

The Electric-Vehicles Revolution

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Some of the first automobiles were propelled by lead-acid batteries and electric motors. However, with the development of the ability to extract crude oil from the Earth that could be refined into gasoline, gasoline cars were more practical for about a century. That century is over!

With the finiteness of crude oil, the facts that burning gasoline pollutes the air and causes global warming, and the development of high-energy inexpensive lithium-ion batteries, electric vehicles have become superior to and more practical than gasoline vehicles. Here are some reasons why electric vehicles are superior and more practical than gasoline vehicles:

- They are about three times more efficient than gasoline vehicles.
- Their maintenance cost is about three times less than gasoline vehicles.
- They emit no carbon dioxide, a main cause of global warming.
- They do not create noise pollution.
- They are more powerful at low speed than gasoline vehicles.
- They are easier to be made autonomous than gasoline vehicles.
- They are largely charged at home and workplaces.
- Building fast-charging stations for long-distance travel cost much less than building gasoline stations.
- Fast-charging stations are being built at an exponential rate.

Because of these reasons electric cars on roads are growing faster per year after introduction than did gasoline and hybrid-gasoline-electric cars.

Tesla ([tesla.com](https://www.tesla.com)) in California is by far the leader in battery-electric cars (BEVs) that can travel long distances (currently full-battery range between 200-350 miles) for the following reasons:

- Developed better high-energy lithium-ion battery systems.
- Sells their cars in their stores rather than through outside dealers.
- Over-air software updates.
- Mobile-service vans, which eventually will be for 80% of service needs.
- Nationwide super-fast charging locations (“Superchargers”), with 6-40 charging stations, that are conveniently located on all major highways and they are rapidly expanding at about one supercharger a day. Lower I-81 locations: Hagerstown, MD; Martinsburg, WV; Strasburg, VA, Mt. Jackson, VA; Lexington, VA; Wytheville, VA; Bristol, TN; Knoxville, TN; in 2019: Staunton, VA and Roanoke, VA (<https://www.tesla.com/supercharger>)
- Provides overnight charging stations (“Destination Chargers”) free to hotels, parks and other locations; about 4,000 are currently in the U.S. Local: Courtyard Blacksburg, Holiday Inn Christiansburg, Comfort Inn Troutville, Country Inn & Suites by Carlson Roanoke, Holiday Inn Express Roanoke and Hotel Roanoke. (<https://www.tesla.com/destination-charging>)
- Started with a luxury sedan BEV (Model S), then a luxury SUV BEV (Model X) and currently a mid-size sedan BEV (Model 3). Promises a future mid-size BEV SUV (Model Y) and a compact BEV.

Other car companies are desperately trying to catch up with Tesla in the BEV category:

- Volkswagen has promised four BEVs with over 250-miles range.
- Audi has promised one long-range BEV.
- Ford has promised 16 BEVs.
- General Motors has the Chevrolet Bolt EV (238-miles range) and has promised 20 BEVs by 2023.
- Volvo has promised some BEVs.
- Nissan has promised a new LEAF with over 250-miles range in 2019.
- Subaru has promised BEV versions of existing models.
- Kia has promised a 236-miles BEV.
- Hyundai has promised a 250-miles BEV.
- BMW has promised a BEV competitor of the Tesla Model 3.
- Mercedes-Benz has promised BEV versions of existing models by 2022.

But having cars that compete with Tesla model is far from enough. They also need a nationwide network of fast-charging stations. Some years ago Tesla offered that other car companies join Tesla in building the Supercharger network and designing their cars to use it, but none did. Now, belatedly, some car companies, notably Volkswagen, are working hard to increase the network of CHAdeMO charging stations for Asian cars and the CCS charging stations for U.S. and European cars. I doubt if they will match the Tesla Supercharger network within the next decade.

There is more pressure than Tesla that is causing the other car companies to move so rapidly to BEVs. Many countries are planning to ban the sale of gasoline/diesel cars in the future:

- Britain plans to ban their sales in 2040 and all cars must be electric in 2050.
- France plans to ban their sales in 2040.
- Germany plans to ban their sales in some future year.
- India plans to ban their sales in 2030.
- China plans to ban their sales in some future year.
- Norway plans to ban their sales in 2025.
- Several other nations plan to ban their sales in some future year.
- Eight U.S. states plan to ban their sales in some future year.

All of this is very good news for reducing carbon-dioxide emissions that cause global warming, for preparing for the disappearance of fossil fuels as their extraction peaks and declines and for those who love to drive high-performance cars.