Electric Vehicles 101: The Truth About Range

Ford PRO™

When it comes to commercial fleet electrification, battery range continues to be a source of concern. A recent Ford Pro™ survey[1] of fleet decision-makers found that nearly 90% of U.S. respondents would like to add electric vehicles (EVs) to their fleets but remain uneasy about battery efficiency. Specifically, U.S. respondents worry about batteries losing efficiency in cold weather (51%) and drivers getting stranded because of dead batteries (49%).

The reality is that the daily mileage most fleet vehicles travel is well below battery ranges. Our survey of fleet decision-makers found that most fleet vehicles travel less than 125 miles per day.[1] After analyzing more than 145 million miles of telematics data, Ford Pro found that 95% of average F-150® commercial customers' daily travel is less than 174 miles.

By contrast, the U.S. Department of Energy reports that most EVs can travel an average of 260 miles on one charge.[2]

The 2023 F-150® Lightning® pickup has an EPA-estimated range of 240 miles with the standard-range battery,[3] while the range on the Pro and Platinum models top at 320 miles and 300 miles with the available extended-range battery, respectively.[4]

The good news is that Ford Pro EVs come equipped with dashboard features that warn drivers of draining batteries well in advance, so drivers can find a charging station with plenty of time to spare. To help EV drivers have plenty of charge throughout the workday, here are some factors fleet managers should consider and monitor.

1.0 Temperature

When the temperatures drop, the batteries in EVs must work extra hard to deliver the same degree of productivity, which results in reduced range.

AAA tested the range effects of 20-degree weather on various EVs and discovered that temperature alone could reduce range by up to 12%.[5] To be sure, less-than-optimal weather conditions impact the range of gas-powered vehicles as well.[6] Denser cold air combined with high driving speeds increase the drag on all vehicles—gas-powered or otherwise—and weaken fuel efficiency.

Still, fuel economy tests show that, at least for now, the effect of cold air on range is greater in EVs.[6] Why? Well, batteries perform best at a specific temperature range,[7] and the further away from that temperature range the battery gets, the quicker the charge will deplete. Plus, unlike gas-powered vehicles, which use surplus engine heat to warm the cabin, EVs must use battery power.

If a cold weather EV driver chooses to turn on their heater or window defroster, range loss could increase to 41%, according to AAA.[5]

Wide variations in temperature throughout the day can also impact range, which can be especially challenging for crews that work long hours on remote job sites.

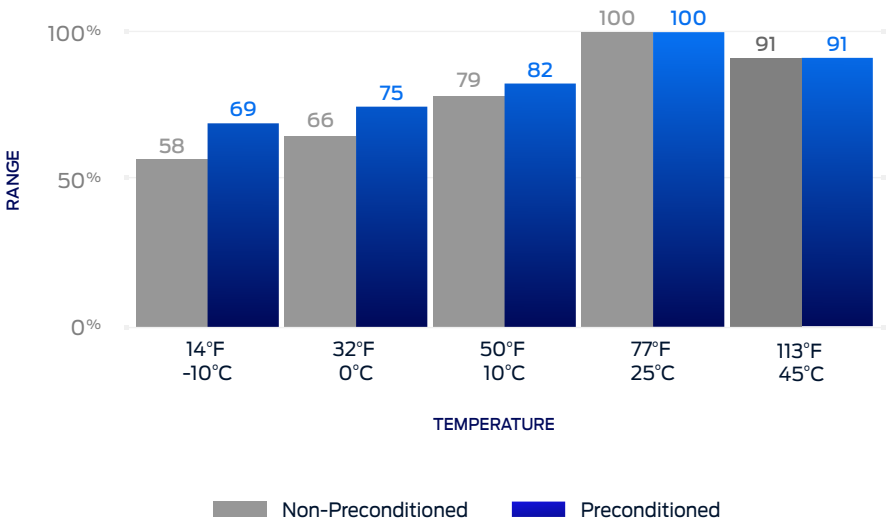
For that reason, fleets operating in regions that experience extreme temperature fluctuations must consider charger accessibility to avoid potential downtime.

Thankfully, there are steps fleet managers can take to diminish the effects of cold weather on EVs and help maximize range.

Non-Preconditioned vs. Preconditioned Vehicles

2022 E-Transit Forecast Driving Range Compared to Baseline with **50% Payload[1] at 77°**

(Figures apply only to 2022 E-Transit)



Preconditioning is the process of warming (or cooling) the battery to that optimal temperature range while the vehicle is still plugged into the charger. This way, the energy will come from the charger versus the battery.

Fleet managers can schedule departure times remotely via the Ford Pro™ E-Telematics[8] Software, which will trigger battery preconditioning to automatically begin up to an hour before departure based on current weather conditions.

When Ford Pro tested the range benefits of preconditioning on the 2022 F-150® Lightning®, we found that doing so could increase range by 17% in 14-degree weather and 14% in 32-degree weather.[9]

Similarly, the 2022 E-Transit™ can maintain 75% of its baseline range if it's preconditioned in 32-degree weather compared to 66% retention when it's not preconditioned.[10]

Even if a commercial fleet isn't based in a colder climate, fleet managers should still monitor the effects of temperatures. The same AAA study looked at the impacts of hot weather on EVs and found that when temperatures hit 95 degrees and drivers use air conditioning to cool the cabin, the driving range falls by 17%.[5]

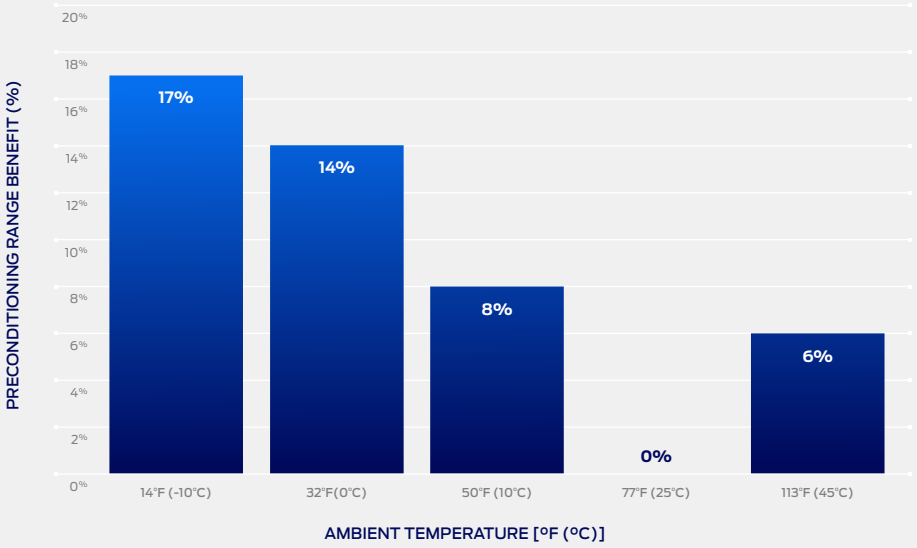
Preconditioning is essential for hot weather fleets but won't impact range as much. For instance, preconditioning the 2022 F-150 Lightning pickup in 113-degree weather resulted in a 6% range increase.[9]

In hot weather, the best way to maximize range is to park the EV in a shaded area and keep it plugged in when it's parked so the charger can do the heavy lifting of keeping the battery and cabin cool prior to departure.

Estimated Range Benefit with 1-Hour Preconditioning vs. Non-Preconditioning at Various Ambient Temperatures

Driving Range Estimates

(Figures apply only to 2022 F-150 Lightning)

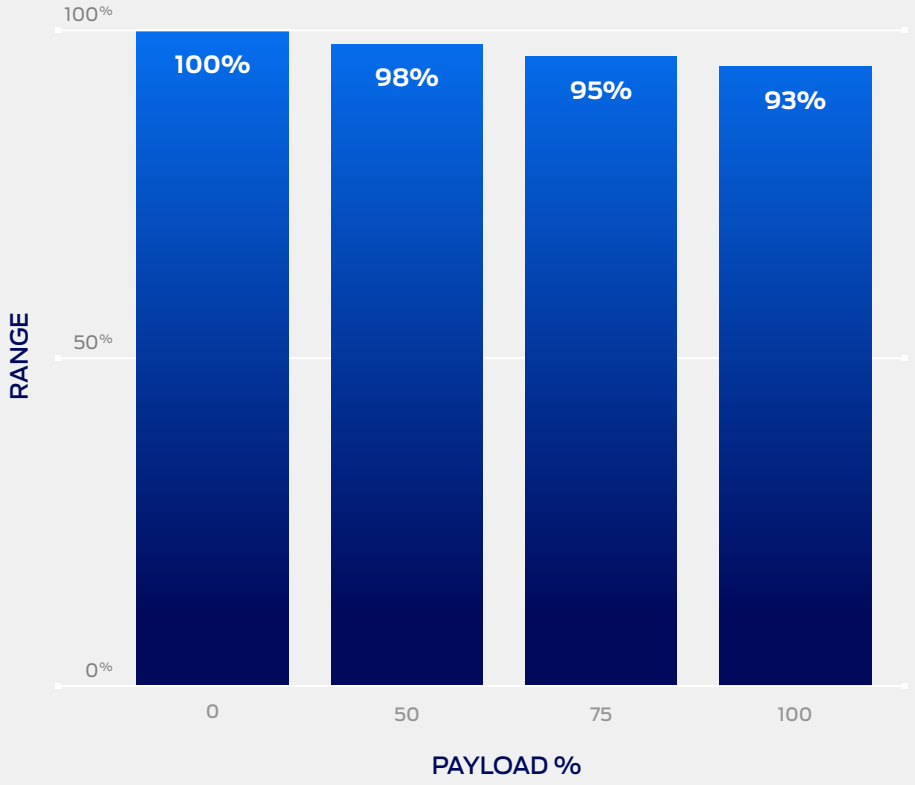


2.0
Towing and Hauling

Just as weather impacts both EVs and gas-powered vehicles' range, so too do payload[11] and towing. Let's look at payload first. An internal engineering study conducted by Ford determined that as the payload percentage of the 2022 F-150® Lightning® pickup increases, the range decreases.[12] At 50% payload, for example, the battery's range operates at 98%.[12]

Payload Impact Estimates

2022 F-150 Lightning

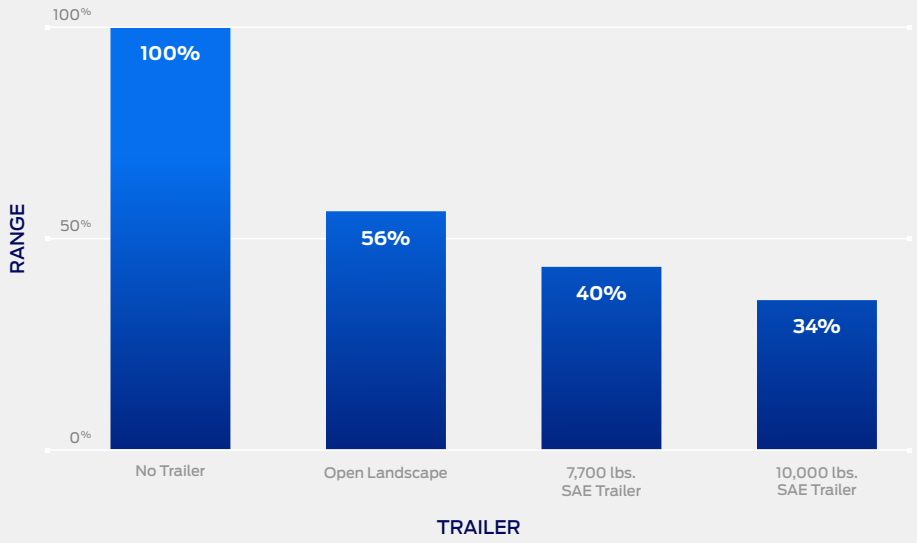


When a trailer is attached to the vehicle, its battery range is further impacted. The heavier the load and the further it has to be towed, the more energy the gas-powered truck must expend to propel itself forward.[13] The same holds true for an electric truck.

For instance, a 2022 F-150® Lightning® with a 7,700-pound SAE trailer attached operates at 40% of the baseline range, while an F-150 Lightning with a 10,000-pound SAE trailer attached operates at 34% of the baseline range.[14]

Trailer Impact Estimates

2022 F-150 Lightning



The takeaway here? F-150® Lightning® drivers will likely have to recharge more often than traditional F-150® drivers will have to refuel. If towing is a big part of fleet operations, fleet managers should note how towing will impact the EV battery range and adjust charge management strategies accordingly. Ford Pro™ Charging Software can help fleet managers control energy use and manage charging efficiency.

However, in extreme use cases—think limited charger access, long towing distances and maxed-out payloads—gas, diesel and hybrid vehicles may be a better fit. Ford Pro works directly with commercial customers to select vehicles that make sense for their business.

Finally, fleet managers need to be aware of the shape of the trailer. For example, lower-profile trailers have superior aerodynamics and do not impact range capacity as much as trailers with broader frontal areas.

3.0
Vehicle Configuration

Light-duty gas-powered trucks and vans have lower fuel economy than lower-profile cars.[15] The shape and the height of an EV will also impact its battery range. For instance, the low-roof E-Transit™ models with a standard-range battery have an estimated range of 126 miles, while medium- and high-roof models have ranges of 116 and 108 miles, respectively.[16]

4.0
Driving Habits

Driving habits can also affect battery range. Just like in gas-powered vehicles, the rate of acceleration and the speed that an EV travels significantly impact energy consumption.

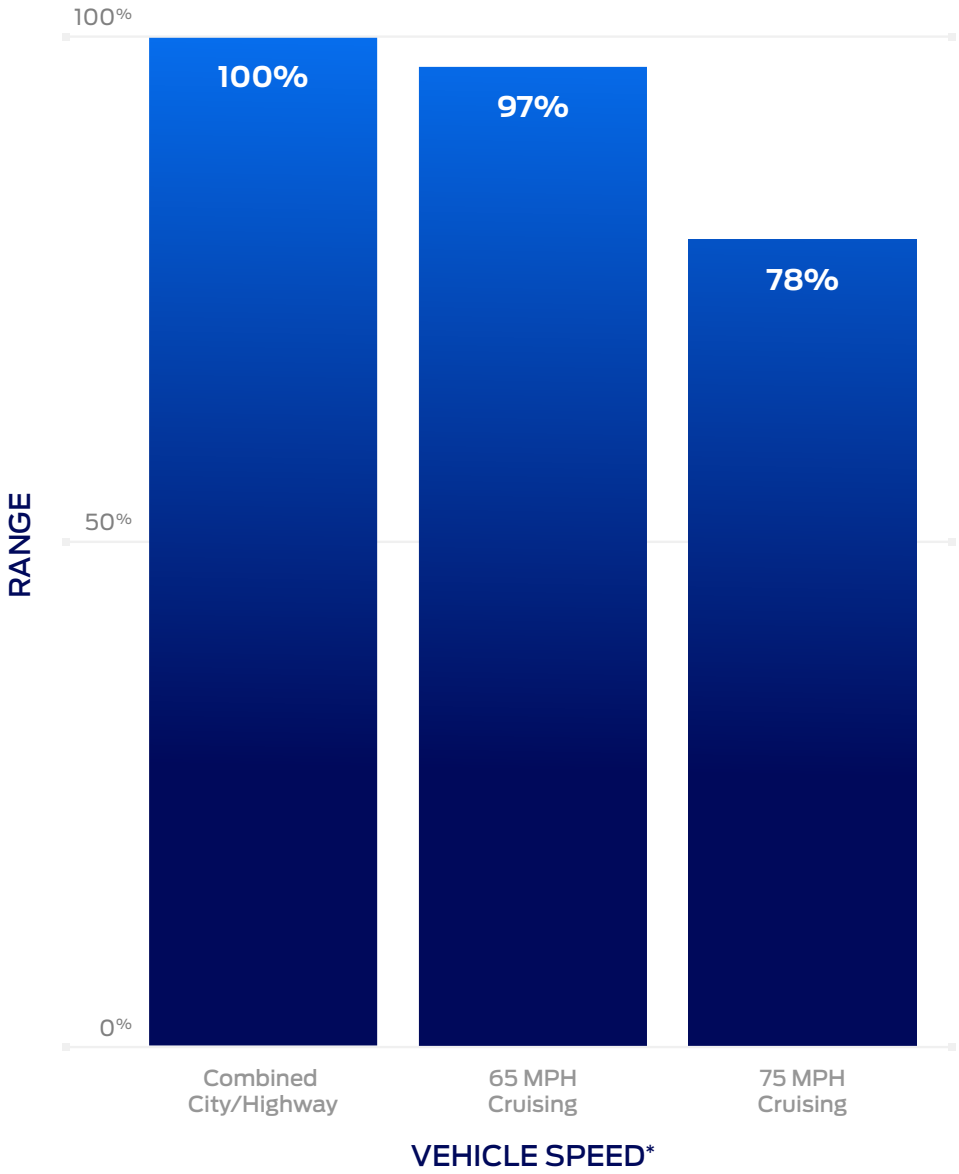
Different vehicle makes and models reach optimum fuel efficiency at different speeds, but generally speaking, gas mileage usually starts to fall when traveling more than 50 miles per hour (mph).[11]

Testing by Ford on the 2022 F-150® Lightning® shows that when the pickup travels 65 mph, its battery range operates at 97% of baseline. Increasing that speed by 10 mph causes the range to drop to 78% of the baseline.[17]

Vehicle Speed Impact Estimates

2022 F-150® Lightning®

(Figures apply only to 2022 F-150 Lightning)



To maximize battery range, fleet managers can provide driving guidelines and monitor driver behavior, including driving speed, braking and acceleration, through Ford Pro™ E-Telematics[8].

Vehicles' built-in modems collect data on driving events and transmit the data to a Ford Pro E-Telematics[8] dashboard and driver behavior scorecard. Armed with this data, fleet managers can help drivers prioritize driving. Drivers can also use One-Pedal Driving Mode[18] to boost regenerative braking, which recaptures otherwise lost kinetic energy from braking and converts it to electrical power, some of which is returned to the battery.[19]

The bottom line:
Range anxiety is a valid concern—but it's not something that should stop fleet managers from exploring the benefits of electrifying a fleet. Demystifying the process is about gathering the correct information on fleet operations and needs and creating a tailored charging strategy to maximize battery range and keep fleets running.

Want help determining if EVs are a good fit for you? Book a free one-hour EV consultation session. We'll work to understand your commercial fleet's unique needs, budget and vehicle use cases and select commercial vehicles that deliver. Not ready to get on the phone just yet? That's OK, too! Download Power and Productivity, a guide to maximizing the range of your F-150 Lightning pickup.

Go to FordPro.com

[1] "Ford Pro Fleet Manager Global Quantitative Study: Perceptions of Electric Vehicles March 2022." This quantitative study was fielded in the United States, United Kingdom and Germany among 1,250 corporate fleet decision-makers. The survey was conducted online in December 2021. PSB was hired by Ford Pro™ to conduct the survey. Results are not weighted.
[2] "At a Glance: Electric Vehicles." *U.S. Department of Energy.* https://afdc.energy.gov/files/u/publication/electric-drive_vehicles.pdf
[3] EPA-estimated driving range based on full charge. Actual range varies with conditions such as external environment, vehicle use, vehicle maintenance, lithium-ion battery age and state of health.
[4] Fleet configuration only, not available for retail sale. Fleet sales require an eligible FIN; see a fleet-sales specialist for details.
[5] "Icy Temperatures Cut Electric Vehicle Range Nearly in Half." *AAA Newsroom.* Feb. 7, 2019. https://newsroom.aaa.com/2019/02/cold-weather-reduces-electric-vehicle-range/
[6] "Fuel Economy in Cold Weather." *U.S. Department of Energy.* https://www.fueleconomy.gov/feg/coldweather.shtml
[7] "Optimization of Thermal and Structural Design in Lithium-Ion Batteries to Obtain Energy Efficient Battery Thermal Management System (BTMS): A Critical Review." *National Library of Medicine.* April 25, 2021. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8074378/
[8] Eligible vehicles receive a complimentary three-year trial of E-Telematics services that begins on the new vehicle warranty start date. Requires modem activation. Terms and conditions apply. Telematics service and features, and access to vehicle data, depend on compatible AT&T network availability. Evolving technology/cellular networks/vehicle capability may limit functionality and prevent operation of connected features. After the three-year trial, annual service contract is required for E-Telematics service. Go to https://fleetaccount.ford.com/customer-signup or 1-833-811-3673 to activate E-Telematics service. Terms and conditions subject to change.
[9] The vehicle tested was a 2022 F-150® Lightning® pickup with extended-range battery with 20-inch all-season tires, with all accessories off except for climate control. Ford conducted the tests at 14ºF (-10ºC), 32ºF (0ºC), 50ºF (10ºC), 77ºF (25ºC) and 113ºF (45ºC) temperature conditions on a vehicle with a fully-charged battery using portions of the EPA Multi-Cycle Test drive, which includes city and highway speeds and representative road loads on a dynamometer in an indoor facility. Preconditioning includes one hour of preconditioning with a cabin temperature setting of 72ºF (22ºC). All tests used a constant cabin temperature setting of auto 72ºF (22ºC) throughout, with vehicle starting the test at the listed ambient temperature and the test chamber maintaining the listed ambient temperature throughout the test. The estimated range comparisons are results from a non-EPA engineering study conducted by Ford. Actual range varies with conditions such as external environment, vehicle use, vehicle maintenance, upfits and alterations, lithium-ion battery age and state of health.
[10] The range comparisons are results from an engineering study tested in specific conditions identified herein.
Actual range varies with conditions such as external environment, vehicle use, vehicle maintenance, upfits and alterations, lithium-ion battery age and state of health. These results reflect the combination of Worldwide Harmonized Light Duty Test Cycle (WLTC) and EPA Urban Dynamometer Driving Schedule for Heavy-Duty Vehicles (HD-UDDS) repeated.
The tests were conducted on a dynamometer at the listed ambient temperatures with a fully charged battery. A constant HVAC setting of auto 70ºF (21ºC), with vehicle and battery cells starting the test at the listed ambient temperature and the test chamber maintaining the listed ambient temperature throughout the test. The vehicle tested was a 2022 E-Transit™ Long Wheelbase High-Roof Cargo Van at road loads representing 50% payload and a sealed bulkhead.
Payload adjustments were calculated based on engineering simulations. 10ºC (50ºF) datapoints were generated from linear relationships between DC energy efficiency, battery available energy and ambient temperature. On-plug programmed departure time preconditioning testing was conducted with the medium cabin temperature setting of 72.5ºF (22.5ºC).
[11] "Techniques for Drivers to Conserve Fuel." *U.S. Department of Energy Alternative Fuels Data Center.* https://afdc.energy.gov/conserve/behavior_techniques.html
[12] The vehicle tested was a 2022 F-150 Lightning pickup with extended-range battery with 20-inch all-season tires and all climate control and accessories off. Ford conducted the baseline test for the 0% condition on a vehicle with a fully-charged battery at EPA- defined test weight and no payload in the truck bed, using the EPA Multi-Cycle Test drive, which includes city and highway speeds and representative road loads on a dynamometer in an indoor facility at 77ºF. Ford used computer simulations to estimate results for payload weights, with the 100% condition reflecting maximum payload of the vehicle (payload percentage includes option weight). Max payload varies and is based on accessories and vehicle configuration. See label on doorjamb for carrying capacity of a specific vehicle. The estimated range comparisons are results from a non-EPA engineering study conducted by Ford. Actual range varies with conditions such as external environment, vehicle use, vehicle maintenance, upfits and alterations, lithium-ion battery age and state of health.
[13] "Many Factors Affect Fuel Economy." *U.S. Department of Energy.* https://www.fueleconomy.gov/feg/factors.shtml
[14] The vehicle tested was a 2022 F-150 Lightning with extended-range battery with 20-inch all-season tires and all climate control and accessories off. Ford conducted baseline tests for the "No Trailer" condition on a vehicle with a fully-charged battery using the EPA Multi-Cycle Test drive schedule on a dynamometer in an indoor facility at 77ºF and used computer simulations to estimate results for the other trailer towing conditions (accounting for trailer tow weights, frontal areas and representative road loads) listed in the graph. Trailer measurements (frontal area/weight): Open Landscape.
[15] "Average Fuel Economy by Major Vehicle Category." *U.S. Department of Energy.* Updated February 2020. https://afdc.energy.gov/data/10310
[16] Range and charge time based on manufacturer computer engineering simulations and US EPA MCT drive cycle methodology (www.fueleconomy.gov/feg/pdfs/EPA test procedure for EVs-PHEVs-11-14-2017.pdf). The charging rate decreases as battery reaches full capacity. Your results may vary based on peak charging times and battery state of charge. Actual vehicle range varies with conditions such as external elements, driving behaviors, vehicle maintenance, lithium-ion battery age and state of health.
[17] The vehicle tested was a 2022 F-150 Lightning with extended-range battery with 20-inch all-season tires and all climate control and accessories off. Ford conducted the city/highway and steady state 65 mph testing on a vehicle with a fully-charged battery on a dynamometer in an indoor facility at 77ºF and used computer simulations to estimate results for 75 mph steady state driving. Baseline combined city/highway figures are as measured on the EPA Multi-Cycle Test drive schedule, which includes city and highway speeds, and at road loads consistent with EPA testing methods. 65 mph testing and 75 mph simulation reflects steady state driving (not based on EPA highway drive cycle) with road loads representing such driving speeds. The estimated range comparisons are results from a non-EPA engineering study conducted by Ford. Actual range varies with conditions such as external environment, vehicle use, vehicle maintenance, upfits and alterations, lithium-ion battery age and state of health.
[18] One-Pedal Drive is an extra driving aid. It does not replace the driver's attention and judgment or the need to apply the brakes. See Owner's Manual for details and limitations.
[19] "Electric Vehicle Technology Overview." *Energy.gov.* https://www.energy.gov/eere/femp/electric-vehicle-technology-overview