Many a young gentleman’s first—and only—experience with an electric car was the “bumper car” ride at the local amusement park or state fair. The author himself fondly recalls the pleasure he derived as an eight-year-old in smashing into the whirling dervish of similarly excited boys in their cars. Of course, the forthcoming generation of electric cars is meant to replace the internal combustion engine, not satisfy the aggression of eight-year-olds. Therefore, the question is whether these cars will provide a realistic alternative, which I define as providing greater energy efficiency and reduced environmental impacts cost-effectively.

There is no doubt that these new electric cars can offer greater energy efficiency, even if claims by General Motors that its Chevy Volt will provide the average driver who recharges the car every night the equivalent of 230 miles a gallon of gas are silly.\(^1\) Estimating the fuel efficiency of an electric car in terms of miles per gallon of gasoline is nonsense, unless the car’s batteries happen to be charged by electricity from a gasoline-powered generator. A more useful measure is one that considers the total energy needed to move an electric car—or any car—a unit of distance.

In a 2006 article, Tesla Motors prepared a report comparing the energy efficiency of their car with those of gasoline and diesel power cars, hybrids, and even hydrogen power vehicles.\(^2\) Based on a number of “best-case” assumptions, the authors of the Tesla report showed that the Tesla Roadster offered twice the “well-to-wheel” energy efficiency (measured in kilometers per megajoule) as a Toyota Prius hybrid.\(^3\) Not surprisingly, the Tesla vehicle, being twice as energy-efficient, was also more environmentally friendly, with half the carbon emissions of the hybrid.

**CONSIDER THE REALITIES**

Thus, it would seem that an electric car future does offer energy and environmental salvation, especially if powered by “free” energy from the sun and the wind. Nevertheless, before we all begin salivating over our extension cords, there are a few economic realities that ought to be considered. First, most electric car batteries will be charged from power produced by the grid using a mix of fossil-fuel and renewable technologies. If you are in the Midwest, for example, the majority of your electricity is likely generated by coal-fired power plants, which are far less fuel-efficient, but far cheaper, than a brand new state-of-the-art combined-cycle plant.

Second, one must consider the cost of the electricity needed to recharge the batteries. The Tesla’s lithium-ion batteries mean the car uses just over 0.2 kilowatt-hours a mile. If the typical residential electric customer pays 15 cents a kilowatt-hour, then the Tesla costs just three cents a mile for “fuel.” Compared with a gasoline-powered vehicle getting 30 miles a gallon, that implies a cost of 90 cents a “gallon,” far less than the average price of gasoline. Thus, from the standpoint of just fuel costs, electric cars look great.

However, recharging one’s electric car, or millions of electric cars, will require more than extension cords. One must consider the cost of the recharging...
Thus, by all means, let us continue research on electric cars and, especially, improved battery technologies, which could be used not only for powering electric cars, but also for broader electric storage alternatives. As for the huge subsidies that will be needed to develop a recharging infrastructure and to induce all but the wealthiest consumers to buy the current generation of electric cars, perhaps that money can be better used elsewhere, especially given the current state of the U.S. economy. In the meantime, check out the bumper cars.

NOTES
3. By “well-to-wheel” efficiency, the authors include the efficiency of extracting and processing fuel used to generate electricity, the efficiency of charging batteries, and the efficiency of the electric motor converting stored electricity into moving the vehicle. Similarly, for an internal combustion engine, the well-to-wheel efficiency includes the energy in extracting and refining gasoline and diesel fuel, and the efficiency of the engine itself. The methodology is based on the assumed efficiency of fossil fuel extraction and transport, refining, and so forth. Tesla, for example, assumed that all of the electricity used to charge its vehicle’s batteries would be generated by a state-of-the-art, natural gas-fired, combined-cycle plant with a fuel efficiency of 60 percent, which implies a heat rate of less than 6,000 Btu’s a kilowatt-hour.
5. Ibid.
6. Of course, research and development continues for new battery technologies that will replace the current state-of-the-art lithium ion batteries. These include lithium iron phosphate, lithium cobalt oxide, and lithium nickel manganese oxide. Unfortunately, at this juncture, the manufacturing costs of these batteries are too high to be commercially viable. Moreover, another concern about rapid increases in the number of electric cars is the world supply of lithium itself. See, e.g., Motavalli, J. (2009, August 25). Will hybrid and electric car batteries force a global lithium shortage? thedailygreen.com, http://www.thedailygreen.com/living-green/blogs/cars-transportation/lithium-batteries-electric-cars-460209?src=rss. See also Tahil, W. (2006, December). The trouble with lithium: Implications of future PHEV production for lithium demand. Meridian International. Available at: http://www.evworld.com/library/lithium_shortage.pdf.