

THE Evolution OF A Revolution

Electric-drive vehicles have the potential to give us a zero-emissions transportation future. UCS outlines the steps needed to make this dream a reality.

The latest news from the auto industry is electrifying—most major car companies and some start-ups are planning to offer at least one car driven partially or completely by electricity in the next few years, with the Nissan Leaf and Chevrolet Volt leading the way this fall. These electric-drive vehicles could be the start of a revolution that helps to dramatically cut urban smog-forming pollution, reduce U.S. global warming

pollution 80 percent or more, and effectively end our oil addiction by 2050.

But to make such a revolution reality, we need patience and a mix of smart policy

To make electric-drive vehicles a reality, we need patience and smart policy changes.

changes. Electric-drive vehicles won't solve global warming overnight, or even in the next 10 or 20 years, but their long-term potential as a key part of the solution is so great that we cannot afford to let them fail.

Believe (Much of) the Hype

Expectations are high for electric-drive vehicles, and rightfully so. Battery-electric vehicles (BEVs), for example, have no gasoline engine and do not directly emit smog-forming or global warming pollution; fuel-cell electric vehicles (FCEVs), which run on hydrogen, emit only water. Plug-in hybrid-electric vehicles (PHEVs), which have both an electric motor and a

By David Friedman

gasoline engine, do emit pollution when they run on gasoline, but can travel between 10 and

40 miles solely on battery power. The environmental impact of these vehicles is further reduced if the electricity or hydrogen on which they run is produced by renewable energy such as solar or wind power, which creates little or no smog-forming or global warming pollution.

These vehicles offer other benefits as well. For example, they can be recharged or refueled at home, are quieter than conventional cars, and deliver better acceleration from a stop. And electric-drive vehicles could be less expensive to own than even the best hybrids if industry and government research efforts are successful in bringing down the costs of fuel cells and batteries.

Of course, even if the auto industry could offer all new-car buyers an electric-drive vehicle today, it would still take about 15 years before all the cars on the road today could be replaced. A full phaseout will in all likelihood take even longer because of the time needed for the auto industry to develop the manufacturing capacity to make a lot of electric-drive vehicles (and for both research and economies of scale to make such vehicles less expensive).

An aggressive, but achievable, path for electric-drive vehicles would be to reach 3 to 5 percent of the new-car market by 2020—a faster penetration than hybrids achieved over the past decade—then accelerating to about 15 percent of the market by 2025 and about 80 percent by 2040. Even that will not be enough to end our oil addiction and cut global warming

pollution from cars at least 80 percent by 2050. But we *can* achieve those goals if we complement electric-drive vehicles with a combination of better fuel economy, better biofuels, and the policies needed to get these solutions in place (see the sidebar on p. 12).

Moving Electric-Drive Cars into the Fast Lane

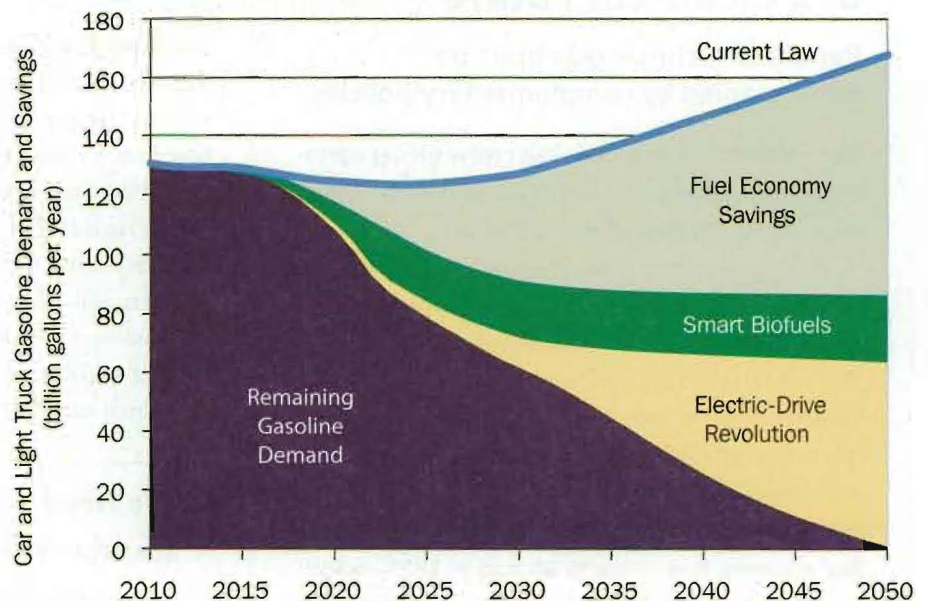
If electric-drive vehicles are to deliver on their significant promise, they will need help. UCS is working with decision makers in both government and the auto industry to adopt the following strategies, which would help ensure electric-drive cars and light trucks fulfill their potential:

Provide certainty for investors. For more than 40 years, the United States has shifted its financial and policy support from one promising energy technology to another, making it impossible for industry and venture capitalists to make long-term investments of their own. To break this cycle, the United States needs to adopt both a National Oil Savings Plan that would cut the country's projected oil use in half by 2030 (see "Perspective" on p. 3), and an emissions limit that would reduce global warming pollution at least 80 percent by 2050.

Invest in the vehicles. Today's electric-drive vehicles are too expensive for most consumers, with price premiums of at least \$10,000 to \$20,000 above the cost of a hybrid. Bringing these costs down will require both technological progress and economies of scale. The federal government should provide research funding for better batteries and fuel cells, incentives to help consumers buy electric-drive vehicles, and grants and loan guarantees for automakers as an incentive to manufacture more of these vehicles in the United States.

Invest in infrastructure. Electric-drive vehicles will be impossible to sell if consumers cannot easily recharge or refuel them, but oil companies and utilities will have little interest in paying for charging or hydrogen fueling stations if they lack confidence in a technology's future. And even for home recharging, most consumers will have to spend as much as a few thousand dollars to upgrade their home wiring to accommodate the cars' higher-voltage charging needs. The only way to solve this proverbial chicken-and-egg problem is to roll out infrastructure and vehicles at the same

The Road to a Gasoline-Free Future



This chart shows how the policies outlined in this article could eliminate gasoline demand in the U.S. transportation sector by mid-century. The uppermost line represents our projection of gasoline demand under current policies; the different colors represent the individual impacts of higher fuel economy standards, increased production of cellulosic biofuels, and a transition to electric-drive vehicles.



Shell Hydrogen and General Motors teamed up to build the first combined hydrogen and gasoline fueling station in North America, located in Washington, DC.

time. Making this work will require incentives for both consumers and industry, as well as changes to local building codes and zoning laws that can unnecessarily make infrastructure more expensive—or even impossible—to install.

Other Components of a Clean-Car Future

Beneficial technologies must be accompanied by complementary policies.

Since electric-drive vehicles can't solve global warming by themselves, UCS has been working to shape these key U.S. transportation policies:

Next-generation fuel economy standards. UCS played a critical role in delivering new regulations (finalized earlier this year by the Obama administration) that will raise the average fuel economy of passenger vehicles to more than 34 miles per gallon (mpg) by 2016 and establish the first-ever national global warming pollution standards for cars and light trucks. Our next step is to push the administration to boost fuel economy even more: to 60 mpg by 2025—which would save at least 40 billion gallons of gasoline by 2030 on top of the benefits from the 2016 standards.

Next-generation biofuels. Cellulosic biofuels made from grass, wood waste, or even garbage could cut gasoline use by another 20 to 25 billion gallons. We are working to get the right incentives in place to help move this technology out of the lab and into the marketplace. To learn more, see "Newsroom" on p. 4.

Ensure the availability of "green" energy. Electric-drive vehicles reduce or eliminate tailpipe pollution, but if they are recharged with electricity generated by fossil fuels, or refueled with hydrogen made from fossil fuels, they will be far from pollution-free. We therefore need a strong renewable electricity standard that requires utilities to increase the percentage of clean power they generate, and a low-carbon fuel standard that ensures hydrogen, biofuels, and other gasoline alternatives are as clean as possible.

Starting the Revolution

The concept of supporting electric-drive vehicles is not new; some tax breaks and other financial resources for such vehicles have been on the books for years. But they are not big enough and do not last long enough to help these vehicles reach the mainstream market. For this revolution to have a chance at success, an investment on the order of \$5 billion per year over the next 15 years will be required. The good news is that this money does not have to come out of taxpayers' wallets. We can instead redirect subsidies that currently go to polluting industries like oil (which currently receives about \$5 billion a year).

We need a renewable electricity standard that requires utilities to increase the percentage of clean power they generate, and a low-carbon fuel standard that ensures gasoline alternatives are as clean as possible.

UCS will continue to remind lawmakers that the typical two- to four-year political cycle is not enough time to deliver big results, and that we have to invest in technologies with some risk if we are to succeed. Considering that our nation has relied on one basic engine technology and one fuel for more than a century, the switch to electric-drive vehicles may feel more like evolution than a revolution—but it is high time we face the challenges of climate change and America's oil dependence by moving our transportation system into the twenty-first century.

David Friedman is research director in the Clean Vehicles Program.



Visit our website at www.ucsusa.org/clean_vehicles to learn more about electric-drive vehicles and other technologies and policies that can help end U.S. oil dependence.