

Electric Vehicles for Fleets

Electric vehicles (EVs) can fulfill many daily driving needs, making them a great solution for fleets. They offer several benefits and can fill roles in light-duty, medium-/heavy-duty (MD/HD), and even off-road applications.

The unique fleet environment presents considerations beyond those that consumers must address before going electric. For example, fleet managers must understand the impacts of charging multiple vehicles while maintaining fleet operations. Larger MD/HD vehicles bring additional factors to consider.

Why Consider an EV?

Lower Costs. In addition to available incentives, EVs offer high fuel economy, which translates to lower operating costs. Operation and maintenance averages about 3 cents per mile for light-duty EVs. They achieve their best fuel economy during stop-and-go driving conditions typical of many fleet applications. Electricity prices have also been less volatile than those of gasoline/diesel, making it easier to estimate future fuel costs (see Figure 2). Finally, lower off-peak electric rates may be available for charging, which further reduces EV fuel costs.

Performance Features. EVs are much quieter than conventional vehicles. They produce maximum torque and smooth acceleration from a full stop, which can be especially useful when hauling heavy loads.



Figure 1. Fleets can choose from a wide variety of electric vehicles available for light-, medium-, and heavy-duty applications. Photo by Dennis Schroeder, NREL 62522

Additionally, some can serve as a significant energy source for off-board equipment such as power tools or lights, providing several kilowatts of electricity through multiple electrical outlets.

Flexible Charging. EVs can charge at fleet facilities or public stations. Facility charging enables EVs to charge overnight and during idle times. Public “fast charge” stations are increasingly available along

major transportation corridors to extend EV range for longer trips. Plug-in hybrid electric vehicles (PHEVs) can fuel with gasoline/diesel at traditional fueling stations when necessary, adding even more flexibility.

Meeting Fleet Requirements. EVs can help fleets comply with state or local alternative transportation policies, as well as net-zero and sustainability goals.

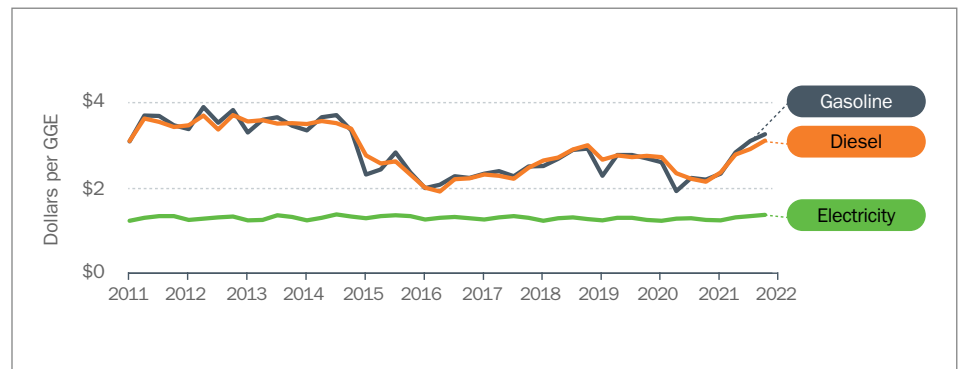


Figure 2. The average retail fuel prices in the United States illustrate that electricity prices are not only lower but much more stable than those of gasoline or diesel fuel.

Medium- and Heavy-Duty Considerations

Vehicles:

- Several MD/HD EV models are available for applications such as school and transit buses, shuttle vans/buses, delivery trucks/vans, and vocational trucks.
- Many off-road EVs are available, including forklifts, mowers, agricultural tractors, and airport ground support equipment.
- Initial vehicle production quantities can be limited, resulting in longer delivery times for some MD/HD EVs, so plan early.
- MD/HD vehicles can be more impacted by factors that can reduce range, such as heating/cooling loads, high driving speeds, significant cargo loads, and auxiliary power use in power takeoff, auxiliary power units, etc.

Charging:

- Level 2 charging equipment can meet the needs of MD/HD EVs with low utilization or long dwell periods.
- MD/HD vehicle charging equipment applications may be different than those of light-duty vehicle equipment.
- Inductive and overhead conductive charging equipment may also be an option, particularly for mid-route charging (e.g., for transit buses). With these charging methods, EVs can automatically begin charging when parked.

Fleet Implementation Checklist

Selecting Vehicles

- Assess the fleet's driving/duty requirements, applicable mandates or policies, and budget
- Determine availability of EVs capable of meeting requirements
- Explore available incentives
- Work with the vehicle provider(s) to verify availability, applicability to fleet needs, charging needs and options, maintenance and local servicing availability, and delivery timeline

Installing Infrastructure

- Establish the fleet's charging needs and options, including hard-wired vs. portable charging units
- Coordinate with the utility to confirm installation requirements and pricing (including utility rates and any electrical upgrades needed at the charging site)
- Select a preliminary charging site location, considering the number and type of charging units required; their proximity to the electrical service panel; accessibility, safety, and signage; weather considerations; and future expansion
- Select vehicle and charging equipment vendors
- Consult with vendors and utility on project needs
- Establish a charging plan, including networking requirements, electricity rate implications, and ownership responsibilities
- Estimate costs, including available incentives, project costs, and ongoing expenses/fees
- Select construction and electrical contractors
- Finalize the site plan and budget
- Conduct engineering and construction, including permitting and inspections
- Conduct staff/driver training
- Download an expanded checklist from the [AFDC](https://afdc.energy.gov/files/pdfs/ev-fleets-checklist.pdf) [afdc.energy.gov/files/pdfs/ev-fleets-checklist.pdf]



Charging EVs

Fleets have many options for charging at their facilities. For fleets considering PHEVs, Level 1 charging may be sufficient. Level 2 equipment can easily charge a typical EV battery overnight, making it a good fleet option.

Opting for portable Level 1 or 2 units can add flexibility and reduce project costs. Instead of installing a pedestal at each EV parking location, 120/240 V receptacles may be installed to support lower cost portable EVSE that can be stored in fleet vehicles.

DC fast charging can add up to 100 miles of range in 20 minutes, making it an option for midday charging or scheduled overnight charging at off-peak electric rates. This type of “managed” charging is made easier by using a networked charging system. Learn more about charging on the [Alternative Fuels Data Center \(AFDC\)](https://afdc.energy.gov/fuels/electricity_infrastructure.html) [afdc.energy.gov/fuels/electricity_infrastructure.html].

Facility Charging. Just as there are many options for charging at a fleet facility, there are also many considerations:

- Charging needs and potential solutions, including hard-wired vs. portable charging
- Site planning (including future expansion)
- Vendor selection (for both vehicles and charging equipment)
- Consultation with vehicle manufacturer, charging equipment vendor, and utility
- Networking options and electricity rates
- Equipment ownership (vendor or fleet)
- Cost estimating including incentives, project costs, and ongoing expenses
- Construction and certified electrical contractor selection
- Final site selection and planning
- Engineering and construction (including permitting and inspections)
- Initial staff and recurring driver training
- Charging equipment maintenance and agreements with the equipment provider
- Fuel/electricity tracking (isolating EV electricity use, tracking usage and costs).

Refer to the [AFDC](https://afdc.energy.gov/ev-fleets) for more information [afdc.energy.gov/ev-fleets].

Buying the Right EVs

Many light-duty vehicles are available for fleet applications. Although some new models are limited to certain states, many are or will soon be available nationwide. MD/HD vehicles are also available for many fleet applications. In addition to federal and



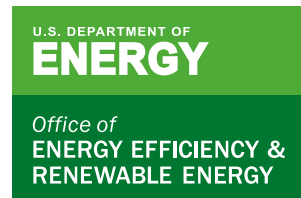
Figure 3. Networked charging systems provide detailed energy use data and the ability to schedule charging events to take advantage of off-peak electric rates. Photo by Dennis Schroeder, NREL 56653

state incentives for light-duty vehicles, some MD EVs also qualify for such incentives. Electrified repowers are an option for MD/HD vehicles as well. These can be new vehicles where the original equipment manufacturer uses an authorized company to electrify the powertrain while maintaining the factory warranty. Whichever vehicle solution a fleet chooses, it's important to ensure that servicing is locally available and appropriate charging is available for all vehicle types. Learn more at the [AFDC](https://afdc.energy.gov/vehicles/electric_availability.html) [https://afdc.energy.gov/vehicles/electric_availability.html].

Driving and Maintaining EVs

From the manufacturer, EVs are very safe and undergo rigorous testing to meet federal requirements. Their electrical systems require little maintenance, but battery life and warranties should be well understood upfront. It's also advisable to work with your vehicle provider to establish a service agreement that outlines who will perform maintenance both during and after the warranty period and how your service technicians will be trained. Driver training is also important to maximize vehicle availability and efficiency, and periodic “refresher” training should be included.

Fleets should also consider training for EV fleet operations staff and first responders. For more information, see the [AFDC](https://afdc.energy.gov/vehicles/electric_maintenance.html) [https://afdc.energy.gov/vehicles/electric_maintenance.html]. ■



For more information, visit:
afdc.energy.gov