

CHARGING

Power Rating	**19.2 kw, 150 Kw**
Charge Time L2	**6-12 hrs**
Charge Time DC	**1-2 hrs**
Connector	**CCS1**

DIMENSIONS

Curb Weight	**-- lbs**
GVWR	**26,000 lbs**
Wheelbase	**-- in**
Length	**-- in**
Width	**-- in**
Height	**-- in**

Story: Molly Green, Photos: Peterbilt

Battery Electric

ACQUISITION
MSRP ..... **$80,000+**
Availability **Q4 2020**
U.S. Sales Units ..... **--**

RANGE
EV Range ..... **200 mi**
MPGe **42.2**

PERFORMANCE
Gradeability **12%**
Top Speed ..... **65 mph**
Drag Coefficient ..... **--**

BATTERY
Volts ..... **12/24 V**
Watt-hours ..... **120 kWh x-pack**
Cooling ..... **Active Air**

DRIVETRAIN
HP/Lb-ft **300/--**
Drive Type ..... **Direct Drive**
Axles **4x2**

CHARGING
Power Rating ..... **18.6, 350 kW**
Charge Time L2 ..... **4 hrs**
Charge Time DC ..... **1-3 hrs**
Connector ..... **J1772, CCS 1**

DIMENSIONS
Curb Weight ..... **8,800 lbs**
GVWR ..... **19,500 - 26,000 lbs**
Wheelbase ..... **168-208 in**
Length ..... **192-302 in**
Width ..... **86-93 in**
Height ..... **81-85 in**

2020 XOS Medium Duty

The Xos Medium Duty is a class 6 base platform upon which different body styles can be built. It is designed as an all-electric solution to growing demand for last-mile deliveries in the e-commerce sector. Its 200-mile range makes it well-suited to applications with established, repeatable routes. In addition to package delivery, the Medium Duty can be configured for food and beverage transportation, refrigerated transport, and utility. Xos estimates that the Medium Duty has a cost of ownership 30 percent lower than a traditionally fueled step van. The company also calculates a 30 percent increase in power from diesel. As with the class 8 ET-One, Xos has partnered with other auto-manufacturers for off-the-shelf parts, distribution, and maintenance. The lithium-ion batteries, however, are designed and built by Xos itself.

In 2018 and 2019, the Medium Duty was tested in select fleets with routes of 100 miles or less. UPS, for example, tested a step-van Medium Duty on Los Angeles delivery routes to ensure that the durability, battery capacity, and fleet integration were as promised. In 2019, Xos constructed two armored cash-hauling Medium Duty trucks for Loomis, likewise for primary use in California.

In addition to the standard, 200-mile Medium Duty, Xos has also discussed plans for a model with a 50-mile range, which would start at $68,000. This choice of ranges enables fleet owners to customize the Medium Duty to suit their routes and other operating requirements.

Story: Molly Green, Photos: Xos

Battery Electric

2019 - 2020

LION ELECTRIC CO Lion8

The Lion8 is the first class 8 truck released by the Québec-based Lion Electric Company, primarily known for innovation in electric school buses. With a range of up to 250 miles and a 30,000-pound payload, the Lion8 is an optimal vehicle for heavy-duty work on short, planned routes. Lion Electric has so far demonstrated the Lion8 in six configurations specialized for in-city applications: semi-truck, refuse, refrigerated, bucket, utility, and ambulance. All configurations benefit from the Lion8's 470 horsepower, 2,507 pound-feet of torque, and top speed of 65 mph.

Because of its compatibility with both J1772 and CCS-Combo charging systems, fleet owners can connect the Lion8 to the charging infrastructure that is most suitable for their business. At Level 2, the 480-kWh battery charges in five to 16 hours. With DC fast charging, the Lion8 can reach full charge in an hour and a half. Given a midday break to charge, the truck could see 500 miles per shift.

Lion estimates that owners who switch to the Lion8 from a conventional semi-truck will see an 80 percent reduction in energy cost and a 60 percent maintenance cost reduction, thanks to oil-free operation, fewer moving parts, and longer-lasting regenerative brakes.

Following the Lion8's 2019 unveiling, Lion received orders with a rapidity that speaks to the truck's promise. Fleets integrating the Lion8 include Société des Alcools du Québec, Constar Supply, and C&S Wholesale Grocers.

ACQUISITION

MSRP	**$ --**
Availability	**2019-present**
U.S. Sales Units	**--**

RANGE

EV Range	**250 mi**
MPGe	**--**

PERFORMANCE

Gradeability	**--**
Top Speed	**65 mph**
Drag Coefficient	**--**

BATTERY

Volts	**800 V**
Watt-hours	**480 kWh**
Cooling	**--**

DRIVETRAIN

HP/Lb-ft	**470/2,507**
Drive Type	**Direct Drive**
Axles	**--**

CHARGING

Power Rating	**-- kW**
Charge Time L2	**7-16 hrs**
Charge Time DC	**2.5-5 hrs**
Connector	**J1772 & CCS-Combo**

DIMENSIONS

Curb Weight	**On Request**
GVWR	**54,600 lbs**
Wheelbase	**195 – 280 in**
Cabin Length	**79 in**
Cabin Width	**96 in**
Cabin Height	**107 in**

Story: Molly Green, Photos: Lion Electric Co

Battery Electric

ACQUISITION
MSRP ..... **On Request**
Availability **2018-present**
U.S. Sales Units ..... **--**

RANGE
EV Range ..... **125 mi**
MPGe ..... **--**

PERFORMANCE
Gradeability **25%**
Top Speed ..... **65 mph**
Drag Coefficient ..... **--**

BATTERY
Volts ..... **-- V**
Watt-hours ..... **435 kWh**
Cooling ..... **Liquid**

DRIVETRAIN
HP/Lb-ft **483/1,770**
Drive Type ..... **Dual eAxle**
Axles ..... **--**

CHARGING
Power Rating ..... **120 kW**
Charge Time L2 ..... **13.5 hrs**
Charge Time DC ..... **2-4 hrs**
Connector **CCS1**

DIMENSIONS
Curb Weight ..... **-- lbs**
GVWR ..... **105,000 lbs**
Wheelbase ..... **166.3 in**
Length ..... **278.3 in**
Width ..... **100.4 in**
Height ..... **121.3 in**

2018 - 2020
BYD Class 8

The Build Your Dreams (BYD) Class 8 is a fully electric day cab with a range of 125 miles and a top speed of 65 mph. With 483 horsepower, 1,770 foot-pounds of torque, and a GVWR of 105,000 pounds, the Class 8 can handle heavy-duty drayage and short-range delivery operations. At level two, the 409-kWh battery charges in 13.5 hours via a 33-kW AC charger. Options for DC fast charging are rated 120 and 240 kW and fully charge the battery in two to four hours. Because all charging options draw on power that is less expensive than gasoline, BYD estimates that by making the switch from a conventionally fueled semi-truck to the Class 8, fleet owners will save $15,000 to $20,000 in fuel costs, annually. In addition to lower cost of ownership, high performance, and environmental benefits, the Class 8 produces half the noise of diesel, hybrid, or compressed natural gas (CNG) engines, which makes for a less stressful driver experience and expands hours of potential operation without disturbing communities. Large fleets have shown an interest in converting to the Class 8. In October of 2019, Anheuser-Busch, for example, ordered 21 Class 8s for use at four Southern California-based distribution facilities. These 21 trucks are expected to eliminate an estimated 462 metric tons of greenhouse gas emissions, specifically 732.9 pounds of nitrogen oxide emissions, per year. The trucks were delivered in late 2019 and initial testing of range, acceleration, and charging speed found that the trucks exceeded Anheuser-Busch's requirements.

Story: Molly Green, Photos: BYD

Battery Electric

2019 - 2020 BYD Class 6

Built to meet medium duty needs, the Class 6 from Build Your Dreams (BYD) can be configured as a day cab, step van, or refuse truck. Each configuration offers owners a GVWR of 26,000 pounds, 335 horsepower, and 1,328 foot-pounds of torque. With a range of 125 miles while fully loaded, the Class 6 is well-suited to applications with predictable routes such as refuse and local delivery of packages, food, and linens.

The 221-kWh battery pack charges in 4.5 hours via a 33-kW AC charger, best-suited to overnight charging in the depot. By contrast, the 120-kW DC charger can charge the batteries to full in 1.5 hours. Used during a mid-day break, DC rapid charging could give the Class 6 a significant boost, which would allow it to operate across longer distances over the course of the day.

The BYD Class 6 compares favorably with other class six electric vehicles. With a payload of around 14,750 pounds, it more than doubles the 6,000 pounds offered by the Workhorse C1000 while providing 20 more miles of range. At top speed, it can reach 70 mph, significantly faster than the Zenith Electric Step Van's electronically limited 55 mph. Though its range is smaller than the Peterbilt 220EV's 250 miles, it matches the 220EV's 26,000-pound GVWR pound-for-pound.

BYD estimates that, in addition to providing an effective option for medium duty operations, the Class 6 will save operators as much as $15,000 to $20,000 on fuel costs annually and reduce emissions by 250 metric tons of CO2 per year.

ACQUISITION

MSRP	**On Request**
Availability	**2019-present**
U.S. Sales Units	**--**

RANGE

EV Range	**125 mi**
MPGe	**--**

PERFORMANCE

Gradeability	**25%**
Top Speed	**70 mph**
Drag Coefficient	**--**

BATTERY

Volts	**-- V**
Watt-hours	**221 kWh**
Cooling	**Liquid**

DRIVETRAIN

HP/Lb-ft	**335/1,328**
Drive Type	**eMotor**
Axles	**--**

CHARGING

Power Rating	**-- kW**
Charge Time L2	**1.5 hrs**
Charge Time DC	**4.5 hrs**
Connector	**CCS1**

DIMENSIONS

Curb Weight	**-- lbs**
GVWR	**26,000 lbs**
Wheelbase	**153.5 in**
Length	**227 in**
Width	**94.5 in**
Height	**93.9 in**

Story: Molly Green, Photos: BYD

Battery Electric

ACQUISITION

MSRP ..... **On Request**
Availability **2020**
U.S. Sales Units **250**

RANGE

EV Range ..... **200 mi**
MPGe ..... **--**

PERFORMANCE

Gradeability ..... **19 %**
Top Speed ..... **Configurable**
Drag Coefficient ..... **0.8 cd**

BATTERY

Volts ..... **394.2 V**
Watt-hours ..... **138 kWh**
Cooling ..... **Air**

DRIVETRAIN

HP/Lb-ft **170/1,106**
Drive Type ..... **Direct**
Axles **4x2**

CHARGING

Power Rating ..... **19.2 kW**
Charge Time L2 ..... **8 hrs**
Charge Time DC ..... **1.5 hrs**
Connector **J1772**

DIMENSIONS

Curb Weight ..... **12,500 lbs**
GVWR ..... **19,500 lbs**
Wheelbase ..... **173.2 in**
Length ..... **263.9 in**
Width ..... **82 in**
Height ..... **94 in**

2020 SEA ELECTRIC Hino M5 EV

SEA Electric and Hino collaborated to produce the Hino M5 EV: an all-electric cabover. The vehicle takes Hino's M5 medium duty truck body and equips it with SEA Electric's SEA-Drive 120a powertrain. The Hino M5 EV is powered by an AC asynchronous electric motor that delivers 110 hp of continuous power and supplies a maximum power of 170 hp. Its maximum torque is an impressive 1,106 lb-ft. The electric cabover has a gross vehicle weight rating (GVWR) of 19,500 pounds.

The Hino M5 EV's battery pack is mid-mounted to maximize safety and drivability. It has a 138kWh capacity that supplies up to 200 miles of emissions-free range. SEA Electric's suggested applications include dry box freight, refrigeration, tipper, curtain sider, and tray trucks. The company reports a break-even point of less than four years before subsidies, after which all additional reduced fuel and maintenance costs confer outright savings.

In November of last year, commercial electric vehicle service provider Zeem Solutions placed an order for 210 Hino M5 EVs. Throughout 2020, they will be constructed in the USA by North Carolina-based Fontaine Modifications. First delivery targets are California cities such as Los Angeles, Sacramento, San Francisco, and San Diego as well as New York.

Story: Austin Tannenbaum, Photos: SEA Electric

Battery Electric

2015 - 2020

MOTIV POWER SYSTEMS EPIC E-450

Motiv Power Systems all-electric chassis is a proven platform for the electrification of medium-duty trucks and buses. Motiv's Ford eQVM-approved Electric Powered Intelligent Chassis (EPIC) offers fleets a seamless solution to switch to all-electric. It requires little to no engineering or redesign and provides maximum vehicle configurations and compatibility with existing truck and bus body builders. Motiv's EPIC chassis provides fleet owners with up to 85 percent cost savings in operation and maintenance over internal combustion engine (ICE) vehicles. The vehicle gives commercial drivers reliable performance of greater than 99 percent uptime. It delivers a smooth and quiet ride with no tailpipe emissions. The EPIC E-450 is available for school buses, delivery trucks, box trucks, step vans, shuttle buses, work trucks, and specialty vehicles such as bookmobiles or food trucks. The EPIC E-450 has a gross vehicle weight rating (GVWR) of 14,500 pounds and can travel up to 120 miles fully loaded. Its powertrain supplies 201 horsepower at a top speed of 65 mph with a gradeability of 17 percent. The EPIC E-450 is powered by BMW passenger car battery packs totaling 127 kWh and is available with both Level 2 and Level 3 charging capability.Motivprovidesover-the-airsoftwareupdatesofnewfeaturesand functionality without requiring any vehicle down time. Motiv's fleet customers can maximize their savings through state and federal funding programs, which can offer up to $200,000 in incentives.

ACQUISITION

MSRP	**$ --**
Availability	**2015-present**
U.S. Sales Units	**--**

RANGE

EV Range	**Up to 120 mi**
MPGe	**28**

PERFORMANCE

Gradeability	**17%**
Top Speed	**65 mph**
Drag Coefficient	**--**

BATTERY

Volts	**-- V**
Watt-hours	**127 kWh**
Cooling	**Active**

DRIVETRAIN

HP/Lb-ft	**201/780**
Drive Type	**Direct Drive**
Axles	**2**

CHARGING

Power Rating	**15 kW / 50 kW**
Charge Time L2	**8 hrs**
Charge Time DC	**2.5 hrs**
Connector	**J1772, CCS**

DIMENSIONS

Curb Weight	**-- lbs**
GVWR	**14,500 lbs**
Wheelbase	**158+ in**
Length	**14+ ft truck, 23+ ft bus**
Width	**94+ in**
Height	**108+ in**

Story: Austin Tannenbaum, Photos: Motiv Power Systems

Battery Electric

ACQUISITION
MSRP ..... **$ --**
Availability ..... **--**
U.S. Sales Units ..... **--**

RANGE
EV Range ..... **80, 115, or 150 mi**
MPGe ..... **--**

PERFORMANCE
Gradeability ..... **--**
Top Speed ..... **58 or 64 mph**
Drag Coefficient ..... **--**

BATTERY
Volts ..... **-- V**
Watt-hours ..... **70, 105, 140 kWh**
Cooling ..... **--**

DRIVETRAIN
HP/Lb-ft **308/--**
Drive Type ..... **RWD**
Axles ..... **--**

CHARGING
Power Rating ... **13 kW or 50 kW**
Charge Time L2 ..... **-- hrs**
Charge Time DC ..... **-- hrs**
Connector ..... **J1772, CHAdeMO**

DIMENSIONS
Curb Weight ..... **8,000 lbs**
GVWR ..... **14,500 lbs**
Wheelbase ..... **158-176 in**
Length ..... **-- in**
Width ..... **-- in**
Height ..... **-- in**

2020
PHOENIX MOTORCARS
Zeus 500

The Phoenix Zeus 500 is designed to meet an array of operational requirements across work truck applications. The body, built on the Ford E-450 Super Duty Chassis, can be configured as a flatbed, service and utility truck, box truck, walk-in van, animal control truck, or refrigerated vehicle. Peak power output in all configurations reaches 308 horsepower and, regardless of body type, the truck can handle a payload of 6,500 pounds.

With a top speed of 58 mph, operations might be limited to surface streets, however, an optional configuration allows for up to 64 mph—sufficient for highway conditions. While the Zeus 500 is best suited to short, regular routes, possible ranges increase with battery capacity: the 70-kWh battery allows for up to 80 miles, the 105-kWh battery provides enough power for up to 115 miles, and the 140-kWh battery can carry the truck up to 150 miles on a full charge. Batteries charge via a 13-kW AC charger at level two or by a 50-kW CHAdeMO charger for DC fast charging.

For every 200,000 miles driven in a Phoenix electric vehicle rather than a conventionally fueled truck, the company estimates that fleet owners will see a 70 percent reduction in fuel costs and a 75 percent reduction in maintenance costs. As the total savings could equate to up to $127,000 over the life of the vehicle, the Zeus 500 is not just an environmental work truck solution, but an economical solution as well.

Story: Molly Green, Photos: Phoenix Motorcars

Battery Electric

2015-2020

MOTIV POWER SYSTEMS EPIC F-59

Motiv Power Systems is a sustainable technology company delivering all-electric chassis with a proven software platform for the electrification of medium-duty trucks and buses. Motiv's Ford eQVM-approved Electric Powered Intelligent Chassis (EPIC) offers fleets a seamless solution to switch to all-electric, as it requires little to no engineering or redesign and provides maximum vehicle configurations and compatibility with existing truck and bus body builders. Motiv's EPIC chassis provides fleet owners with up to 85 percent cost savings in operation and maintenance over internal combustion engine (ICE) vehicles, and gives commercial drivers reliable performance of greater than 99 percent uptime, as well as a smooth and quiet ride with no tailpipe emissions. The EPIC F-59 is based on Ford's F-59 platform and is available for school buses, delivery trucks, step vans, shuttle buses, and specialty vehicles such as bookmobiles and food trucks. The EPIC F-59 has a gross vehicle weight rating (GVWR) of 22,000 pounds and can travel up to 120 miles fully loaded. Its powertrain supplies 335 horsepower at a top speed of 65 mph with a gradeability of 20 percent. The EPIC F-59 is powered by BMW passenger car battery packs totaling 127 kWh and is available with both Level 2 and Level 3 charging capability. Motiv provides over-the-air software updates of new features and functionality without requiring any vehicle down time. Motiv assists with project planning, offers free training, and helps buyers apply for up to $200,000 in federal and state incentives.

ACQUISITION

MSRP ..... **$ --**
Availability **2015-present**
U.S. Sales Units ..... **--**

RANGE

EV Range ..... **Up to 120 mi**
MPGe **28**

PERFORMANCE

Gradeability **20%**
Top Speed ..... **65 mph**
Drag Coefficient ..... **--**

BATTERY

Volts ..... **-- V**
Watt-hours ..... **127 kWh**
Cooling ..... **Active**

DRIVETRAIN

HP/Lb-ft .... **335 hp / 1,700 ft-lbs**
Drive Type ..... **Direct Drive**
Axles ..... **--**

CHARGING

Power Rating ..... **15 kW / 50 kW**
Charge Time L2 ..... **8 hours**
Charge Time DC ..... **2.5 hours**
Connector ..... **J1772 / CCS**

DIMENSIONS

Curb Weight ..... **-- lbs**
GVWR ..... **22,000 lbs**
Wheelbase ..... **168+ in**
Length ..... **16+ ft truck**
Width ..... **86+ in**
Height ..... **110+ in**

Story: Austin Tannenbaum, Photos: Motiv Power Systems

ACQUISITION
MSRP ..... **$ --**
Availability **2018-present**
U.S. Sales Units ..... **200+**

RANGE
EV Range ..... **50 mi**
MPGe ..... **--**

PERFORMANCE
Gradeability ..... **--**
Top Speed ..... **-- mph**
Drag Coefficient ..... **--**

BATTERY
Volts ..... **-- V**
Watt-hours ..... **-- kWh**
Cooling ..... **--**

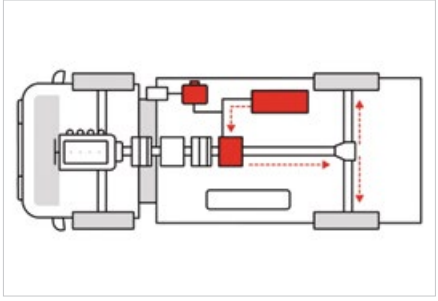
DRIVETRAIN
HP/Lb-ft ..... **--**
Drive Type ..... **--**
Axles ..... **--**

CHARGING
Power Rating ..... **-- kW**
Charge Time L2 ..... **8 hrs**
Charge Time DC ..... **-- hrs**
Connector **J1772**

DIMENSIONS
Curb Weight ..... **-- lbs**
GVWR ..... **-- lbs**
Wheelbase ..... **-- in**
Length ..... **-- in**
Width ..... **-- in**
Height ..... **-- in**

2018 - 2020 CUMMINS PowerDrive

Cummins' PowerDrive is a suite of electric powertrains for light, medium, and heavy-duty trucks. They are installed on the chassis of conventional trucks to equip them with EV capabilities. A PowerDrive system replaces the truck's pre-existing transmission. Once installed, the system automatically adjusts between four modes (two all-electric, two hybrid) depending on driving conditions to optimize fuel economy. EV mode provides purely electric driving on ordinary cities and highways. EV+ mode kicks in to provide extra power when needed, for instance during rapid acceleration or hill climbing. Cummins reports that the PowerDrive system offers 50 miles of all-electric range. The PowerDrive's Hybrid modes are utilized for routes greater than 300 miles. Series Hybrid mode is designed for low-speed and stop-and-go driving and applies strong regenerative braking for added range. Parallel Hybrid mode is activated during highway driving. Cummins offers the ability to integrate two optional modules into PowerDrive systems. Its Power2E™ technology is a bi-directional power module that provides up to 200kW of power for applications such as vehicle-to-vehicle (V2G) charging, running job-site tools, and emergency power. Its PowerSuite™ software optimizes drivetrain, battery system, and emission reduction functions and tracks and analyzes vehicle data for monitoring purposes. The PowerDrive EV is compatible with a wide range of class 4 through class 8 vehicles including light duty trucks, step vans, package delivery vehicles, utility trucks and port drayage trucks.



Story: Austin Tannenbaum, Photos: Cummins

Battery Electric

2021 WINNEBAGO J33SE

Because of its 85-mile to 125-mile range, the class A Winnebago J33SE is ideal for short-range, commercial use with a fixed base of operations. Suggested applications include mobile blood banks, bookmobiles, medical screening units and other mobile clinics, law enforcement command units, and media event vehicles. Depending on the length of time spent at destinations and charger availability, the J33SE may extend their action radius—the sodium-nickel battery can charge to 50 percent in two hours, 75 percent in four hours, and 100 percent in eight hours. The J33SE is 33 feet long, with a GVWR of 22,000 pounds, and offers a single slide configuration. The J33SE shares the sturdy construction of other Winnebago specialty vehicles, including such elements as a one-piece fiber-glass roof and thermo-panel sidewalls. Because its framework is strong enough that no internal walls or cabinets are necessary for support, the floorplan is fully customizable. Additional metal substructure embedded in the walls allow for mounting of heavy and sensitive equipment. A wide array of features come standard, such as a blind spot monitoring system, passenger seat workstation, driver cab entry door, and a trailer hitch with a 5,000-pound drawbar. Further options include alternate entrance locations, wheelchair lifts, and cargo doors. Taken together, construction, capabilities, and standard and optional features make the J33SE a model outreach vehicle. Its cleaner, quieter operations are healthier for and less obtrusive in the communities they serve.

ACQUISITION
MSRP ..... **$ --**
Availability ..... **--**
U.S. Sales Units ..... **--**

RANGE
EV Range ..... **85–125 mi**
MPGe ..... **--**

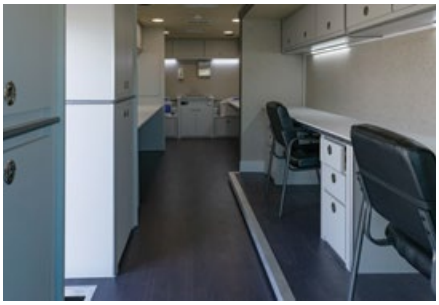
PERFORMANCE
Gradeability ..... **--**
Top Speed ..... **60 mph**
Drag Coefficient ..... **--**

BATTERY
Volts ..... **350 V**
Watt-hours ..... **126.6 kWh**
Cooling ..... **Liquid**

DRIVETRAIN
HP/Lb-ft **268/1,534**
Drive Type ..... **RWD**
Axles ..... **--**

CHARGING
Power Rating ..... **-- kW**
Charge Time L2 ..... **7-8 hrs**
Charge Time DC ..... **-- hrs**
Connector **J1772**

DIMENSIONS
Curb Weight ..... **-- lbs**
GVWR ..... **22,000 lbs**
Wheelbase ..... **208 in**
Length ..... **404 in**
Width ..... **101.5 in**
Height ..... **155 in**



Story: Molly Green, Photos: Winnebago

Battery Electric

ACQUISITION
MSRP ..... **$ --**
Availability **2015-present**
U.S. Sales Units ..... **--**

RANGE
EV Range ..... **Up to 120 mi**
MPGe **28**

PERFORMANCE
Gradeability **20%**
Top Speed ..... **65 mph**
Drag Coefficient ..... **--**

BATTERY
Volts ..... **-- V**
Watt-hours ..... **127 kWh**
Cooling ..... **Active**

DRIVETRAIN
HP/Lb-ft .... **335 hp / 1,700 ft-lbs**
Drive Type ..... **Direct Drive**
Axles ..... **--**

CHARGING
Power Rating ..... **15 kW / 50 kW**
Charge Time L2 ..... **8 hours**
Charge Time DC ..... **2.5 hours**
Connector ..... **J1772 / CCS**

DIMENSIONS
Curb Weight ..... **-- lbs**
GVWR ..... **22,000 or 26,000 lbs**
Wheelbase ..... **190+ in**
Length **30+ ft troll, 33+ ft specialty**
Width ..... **8+ ft**
Height ..... **12+ ft**

2015-2020
MOTIV POWER SYSTEMS EPIC F-53

Motiv's Ford eQVM-approved Electric Powered Intelligent Chassis (EPIC) offers fleets a seamless solution to switch to all-electric, as it requires little to no engineering or redesign and provides maximum vehicle configurations and compatibility with existing truck and bus body builders. Motiv's EPIC chassis provides fleet owners with up to 85 percent cost savings in operation and maintenance over internal combustion engine (ICE) vehicles, and gives commercial drivers reliable performance of greater than 99 percent uptime, as well as a smooth and quiet ride with no tailpipe emissions. The EPIC F-53 is based on Ford's F-53 platform and is available for trolleys and specialty applications such as bookmobiles, mobile medical, and command centers. The EPIC F-53 has a gross vehicle weight rating (GVWR) of 22,000 or 26,000 pounds and can travel up to 120 miles fully loaded. Its powertrain supplies 335 horsepower at a top speed of 65 mph with a gradeability of 20 percent. The EPIC F-53 is powered by BMW passenger car battery packs totaling 127 kWh and is available with both Level 2 and Level 3 charging capability. Motiv provides over-the-air software updates of new features and functionality without requiring any vehicle down time. Motiv helps fleet customers with project planning, free training, and applying for available incentives. Motiv's fleet customers can maximize their savings through state and federal funding programs, which can offer up to $200,000 and can translate to 50 – 90 percent of costs in incentives for vehicles and charging infrastructure.

Story: Austin Tannenbaum, Photos: Motiv Power Systems

Battery Electric

2004 - 2020

CANADIAN ELECTRIC VEHICLES Might-E Truck

The Canadian Electric Vehicles Ltd. Might-E Truck is a Neighborhood Electric Vehicle with a payload capacity of 300 to 500 pounds on-road and 1,000 to 1,500 pounds off-road. The Might-E truck can be configured as a base cab and chassis, cube van, garbage tipper, flat deck, pickup, box, or can be customized for specific applications. Combined with its 50-mile range and programmable, limited top speed of 25 mph, its customizability and capacity make the Might-E Truck well-suited to a wide range of uses by municipalities, parks, universities, and other industries.

Intended for off-road work, the Might-E Truck's welded steel box tube frame supports an aluminum and composite cab that ensures durability in the face of hard use. The standard motor continuously provides 9 horsepower and can reach a peak of 29 horsepower, but if more power is required, an optional, stronger drive system reaches 15 continuous and 47 peak horsepower. Likewise, power steering, an upgraded off-road load capacity of 2,000 pounds, and all-terrain tires are available.

To avoid corrosion in wet environments, the Might-E Truck's frame is powder-coated. Its cab is epoxy-painted and all exterior hardware is stainless. The brake lines are cupro-nickel. An optional 120-volt AC battery heating pad enhances the lead-acid battery's performance in cold weather, where range and charging time might ordinarily suffer. Further options include custom colors, a single point battery watering system, a battery pack, oversized side view mirrors, a strobe light, and a backup beeper.

ACQUISITION

MSRP	**$29,000 +**
Availability	**2004-present**
U.S. Sales Units	**--**

RANGE

EV Range	**50 mi**
MPGe	**--**

PERFORMANCE

Gradeability	**17-25%**
Top Speed	**25 mph**
Drag Coefficient	**--**

BATTERY

Volts	**72 V**
Watt-hours	**-- kWh**
Cooling	**Air**

DRIVETRAIN

HP/Lb-ft	**15-47/--**
Drive Type	**RWD**
Axles	**2 axle**

CHARGING

Power Rating	**1-5 kW**
Charge Time L2	**4 hrs**
Charge Time DC	**N/A**
Connector	**standard 120V, J1772**

DIMENSIONS

Curb Weight	**2,100 lbs (Li-Ion)**
GVWR	**3,000 lbs**
Wheelbase	**72 in**
Length	**138 in**
Width	**53 in**
Height	**70 in**

Story: Molly Green, Photos: Canadian EV

Battery Electric

ACQUISITION
MSRP ..... **$ --**
Availability ..... **--**
U.S. Sales Units ..... **--**

RANGE
EV Range ..... **100 mi**
MPGe ..... **--**

PERFORMANCE
Gradeability ..... **--**
Top Speed ..... **75 mph**
Drag Coefficient ..... **--**

BATTERY
Volts ..... **-- V**
Watt-hours ..... **70 kWh**
Cooling ..... **--**

DRIVETRAIN
HP/Lb-ft ..... **--**
Drive Type ..... **--**
Axles ..... **--**

CHARGING
Power Rating ..... **-- kW**
Charge Time L2 ..... **-- hrs**
Charge Time DC ..... **-- hrs**
Connector ..... **--**

DIMENSIONS
Curb Weight ..... **-- lbs**
GVWR ..... **12,000 lbs**
Wheelbase ..... **-- in**
Length ..... **324 in**
Width ..... **86 in**
Height ..... **122 in**

2020 WORKHORSE C1000

Known as the Workhorse N-GEN while in development, the class 5 Workhorse C1000 step truck is now named for notable aspects of its construction. C refers to the structural composite body and frame, which Workhorse estimates eliminates 4,000 pounds of weight from the body compared to a conventional delivery truck. 1000 references the model's 1,000 cubic feet of cargo space.

The C1000 has a payload capacity of 6,000 pounds and a GVWR of 12,000 pounds. Modular EnerDel 70-kWh battery packs enable fleet owners to choose configurations that meet their range needs up to 100 miles while keeping the truck lightweight. Designed for efficient maintenance, the rear suspension cradle can be dropped from the vehicle with the removal of a few bolts. A replacement cradle can then be installed to keep the C1000 on the road while repairs are carried out. An optional, hexacopter-based HorseFly delivery drone can be integrated with the C1000. The HorseFly charges on and launches from the C1000 and returns to the truck once its delivery is made. While the HorseFly is fully automated, the driver can monitor its progress from a command center aboard the C1000. Customers can also interact with the HorseFly via Workhorse's delivery app, which allows them to set the delivery location, cancel the delivery, monitor the location of their package, and watch real-time video from the drone. The fully electric powertrain, ease of maintenance, and drone integration make the Workhorse C1000 a forward-looking contender in zero-emissions delivery.

Story: Molly Green, Photos: Workhorse

Battery Electric

2019-2020 LIGHTNING ELECTRIC Ford Transit Passenger Van

Lightning eMotors has taken the Ford Transit Passenger and Cargo Vans and made them electric. Based on Ford's 350HD chassis, the Lightning Electric Zero Emission Ford Transit Vans are fully electric vehicles with an estimated range of 60 or 120 miles depending on the model.

Lightning's electrified version is identical to the conventional Ford Transit Van with a high, sloped roof, boxy rear end, and a large sliding door. The 60-mile and 120-mile Passenger models fit 15 passengers. The Cargo Van's payload capacity is up to 5,000 lbs, depending on configuration. To accommodate 60 miles of range, Lightning equips the shorter-range model with a 43-kWh battery pack that recharges in five and a half hours with a Level 2 charger and one hour with a DC charger. The longer-range model enjoys two packs for a total of 86 kWh that recharges in just over 11 hours with a Level 2 charger and one and a half hours with a DC charger. Both models are compatible with J1772 CCS Type 1 Combo connectors. They boast an efficiency of 61 MPGe (city) and a 66 MPGe (highway) — the best efficiency of any vehicle in its class 3 van weight class.

The upfitted Ford Transit Vans make zero compromises on performance with 215 horsepower and 733 pound-feet of torque, a Gross Vehicle Weight Rating (GVWR) of 10,360 pounds and an electronically limited top speed of 65 mph. Lightning Systems provides a 5-year/60,000-mile warranty on the powertrain and battery, while Ford's vehicle warranty remains in effect.

ACQUISITION
MSRP ..... **$132,900 - $152,900**
Availability **2019-present**
U.S. Sales Units ..... **--**

RANGE
EV Range ..... **60 mi, 120 mi**
MPGe ..... **61 City, 66 Hwy**

PERFORMANCE
Gradeability ..... **--**
Top Speed ..... **65 mph**
Drag Coefficient ..... **--**

BATTERY
Volts **350V**
Watt-hours ..... **43 kWh, 86 kWh**
Cooling ..... **Active**

DRIVETRAIN
HP/Lb-ft **215/733**
Drive Type . **RWD via main shaft**
Axles **2**

CHARGING
Power Rating ..... **6.6 kW, 80 kW**
Charge Time L2 .... **5.5 hrs, 11 hrs**
Charge Time DC ..... **1 hr, 1.5 hrs**
Connector **J1772, CCS-1 Combo**

CAPACITY
Passengers **15**

DIMENSIONS
Curb Weight .... **6,700-8,260 lbs**
GVWR ..... **10,360 lbs**
Wheelbase ..... **148 in**
Length ..... **264 in**
Width (mirrors folded) ..... **84 in**
Height ..... **110 in**

Story: Molly Green, Photos: Lightning eMotors

Battery Electric

ACQUISITION
MSRP ..... **On Request**
Availability **2018-present**
U.S. Sales Units ..... **--**

RANGE
EV Range ..... **150 mi**
MPGe **50**

PERFORMANCE
Gradeability ..... **--**
Top Speed ..... **81 mph**
Drag Coefficient ..... **--**

BATTERY
Volts ..... **-- V**
Watt-hours ..... **100 kWh**
Cooling ..... **Liquid**

DRIVETRAIN
HP/Lb-ft **198/563**
Drive Type ..... **RWD**
Axles ..... **--**

CHARGING
Power Rating ..... **13.2 kW**
Charge Time L2 ..... **8 hrs**
Charge Time DC ..... **1 hr**
Connector ..... **CCS**

DIMENSIONS
Curb Weight ..... **10,535 lbs**
GVWR ..... **16,535 lbs**
Wheelbase ..... **-- in**
Length ..... **318.1 in**
Width ..... **86.4 in**
Height ..... **109.4 in**

2018 - 2020 CHANJE V8100

The V8100 has been part of California-based medium duty EV startup Chanje's roster since 2018. It is a cargo van designed to enable all-electric transportation of "last mile" goods, which must be transported from a general hub to individual locations. It is thus ideal for delivery fleets such as online retailers and mail services. FedEx's fleet includes 1,000 Chanje V8100s and Ryder is Chanje's exclusive sales channel partner and service provider. The V8100 features a large, back-heavy exterior with a unibody construction body. It has 675 cubic feet of cargo space. The V8100's ergonomically designed interior includes a 10.4-inch touchscreen that controls the vehicle's Android-based infotainment system. Its 100-kWh battery affords a 150-mile range assuming 2,000 pounds of payload (although it can carry up to 6,000 pounds). At the end of each day, the V8100 is driven back to a fleet depot for convenient Level 2 charging overnight. Alternatively, the V8100 can be plugged into a DC fast charger for 80 percent refueling in just over an hour. The V8100 holds numerous advantages over gas-powered cargo vans. Because of the simplicity of its electric motor vis-a-vis an internal combustion engine, Chanje estimates that the V8100 will net owners 70 percent lower maintenance costs. Additionally, since electric vehicles are highly efficient, Chanje reports that the V8100 will save owners an average of 70 percent in fuel costs. Chanje highlights the V8100's silent operation as an opportunity for off-peak deliveries to reduce time spent idling, which can increase energy efficiency and productivity.

Story: Austin Tannenbaum, Photos: Chanje

Battery Electric

2021 MCI J4500e

Fleet operators who switch to the zero-emissions MCI J4500e CHARGE from its diesel predecessor, the J4500 coach, won't find themselves compromising on speed or power given its top speed of 72 mph, 260kW, and 3,320 pound-feet of torque.

The stainless-steel frame and fiberglass composite body are designed for durability and low corrosion. In addition to the luxuries the J4500e shares with the J4500 (spacious legroom, Wi-Fi connectivity, and power outlets at each seat), up to 60 passengers will enjoy a smoother, quieter ride, without any greenhouse gas emissions or any tailpipe emissions at all.

The 544-kWh battery reaches full charge in less than four hours and and has an estimated range well over 200 miles under normal operating conditions. The Siemens electric drive system is designed to handle highway speeds, while regenerative braking makes the J4500e highly efficient in start and stop environments. The J4500e provides approximately 128 cubic feet of parcel rack storage and 166 cubic feet of baggage bay cargo space. The engine compartment and most of the underfloor areas are replaced by the energy storage system.

MCI offers analysis and integration services and 24/7 support to guarantee fleet managers a smooth transition process.

ACQUISITION

MSRP	**On Request**
Availability	**2021**
U.S. Sales Units	**--**

RANGE

EV Range	**230 mi**
MPGe	**18**

PERFORMANCE

Gradeability	**Exceeds APTA Req.**
Top Speed	**72 mph**
Drag Coefficient	**--**

BATTERY

Volts	**618 V (nominal)**
Watt-hours	**544 kWh**
Cooling	**Active Liquid**

DRIVETRAIN

HP/Lb-ft	**260kW/3,320**
Drive Type	**4.7:1 diff. direct**
Axles	

CHARGING

Power Rating	**150 kW+**
Charge Time L2	**N/A**
Charge Time DC	**< 4 hrs**
Connector	**J1772/CCS 1**

CAPACITY

Passengers	**60**

DIMENSIONS

Curb Weight	**~ 44,000 lbs**
GVWR	**54,000 lbs**
Wheelbase	**315 in**
Length	**45.5 ft**
Width	**8.5 ft**
Height	**11.7 ft**

Story: Molly Green, Photos: MCI

Battery Electric

ACQUISITION
MSRP ..... **On Request**
Availability **Q1, 2021**
U.S. Sales Units ..... **--**

RANGE
EV Range ..... **230 mi**
MPGe ..... **--**

PERFORMANCE
Gradeability **19.5%**
Top Speed ..... **71 mph**
Drag Coefficient ..... **--**

BATTERY
Volts ..... **650 VDC**
Watt-hours ..... **648 kWh**
Cooling ..... **Liquid**

DRIVETRAIN
HP/Lb-ft **483/3,127**
Drive Type .. **Siemens PEM Motor**
Axles ..... **VH-MAN, DANA**

CHARGING
Power Rating ..... **125 kW**
Charge Time L2 ..... **-- hrs**
Charge Time DC ..... **4.5 hrs**
Connector **CCS1**

CAPACITY
Passengers **56**

DIMENSIONS
Curb Weight ..... **44,272 lbs**
GVWR ..... **54,000 lbs**
Wheelbase ..... **304.5 in**
Length ..... **547 in**
Width ..... **102 in**
Height ..... **138 in**

2021 VAN HOOL CX45E Proterra Drivetrain

With seating for 56 passengers and a range of 230 miles, the 45-foot CX45E from Belgian bus manufacturer Van Hool is intended for transit along regular routes, such as employee shuttle services. In addition to the smooth, quiet ride, passengers will appreciate the sleek interior design, including brushed metal, parcel rack lighting, and textured finishes on seating and side walls. Black window frames, trim, and seat tracks add to the luxury feel and require less maintenance and cleaning by operators.

The CX45E is powered by 648 kWh of on-board energy in the Proterra battery packs. The CX45E provides up to 483 horsepower and allows the coach to reach a top speed of 71 mph for comfortable highway driving. Given these capabilities, the CX45E may be used for light intercity travel, provided there is a charger at each end of its journey. The charging port is located on the rear curbside with a CCS1 connector. With a DC power output of 125 kW, the CX45E reaches full battery capacity in around 4.5 hours.

The CX45E is produced in part in Van Hool's manufacturing facility in Skopje, North-Macedonia alongside the conventionally fueled CX35, CX45 and TDX25, then transported to Belgium for completion and finishing of the electric drivetrain and installation of the Proterra battery packs. This allows the company to capitalize on pre established processes and scale production to meet demand.

Story: Molly Green, Photos: Van Hool

Battery Electric

2020 NEW FLYER Xcelsior CHARGE - 60ft

With 35-, 40-, and 60-foot lengths and battery configurations ranging from 160 kWh to 466 kWh, the New Flyer Xcelsior CHARGE is easily scaled for applications across the transportation sector, though it is especially well-suited to public transportation. The Xcelsior CHARGE's on-route charging capabilities are excellent for continuous, in-city driving along regular routes—six minutes of on-route rapid charge allows for an hour and a half of operation, providing essentially limitless range so long as the bus stops beneath on-route chargers.

In the absence of on-route charging infrastructure, "long-range" depot charging provides the Xcelsior CHARGE with significant power. A full charge of the 60-foot articulated model's 466-kWh battery pack provides a range of up to 135 miles. The 35-foot model has a maximum battery capacity of 388 kWh which can carry it up to 195 miles. The 40-foot model has the largest range: 225 miles on a full charge of its 466-kWh batteries. Both on-route and plug-in depot charging systems are built to industry standards and are interoperable with other electric vehicles.

New Flyer estimates that, when compared to conventionally fueled buses, the Xcelsior CHARGE will reduce greenhouse gas emissions by 100 to 160 tons annually and can save operators up to $125,000 in maintenance costs and $400,000 in fuel costs over the 12-year life of the bus.

Photos depict 35-, 40-, and 60-foot lengths. Specs column depicts 60-foot bus.

ACQUISITION
MSRP ..... **$--**
Availability ..... **--**
U.S. Sales Units ..... **--**

RANGE
EV Range ..... **135 mi**
MPGe ..... **--**

PERFORMANCE
Gradeability ..... **--**
Top Speed ..... **-- mph**
Drag Coefficient ..... **--**

BATTERY
Volts ..... **-- V**
Watt-hours ..... **213-466 kWh**
Cooling ..... **Liquid**

DRIVETRAIN
HP/Lb-ft **282/1,475**
Drive Type ..... **Direct Drive**
Axles ..... **Man & ZF 6x4**

CHARGING
Power Rating ..... **-- kW**
Charge Time L2 ..... **-- hrs**
Charge Time DC ..... **3.5 hrs**
Connector **SAE J1772, CCS Type 1**

CAPACITY
Passengers **125**

DIMENSIONS
Curb Weight ..... **45,662 lbs**
GVWR ..... **-- lbs**
Wheelbase **299 in front, 293 in rear**
Length ..... **60 ft 10 in**
Width ..... **102 in**
Height ..... **11 ft 1 in**

Story: Molly Green, Photos: New Flyer

Battery Electric

ACQUISITION
MSRP ..... **On Request**
Availability ..... **--**
U.S. Sales Units ..... **--**

RANGE
EV Range ..... **230 mi**
MPGe ..... **--**

PERFORMANCE
Gradeability ..... **--**
Top Speed ..... **65 mph**
Drag Coefficient ..... **--**

BATTERY
Volts ..... **-- V**
Watt-hours ..... **446 kWh**
Cooling ..... **--**

DRIVETRAIN
HP/Lb-ft ..... **241 x 2/1,106 x 2**
Drive Type ..... **--**
Axles ..... **ZF, in-wheel**

CHARGING
Power Rating ..... **200 kW**
Charge Time L2 ..... **-- hrs**
Charge Time DC ..... **2-2.5 hrs**
Connector ..... **CCS**

CAPACITY
Passengers ..... **57+1**

DIMENSIONS
Curb Weight ..... **42,990 lbs**
GVWR ..... **54,013 lbs**
Wheelbase ..... **313.8 in**
Length ..... **45.8 ft**
Width ..... **101.6 in**
Height ..... **139.4 in**

2020 BYD Motor Coach - 45ft

The Build Your Dreams (BYD) Electric Motor Coach line ranges in length from the 23-foot C6M to the 45-foot C10M. The smallest motor coach seats 16 ambulatory passengers, the 35-foot C8M seats 41, the 40-foot C9M can seat up to 49, and the largest option seats 57. Each model includes two wheelchair positions on the street side of the coach.

As the larger models allow more room for internal components, battery capacity increases with model size. The 23-foot model's 121-kWh batteries provide a range of 125 miles, a top speed of 62.4 mph, and up to 201 x 2 horsepower. All larger models have a top speed of 65 mph and achieve up to 241 x 2 horsepower. The C8M and C9M both provide a range of up to 200 miles. The C10M can travel as far as 230 miles.

Though the C6M has a shorter range and offers less power than other members of the motor coach line, its smaller size comes with the advantage of better maneuverability. Its maximum gradeability is slightly higher than the other models' (greater than or equal to 17 percent compared to a maximum of 16 percent) and its turning radius is only 26.25 feet (compared to the C10M's 51-foot radius). The C6M is best suited to transporting small groups on short routes, such as at universities and airports. The C10M, by contrast, might be put into use on commuter routes. By offering a range of models with different options and capabilities, BYD offers its Electric Motor Coach as a versatile line within the electric bus market.

Story: Molly Green, Photos: BYD

Battery Electric

2020 BYD Transit Bus - 40ft

The Build Your Dreams (BYD) Electric Transit Bus line ranges in size and passenger capacity to meet needs across the transportation industry. The shortest, the 30-foot K7, can carry 22 passengers up to 150 miles, making it well suited to work between airport terminals or as a parking shuttle. The 35-foot K9S has a range of 145 to 215 miles, depending on the components selected, and seats up to 32 passengers. The 40-foot K9, which seats 37 and has a range of 157 to 177 miles, can be put to airport use where larger passenger volume is necessary or employed in public transportation. Finally, the 60-foot K11 articulated bus can carry 47 to 55 passengers up to 220 miles and is intended for urban transit work. All models have two ADA compliant wheelchair positions.

As with other BYD lines, because larger vehicles allow more room for internal components, battery size increases with bus length. The 30-foot model's 215-kWh battery charges in three and a half to four hours. The K9S also reaches its full battery capacity of 266 kWh in three and a half to four hours. The K9's 352-kWh battery charges in four and a half to five hours. Remarkably, the K11's 446-kWh battery reaches full charge in only two to two and a half hours.

Given their individual strengths and sizes, each of the BYD Electric Transit Buses is an effective option for its segment of the transportation industry. Fleet owners have an array of vehicles to choose from to meet their operational needs.

ACQUISITION
MSRP ..... **On Request**
Availability ..... **--**
U.S. Sales Units ..... **--**

RANGE
EV Range ..... **157-177 mi**
MPGe ..... **--**

PERFORMANCE
Gradeability ..... **--**
Top Speed ..... **65 mph**
Drag Coefficient ..... **--**

BATTERY
Volts ..... **-- V**
Watt-hours ..... **352 kWh**
Cooling ..... **--**

DRIVETRAIN
HP/Lb-ft ..... **201 x 2/405 x 2**
Drive Type ..... **--**
Axles ..... **--**

CHARGING
Power Rating ..... **80 kW**
Charge Time L2 ..... **-- hrs**
Charge Time DC ..... **4.5 hrs**
Connector **CCS1**

CAPACITY
Passengers ..... **37+1**

DIMENSIONS
Curb Weight ..... **31,702 lbs**
GVWR ..... **43,431 lbs**
Wheelbase ..... **246.1 in**
Length ..... **40.2 ft**
Width ..... **101.6 in**
Height ..... **134 in**

Story: Molly Green, Photos: BYD

Battery Electric

ACQUISITION
MSRP ..... **$ --**
Availability **2013-present**
U.S. Sales Units ..... **950+**

RANGE
EV Range ..... **121-238 mi**
MPGe **18.8-25.1**

PERFORMANCE
Gradeability **29.5-33%**
Top Speed ..... **65 mph**
Drag Coefficient ..... **--**

BATTERY
Volts ..... **-- V**
Watt-hours ..... **220-440 kWh**
Cooling ..... **--**

DRIVETRAIN
HP/Lb-ft **338-550/--**
Drive Type ..... **--**
Axles ..... **--**

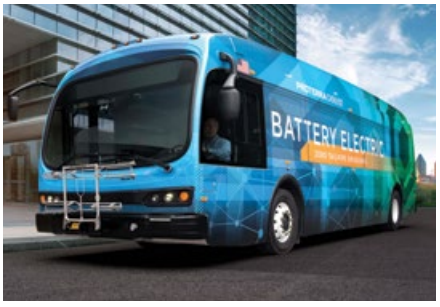
CHARGING
Power Rating ..... **73-330 kW**
Charge Time L2 ..... **-- hrs**
Charge Time DC ..... **2.8-3.4 hrs**
Connector **J1772-CCS/J3105**

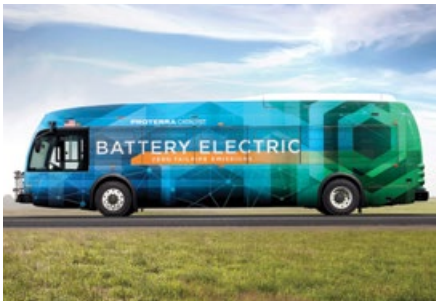
CAPACITY
Passengers **29**

DIMENSIONS
Curb Weight **26,358-29,658 lbs**
GVWR ..... **42,000 lbs**
Wheelbase ..... **243 in**
Length ..... **443 in**
Width ..... **102 in**
Height ..... **128 in**

2013-2020
PROTERRA ZX5 - 35ft

Recently rebranded from the Proterra Catalyst, the Proterra ZX5 is a highly customizable electric bus intended for flexible routes. Its 238-mile top range is enough to ease range anxiety. Series and drivetrain options provide the 35-foot model with an energy density of 220 kWh to 440 kWh and the 40-foot model with between 220 kWh and 660 kWh. Because of this flexibility, Proterra's team executes in-depth route analyses to offer fleet operators the options best tailored to their operating requirements. Though the whole bus is only covered by Proterra's warranty for one year or 50,000 miles and the batteries are covered for 12 years with unlimited miles, Proterra estimates that the ZX5 has a lifespan of 18 years. The body, composed of carbon-fiber-reinforced composite materials, experiences significantly less deterioration over a 12-year period than a steel-body bus. Tests that simulated 750,000 miles, the equivalent of 18 years in service, resulted in no damage to the body or systems, including the batteries. In addition to the 750,000-mile test, the ZX5's batteries have undergone rigorous safety testing, including operation at 80° C (176° F) and underside abuse that tests the batteries against the weight of the bus. Battery packs are placed between the axles, separated from the passenger compartment by a structural barrier for maximum passenger safety. Proterra estimates that by switching to a ZX5 from a diesel bus, operators can reduce emissions by 229,167 pounds of carbon dioxide per year and can save up to $400,000 in operational costs over the life of the bus.





Story: Molly Green, Photos: Proterra

Battery Electric

2017-2020 GREEN POWER EV350

GreenPower's line of electric buses, ranging in size from the 30-foot EV250 to the 45-foot EV550 Double Decker, provides an array of options which meet diverse transit requirements. Seating starts with the EV250's 25 passenger seats and increases steadily through the 35-foot EV300's 34 seats, the 40-foot EV350's 40, and the 45-foot EV400's 44, all with room for standees. As larger buses allow for larger battery systems, the power and capacity of GreenPower's buses increases with size—the EV250 and EV300, with battery capacities of 240 kWh and 260 kWh, have a range of more than 160 miles. The EV350 and EV400's 430-kWh batteries allow for a range more than 220 miles. The EV550 is at the forefront of the GreenPower line up, offering owners a range of 300 miles on a single charge of its 575-kWh battery. With 35 seats on the bottom floor and 65 seats on top, the double decker has room for 100 seated passengers, plus standees. Because of its panoramic windows, which offer riders an uninterrupted view, the EV550 has been successfully employed as a tour and sightseeing bus. The other members of the line largely operate in transit, where they have seen substantial success. The 350EVs, in particular, are effective enough that the city of Porterville, California deployed them to replace their municipal fleet of ten CNG powered buses. Porterville is not alone, either—the scalability of the line's size, power, and passenger capacity ensure that many fleet owners will find GreenPower EV transit buses that suit their operating needs.

ACQUISITION
MSRP ..... **On Request**
Availability **2017-present**
U.S. Sales Units **11**

RANGE
EV Range ..... **220 mi**
MPGe **24**

PERFORMANCE
Gradeability **10%**
Top Speed ..... **65 mph**
Drag Coefficient ..... **--**

BATTERY
Volts **637V**
Watt-hours ..... **430 kWh**
Cooling ..... **Ambient, Liquid**

DRIVETRAIN
HP/Lb-ft **380/--**
Drive Type ..... **Direct Drive**
Axles ..... **--**

CHARGING
Power Rating ..... **100 kW**
Charge Time L2 ..... **N/A**
Charge Time DC ..... **3.5 hrs**
Connector ..... **CCS**

CAPACITY
Passengers **40**

DIMENSIONS
Curb Weight ..... **33,400 lbs**
GVWR ..... **47,400 lbs**
Wheelbase ..... **254.5 in**
Length ..... **40 ft**
Width ..... **102 in**
Height ..... **126 in**

Story: Molly Green, Photos: Green Power

Battery Electric

ACQUISITION
MSRP ..... **On Request**
Availability **2020**
U.S. Sales Units ..... **--**

RANGE
EV Range ..... **230 mi**
MPGe ..... **--**

PERFORMANCE
Gradeability ..... **--**
Top Speed ..... **65 mph**
Drag Coefficient ..... **--**

BATTERY
Volts ..... **-- V**
Watt-hours ..... **446 kWh**
Cooling ..... **--**

DRIVETRAIN
HP/Lb-ft ..... **241 x 2/1,106 x 2**
Drive Type ..... **--**
Axles ..... **ZF, in-wheel**

CHARGING
Power Rating ..... **200 kW**
Charge Time L2 ..... **-- hrs**
Charge Time DC ..... **2-2.5 hrs**
Connector ..... **CCS**

CAPACITY
Passengers ..... **77+1**

DIMENSIONS
Curb Weight ..... **47,000 lbs**
GVWR ..... **59,100 lbs**
Wheelbase ..... **283.3 in**
Length ..... **45 ft**
Width ..... **101.6 in**
Height ..... **160.2 in**

2020 BYD Double Decker Bus - 45ft

The Build Your Dreams (BYD) Double Decker Electric Bus line provides a positive passenger experience, beginning with the smoother, quieter ride provided by the all-electric systems. Wide windows on the upper deck offer passengers a clear view of their surroundings, making the 35-foot C8MS and 45-foot C10MS ideal sightseeing buses. An onboard bathroom is available for the 47-seat passenger configuration of the C8MS; without a bathroom, the C8MS seats 51. The C10MS seats up to 77. Both models feature two wheelchair positions on the street side, regardless of configuration. The C8MS has a range of up to 170 miles. The 313-kWh batteries charge in four to four and a half hours via an 80-kW charger. The C10MS allows enough space for a larger 446-kWh battery pack, which can carry the bus up to 230 miles. The C10MS's batteries charges in two to two and a half hours via a 200-kW charger. Despite the discrepancy in battery sizes, both Double Deckers offer 241 horsepower, 1,106 foot-pounds of torque, and have a top speed of 65 mph.

While the C8MS doesn't match the range or battery capacity of the C10MS, its smaller size and 39-foot turning radius make it more maneuverable in urban environments than the C10MS, which has a turning radius of 47.1feet. In addition to sharing tour applications with the C10MS, the C8MS has seen success in public transportation as a zero-emissions version of London's iconic red double decker buses, demonstrating the line's potential for integration into existing fleets.

Story: Molly Green, Photos: BYD

Battery Electric

2020 LION ELECTRIC CO LionM

The 26-foot LionM midi/minibus from the Lion Electric Company is designed specifically for the urban, and shuttle market. Passenger experience begins with quick and easy boarding, as the low floor bus kneels 3.25 inches and the integrated Bi-Fold access ramp deploys in eight seconds for maximum passenger accessibility. The 40.69-inch main door allows room for wheelchair access, as does the 90-inch internal width, which provides plenty of space to maneuver. To meet diverse passenger needs, Lion offers various seating configurations. The LionM can be configured with two or four battery packs for range and power options that suit a variety of route requirements. An 80-kWh battery can carry the vehicle 75 miles on a full charge, while the battery system has a capacity of 160 kWh and a 150-mile range. An aluminum and steel chassis makes the LionM strong yet light, which allows for a longer range while placing less strain on the batteries. These batteries can be charged via a 19.2-kW J1772 charger or an optional CCS-Combo charger for DC fast charging. Lion can also integrate optional battery swapping technology which increases uptime, provided the necessary infrastructure is in place. The marriage of the LionM's paratransit design to its electric systems provides greater benefit to passengers than either would alone. Not only will passengers have easier access to the bus, but their ride will be smooth, quiet, and clean, without engine noise or diesel fumes.

ACQUISITION
MSRP ..... **On Request**
Availability **2018-present**
U.S. Sales Units ..... **--**

RANGE
EV Range ..... **75-150 mi**
MPGe ..... **--**

PERFORMANCE
Gradeability ..... **--**
Top Speed ..... **55 mph**
Drag Coefficient ..... **--**

BATTERY
Volts ..... **-- V**
Watt-hours ..... **80-160 kWh**
Cooling ..... **--**

DRIVETRAIN
HP/Lb-ft **215/885**
Drive Type ..... **Direct Drive**
Axles ..... **--**

CHARGING
Power Rating ..... **19.2 kW**
Charge Time L2 ..... **5-10 hrs**
Charge Time DC ..... **2, 5 hrs**
Connector .. **J1772, CCS-Combo**

CAPACITY
Passengers **31**

DIMENSIONS
Curb Weight ..... **16,500 lbs**
GVWR ..... **-- lbs**
Wheelbase ..... **143 in**
Length ..... **313 in**
Width ..... **95 in**
Height ..... **111 in**

Story: Molly Green, Photos: Lion Electric Co

Battery Electric

ACQUISITION
MSRP ..... **On Request**
Availability **2018-present**
U.S. Sales Units ..... **4 delivered**

RANGE
EV Range ..... **150 mi**
MPGe **26**

PERFORMANCE
Gradeability **20%**
Top Speed ..... **65 mph**
Drag Coefficient ..... **0.65 cd**

BATTERY
Volts ..... **614 V**
Watt-hours ..... **194.5 kWh**
Cooling ..... **Ambient**

DRIVETRAIN
HP/Lb-ft **333/--**
Drive Type ..... **Direct**
Axles ..... **--**

CHARGING
Power Rating .... **19.2 kW, 50 kW**
Charge Time L2 ..... **-- hrs**
Charge Time DC ..... **2.5 hrs**
Connector ..... **J1772, CCS**

CAPACITY
Passengers **90**

DIMENSIONS
Curb Weight ..... **26,770 lbs**
GVWR ..... **38,580 lbs**
Wheelbase ..... **264 in**
Length ..... **40 ft**
Width ..... **102 in**
Height ..... **11.7 ft**

2018-2020
GREEN POWER BEAST/SYNAPSE

Both the BEAST and the SYNAPSE are based on the same chassis and built from a clean-sheet design to meet the needs of shuttle and school transit operations. The BEAST School Bus is a Type D zero-emissions bus in 36.5-foot and 40-foot lengths which can carry up to 72 and 90 passengers, respectively. The SYNAPSE Shuttle Bus matches the dimensions of the smaller school bus but only has the capacity for 45 passengers.Battery configurations range from 100 kWh to 200 kWh to suit a spectrum of duty requirements. Range increases with battery capacity, from 75 miles per charge up to 140. Fleet owners can also tailor charging systems to meet their specific needs with options including Level 2 on-board charging and DC fast charging. Both the BEAST School Bus and the Synapse Shuttle Bus have an estimated lifetime of more than 20 years. The high-floor platform and monocoque body are designed for durability and, because of the reduction in moving parts compared to a diesel bus, the Synapse will likely require little maintenance. As parts do eventually experience wear, they are easily cared for and replaced thanks to GreenPower's partnerships with industry parts providers such as ZF, Neway, Knorr, Bendix, Thermo King, Wabco, and Parker. The BEAST School Bus (formerly called the Synapse 72 School Bus) first entered service in 2018, with deliveries to the Los Angeles Unified School District. In the years since, GreenPower has received a high volume of orders from more school districts and other transit service providers who see promise in the electric buses.

Story: Molly Green, Photos: Green Power

Battery Electric

2016-2020 LION ELECTRIC CO LionC

Replacing a conventionally fueled school bus with a LionC from the Lion Electric Company has the potential to eliminate 23 tons of GHG emissions, the equivalent of removing five cars from the road. Not only does this have a powerful effect on the environment, it provides the children it carries, who will grow up to face the effects of climate change, with a real-world example of an environmental solution at work in their daily lives. With a maximum range of 155 miles, Lion estimates that the LionC can travel 15 times the average route between home and school on a full charge of the 220-kWh battery. As the batteries charge in 5 to 16 hours, they can reach maximum capacity during the school day as well as overnight. The standard J1772 connector allows the LionC to connect with most public chargers when necessary, such as for refueling on field trips. Should faster charging systems be required, Lion offers an optional CCS-Combo charger for DC rapid charging.

The LionC is built to withstand challenging environments. A gel-coated composite exterior guards against corrosion and leaks, as do the rotomolded polyethylene stepwell, anti-acid battery box and tray, and wheelhouses. The recyclable thermoplastic olefin (TPO) body skirts are easily removable and replaceable if damaged.

The estimated life of the LionC is 15 years or, as Lion points out on their website, long enough for a child to go from kindergarten to college—long enough to make a powerful impact on a child's future.

ACQUISITION

MSRP	**On Request**
Availability	**2016-present**
U.S. Sales Units	**--**

RANGE

EV Range	**65-155 mi**
MPGe	**--**

PERFORMANCE

Gradeability	**--**
Top Speed	**-- mph**
Drag Coefficient	**--**

BATTERY

Volts	**-- V**
Watt-hours	**220 kWh**
Cooling	**--**

DRIVETRAIN

HP/Lb-ft	**335/1,800**
Drive Type	**Direct Drive**
Axles	**--**

CHARGING

Power Rating	**19.2 kW**
Charge Time L2	**5-16 hrs**
Charge Time DC	**2.5-6.5 hrs**
Connector	**J1772/CCS-Combo**

CAPACITY

Passengers	**71**

DIMENSIONS

Curb Weight	**-- lbs**
GVWR	**33,000 lbs**
Wheelbase	**254, 276 in**
Length	**473 in**
Width	**96, 102 in**
Height	**122 in**

Story: Molly Green, Photos: Lion Electric Co

Battery Electric

ACQUISITION
MSRP ..... **$ --**
Availability **2018-present**
U.S. Sales Units ..... **--**

RANGE
EV Range ..... **120 mi**
MPGe ..... **--**

PERFORMANCE
Gradeability ..... **--**
Top Speed ..... **-- mph**
Drag Coefficient ..... **--**

BATTERY
Volts ..... **620 V**
Watt-hours ..... **-- kWh**
Cooling ..... **--**

DRIVETRAIN
HP/Lb-ft **315/2,400**
Drive Type ..... **--**
Axles ..... **--**

CHARGING
Power Rating ..... **-- kW**
Charge Time L2 ..... **8 hrs**
Charge Time DC ..... **3 hrs**
Connector ..... **SAE J1772**

CAPACITY
Passengers ..... **78 - 84**

DIMENSIONS
Curb Weight ..... **-- lbs**
GVWR ..... **36,000 lbs**
Wheelbase ..... **-- in**
Length ..... **245 - 273 in**
Width ..... **96 in**
Height ..... **124 in**

2018 - 2020
BLUE BIRD
All American RE Electric

Following successful innovation in alternative fuels, such as propane, well-established school bus manufacturer Blue Bird launched the Vision Electric, All American RE Electric, and Micro Bird G5 Electric. The type C Vision Electric and type D All American RE Electric are powered by the Cummins electric drivetrain. The type A G5 Electric is built on the Ford E-450 chassis. Both the Vision Electric and All American RE Electric have 120-mile range while the G5 Electric offers up to 100 miles. From smallest to largest, Blue Bird's electric buses can handle 30 passengers, 77 passengers, or 84 passengers. As safety is a chief concern for passenger buses, especially those that transport children, all Blue Bird models undergo testing which exceeds Federal Motor Vehicle Safety Standards. The Colorado Rack Test simulates a bus rollover to ensure structural integrity and the Kentucky Pole Test verifies that internal panels will not form sharp edges during a crash. In the case of Blue Bird's electric buses, quiet operations enhance safety by allowing the driver to better hear the passengers in case of distress and focus on the road without the distraction of engine noise. As of the start of the 2019-2020 school year, Blue Bird had received over 100 orders for electric buses from districts in California, North Dakota, Washington, Colorado, New York, New Jersey, and Quebec. That so many districts chose these buses to reduce their environmental impacts and protect their children's futures speaks to the wide-ranging appeal of Blue Bird's offerings.

Story: Molly Green, Photos: Blue Bird

Battery Electric

2018 - 2020

GREEN POWER EV Star

GreenPower's EV Star line of "Min-eBuses" offers standard, luxury, extra-wide, and ADA compliant shuttle buses. The standard EV Star seats 19 passengers or, in an optional luxury configuration, up to 9. The EV Star ADA provides 14 ambulatory passenger seats and two wheelchair positions. An optional curbside wheelchair lift is available. The EV Star+ is larger than the rest of the line. While having the same 25-foot length as the EV Star, the EV Star+ is over three feet more wide for a full width of 10 feet. With this extra space comes the capacity to carry up to 24 passengers. All configurations of the EV Star have a 150-mile range on a full charge of the 118-kWh battery. The charging system combines level two charging via a J1772 AC charger and DC fast charging by a CCS connector for an efficient system that suits a variety of infrastructures and duty cycle requirements. The drive motor is rated for 600,000 miles of driving before maintenance is required. For operations that see around 60,000 miles per year, that could mean no maintenance for the 10-year design life of the vehicle. When maintenance is eventually required, parts are easily replaceable as the EV Star is built with industry standard parts from manufacturers such as Siemens and Parker. With its ability to meet a range of passenger and operational needs, the EV Star can be effectively deployed in paratransit, shuttle service, vanpools, and other transit applications. It has seen particular success as an airport parking shuttle and in micro-transit.

ACQUISITION
MSRP ..... **On Request**
Availability **2018-present**
U.S. Sales Units **68**

RANGE
EV Range ..... **150 mi**
MPGe **49**

PERFORMANCE
Gradeability **22%**
Top Speed ..... **65 mi**
Drag Coefficient ..... **0.36 cd**

BATTERY
Volts ..... **563.2 V**
Watt-hours ..... **118 kWh**
Cooling ..... **Ambient, Liquid**

DRIVETRAIN
HP/Lb-ft **268/733**
Drive Type ..... **Direct**
Axles ..... **--**

CHARGING
Power Rating ..... **60 kW**
Charge Time L2 ..... **8 hrs**
Charge Time DC ..... **2 hrs**
Connector ..... **J1772, CCS**

CAPACITY
Passengers ..... **up to 19**

DIMENSIONS
Curb Weight ..... **9,970 lbs**
GVWR ..... **14,331 lbs**
Wheelbase ..... **170 in**
Length ..... **25 ft**
Width ..... **79 in**
Height ..... **109.5 in**

Story: Molly Green, Photos: Green Power

Battery Electric

ACQUISITION
MSRP ..... **$ --**
Availability ..... **--**
U.S. Sales Units ..... **--**

RANGE
EV Range ..... **80-150 mi**
MPGe ..... **--**

PERFORMANCE
Gradeability ..... **--**
Top Speed ..... **58 or 64**
Drag Coefficient ..... **--**

BATTERY
Volts ..... **-- V**
Watt-hours ..... **70-140 kWh**
Cooling ..... **--**

DRIVETRAIN
HP/Lb-ft **308/--**
Drive Type ..... **--**
Axles ..... **--**

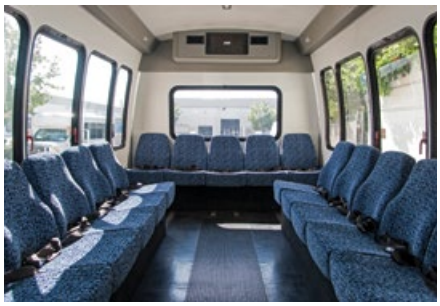
CHARGING
Power Rating ..... **13 kW, 50 kW**
Charge Time L2 ..... **-- hrs**
Charge Time DC ..... **-- hrs**
Connector ..... **J1772, CHAdeMO**

CAPACITY
Passengers **16-23**

DIMENSIONS
Curb Weight ..... **8,000 lbs**
GVWR ..... **14,500 lbs**
Wheelbase ..... **158-176 in**
Length ..... **-- in**
Width ..... **-- in**
Height ..... **-- in**

2020
PHOENIX MOTORCARS
Zeus Shuttle

The Phoenix Zeus 400 Shuttle Bus harnesses the inherent benefits of its electric motor to provide passengers a smoother, quieter shuttle ride. With range options of 80, 115, and 150 miles, the Zeus 400 shuttle bus is ideal for rides to and from parking structures, hotels, and senior centers as well as routes on corporate and university campuses. Seating can be configured to suit these applications, with options including 16 ambulatory passenger seats and two wheelchair positions, 16 ambulatory passenger seats and a 72-inch luggage rack, or 23 forward-facing ambulatory passenger seats. The Zeus 400 Shuttle Bus is constructed from a Starcraft Allstar Body on the Ford E-450 Super Duty Chassis. With a curb weight of 8,000 pounds and a payload of up to 6,500 pounds, the shuttle has plenty of capacity for luggage and other cargo in addition to passengers. Though a top speed of 58 mph is standard, an optional upgrade to 64 mph allows the shuttle to operate near highway speeds. With 70-kWh, 105-kWh, and 140-kWh configurations, battery capacity options meet an array of operational requirements. The 13-kW level two onboard charging system employs a J1772 connector—best used overnight to ensure a full charge at the start of the workday—and a CHAdeMO system for DC fast charging, to maximize up time. The Zeus 400 Shuttle Bus is already in use by NASA, the United States Department of Defense, airport parking companies, and municipalities—a broad spectrum that speaks favorably of the shuttle bus's applicability.



Story: Molly Green, Photos: Phoenix Motorcars

EV Educational Resources

Supporting EV Adoption from Awareness to Advocacy

Electric Car INSIDER

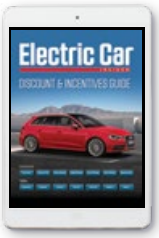
EV & EVSE Buyers Guides

Comprehensive, full page profiles of the best EVs and EV chargers.

Electric Car Guest Drive

Test drive the latest electric cars and learn from EV owners at a no-pressure social event.

Discount Pricing Guide



The app that can save you thousands of dollars on EV and EVSE purchases. Customizable for utilities and AQMDs.

Educational Pillars

Large scale interactive exhibits for indoor and outoor events.

Mobile EVSE Classroom

ECI will deploy a mobile classroom – towed by a Cybertruck – througout the US in 2021.

EV Navigator

Online, interactive app to guide prospective EV drivers on the path to ownership and advocacy.

ECI creates electric vehicle educational resources for utilities, AQMDs, automakers and EVSE manufacturers, integrators and installers.

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