

## *Electricity: Fuel of the Future*

Nick Enge

“America is addicted to oil,” admitted President Bush in his 2006 State of the Union address. Petroleum accounts for 40 percent of all energy use in the United States today, and a whopping 96 percent of U.S. transportation energy. Our addiction is a major contributor to our economic problems (the deficit, high product prices), our social problems (terrorism, war) and our environmental problems (resource depletion, climate change). If we want any chance at continued prosperity in the future, we will need to free ourselves from oil.

In order to break our addiction to this admittedly awe-inspiring substance, we will need a swift economy-wide fuel shift toward an energy resource that is domestic, efficient, economic and clean. Despite the hype around biofuels, the only fuel that truly meets these needs is electricity.

Not only does electricity meet the needs of the transportation sector — it triumphs over both biofuels and gasoline in all relevant metrics. To begin with, electricity is the fuel that most efficiently makes use of the limited resources available to us. Unlike petroleum, which will eventually be depleted, electricity can be generated renewably from the sun. Of course, the biofuels “solution” also utilizes solar energy. But given an acre of switchgrass, and an acre of solar panels, you could drive 70 times farther in an electric vehicle (EV) than you could running on cellulosic ethanol. If we covered all sun-facing roof space in the United States with solar panels, we could meet our entire transportation energy demand with solar power. Alternatively, an area in the desert one-fortieth the size of Nevada would do. Cellulosic ethanol would require us to plant a crop of switchgrass over an area the size of Colorado and Wyoming combined.

With the option of solar power available to us, electricity is also the cleanest transportation fuel we have (black bars in the figure). While the average U.S. gasoline car emits more than four tons of carbon dioxide each year, along with various other pollutants, a solar-powered electric car would have zero emissions. Current biofuels have repeatedly been shown to reduce carbon emissions very little, if at all, and the research of Stanford professor Mark Jacobson has suggested that widespread use of ethanol could increase emissions toxic to human health.

But what if the source of electricity is not the sun? Even charging the car with power from the average U.S. electricity grid — half of which comes from coal — the yearly carbon emissions would be one and a half tons, significantly less than gasoline’s four.

Even in the wildly unreasonable scenario that an electric car was charged with one hundred percent coal-fired electricity, emissions would be two and a half tons per year, still less than corn ethanol's three. Regardless of its source, electricity is the cleanest transportation fuel.

Perhaps most surprisingly, electricity is also the cheapest fuel available (gray bars in the figure). While it costs almost \$1,500 per year to drive the average gasoline car, and would cost about \$1,200 to fuel up with ethanol, an electric car would cost just \$300 per year to charge from the regular power grid. Charging an EV with residential solar power in California would cost \$500. Even in Massachusetts, which has significantly less solar potential than other parts of the country due to its climate and latitude, a solar electric car would cost just \$750 per year — half that of your current gasoline car.

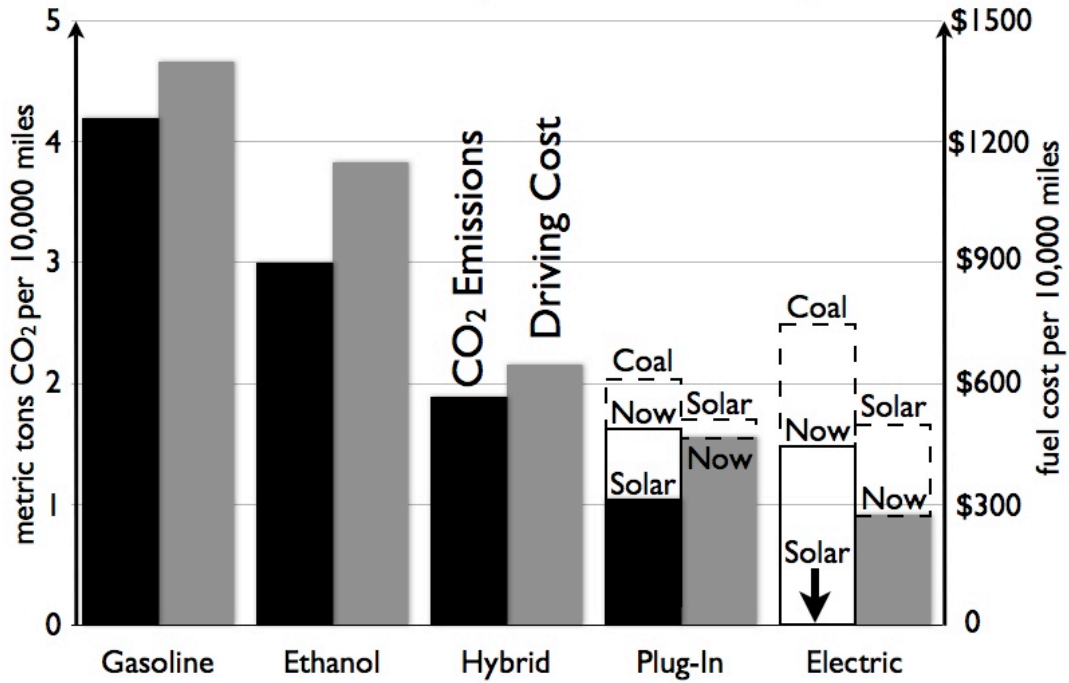
Historically, the biggest drawback to EVs has been their range — even today, the best all-electric car, the Tesla Roadster, is limited to 220 miles per charge. However, in the coming transition to electric vehicles, you need not worry that you will be restricted in your ability to roam. The all-electric cars of the near future will be joined by “range-extended electric vehicles” (REVs), also known as “plug-in hybrids” (PHEVs), which will feature small gasoline generators to recharge the car's battery on-the-go. With an REV, you will be able to drive all-electric for your daily commute (up to about 40 miles per day), then hybrid gas-electric for an unlimited range beyond that.

So when can you buy an EV, and for how much? The first full-featured EVs will be hitting the road later this year. Although the Tesla Roadster EV, which accelerates from zero to sixty in 3.9 seconds, is selling for \$100,000, more affordable options are on the way. The Aptera Typ-1 (available as EV or REV) and Chevy Volt (REV) will be available in 2009 and 2010 respectively, for about \$30,000 each. A Tesla REV in the same price range is expected in 2012. By then, Toyota, Honda and others can be expected to join the market. If you can't wait until then, a regular hybrid like the Prius is the best option for 2008.

But remember, even driving a Prius will not reduce your petroleum demand and carbon emissions enough to solve all the problems associated with oil. If we want a sustainable energy source for fuel that is domestic, affordable and clean, the only logical choice is electricity.

*Special thanks to Gil Masters for his insights on this issue. Nick wants an Aptera Typ-1 REV. Send donations to [nick@positivesustainability.org](mailto:nick@positivesustainability.org).*

## Future Fuel Options Compared



**Citation:** Enge, Nick. (2008, May 8). "Electricity: Fuel of the Future" *The Stanford Daily*. <http://www.positivesustainability.org/daily/ps4cars.php>