The Electric Car Boondoggle

By Mathew Hurwitz

There are two electric cars on the market that have received a lot of attention in the media. One is GM's Chevy Volt and the other is the Tesla Model S. Extravagant claims have been made by both manufacturers to have us believe that these that these automobiles are practical and economical to drive. As we shall see, that is not really true when one takes into account all the factors which contribute to the total operating cost of each of these two vehicles.

Chevy Volt

The manufacturer claims that "The Chevy Volt is the most fuel-efficient car with a gasoline engine currently sold in the U.S. -- and it's easy to see why. While most plug-in cars can make it about 20 miles tops before switching to hybrid mode, the Volt can run up to 38 miles on battery before switching over to its 1.4-liter four-cylinder engine." GM describes their product as follows: "The Volt is powered by an electric motor that's connected to a 1.4-liter four-cylinder gasoline engine. It runs exclusively on battery power until the charge drops to 30 percent and the gas motor kicks in. There are four modes -- Normal, Hold, Sport and Mountain ....When running on gasoline, the Volt returns 35 mpg city and 40 mpg highway." When all of the energy, battery plus gasoline, is used the total range of the car is 270 miles. At that point one must recharge the battery which takes nearly 10 hours if the car is plugged into a 120 V outlet. The charging time is less if one has a 240 V outlet and a special battery charger.

The cost of the electricity to charge the Volt battery to its capacity of 16 kwh is approximately $2.40. The cost to fill the 9 gallon tank with $4 a gallon gas is $36*. Therefore the total cost to drive the Volt 170 miles is $40.40. That works out to a little under 24 cents a mile.

The cost of the car is $34,000. If the car runs 15,000 miles a year for an expected lifetime of 10 years, then it costs 20 cents a mile to amortize it.

GM claims that the cost of replacing the battery at the end of its seven-year life is about $3000. It costs just under 3 cents a mile to amortize the battery.

The total Operating Cost of the Chevy Volt is 47 cents per mile.

Tesla

For the purpose of discussion consider the Tesla Model S with the 85 kwh battery which will charge to attain a range of 270 miles. According to independent tests, driving the way most of us do, the range is about 180 miles. The cost of recharging the battery is nearly $13 which works out to 7 cents per mile.
The Tesla model S, with the 85 kWh battery, costs $74,000. Assuming that the owner drives the car for 10 years and puts on 150,000 miles, and assuming the car depreciates by 90%, the $67,000 lost value works out to 44 cents per mile. (It is doubtful that a 10-year-old Tesla will be worth $7400).
The 85 kWh battery costs $12,000 to replace and it has a life of 8 years, which, in our example, equals 120,000 miles. That works out to 10 cents per mile.
So the operating cost of the Tesla Model S, with the 85 kwh package, adds up to 61 cents a mile.

Comparison 1

Let's compare the operating cost of the Chevy Volt with the typical gasoline powered subcompact car after which it is fashioned. These conventional small cars cost as little as $15,000 and get up to 40 miles per gallon.
Using $4 a gallon gas the operating cost is 4 cents per mile.
The cost of amortizing the car for 10 years, or 150,000 miles, is 10 cents per mile.
So the total cost to run the conventional car adds up to 14 cents a mile.
Therefore the cost per mile of driving the Chevy Volt is 3.4 times more than for a conventional gas-powered subcompact car. The purchase price of the Chevy Volt is more than double that of the conventional gas powered subcompact car. It is no wonder that General Motors is having such a hard time selling these exquisitely complicated cars.
Furthermore, the range of the Volt is only 270 miles, whereas the range of the conventional gas powered subcompact is over 350 miles. It takes 10 hours to recharge the Volt but it only takes 10 minutes to refill the gas tank of the conventional subcompact.

Comparison 2

Let's compare the Tesla Model S 85kwh with the Cadillac Model CTS 3.6 L V6. This car is comparable in every way to the Tesla. The fuel economy is 24 mpg city and 31 mpg highway. Using the average, the Cadillac is good for nearly 28 mpg. So the gasoline cost is 14 cents per mile.
Assuming the $55,000 Cadillac is used for 10 years and 150,000 miles, and assuming that the car depreciates by 90%, the same as for the Tesla S, the cost to amortize the $50,000 lost value is 33 cents per mile.
So the total operating cost of the Cadillac CTS is 47 cents per mile.

Therefore the cost of driving the Tesla Model S 85kwh is 30% more than the Cadillac CTS. And the Tesla costs $19,000 more than the Cadillac. With its 18 gallon fuel tank the Cadillac has a range of 500 miles whereas, optimistically, the Tesla has a "claimed range" of 270 miles. Refilling the fuel tank of the Cadillac takes 10 minutes. At-home recharging the battery of the 85 kwh Tesla S takes 10 hours. It takes 30 to 60 minutes to recharge at a "Supercharger" recharging station.

Conclusion

The Chevy Volt and the Tesla S are both overpriced turkeys. Both of these electric cars deliver about half the driving range of their conventional gas powered counterparts. Measured in cents per mile, both of the electric cars cost considerably more to operate than their conventional gas powered counterparts.
Clearly the electric car is not ready for prime time. It is no wonder that very few Americans are buying these novelties. The electric car is a boondoggle.
Corrections:

1) In MA, HI. and FL (where I lived all my life) electricity costs 15 cents/kwh, or more,
2) Volt battery is rated by GM at 16 kwh
3) GM claims the range of the Volt is 270 miles.
4) 9 gallons of $4 gas costs **$36.00**
5) Cost to recharge battery is 16kwh X $0.15 = **$2.40**
6) Total cost to go 270 miles + $2.40 + $36.00 = **$38.40**
7) Cost per mile is $38.40 / 270 = **14 cents per mile**
8) Cost per mile to amortize 90% of the cost of the Volt used for 10 years at 15,000 miles per year = (0.9 X 34000) / (150000) is 30600 / 150000 = **20 cents per mile**
9) cost of battery / (life of battery X15000 miles per year) = 3000 / (7 X 15000) = 3000 / 35000 = 2.86 which rounds to **3 cents per mile**
10) total cost per mile = 14 + 20 + 3 = **37 cents per mile**
11) The operating cost of the ICE car is **14 cents per mile**
12) Volt cost per mile / ICE car cost per mile = 37 / 14 = **2.6 times more costly to operate. (not 3.4)**

The author is a retired engineer, BSME, MIT, a consultant, and independent inventor with several dozen patents and peer reviewed technical papers to his credit. He welcomes feedback at hurwitzmathew@gmail.com

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